INCOME TAXES IN A LONG-TERM MACROECONOMETRIC FORECASTING MODEL.

bу

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ABSTRACT

Title of Dissertation: Income Taxes in a Long-Term Macroeconometric

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This dissertation describes the building of an econometric model of the income distribution and income tax system and its incorporation into a large interindustry forecasting model of the U.S. economy. The model is used to help answer relevant questions about the size distribution of income, the tax burden by income size, and economic effects of different types of tax reform. The interindustry model was developed by the Interindustry Forecasting Project at the University of Maryland (Inforum).

The dissertation has four main parts. First, a detailed model of the U.S. income distribution is constructed. The model explains and forecasts cyclical and secular trends in the size distribution of adjusted gross income. An original way of describing and modeling the income distribution is introduced which not only accurately portrays and forecasts the empirical distribution but also uses linear parameters which are easily estimated and have clear economic interpretations.

Second, a forecasting model of federal income tax collection is constructed which uses the results of the income distribution model. The tax model has sufficient detail to predict and simulate changes in the tax burden of various income groups under differing scenarios of tax reform. It explicitly takes into account the major parameters of the tax system which include the rate schedule as it appears in the form

1040, the personal exemption amount, the zero-bracket or standard deduction amount, and the benefits available to certain taxpayers through itemizing deductions and taking tax credits.

Third, a bridge is constructed which converts the distribution of adjusted gross income to a distribution of personal income as defined by the National Income Accounts. This bridge distributes transfer payments and other types of income not part of adjusted gross income to the various groups of people defined by size of income.

Finally, the model is used to simulate the economic effects of, among other scenarios, the tax reform package passed by Congress in September of 1986. The simulation includes a detailed analysis of the proposal's effects on equipment investment incentives, which makes use of features and properties previously existing in the interindustry forecasting model.

This work is distinguished from other modeling exercises in its emphasis on detailed tax policy simulation capabilities and long-term forecasting properties in the context of a macroeconometric forecasting model.

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TABLE OF CONTENTS

Chapter 1 - Introduction.	1
Structure of the Model. Capabilities of the Model Illustrated: The Base Forecast.	5 11
More Capabilities of the Model: Tax Reform. The Effects on the Goods Mix of Consumption: a Flat Tax.	15 19
Chapter 2 - The Income Distribution Model. The Personal Consumption Model. The Modeling Framework. Estimation Procedure for A and B. Interpretation and Forecast of the Parameters. Preparing the Data for Income Tax Collection.	35 38 41 52 58 63
Chapter 3 - The Income Tax Model. Applying the Tax Laws. Conversion of Standard to Effective Tax Rates. Determination of the Distribution of Disposable AGI. Advantages of the Framework.	95 96 99 109
Chapter 4 - The Reconciliation of Adjusted Gross Income and Personal Income. Part (a): Conversion of PI to AGI in the	135 136
Aggregate. Part (B): The AGI-PI Bridge. The Construction of the AGI-PI Bridge.	144 150
Chapter 5 - Simulation of a Tax Reform Proposal. The Tax Reform Plan. Putting the Tax Reform Provisions in the Model. 1. The Rates. 2. Accounting for Tax Base Expansion Under Tax Reform.	167 169 170 170
3. The Conversion From Standard to Effective Tax Under Tax Reform. Simulating Corporate Tax Reform. Provisions Not Modeled. The Results of the Simulation.	172 174 183 185
Appendix A - The Inforum Investment Equations.	207
Appendix B - The User Cost of Capital.	213
Appendix C - The CES Income Distribution Model. Estimation Procedure. Interpretation of the Parameters.	216 216 222
Mathematical Appendix.	243
Selected Bibliography.	256

LIST OF TABLES

1.1	Population and Income Distribution by	24
	Ventile and Household Size - 1981.	
1.2	The AGI Distribution Forecast.	25
1.3	Forecast Tax Rates.	26
1.4	Upper Limits for Per Capita Income.	27
1.5	Index of Ventile Limits for Personal Income.	28
1.6	Ratio of Post-Tax to Pre-Tax Income Indexes.	29
1.7	The Impact of Tax Reform on Selected Economic Variables.	30
1.8	Equipment Investment by Broad Industry Group.	30
1.9	The Impact on Persons: Distribution of Federal Income Tax Liability.	31
1.10	The Impact on Business: Output by	31
	Producing Sector.	
1.11	Rates, Revenue and Personal Income	32
	Distribution Indexes for 1988 Under Base and Flat Tax.	
1.12	The Goods Mix of Consumption Under Base	33
	and Flat Tax, 1988.	
2.1	Regression Results.	68
2.2	The Fit of the Model.	71
2.3	History of the Explanatory Variables.	77
2.4	Parameter Expectations and Qualitative Estimation Results.	78
2.5	Time-Series Regression Results.	79
2.6	Equation for Forecasting Federal Income Tax Population Base.	80
2.7	Regression Equations for Forecasting the Share of Total Population from Each of	81
	the Household Size Categories.	
2.8	Regression Equations for Forecasting the	87
	Share of Total AGI from Each of the Household Size Categories.	
2.9	Equation for Forecasting the Average	93
	Household Size if Over Six.	
2.10	Population and Income Distribution by Ventile and Household Size - 1981.	94
3.1	Equations and Plots for Standard and Effective Tax Rates.	113
3.2	Estimated Ratios of Effective-to- Standard Tax Rates: Regression Results.	132
3.3	Estimated Ratios of Effective to Standard Tax Rates by Household Size.	133
3.4	Estimation Results of ETR = a + b *STR.	134

LIST OF TABLES (continued)

4.1	The Relation of the 12 Reconciliation Items to the NIPA Tables.	155
4.2	Regression Results of Equations Used to	156
4.2	Forecast Reconciliation Items.	150
4.3	The Adjusted Gross Income - Personal	162
	Income Bridge.	
4.4	An Illustration of the Adjustment Procedure.	163
4.5	The Indexes of Income Distribution Before	16 4
	and After the Nonfiler Adjustment.	
4.6	Indexes of Ventile Limits for Personal Income.	165
4.7	Ratios of Post-Tax to Pre-Tax Income	166
	Indexes - Personal Income.	
5.1	A Summary of the Tax Reform Plan.	193
5.2	Standard-to-Effective Tax Ratios.	195
5.3	Percent Change in Aggregate Capital Cost	196
	from Current Law Base.	-
5.4	Simulated Personal Income Tax Revenue.	187
5.5	Distribution of AGI - Base and Reform.	197
5.6	Upper Limits for Per, Capita. AGI.	198
5.7	Tax Rates - Base and Reform.	199
5.8	Federal Income Tax Liability	200
	and Reform.	
5.9	Index of Ventile Limits for Disposable	201
	Personal Income - Base and Reform.	
5.10	User Cost of Capital by Industry.	202
5.11	Equipment Investment By Industry.	204
5.12	The Impact of Tax Reform on Selected	206
	Economic Variables.	
A. 1	Price Elasticities and Simulation Results.	211
C.1	Estimation Results of the CES Income	230
	Distribution Model.	-
C.2	The Fit of the CES Income Distribution Model.	235
C.3	Regression Results of the Time-Series	241
	Equations for the CES Parameters.	

LIST OF FIGURES

1.1 1.2	The Distribution of AGI - 1988. Forecast of Tax Rates - 1988.	13 14
2.1	The Lorenz Curve Transformation.	43
2.2	T & S for 1981, Household Size 1.	49
2.3	$s^{1.5}(\sqrt{2}-s)^{.5}$ Plotted on S.	49
2.4		50
2.5		50
_	S & T With Differing Values of A and B.	51
	S & T With Differing Values of A and B.	51
2.8		57
2.9	- · · · · · · · · · · · · · · · · · · ·	60
-	Time Series of Parameters "B."	60
3.1	Standard and Effective Tax Rates, 1981, 82.	101
4.1	Flow Chart.	136
4.2	NIPA Table 8.14.	137
4.3	•	138
5.1	Standard-to-Effective Tax Ratios - Base and Tax Reform Scenarios.	175
5.2	Capital Cost and the Inflation Rate.	1 82
C. 1	Time-Series of Parameter A.	225
C.2	Time-Series of Parameter D.	225
C.3	Time-Series of Parameter P.	225
C. 4	Time-Series of Parameter V.	225

CHAPTER 1 INTRODUCTION.

The U.S. income tax system is one of the most influential and complex institutions in the economy. Yet most macroeconometric forecasting models give it only summary treatment. If econometric models are to imitate the structural characteristics of the economy, then the most detail and attention should be given those areas which are most important to the economy. This explains why modelers of an economy such as ours give most of their attention to the behavior of the private sector. However, they must not forget that ours is a mixed economy, and that the federal government exerts an influence nearly as large as that of the private sector.

Income tax policy in econometric models is necessarily treated as exogenous. But exogeneity must not be confused with irrelevance or invariance. In most models, the income tax section focuses only on the question of "how much?". The typical model's tax section consists merely of a scalar representing the average tax rate applied to a measure of taxable income. This approach scarcely reflects the complexity of the tax code. The questions of "how?" and "from whom?" are ignored. In addition, few models are equipped to answer the "what if?" questions of tax reform.

There have actually been two main approaches to building a forecasting or simulation model of the tax system. The first is the scalar method adopted in most macroeconometric forecasting models, briefly outlined above. Its main drawback is its inability to simulate specific changes in the tax law. The other approach is the microsimulation method. This approach works with a data base that

consists of a large number of individual income tax returns for a single year. Each observation has data from every line on the tax return, and thus can be used to analyze every provision of the tax code. This cross-section analysis can be used to estimate and simulate behavioral responses to detailed changes in the law. The Joint Committee on Taxation uses such a model for its analyses of tax reform proposals. Another recent example of the applications of this approach can be found in Lindsey (1985). The drawback of this approach is that it is static in the sense that there is no built-in response of macroeconomic variables to changes in the tax code. These variables, most notably aggregate income, have important feedback effects on the outcome of the tax system.

There does exist a model which helps fill the gap between the two approaches in the microsimulation context. The Transactions Model of Bennett and Bergmann² simulates the behavior of individual actors in the economy and sums and scales them to obtain macro aggregates. Their model, without the tax detail of the microsimulation models described above, does have the capability for many tax policy simulations in which macroeconomic feedback effects are important. It is a unique model in that it is recursive with a weekly simulation period. It is entirely different in character than any macroeconometric model.

This dissertation seeks to fill the gap in income tax modeling between the main micro and macro approaches while staying within the more traditional context of a macroeconometric model. This tax model has a much more detailed simulation capability without having to go to a huge data base of individual income tax returns. Both the income distribution and the tax system are modeled and incorporated into a

large interindustry model of the U.S. economy where feedback effects from macroeconomic variables are possible. The model is used to help answer relevant questions about the size distribution of income, the tax burden by income size, and economic effects of different types of tax reform. The interindustry model was developed by the Interindustry Forecasting Project at the University of Maryland (Inforum).

The model developed here does address the questions of how, and from whom are taxes collected, is able to address many "what if?" questions in addition to answering the all important question of "how much?". An outline of the model will follow, but first, the next few paragraphs will give very brief sketches of the tax sections of some well-known macroeconometric forecasting models. Without going deeply into the advantages and disadvantages of each method's ability to forecast, it should be clear that they leave much to be desired in terms of their abilities to simulate legislated changes in the tax code.

The DRI model calculates an average effective tax rate for federal personal taxes and nontaxes which is the ratio of revenues to the estimated tax base. That tax rate is forecast with a regression equation estimated with quarterly data using as explanatory variables the ratio of the tax base to employee hours worked, which is presumably a measure of inflation, and a list of dummy variables reflecting past changes in the tax code. Simulations are done by changing that single tax rate which is then multiplied by the estimate of the tax base³.

The Chase Econometrics quarterly model adopts an approach only slightly different, explained in the following quote: "The effect of overall changes in tax rates cannot be directly quantified without including the whole range of tax tables. A reasonable proxy variable

can be constructed by dividing total tax receipts generated at marginal tax rates by total income subject to tax at marginal rates. This procedure generates an average marginal tax rate. The Chase model then uses this constructed rate times personal income minus transfers as an explanatory variable in an equation which forecasts federal personal tax receipts. Other variables in the equation are dummy variable reflecting past code changes and witholding policy changes and separate terms for wage income and other income. Again, simulations are performed by changing the calculated average marginal rate. \$\frac{1}{4}\$

The Federal Reserve Board model uses the same basic approach, but at least allows for changes in the personal exemption amount. It forecasts the tax base with a regression equation as a function of personal income per capita and the personal exemption amount. Then, tax revenue is calculated in the usual way by multiplying that tax base by a calculated single overall effective tax rate. The Washington University model says only: "Various categories of tax liablilities generally are calculated as the product of taxable income and an appropriately defined average tax rate."

The Fairmodel handles federal income taxes in about the same way except that the average tax rate is calculated as a constant term plus a "progressivity parameter." The values of those two components of the average tax rate were determined by an equation which regressed aggregate income tax revenue per person on a set of dummy variables reflecting subperiods with a constant tax code times per capita taxable income, an intercept, and the per capita taxable income squared. The coefficient on the last term is the progressivity parameter, and the sum of the intercept and dummy terms is defined to be the constant term.

Alternate policy simulations are achieved by changing the constant term component of the average tax rate. This approach allows an estimate of progressivity to affect the income elasticity of revenue, but like the others, offers limited capability for simulation of changes in the tax code. 7

The models listed above are all shorter-term quarterly models. stated before, a tax model which accurately reflects the way in which taxes are actually collected is even more important for a long-term simulation model. Perhaps this is why the only model surveyed which has much detail in its tax section is the Wharton long-term annual model. The Wharton model distributes "taxable income" over 342 brackets ranging from \$100 to over \$500,000. Taxable income is derived from personal income after adjustments are made for Social Security contributions, transfer payments to persons, the number and value of exemptions, and The distribution is done according to a gamma probability deductions. function with taxable income and number of returns as inputs. are computed using only the 1980 IRS schedule "Y" for married taxpayers. The Wharton long-term model is capable of simulating across-the-board tax changes and tax bracket indexation for inflation. Those are the only two capabilities mentioned in the description. o

The Structure of the Model.

The goal of the model described in this dissertation can be explained in terms of its desired inputs and outputs. There was a need to construct a model that uses as its exogenous inputs the major provisions of the tax code: the complete tax rate schedules, the standard deductions, the personal exemption amount, the earned income

credit and a way to account for less universal provisions like itemized deductions, and tax credits. The desired output of this model is a forecast of federal tax revenue, a distribution of disposable personal income, and a relatively detailed simulation capability. In order to meet these needs, a method for modeling the income distribution had to be developed.

The method developed in this dissertation for the income distribution model has been applied here to a unique and specialized way of describing that distribution. The method itself is fairly general. It can be applied to the distribution of anything for which a quantified Lorenz curve can be constructed. A Lorenz curve of income distribution plots the cumulative percentage of the population against the cumulative percentage of income which they receive. The method used here will work either for individual or grouped data, and is applied here to the grouped data on the distribution of adjusted gross income (AGI) as it is appears in the <u>Statistics of Income</u>, (SOI) published annually by the Internal Revenue Service.

The objective of the income distribution model is to convert the model's forecasts of aggregate personal income into a detailed distribution of AGI. The detail is necessary so that the tax rate schedule can be appropriately applied. In other words, the number of households which fall into each marginal tax bracket and their average incomes must be forecast. The model of income distribution is entirely empirical.

The first step in modeling the tax system is to obtain a forecast of the size distribution of income. Certain economic variables have been found to affect the income distribution and the model explains and

forecasts cyclical and secular trends in the distribution. The method, which is described in more detail in Chapter 2, and with more precision in the mathematical appendix, was developed by first transforming the axes of the Lorenz curve⁹. That simple transformation makes possible the modeling of the income distribution with an elegant and smooth functional form. The advantages of this are that the function fits the data better than the usual statistical functions, and that the income distribution is allowed to vary cyclically and secularly, but is stable enough over time so that long-term simulations give plausible and well-defined results.

The shape of each Lorenz curve is described by two parameters. Roughly, the first of these parameters represents the amount which each curve protrudes or "bows" out from the diagonal line of equally distributed income relative to the base year's (1981) curve. The second parameter represents the amount which each curve "leans" or is skewed toward either the upper or lower end of the distribution, relative again to the base year's curve. The two parameters are estimated from the cross-section grouped data for each Lorenz curve. Lorenz curves are estimated for each year and each size household. The estimated Lorenz curve parameters are arranged in time-series, and are regressed on cyclical economic variables and a time trend. These equations are then used in conjunction with forecasts of the cyclical variables which come out of the macro model in order to forecast the shape of the Lorenz The resulting Lorenz curves are then applied to the aggregate curves. amount of AGI which is forecast as a function of personal income and the items such as transfer payments which make up the difference between personal and adjusted gross income, in order to forecast the number of people in each income tax bracket, and their average incomes.

The information on the distribution of AGI is then used to forecast income tax revenue. The average income from each income group obtained from the Lorenz curves is applied to the tax rate schedules exactly as they appear in the form 1040. There are a total of 120 groups for which these calculation are done, twenty groups defined by size of income for each of six household sizes. The incomes of single-person households are applied to the single tax rate schedule, while the incomes of all other household sizes are applied to the rate schedule for married taxpayers. The appropriate amount for each personal exemption is subtracted first, and the earned income credit is applied where appropriate. The application of these major parameters of the tax system results in a construct refered to as "standard tax rates," which are an estimate of the tax rate paid by the average members of each group assuming they take the standard deduction but do not take any other tax credits or tax preference items.

The standard tax rates are also calculated for each of the 120 groups for the years 1966 through 1982. It was possible to obtain, with some interpolations of the SOI data, estimates of the actual tax rates paid by comparable groups in the history. A relationship between standard tax rates and actual or effective tax rates by income group was then established by regression analysis over the historical period. The difference between standard and effective taxes represents the amount saved by each group from itemized deductions, tax credits and other tax-reducing provisions in the tax law. It is these regression equations which model this type of legal tax avoidance.

This analysis shows that the gap between standard and effective tax

rates grows not only according to the relative position of each income group in the overall distribution, but the gap also has grown over time for some groups. The projected relation of standard and effective tax rates in combination with the forecast of the income distribution allows a forecast of the tax revenue from each income group and in the aggregate. By making assumptions based on cross-section analysis of recent income tax returns about the relationship between standard and effective taxes under different tax reform proposals, it is possible to simulate the aggregate and distributional effects of tax reform with this model. Thus, by modeling the tax system in the way taxes are actually collected, the model can forecast not only how much revenue the income tax generates, but from what income groups it comes, and what changes would occur under different tax laws.

The tax system can have an overwhelming effect on the size distribution of disposable income. This is important not only in itself, but also because the mix of consumption goods depend on it. A detailed model of the tax system is necessary in order to give the consumption section an accurate estimate of the size distribution of disposable income.

Actually, the distribution of two types of income are necessary. The size and distribution of the tax burden depends on the size and distribution of AGI. It is the distribution of personal income, however, which helps determine the goods mix of consumption. There are many items which affect this latter distribution besides taxes and AGI, most importantly transfer payments. The model includes a section which distributes the items which represent the difference between AGI and personal income among the appropriate income groups.

The income distribution and tax models are further modified to accommodate a unique and special way of describing the income distribution. A good deal of computational effort has gone in to making the more general method apply to the specific requirements of the Inforum model. Consumption in the Inforum model depends on per capita income. Family size and other demographic variables are considered separately. 10 Also. the consumption part of the model requires a distribution of personal disposable income which groups the population into "ventiles." Each ventile contains 5% or one twentieth of the population. The ventiles contain people with similar per capita incomes arranged in ascending order. The income distribution is defined by indexes which represent the income of the highest person in each ventile relative to the overall mean per capita income. For example, an index value of 50 for the fifth ventile means that the person right at the cutoff between the fifth and sixth ventile, that is the person exactly at the 25th percentile of the income distribution, has an income of one-half the average per capita income.

A fair portion of the following chapters concerns making the output of income distribution and tax models conform to the form and definitions just described. For example, an algorithm had to be developed which combines the separate distributions from the six different household sizes into the ventiles just described, which contain people from all household sizes. These and similar procedures show that the method is flexible in conforming to different modeling regimes.

In long-term forecasting exercises such as the ones described here, the structure of the tax code becomes very important. The drawbacks of say, a simple scalar applied to taxable income are very apparent. The tax code is structured, so that when income increases, tax increase more than proportionally. This is because marginal rates are higher than average rates, and because the marginal rate structure is progressive. This effect is not captured by a scalar model, or even by a model which uses average tax rates by income group. Such models will tend to underestimate the revenue elasticity of income. This can become a serious problem in long-term forecasting because the changes in income over the long-term can be quite substantial. This is a significant factor even in a tax system which is indexed to inflation, because real income growth is taxed progressively at the margin also. The model described here taxes income at the margin, and fully accounts for bracket creep. It can also adjust for indexation to inflation of the brackets and personal exemption amounts. These are important properties for a long-term forecasting model.

What follows is an explanation, illustration, and demonstration of some of the model's capabilities. The output of the model under a base case forecasting scenario will be shown, along with brief explantions of how different tax law scenarios are simulated and the results of two such alternate scenario simulations.

Capabilities of the Model Illustrated: The Base Forecast.

The income distribution model, as shown before, distributes AGI among twenty equally populated groups. But an important consideration for a tax model is household size, because of the personal exemption amount. Unlike most models, which employ a measure of overall average household size of somewhere between three and four, this model

explicitly calculates the number of families of each of six sizes for each of the twenty income groups. Standard taxes are calculated for 120 groups. Table 1.1 shows the household size breakdown afforded by the model. Eventually, the household sizes are aggregated so that there are just twenty groups. The distribution of AGI for the base forecast is shown in figure 1.1 and table 1.2. The base forecast assumes the tax code that was in place just prior to August, 1986.

Figure 1.2 and table 1.3 illustrate the tax rates both standard and effective for each income group. Note that effective rates are never higher than standard rates. That is because the difference represents the amount of legal tax avoidance afforded by the tax code in the form of deductions other than the standard deduction, tax credits, and other preferential tax items. Items in the tax code which are additional taxes and would tend to raise effective tax rates above standard tax rates, such as the minimum tax, are accounted for, but are not sufficient to offset the preferential items. Note that the top group under the base tax law is able to reduce its average tax rate by about 30% relative to the standard tax rate. The effective tax rates in table 1.3 are multiplied by the tax base in table 1.2 to get the federal income tax revenue by income group.

Table 1.4 shows the highest per capita AGI in each ventile. These incomes are arrived at by interpolations described in the mathematical appendix and in Chapter 2. It is actually the distribution of personal income, not AGI which determines consumption in the model. The distribution of personal income also determines the incidence of other taxes besides income taxes at both the federal and state and local levels. The transformation of the distribution of AGI to personal

FIGURE 1.1



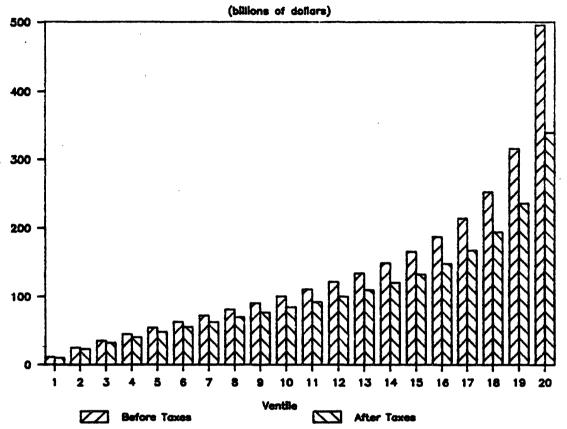
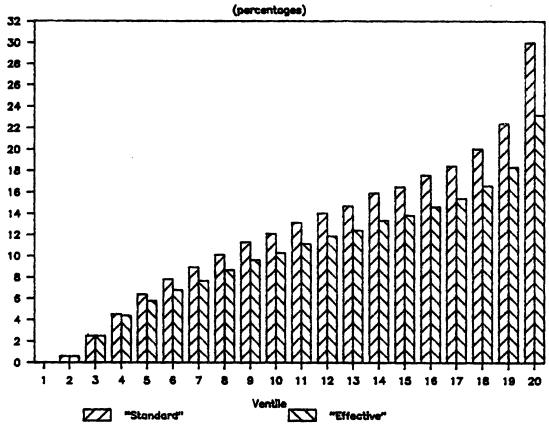


FIGURE 1.2

FORECAST OF TAX RATES — 1988.



income is accomplished through a bridge which distributes the items not part of AGI among the ventiles. These items include transfer payments, fringe benefits, imputations and other types of income.

Total taxes per ventile are subtracted from the distribution of AGI and personal income to get the distribution of both disposable AGI and disposable personal income, and at both the aggregate and cutoff definitions. It is the distribution of disposable personal income which determines the goods mix of consumption. That distribution, in index form is shown in table 1.5. The index is constructed by dividing the cutoff income by the overall mean. The number for the top income ventile represents not the income of the economy's single highest income, but the share of total income accruing to the top 5% of the population. The table shows the index both before and after all personal taxes. The progressivity of the personal tax system is evident by comparing values. Table 1.6 makes such a comparison by calculating the ratios of the indexes before and after taxes. The numbers in that table indicate that the lower ventiles, whose post-tax to pre-tax ratios are greater than one, are made better off in relative terms by the tax system. The upper ventiles whose ratios are less than one are made worse off. For many people in the middle portion of the income distribution, personal taxes make no difference in their relative positions.

More Capabilities of the Model: Tax Reform.

The model was used to estimate the major effects of the tax reform proposal passed by Congress in September, 1986. The details of this simulation are provided in Chapter 5. This section will provide just

the briefest description of the method and results. A description of the rest of the interindustry forecasting model can be found in Monaco (1984). 11 Because the section of the model which forecasts corporate income tax revenue is inadequate to simulate the detailed changes in this tax reform plan, overall static revenue neutrality was imposed. That is, it was assumed that corporate tax revenue would increase by the amount that personal taxes would be cut under a constant level of income.

The model predicts that the plan will give the economy a very slight boost in the long run. Although the plan will depress Gross National Product adjusted for inflation (real GNP) by 0.2% in 1987, real GNP will be 0.3% higher than it otherwise would have been in 1988 when the plan is phased in. By 1995, the economy will also be 0.3% stronger. The impacts of tax reform on the major macroeconomic variables generated by the model are shown in table 1.7

Personal income tax revenue will fall by about 5% once the plan is phased in. The largest relative tax cuts will go to the income groups at the bottom 30% and top 10% of the income distribution. This can be seen in table 1.10 which shows the estimated effects of tax reform on the distribution of federal personal income tax liability by income ventile. The groups which enjoy larger percentage tax reductions than the overall average are at the extremes of the distribution, meaning that the tax system becomes somewhat less progressive at the upper end, but more progressive at the lower end.

Except for the very lowest income recipients, who pay no taxes in either case, the low income groups are better off both absolutely and relatively because of the substantial increases in the personal

exemption amount and standard deduction. The middle and upper middle income groups benefit in absolute terms, but enjoy a relatively smaller tax cut than the other groups mainly because of the reduced deductions and credits. The highest income groups are made better off because of the lower marginal tax rates.

There will be individual winners and losers throughout, but the tax burden of any income group as a whole will not be drastically altered. The bill does go a long way, however, in correcting major problems with the current system. Besides its complexity and high marginal rates, the current system is "horizontally inequitable," which means a family's tax bill depends not so much on the amount of income received but on the type of income and the items on which it is spent.

The increase in corporate taxes, most notably the repeal of the investment tax credit, will depress equipment investment. The after-tax cost of using capital equipment will rise by a little over 5%, which will cause investment to fall by 2.6% in the short run and 4.4% by 1995. This cost of capital, which is explicitly modeled, depends on the corporate profits tax rate, the depreciation schedules, the investment tax credit, and interest rates. Interest rates will rise only slightly under the new plan. The model's ability to simulate the effects of changes in the cost of capital was an existing property. Only slight modification of the model was necessary to accommodate a simulation of the effects of this tax reform plan on capital costs, and hence, investment behavior.

The stimulus to the economy comes from the increase in consumption.

Although the decline in investment tempers the stimulus, it is not large enough to overcome the increase in consumer spending. Corporate tax

revenue is assumed to rise by enough to make the plan revenue neutral overall, therefore leaving the federal deficit unchanged. In other words, the tax bill is assumed to transfer taxes dollar-for-dollar from persons to corporations. This transfer results in a small net increase in aggregate spending because personal consumption is more responsive to changes in disposable personal income than is business spending to after-tax revenue. Profits and retained earnings absorb a substantial portion of the corporate tax increase. Also, the increase in consumption tempers the fall in investment. The overall outcome is a modest increase in aggregate spending and redistribution of resources from investment to consumption industries.

Other moderating forces are at work in the model. One is the savings rate, which rises in the simulation. Among other factors, the savings rate is a negative function of the unemployment rate and a positive function of lagged changes in disposable income. Both these variables act to increase the savings rate, thus dampening the stimulus to the economy. Therefore, aggregate consumption increases, in 1988, but not by the full amount of the increase in disposable income. The rise in consumption income will be further tempered by a decline in dividends paid to individuals because of the higher corporate taxes, thus lowering disposable personal income. Inflation was not affected by the proposal.

The effect on equipment investment by industry group is shown in table 1.8. Investment is affected because the tax bill will alter the after-tax cost of using capital equipment. The capital cost is the return on investment necessary to recover the cost of financing the machine, its depreciation and taxes. This cost would rise by about 12%

due to the elimination of the investment tax credit; but because the bill also lowers the corporate tax rate from 46% to 34% and changes the depreciation schedules, the overall rise in capital costs will be about 5% under tax reform. The estimates shown reflect economy-wide averages with respect to depreciation schedules and equipment costs. The bill's effects on capital costs for individual firms and types of equipment will vary significantly. This is discussed in more detail in Chapter 5.

Table 1.9 shows the tax bill's effect on outputs by industry group. It illustrates the redistribution of resources from investment-oriented industries to consumption oriented industry groups. Again, much more industry detail is available from the model than is presented here. These estimates were generated with a fully dynamic model of the U.S. economy. The interrelated macroeconomic and industry structure of the Inforum model makes it particularly well-suited to detailed policy analysis such as this one on tax reform.

The Effects on the Goods Mix of Consumption: A Flat Tax.

The objective of this simulation is to illustrate how tax policy can affect the after-tax income distribution, and thus the goods mix of personal consumption expenditures in the model. The scenario was designed so that the aggregate amount of both taxes and consumption was the same for the base and alternate cases. A flat tax was imposed on AGI by eliminating the personal exemption amount, the earned income credit, all deductions and credits and preference items, and by making all income brackets pay the same marginal tax rate, which in this case is also the average tax rate. The rate which under this structure yielded the same revenue as the base case for 1988 was 14.85%.

Table 1.11 shows the results of the tax variables in 1988 under both scenarios. The only curiosity on this table might be that the pre-tax and post-tax index of ventile cutoff personal incomes differ. While income taxes at both the federal and state level are applied to AGI at a flat rate, the other taxes are applied at flat rates to personal income, which because of transfers and other income items in the AGI-PI bridge, is distributed more equally. Therefore the difference occurs because the income tax burden is distributed like AGI, while the other taxes are distributed like personal income.

The goods mix of consumption is shown by each class of goods in table 1.12. The model forecasts consumption by 78 different types of goods. Each category of goods is forecast with, among other things, its own "piece-wise linear" Engel curve. An Engel curve plots the consumption of a good against the income of consumers. "Piece-wise linear" means that the curve is composed of a number of linear segments, in this case five. The curve was estimated in the cross-section with data from the Survey of Consumer Expenditures of the Census Bureau. slope of each segment represents the portion of an increase of income in that piece's income range that is spent on the good. That is referred to as the specific propensity to consume (SPC). Each slope is specific to the good and the income range. The five income ranges to which the SPC's for each good correspond each contain the per capita incomes of one fifth of the population.

Goods with high SPCs in the top income range and low SPCs in the low ranges generally tend to be "luxury" goods, which claim an increasing share of consumer budgets as incomes become high. Think of "necessity" goods as those with low SPCs in the top income range and

higher SPCs in the lower ranges. The flat tax proposal makes the disposable income distribution less equal, taking income away from the lower end and adding it to the upper end. This should tend to redistribute consumption towards those "luxury" goods and away from the "necessity" goods. This is because as low incomes get lower, the normal goods with higher SPCs in that range are hurt most, and when high incomes get higher, the luxury goods with high SPCs in that range are helped the most. That this is indeed the case can be verified by examining the last two columns of table 1.12 which show the SPCs for the lowest and highest income ranges for each category of goods. Any shifts not obviously attributable to these factors may be due to the other three SPCs for the middle income ranges not shown here. 12

This simulation should serve to illustrate the importance to the Inforum model of having a detailed income distribution and tax model. The work described here does more than just forecast revenue. It forecasts revenue by income group. It also has an important impact on industry detail at the consumption level. Its estimation led to some significant revelations about the determinants of the size distribution of income. But perhaps most importantly from a modeling standpoint is its ability to simulate in a long-term, time-series framework, the impact of a whole array of changes in the tax code. This is an important property for a forecasting model to have, particularly now, when future tax law changes are likely to occur.

The balance of the dissertation develops in detail the material which was introduced here. Chapter 2 describes the method developed for modeling the distribution of AGI. Chapter 3 explains in detail how the model applies the tax laws to the distribution of AGI to get a

distribution of tax liability. Chapter 4 describes the procedure for reconciling the differences between the definitions of AGI and personal income at both the aggregate level and the level disaggregated by income ventile. Chapter 5 explains in detail how the model was used to simulate the effects of the tax reform plan discussed above, for both the personal income tax and the corporate income tax. Appendix A and B explain the Inforum investment equations and cost of capital formula, respectively. Appendix C describes a related method of modeling the income distribution that was tried before the method in Chapter 2 was developed. Finally, the mathematical appendix, while adding some detail, is mostly a summary, in equation form, of the material in Chapters 2 through 4.

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TABLE 1.1
POPULATION AND INCOME DISTRIBUTION BY VENTILE AND HOUSEHOLD SIZE-1981.

Exemptions Other than Age or Blindness in Thousands.

Household	Size 1	2	3	4	5	6	Total
1	2588.8	1582.8	1584.8	1811.1	1412.4	1813.6	107 93 .6
2	1632.9	1358.2	1490.4	1788.4	1585.3	2938.3	107 93 .6
	16 14.4	1239.0	1570.1	1968.7	1767.1	2634.3	107 93 .6
3							
4	1573.8	1284.0	16 47 .5	2160.8	1879.4	2248.2	10793.6
5	1538.6	1343.3	1730.0	2332.6	1956.7	1892.4	10793.6
6	1521.2	1411.3	17 92 .6	2491.2	1986.9	1590.3	107 93 .6
7	1514.5	1488.8	1850.9	26 26 .4	1973.1	1339.9	10793.6
8	1520.1	1576 .6	1905.4	2737.1	1920.0	1134.5	10793.6
9	1534.2	1679.9	1956.7	2820.3	1835.3	967.2	10793.6
10	1566.5	1800.1	2009.5	2872.0	1726.5	818.9	10793.6
11	1608.2	1939.7	2056.6	2890.2	1596.8	702.0	10793.6
12	1671.5	2102.7	2106.6	2862.7	1449.6	600.5	10793.6
13	1752.9	2293.4	2144.5	2792.0	1294.2	516.7	10793.6
14	1855.4	2518.8	2179.5	2672.4	1139.2	428.3	10793.6
15	1988.1	2774.5	2193.5	2492.5	972.6	372.4	10793.6
16	2156.1	3085.6	2178.7	2258.8	820.1	294.2	10793.6
17	2383.5	3431.3	2119.8	1954.2	663.2	241.6	10793.6
18	26 80 .2	3827.7	1982.4	1594.8	519.8	188.7	10793.6
19	3100.8	4216.3	1727.2	1234.9	383.6	130.7	10793.6
20	3624.2	4459.2	1334.7	875.1	329.2	171.2	10793.6
Totals	39425.8	45413.0	37561.4	45236.4	27210.9	21024.1	215871.4
30	JJ. LJ 00	.55 .0	3130.04		_, _, _,		50,

Adjusted Gross Income in Millions of Dollars.

Househol	d Size 1	2	3	4	5	6	Total
	ile	4040 5	4000	4455 0		4.075	
1	713.9	1010.7	1000.3	1157.2	940 .8	1277.4	6100.3
2	2578.5	2273.6	2459.2	2973.8	2534.1	4601.1	17420.2
3	3668.3	2875.7	3581.9	4489.5	4018.4	5938.6	24572.5
4	4484.4	36 50 .5	4648.6	6135.1	5308.8	6337.7	30565.2
5	5124.7	4489.9	57 84 . 4	7785.6	6521.6	6293.8	35999.9
6	5771.8	5399.1	6859.3	9524.3	7587.4	6058.5	41200.4
7	6545.3	6399.2	7950.8	11276.9	8478.0	5745.0	46395.3
8	7243.5	7512.2	9101.6	13080.1	916 9.5	5407.5	51514.4
9	80 96 .8	8862.1	10317.2	14854.8	9669.9	5083.0	56 883 .7
10	9066.7	10457.8	11633.2	16649.5	9995.0	4745.7	62547.9
11	10247.0	12341.1	13092.4	18376.0	10142.7	4456.8	6 86 56 .0
12	11658.4	14670.4	14686.0	19981.5	10108.1	4180.0	75284.3
. 13	13455.6	17630.1	16 47 9.8	21438.5	9928.5	3945.2	82877.7
14	15760.6	21391.1	18495.7	22664.6	9644.0	3637.2	91593.0
15	18787.4	26 258.9	20721.7	23525.1	9178.3	3482.9	101954.2
16	23020.0	32917.8	23227.5	240 25.3	8704.9	3136.2	115031.7
17	29227.3	42142.5	25968.1	23 900 .1	8085.7	2929.8	132253.4
18	39217.3	55 976 .6	28882.8	23171.3	7481.1	2677.9	157406.9
19	58203.6	78911.7	31984.0	22567.6	6 921.7		200796.0
20	129084.5	166316.5	46712.4	31789.7	12361.1		392061.7
Totals	401955.6		303586.8		156779.5		1791114.

TABLE 1.2
THE AGI DISTRIBUTION FORECAST.
(Billions of Dollars)

	Adina	ted Gross	Troome (Dno-tov)
	1986	1988	1991	1995
Ventile	1900	1900		
	11 00	11 00	4): 33	17.60
1	11.28	11.89	14.32	17.62
2	23.53	25.60	31.14	39.68
3	32.51	35.65	43.49	55.98
4	40.98	45.28	54.95	71.02
5	49.38	54.66	66.59	86.21
6	57.31	63.58	77.43	100.51
7	65.21	72.68	88.50	115.20
8	73.43	81.82	99.64	129.94
9	81 .56	90.95	110.93	144.68
10	90.13	100.86	123.02	160.74
11	99.52	111.36	135.82	177.47
12	109.12	122.13	148.95	194.98
13	120.23	134.79	164.51	215.66
14	133.26	149.44	182.25	238.60
15	147.95	166.10	202.66	265.59
16	167.22	187.96	229.17	300.05
17	191.47	214.69	<i>2</i> 61. <i>2</i> 6	342.17
18	225.49	253.32	308.42	403.46
19	282.16	316.34	384.60	501.51
20	463.36	496.18	605.97	773.84
Total	2465.09	2735.29	3333.59	4334.92
		Af ter-ta	x AGI	
Ventile				
. 1	10.06	, 10.53	12.74	15.63
2	21.61	23.48	28.46	36.17
3	29.88	32.65	39.53	50.65
4	37.04	40.82	49.20	63.22
5	44.05	48.64	58.86	75.75
6	50.57	55.96	67.75	87.39
7	56.97	63.32		
8	63.43	70.43	76.59 85.09	99.02
				110.14
9	69.55	77.29	93.59	121.13
10	76.21	84.98	102.83	133.16
11	83.29	92.78	112.13	145.15
12				455 05
	90.36	100.72	121.82	157.87
13	98.90	100.72 110.35	121.82 133.34	172.98
14	98.90 108.25	100.72 110.35 120.72	121.82 133.34 145.70	172.98 188.66
1 4 15	98.90 108.25 119.17	100.72 110.35 120.72 133.21	121.82 133.34 145.70 160.83	172.98 188.66 208.27
1 4 15 16	98.90 108.25 119.17 133.29	100.72 110.35 120.72 133.21 148.94	121.82 133.34 145.70 160.83 179.70	172.98 188.66 208.27 232.87
1 4 15 16 17	98.90 108.25 119.17 133.29 150.66	100.72 110.35 120.72 133.21 148.94 168.12	121.82 133.34 145.70 160.83 179.70 202.09	172.98 188.66 208.27 232.87 261.62
1 4 15 16 17 1 8	98.90 108.25 119.17 133.29 150.66 174.34	100.72 110.35 120.72 133.21 148.94 168.12 194.85	121.82 133.34 145.70 160.83 179.70 202.09 234.23	172.98 188.66 208.27 232.87 261.62 302.51
1 4 15 16 17 1 8 1 9	98.90 108.25 119.17 133.29 150.66 174.34 210.70	100.72 110.35 120.72 133.21 148.94 168.12 194.85 236.68	121.82 133.34 145.70 160.83 179.70 202.09 234.23 284.77	172.98 188.66 208.27 232.87 261.62 302.51 367.50
1 4 15 16 17 1 8	98.90 108.25 119.17 133.29 150.66 174.34	100.72 110.35 120.72 133.21 148.94 168.12 194.85	121.82 133.34 145.70 160.83 179.70 202.09 234.23	172.98 188.66 208.27 232.87 261.62 302.51

TABLE 1.3
FORECAST TAX RATES.
(Percent)

	"Standard	l Deducti	Lon" Tax	Rates.
	1 986	1988	1991	1995
Ventile			•	
1	0.00	0.00	0.00	0.00
2	0.65	0.63	1.05	1.28
3	2.37	2.57	3.25	3.62
4	4.43	4.58	5.15	5.63
5	6.23	6.41	6.99	7.48
6	7.69	7.87	8.39	8.92
7	8.79	9.01	9.59	10.16
8	9.94		10.88	11.50
9	11.09	11.36	11.97	12.59
10	11.90	12.17	12.83	13.55
11	12.85	13.20	13.95	14.70
12	13.75	14.07	14.74	15.54
13	14.40	14.76	15.57	16.39
14	15.54	15.97	16.79	17.65
15	16.23	16.56	17.39	18.32
16	17.18	17.63	18.45	19.24
17	18.12	18.48	19.42	20.30
18	19.70	20.09	21.06	22.02
19	22.63	22.48	23.26	24.03
20	30.19	30.05	31.11	31.91
	Rffe	ective Ta	y Rates	
1	0.00	0.00	0.00	0.00
2	0.65	0.63	1.05	1.28
3	2.37	2.57	3.25	3.62
4	4.29	4.44	5.00	5.46
5	5.67	5.83	6.37	6.81
5 6	6.68	6.83	7.29	7.75
7	7.52	7.71	8.21	8.70
8	8.51	8.74	9.32	9.85
9	9.46	9.69	10.21	10.74
10	10.14	10.37	10.94	11.55
11	10.92	11.22	11.85	12.49
12	11.65	11.92	12.49	13.17
13	12.17	12.48	13.16	13.85
14	13.04	13.41	14.10	14.82
15	13.60	13.88	14.58	15.35
16	14.32	14.69	15.38	16.04
17	15.18	15.48	16.27	17.01
18	16.34	16.65	17.46	18.26
19	18.53	18.40	19.04	1,9.67
20	23.37	23.25	24.08	24.69
E V	-5.51		E-7.00	L7.0 J

TABLE 1.4
UPPER LIMITS FOR PER CAPITA INCOME.
(Thousands of Dollars)

	Pre-ta	x AGI Cut	off Incom	es.
	1986	1988	1991	1995
Ventile				
1	1.59	1.68	1.97	2.41
2	2.45	2.63	3.10	3.84
3	3.20	3.45	4.07	5.06
4	3.94	4.26	5.03	6.28
5 6	4.65	5.05	5.95	7.45
6	5.34	5.80	6.86	8.60
7	6.04	6.59	7.78	9.78
8	6.75	7.37	8.70	10.94
9	7.47	8.17	9.66	12.17
10	8.26	9.05	10.70	13.49
11	9.09	9.95	11.77	14.84
12	9.97	10.93	12.93	16 .33
13	11.04	12.11	14.33	18.11
14	12.22	13.40	15.85	20.03
15	13.71	15.07	17.82	22.52
16	15.54	17.08	20.19	25.51
17	18.04	19.82	23.39	29.53
18	21.89	24.03	28.33	35.66
19	29.09	31.88	37.62	47.31
	7 4-4	- fon Dia	no se blo A	O T
4			posable A	
1	1.44	1.51	1.78	2.17
2	2.25	2.41	2.83	3.49
3	2.92	3.14	3.67	4.54
4	3.54	3.82	4.48	5.56
5	4.13	4.47	5.24	6.51
0	4.69	5.08	5.97	7.44
7	5.25	5.71	6.69	8.35
8	5.80	6.30	7.39	9.22
9	6.35	6.91	8.11	10.14
10	6.95	7.58	8.89	11.11
11	7.57	8.25	9.67	12.08
12	8.23	8.98	10.53	13.17
13	9.02	9.85	11.54	14.42
14	9.89	10.79	12.63	15.78
15	10.98	12.01	14.06	17.57
16	12.32	13.46	15.73	19.66
17	14.08	15.39	17.95	22.38
18	16.66	18.25	21.27	26.47
19	21.21	23.21	27.08	33.64

TABLE 1.5
INDEX OF VENTILE LIMITS FOR PERSONAL INCOME.

`		(Pre-Ta	ax)	
37 4 3 3 -	1986	1988	1991	1995
Ventile	45.60	45 55	45 40	46 00
1	17.62	17.75	17.19	16.90
2	28.63	28.85	27.94	27.45
3 4	46.96	47.08	45 .85	45.02
4	48.19	48.25	47.31	46.62
5 6	50.89	50.98	50.29	49.80
	54.89	55.00	54.50	54.21
7	59.96	60.18	59.84	59.75
8	64.70	65.00	64.80	64.87
9	70.01	70.34	70.22	70.41
10	76.00	76.44	76.46	76.80
11	82.20	82.77	82.90	83.38
12	89.62	90.26	90.47	91 • 10
13	97 • 86	98.64	98.96	99.73
14	107.82	108.68	109.03	109.91
15	120.74	121.84	122.24	123.25
16	136.67	137.95	138.40	139.55
17	157 .6 4	159.05	159.44	160.66
18	190.13	191.67	191.92	192.88
19	261.78	265.24	265.95	267.87
20	20.08	19.52	19.66	19.40
	Limits For	Di sposa	ble Person	al Income.
1	20.19	20.35	19.85	19.62
2	32.82	33.07	32.25	31.88
2	53.60	53.73	52.61	51.92
2 3 4	54 . 37	54.42	53.56	52.98
	56.55	56.62	56.03	55.66
5 6	60.17	60.25	59.89	59.73
	65.01		65.03	65.07
7 8		65.19		
	69.29	69.53	69.48	69.67
9	74.07	74.30	74.34	74.62
10	79.57	79.91	80.07	80.47
11	85 .15	85.57	85.80	86 .30
12	91.99	92.43	92.73	93 • 3 4
13	99.51	100.04	100.40	101.09
14	108.58	109.14	109.47	110.18
15	120.57	121.32	121.69	122.50
16	135.17	136.02	136 .36	137.30
17	153.89	154.82	154.96	155.81
18	181.81	183.14	183.15	183.68
19	244.18	247.88	248.41	249.95
20	18.34	17.91	18.02	17.80

The numbers are indexes (mean=100) of the cutoff income between the ventile shown and the next ventile. Ventile 20 has that group's share of all income.

TABLE 1.6
RATIO OF POST-TAX TO PRE-TAX INCOME INDEXES.

Personal Income

	1986	1988 BASE	1988 Reform	1991 BASE	1991 REFORM	1995 BASE	1995 REFORM
Ventile							
1	1.1459	1.1465	1.1399	1.1498	1.1485	1.1609	1.1548
2	1.1464	1.1463	1.1401	1.1500	1.1486	1.1614	1.1554
3	1.1414	1.1412	1.1393	1.1436	1.1465	1.1533	1.1522
1	1.1282	1.1279	1.1329	1.1292	1.1379	1.1364	1.1403
5	1.1112	1.1106	1.1177	1.1120	1.1190	1.1177	1.1198
6	1.0962	1.0955	1.0972	1.0969	1.0973	1.1018	1.0983
7	1.0842	1.0833	1.0791	1.0846	1.0805	1.0890	1.0818
8	1.0709	1.06 97	1.0638	1.0705	1.0651	1.0740	1.0662
9	1.0580	1.0563	1.0506	1.0571	1.0522	1.0598	1.0530
10	1.0470	1.0454	1.0403	1.0458	1.0415	1.0478	1.0417
11	1.0359	1.0338	1.0295	1.0340	1.0302	1.0350	1.0293
12	1.0264	1.0240	1.0203	1.0241	1.0204	1.0246	1.0191
13	1.0169	1.0142	1.0109	1.0137	1.0104	1.0136	1.0090
14	1.0070	1.0042	1.0012	1.0035	1.0005	1.0025	0.9992
15	0.9986	0.9957	0.9927	0.9951	0.9928	0.9939	0.9922
16	0.9890	0.9860	0.9840	0.9874	0.9841	0.9839	0.9832
17	0.9762	0.9734	0.9736	0.9722	0.9717	0.9698	0.9690
18	0.9562	0.9555	0.9579	0.9548	0.9560	0.9523	0.9535
19	0.9328	0.9345	0.9398	0.9347	0.9399	0.9331	0.9399
20	0.9133	0.9175	0.9244	0.9183	0.9247	0.9175	0.9272

TABLE 1.7
THE IMPACT OF TAX REFORM ON SELECTED ECONOMIC VARIABLES.
(Changes in percentages and billion dollars)

Economic Variable	1988	1	995
•	pet. ch. \$ ch.	pet.ch.	\$ ch.
Gross national product (72\$)	+ 0.3 + 6.1	1 + 0.3	+ 5.5
Personal consumption (72\$)) + 0.8 + 9.5	+ 0.9	+ 13.5
Equipment investment (72\$)	- 2.6 - 3.7	- 4.4	- 7.9
Structures (72\$)	+0.4 + 0.6	+ 0.1	+ 0.2
Inventory change (72\$)	+0.2 + 0.0	- 2.7	- 0.3
Exports (72\$)	+0.1 + 0.2	+ 0.2	+ 0.4
	+ 0.3 + 0.5	+ 0.2	+ 0.4
	+0.0 + 0.0	+ 0.0	+ 0.0
Unemployment rate (pct.)	- 0.3	1 - 0.3	
Inflation (GNP Deflator) (pct.)	+0.0	+ 0.0	
AAA bond yield (basis points)	+ 2	+ 27	
10 year T-bond yld. (basis points)	+ 3	+ 14	خادية
Savings rate (pct. of disp. inc.)	+ 0.4	+ 0.4	
Labor productivity (index)	+ 0.0	+ 0.0	
Cost of capital (avg.index)	+ 5.4	+ 5.2	
Fed. personal tax revenue (cu\$	- 5.0 -20.5	- 5.0	- 34.7
Disposable personal income (cu\$		1 + 1.4	+ 72.6
Corporate profits after tax (cu\$		- 1.0	- 3.5
	- 5.8 - 5.2	1 -17.5	- 20.6

TABLE 1.8
EQUIPMENT INVESTMENT BY BROAD INDUSTRY GROUP.
(billions of 1977\$)

	BASE 1986		BASE 1988	REFORM 1988	!	BASE 1995	REFORM 1995
		i			i		
All industries	210.08		205.78	200.52		254.81	243.66
Ag, mining, constr	45.63		42.69	41.10		52.20	49.71
Non-durable good	s 29.41		25.87	25.28		31.26	30.02
Durable goods	30.79		28.73	27.95		38.38	36.88
Transportation	12.99		13.17	12.99		15.39	14.74
Utilities	29.55		31.81	31.52		41.25	40.25
Wholesale, retail	1 30.12		29.13	27.99		32.41	29.95
Fin, ins, real est	11.70		11.99	11.85		14.30	14.83
Services	19.04		21.19	20.71		27.83	26.52
Miscellaneous	0.85		1.20	1.14		1.80	1.76

TABLE 1.9
THE IMPACT ON PERSONS:
DISTRIBUTION OF FEDERAL INCOME TAX LIABILITY.
(Billions of Dollars)

	BASE	BASE	REFORM	BASE	REFORM
Ventil	e# 1986	1988	1988	1995	1995
1	0.00	0.00	0.00	0.00	0.00
2	0.15	0.16	0.00*	0.51	0.00*
3	0.77	0.92	0.19*	2.03	0.85*
4	1.76	2.01	0.99#	3.88	2.62*
5	2.80	3.19	2.30*	5.87	5.10*
6	3.83	4.35	4.00*	7.79	7.57
7	4.91	5.60	5.44	10.02	9.97
8	6.25	7.15	7.03	12.80	12.66
9	7.71	8.81	8.63	15.54	15.32
10	9.14	10.46	10.19	18.57	18.07
11	10.87	12.50	12.13	22.17	21.80
12	12.72	14.56	14.04	25.67	25.10
13	14.63	16.82	16.36	29.88	29.13
14	17.38	20.03	19.27	35.36	34.37
15	20.12	23.06	22.40	40.77	39.17
16	23.94	27 .6 1	26.77	48.12	46.06
17	29.06	33.23	31.72	58.19	55.76
18	36.84	42.19	40.07	73.66	71.32
19	52.27	58.22	54 . 76*	98.65	92.80#
20	108.27	115.37	109.46#	191.09	178.22*
Total	363.41	406.24	385.75	700.57	665.88

^{*} Denotes ventiles which enjoy tax cuts greater than average in percentage terms. Each ventile contains one twentieth of the population. They are ranked by per capita adjusted gross income.

TABLE 1.10
THE IMPACT ON BUSINESS: OUTPUT BY PRODUCING SECTOR. (billions of 1977\$)

	/		7 /		
	BASE	BASE	REFORM	BASE	REFORM
	1986	1988	1988	1995	1995
Winners:					
Agriculture	166.02	168.26	168.83	191.18	191.79
Mining	93.01	97.21	97.30	113.87	113.98
Non-durables	779.74	804.52	807.90	926.12	929.48
Trade	525.52	550.33	552.53	660.87	663.41
Transportation	152.55	159.17	159.63	191.50	192.09
Utilities	240.29	256.82	257.62	322.62	323.33
Finance & insurance	181.44	189.17	190.38	222.99	224.47
Real estate	165.79	172.46	173.40	195.71	197.09
Services	640.17	670.97	674.43	808.05	811.70
Losers:					
Non electric machinery	154.01	159.08	157.27	228.74	224.35
Electrical machinerey	136.49	146.42	146.10	198.91	197.54
Transportation equip.	178.27	181.46	181.46	207.63	205.97
Instruments	37.34	38.51	38.28	49.80	49.24
Other durables	312.42	327.58	328.24	389.96	389.45

TABLE 1.11

RATES, REVENUE AND PERSONAL INCOME DISTRIBUTION INDEXES FOR 1988 UNDER BASE AND FLAT TAX.

Ventil	BASE Effective Tax Rates e	FLAT Std. & Effective Tax Rates		FL AT Revenue	BASE & FLAT Pre-Tax Index	BASE Post-Tax Index	FLAT Post-Tax Index
1	0.00	14.85	0.00	1.77	17.75	20.35	19.46
2	0.63	14.85	0.16	3.80	28.85	33.07	31.62
3	2.57	14.85	0.92	5.30	47.08	53.73	50.83
4	4.44	14.85	2.01	6.73	48.25	54.42	50.93
5	5.83	14.85	3.19	8.12	50.98	56.62	52.88
6	6.83	14.85	4.35	9.45	55.00	60.25	56.35
7	7.71	14.85	5.60	10.80	60.18	65.19	61.19
7 8	8.74	14.85	7.15	12.16	65.00	69.53	65.59
9	19.69	14.85	8.81	13.52	70.34	74.30	70.57
10	10.37	14.85	10.46	14.99	76.44	79.91	76.39
11	11.22	14.85	12.50	16 .55	82.77	85 • 57	82.36
12	11.92	14.85	14.56	18.15	90.26	92.43	89.60
13	12.48	14.85	16.82	20.03	98.64	100.04	97.67
14	13.41	14.85	20.03	22.21	108.68	109.14	107.39
15	13.88	14.85	23.06	24.69	121.84	121.32	120.30
16	14.69	14.85	27.61	27.94	137.95	136.02	136.05
17	15.48	14.85	33.23	31.91*	159.05	154.82	156.59
18	16.65	14.85	42.19	37.65*	191.67	183.14	188.36
19	18.40	14.85	58.22	47.02	265.24	247.88	262.30
20	23.25	14.85	115.37	73.58	19.52	17.91	19.51
Total			406 .24	406 .37			

^{* -} Denotes those ventiles paying less federal income tax under the FLAT scenario.

TABLE 1.12
THE GOODS MIX OF CONSUMPTION UNDER BASE AND FLAT TAX 1988.

Durable goods			BASE	FLAT	Percent L Difference		ighest SPC
Durable goods	_						
Motor vehicles and parts					_		•
1 New cars					-		
2 Used cars		-					_
New & used trucks			-	-			-
# Tires & tubes				-		.042	.022
5 Auto accessories & parts 6.20 6.18 -0.32 .016 .006 Furniture, anthresses, bedsprings 16.92 2.69 92.69 0.03 6 Furniture, mattresses, bedsprings 16.92 17.20 1.65 .013 .046 7 Kitchen, household appliances 6.14 6.12 -0.33 .002 .002 8 China, glass&tableware, utensils 6.14 6.12 -0.33 .002 .002 9 Radio, TV, records, musical instr. 35.61 35.45 -0.45 .013 .015 10 Floor coverings 6.44 6.48 0.62 .006 .028 11 Durable housefurnishings nec 8.87 8.95 0.90 .006 .028 11 Jewelery 1.16 1.16 0.00 - - - 15 Ophthalmic & orthopedic goods 3.99 3.93 -1.50 .011 .006 16 Books & maps 3.89 3.86 -0.77 .012 .006 17 Wheel goods, dur sports eq&toys 12.58 12.45 -1.	-	New & used trucks		-		-	-
Furniture & household equipment 92.66 92.69 0.03 6 Furniture, mattresses, bedsprings 16.92 17.20 1.65 .013 .046 7 Kitchen, household appliances 15.11 14.95 -1.06 .016 .009 8 China, glass&tableware, utensils 5.11 14.95 -1.06 .016 .009 9 Radio, TV, records, musical instr. 35.61 35.45 -0.45 .013 .015 10 Floor coverings 6.44 6.48 0.62 .006 .028 11 Durable housefurnishings nec 8.87 8.95 0.90 .006 .028 12 Writing equipment 1.16 1.16 0.00 13 Hand tools 2.39 2.37 -0.84 0ther durables 40.28 40.67 0.94 14 Jewelery 13.02 13.54 3.99 .005 .018 15 Ophthalmic & orthopedic goods 3.99 3.93 -1.50 .011 .006 16 Books & maps 3.89 3.86 -0.77 .012 .006 17 Wheel goods, dur sports eq&toys 12.58 12.45 -1.03 .012 .013 18 Boats, rec vech., & aircraft 6.79 6.89 1.47 .003 .032 Non-durable goods 436.72 435.66 -0.24 Food and alcohol 211.34 210.61 -0.35 19 Food, off premise 128.97 128.14 -0.64 .151 .036 20 Food on premise 128.97 128.14 -0.64 .151 .036 20 Food on premise 128.97 10.61 -0.35 21 Alcohol, off premise 20.66 20.71 0.24 .005 .005 22 Alcohol, on premise 11.55 11.78 1.99 .008 .026 Clothing 109.47 109.35 -0.11 23 Shoes & footware 11.55 11.78 1.99 .008 .026 Clothing 27.82 27.78 -0.14 .025 .030 26 Luggage 1.68 1.75 4.17 .005 .018 27 Gasoline & oil 31.17 31.02 -0.48 .071 .021 28 Fuel oil & coal 3.28 3.29 0.30 .005 .001 29 Tobacco 3.28 3.29 0.30 .005 .001 29 Tobacco 13.20 13.18 -0.15 .019 .006 31 Drug preparations & sundries 13.79 13.73 -0.44 -			-	-			
6 Furniture, mattresses, bedsprings 16.92 17.20 1.65 .013 .046 7 Kitchen, household appliances 15.11 14.95 -1.06 .016 .009 8 China, glass&tableware, utensils 6.14 6.12 -0.33 .002 .002 9 Radio, TV, records, musical instr. 35.61 35.45 -0.45 .013 .015 10 Floor coverings 6.44 6.48 0.62 .006 .028 11 Durable housefurnishings nec 8.87 8.95 0.90 .006 .028 11 Durable housefurnishings nec 8.87 8.95 0.90 .006 .028 11 Durable housefurnishings nec 9.39 2.37 -0.84 13 Hand tools 2.39 2.37 -0.84 14 Jewelery 13.02 13.54 3.99 .005 .018 15 Ophthalmic & orthopedic goods 3.99 3.93 -1.50 .011 .006 16 Books & maps 3.89 3.86 -0.77 .012 .006 17 Wheel goods, dur sports eq&toys 12.58 12.45 -1.03 .012 .013 18 Boats, rec vech., & aircraft 6.79 6.89 1.47 .003 .032 Non-durable goods 436.72 435.66 -0.24 Food and alcohol 211.34 210.61 -0.35 19 Food, off premise 128.97 128.14 -0.64 .151 .036 20 Food on premise 50.16 49.97 -0.38 .064 .075 21 Alcohol, off premise 20.66 20.71 0.24 .005 .005 22 Alcohol, on premise 11.55 11.78 1.99 .008 .026 Clothing 109.47 109.35 -0.11 23 Shoes & footware 14.20 14.42 1.55 .005 .018 24 Women's clothing 65.77 65.40 -0.56 .033 .038 25 Men's clothing 65.77 65.40 -0.56 .033 .038 26 Luggage 1.68 1.75 4.17 .005 .018 27 Gasoline & oil 31.17 31.02 -0.48 .071 .021 28 Fuel oil & coal 3.28 3.29 0.30 .005 .001 29 Tobacco 13.20 13.18 -0.15 .019 .006 31 Drug preparations & sundries 13.79 13.73 -0.44					_	.016	•006
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8 China, glass&tableware, utensils 6.14 6.12 -0.33 .002 .002 9 Radio, TV, records, musical instr. 35.61 35.45 -0.45 .013 .015 10 Floor coverings 6.44 6.48 0.62 .006 .028 11 Durable housefurnishings nec 8.87 8.95 0.90 .006 .028 12 Writing equipment 1.16 1.16 0.00 13 Hand tools 2.39 2.37 -0.84 Other durables 40.28 40.67 0.94 14 Jewelery 13.02 13.54 3.99 .005 .018 15 Ophthalmic & orthopedic goods 3.99 3.93 -1.50 .011 .006 16 Books & maps 3.89 3.86 -0.77 .012 .006 17 Wheel goods, dur sports eq&toys 12.58 12.45 -1.03 .012 .013 18 Boats, rec vech., & aircraft 6.79 6.89 1.47 .003 .032 Non-durable goods 436.72 435.66 -0.24 Food and alcohol 211.34 210.61 -0.35 19 Food, off premise 20.66 20.71 0.24 .005 .005 22 Alcohol, on premise 50.16 49.97 -0.38 .064 .075 21 Alcohol, off premise 20.66 20.71 0.24 .005 .005 .005 22 Alcohol, on premise 11.55 11.78 1.99 .008 .026 Clothing 109.47 109.35 -0.11 23 Shoes & footware 14.20 14.42 1.55 .005 .018 24 Women's clothing 27.82 27.78 -0.14 .025 .030 25 Men's clothing 27.82 27.78 -0.14 .025 .030 26 Luggage 1.68 1.75 4.17 .005 .018 27 Gasoline & oil 31.17 31.02 -0.48 .071 .021 28 Fuel oil & coal 3.28 3.29 0.30 .005 .001 29 Tobacco 13.20 13.18 -0.15 .019 .006 31 Drug preparations & sundries 13.79 13.73 -0.44		• • • • •				_	
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	TABLE 1.12 (C BASE		Percent		highest SPC
					
37		38 4.3			-
38		_			-
39					.006
40					_
	Services 563.				
1. 4	Housing 179.	70 178.2	8 -0.79		
		14 128.06			
42	<u> </u>				
43		14 4.0			
44		91 1.90			.008
h.c			5 - 0.43		0.07
					-
46 47		6.66			
48		02 26.8			
49		82 3.78			
50		92 0.93			
51			7 0.17		
52	<u> </u>	24 2.29			
ےر	. —		-0.39		.012
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54				_	
55	- · · · · · · · · · · · · · · · · · · ·			_	
56				-	
57					
58		•			
59			-		
60		-			
61	Travel agents, oth trans service 0.				
	Medical services 105.				
64	Physicians 25.				.014
65					
66	Private hospitals & sanitariums 49.			.003	.006
67	Health insurance 7.	99 7.92	2 -0.88	.035	.006
76	Education 16.	31 16.1	2 -1.16	.023	.013
	Other services 149.				
62		5.63	3 0.18	.001	.014
63	Barbershops & beauty shops 5.	51 5.47			.008
68	Brokerage, investment counseling 3.	85 3.90	1.30	.002	.004
69	Bank service chrg &serv w/o.pay 31.	22 31.7	2 1.60	.002	.004
70	Life insurance 12.	71 12.76	0.39	.035	.037
71	Legal services 10.	05 10.19	9 1.39	.002	.004
72	Funerals, oth pers business 7.	17 7.2	8 1.53	.002	.004
73		00 1.99	-		
74	Movies, theatre, spec sports 7.	91 8.29			_
75		53 31 . 7			
77	Religious & welfare services 23.	33 23.3			
78	Foreign travel 9.	91 10.00	0.91	001	.031

- Denotes a single-sloped linear Engel curve. SPC stands for specific propensity to consume.

CHAPTER 2.

THE INCOME DISTRIBUTION MODEL.

This chapter describes a model of the distribution of income in the United States. This model fits into and becomes part of the Inforum model, a large, interindustry forecasting model. This chapter will include a description of the specification and estimation of the income distribution model.

Why model the distribution of income? The first and most important reason is to answer questions about the distribution itself. There is much interest in information about the distribution of income, past, present, and future. Intelligent policy formation, including tax policy, requires the guidance of empirical information and analyses. The procedure developed here provides detailed information about the historical distribution of income, as well as a method for its projection into future years.

The second reason for modeling the income distribution is to facilitate a model of the income tax system. In the United States tax system, individual marginal and average tax rates are not flat, but depend on the level of family income. Therefore, tax revenues depend not only on the total amount of income, but also on how income is distributed. The next chapter will describe how taxes are calculated given the income distribution, and how taxes and disposable income and their distribution are incorporated into the large model.

The third reason for modeling the distribution of income is that except in the somewhat special case of linear Engel curves, the distribution of income affects the mix of products demanded. An Engel

curve is a plot of consumption of a particular good or group of goods against the income of consumers. If that plot is a straight line, then the transfer of income from one person to another will reduce the first person's consumption of that good by exactly the amount by which it increased the second person's consumption, leaving total consumption of the good unchanged. However, in the U.S. economy, most Engel curves are non-linear.

The second and third reasons for modeling the distribution of income are irrelevant without a model sophisticated enough to take advantage of the detailed information. The model into which the present work is being incorporated is indeed sophisticated enough. Both the tax model and the consumption model depend on having a detailed model of income distribution. The consumption part of the model uses goods-specific non-linear Engel curves, so that not just the average level, but also the distribution of disposable income is important in determining the demand for various categories of consumption goods. For example, the consumption of a luxury good like jewelry is modeled with an Engel curve which get steeper in slope as income increases. Therefore, if the number of high income people increases, so will the consumption of these goods even if aggregate income does not increase. Since the large model makes full use of input-output tables, the composition of final demand is crucial throughout. Changes in the type of products which are demanded will affect demands for intermediate goods as well as the demand for factor inputs such as labor and capital.

The tax model, which is the topic of the next chapter, is also detailed enough to take advantage of information on the distribution of income. It recognizes that higher family incomes are taxed at higher

marginal rates. The appropriate tax rates are applied to the various income brackets. The procedure takes household sizes and the personal exemption amount into account when calculating tax rates. Finally, it recognizes that higher income families have more opportunities for tax avoidance through deductions and credits.

The model of income distribution must be very versatile because it serves two masters: the tax model, and the consumption model. Taxes are determined from household income and household size. Consumption depends upon per capita income and household characteristics. (For per capita income, four people in a household with a \$20,000 income count as four people each with an income of \$5,000.) Furthermore, taxes depend on "adjusted gross income" (AGI), while consumption depends on disposable personal income. The model is flexible with respect to the definition of income. It calculates both per capita and per household income distributions of both AGI and personal income before and after taxes.

The model begins with AGI as its definition of income. AGI is appropriate because it is the income base for the income tax. There is a detailed time-series of it readily available, updated each year. The data, published in the Treasury Department's <u>Statistics of Income</u>, (SOI), show the size distribution of AGI by income groups. There is a table for each of six household sizes. The data availability by household size is crucial for the analysis of per capita income and also for tax calculation because of the different rate structure for single taxpayers, and because of the allowance for personal exemptions.

The income distribution model is constructed from the historical cross-section data at the household size level. A function is fit to

the income distribution data for each year and each household size. The function has two parameters, and describes a cross-section relationship between the percentage of income and the percentage of people earning at least that income. The relationship is commonly referred to as a "Lorenz curve." The same function is fit to all groups of data with the parameters varying according to household size and year. For each household size, time-series of the parameters of the Lorenz curves become dependent variables in time-series regression equations. These equations are then used to forecast the parameters and thus, the income distributions. Economic variables are used as the predictors in those equations. The persons from the various household sizes are then put together into per capita income groups. So the procedure forecasts not only household income distributions for each household size, but also a per capita income distribution.

The Personal Consumption Model.

Before describing the income distribution modeling process, a brief discussion of the consumption part of the input-output model in which the tax model will be incorporated is in order. The consumption model was built and put in place in 1979, before work on the income distribution and tax sections began. The structure of the consumption section dictated the way in which the income distribution was to be modeled. In particular, it was the format of the consumption model that required the income distribution to be modeled in terms of twenty equally populated ventiles. It was the consumption model that required the modeling of cutoff incomes which represent the incomes of the people on the border of two adjacent ventiles. And it was the consumption

model that required the construction of a per capita income distribution as opposed to the more commonly modeled distribution of household incomes. While some aspects of this thesis are necessarily specific to the Inforum modeling framework, it will be shown that the system is quite flexible and might be applied to other frameworks of analysis.

The consumption section of the model combines cross-section and time-series analysis to produce a system of consumption equations having many desirable properties. They can show substitutability and complementarity between goods; they incorporate demographic variables, and a time trend representing tastes. But for present purposes, the most important feature is the good-specific non-linear relation between per capita income and per capita consumption. The non-linear Engel curve allows the income distribution to affect the mix of products consumed.

Using data from an extensive consumer survey, cross-section effects from income and demographic variables were estimated. The form of the equations postulates that the amount of a good consumed depends in part, on two separate terms: the per capita income effects come about through the piece-wise linear Engel curves explained in Chapter 1, and the "size" of the household. The "size" of the household is not just the number of people. Rather it is an age-weighted size, with a varying set of weights for each good. Using only per household income as a determinant of consumption would not allow for the distinct and significant effects of a changing family age structure. For example, the model is able to simulate the change in product mix consumed as the people from a baby-boom mature. To allow the age structure (and other characteristics) of households to affect the demand for different

products differently, the income distribution must be defined in per capita terms rather than per household terms. This is to allow for households of similar size but differing demographics to have different consumption patterns. Household size has little additional effect on consumption once the demographic characteristics of the individuals are taken into account. However, the income for tax determination is household income. Therefore, the income distribution model must be sufficiently versatile to be able to model both types of income. See Devine (1983) and Almon (1979) for further details about the consumption section of the model.

The consumption model uses a special form for representing the income distribution. The aggregate of disposable income must be divided up into twenty "ventiles." A ventile is a group of people containing exactly one twentieth of the population. The people in each ventile receive a per capita income between the ventile's lower and upper bounds. The ventiles are ordered according to per capita (not per household) incomes. The precise per capita incomes which lie at the border of each ventile must be determined. These cutoff incomes are then divided by the overall mean disposable income to form a series of index numbers which describe the income distribution. Each ventile's number is its highest per capita income as a per cent of the overall mean. The top ventile's number is not indexed as are the other numbers because the highest individual income in the economy is an irrelevant statistic. Rather, the top ventile's total income is expressed as a percentage of the aggregate disposable income.

Before the model of the income distribution described in this chapter was built and incorporated, the pre-existing distribution model

predicted the index numbers directly with separate regression equations for each ventile.. Certain cyclical and demographic variables served as the regressors. Taxes were removed by a simple tax function with five income brackets. This approach was unsatisfactory for several reasons. First, it was unrealistic. Tax laws are complex and not well represented by a simple five-bracket schedule. Second, no household size information was taken into account in calculating taxes. taxable income is the household income, not per capita income, which was the distribution being forecast. The old system was estimated on the basis of the 1972 tax distribution, and it could not take into account the changes in the tax law between 1972 and the present for its forecasts. Each year in the forecast, more and more people were, because of inflation and real income growth, being allocated to the top income bracket. The tax schedule was becoming mostly a single bracket schedule as the model got further out into the forecast. Finally, the old system was not built for simulation of tax law changes. Changes in the rate schedule, deductions, credits, the personal exemption amount, indexing or the taxable income base were not modeled. The model in this dissertation corrects these and other deficiencies.

The Modeling Framework.

As discussed previously, a flexible approach is appropriate for modeling the income distribution. It was first thought that trying to use some smooth functional form to describe the distribution would be too restrictive. In particular, it seemed that the well-known statistical distributions would not give a satisfactory fit to the income distribution data. Therefore, the first modeling attempt made

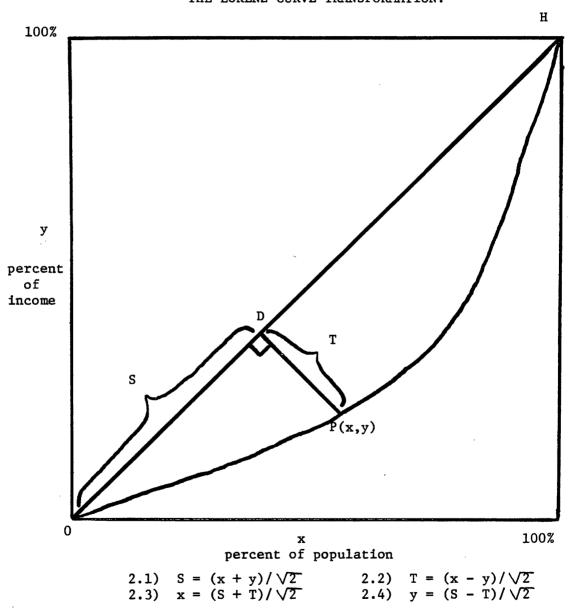
was to forecast the twenty cutoff points individually by regression equation, using numerical methods of integration to complete the income distribution. In this way, there would be no imposition of a single functional form. However, this freedom sometimes resulted in forecasts of odd-shaped income distributions, particularly as the forecast went further into the future. At times, one ventile's upper limit might even move above that of the ventile above it. Many arbitrary fixes were required to keep the distribution in the proper increasing order. The forecasts of the income distribution were also quite sensitive and volatile, which made simulation studies difficult.

Because of the problems with the free-form distribution, it was felt that imposing a mathematical form that would guarantee sensible properties was necessary. Most previous efforts fit functions to frequency density functions. The curves used were mathematically complex such as the log-normal, F, Cauchy, or Gamma; and none fit very well. An alternative introduced by Kakwani and Podder (1976) is to fit the distribution instead to the Lorenz curve. Several functions can be devised to fit the curve in terms of alternate coordinates (S and T) shown in figure 2.1.

The procedure used is particularly well-suited to grouped distribution data, which corresponds to the reporting method actually used by the IRS. The data used are reported in <u>Statistics of Income</u>, (SOI), published annually by the IRS. The data come from the section of tables titled: "All Returns: Exemptions by Type, Number of Exemptions, Sources of Income, by Size of Adjusted Gross Income, returns classified by number of exemptions other than age or blindness."

Considerable effort went into finding the best way to implement the

FIGURE 2.1
THE LORENZ CURVE TRANSFORMATION.



smooth Lorenz curve approach. Several functions were tried, and the best one was the CES function. This method showed so much potential that is was implemented completely, and the entire tax model was built around it. However, the problem of goodness of fit with smooth functions was not adequately alleviated. Another approach was adopted which used the same basic Lorenz curve framework in "T and S" space. A complete description, including tables on goodness of fit of the CES approach is found in appendix C. The CES procedure is the same as the final chosen procedure up to the point where the form of the function T=f(S) is chosen. Rather than the smooth CES function, the function finally used is a linear combination of an actual base year distribution and a smooth function representing deviations from that base.

The first step in the procedure is to forecast the size distribution of AGI. The distribution is defined in terms of a Lorenz curve. The Lorenz curve plots the cumulative percentage of population on the horizontal axis against the cumulative percentage of income received on the vertical axis. The curve is plotted in a unit square with the population arranged in ascending order of its income. The curve is a straight line if income is distributed equally, and will bow downward and to the right as the income distribution is more skewed.

Consider figure 2.1. Let P be any point on the Lorenz curve with coordinates P(x,y), where x is the cumulative percent of the population, and y is the corresponding cumulative percent of income. The line of equal distribution is the diagonal running from 0 to H, and it is of length $\sqrt{2}$. The angle ODP is a right angle by construction. The line segment OD is labled S, and the line segment DP is labled T. The lengths of S and T can be expressed in terms of x and y, and vice versa.

The Pythagorean theorem tells us that $S^2 + T^2 = x^2 + y^2$, and alternatively that $(\sqrt{2}-S)^2 + T^2 = (1-x)^2 + (1-y)^2$. Combining these two equations and solving for S yields:

2.1)
$$S = (x+y)/\sqrt{2}$$

This equation, combined with the above information allow the derivation:

2.2)
$$T = (x-y)/\sqrt{2}$$

Equations 1 and 2 can then be solved for x or y and combined to derive:

2.3)
$$x = (S+T)/\sqrt{2}$$

2.4)
$$y = (S-T)/\sqrt{2}$$

A full derivation of these formulae is found at the end of the mathematical appendix.

By definition, x must be greater than or equal to y. The restriction that income is positive must be imposed, meaning that S must be greater than or equal to T, or alternatively, the Lorenz curve must lie completely within the box. Observations of income groups with negative AGI could not be used. The Lorenz curve and size distribution of income may be defined by expressing T as a function of S.

The function T = f(S) must conform to several restrictions if it is to describe a proper Lorenz curve: 1) y must always increase as x increases. 2) The Lorenz curve must always lie on or below the line of equal distribution. 3) T must be of length 0 at the corners when S is of length 0 or $\sqrt{2}$. 4) The second derivative of y with respect to x must always be positive. Kakwani and Podder (1976) show that these restrictions are met with the CES production function. The second and third of these conditions are also met for the version of the function actually used. The first condition is probably, but not necessarily met, and the fourth condition is violated, but only at the end points of

the Lorenz curve in an empirically unimportant way.

Both the individual equation and the CES function approaches seemed lacking in certain respects. The first approach, where ventile cutoff incomes were each estimated separately, had the desirable property of fitting the history perfectly, but led to ill-defined and ill-shaped income distributions which did not meet any of the three restictions listed above in forecast and simulation exercises. The smooth functional form approach had well behaved forecast and simulation properties, but was unable to yield a curve which adequately fit the actual historical income distributions, particularly at the two extreme ends. An approach had to be found that not only fits the historical data well, but gives sensible forecasts. An alternative approach was developed which maintains and combines the desirable aspects of the above two methods, while minimizing their shortcomings.

The approach taken, which is described more concisely in the mathematical appendix, begins with a curve that fits one year of the history perfectly. Again, the Lorenz curve with T as a function of S is used, but this time with a different function f(S). The function is additive in two parts. The first part uses the exact income distribution from historical observation as its base, or starting point. The historical base year could have been any year or average of years but was chosen as 1981, because of its position near the end of the sample and the fact that there were 31 income groups published in SOI for each of the six household sizes for that year compared to only 15 published observations per distribution in 1982. Also, 1982 may have had an atypical distribution due to the recession that year. So the first part of the function is just the exact 1981 income distribution

denoted as T81. This part consists of the actual values of T at various points along the x axis.

The second part of the function is a smooth but skewed curve to be added to the base. This curve represents values of T, the perpendicular distance from the diagonal, as a function of S, the distance along the diagonal at which the function is evaluated. The entire formula for the income distribution for year t, household size h is:

2.5)
$$T_{thi} = A_{th} T81_{hi} + B_{th} \{S_{thi}^{1.5} (\sqrt{2} - S_{thi})^{.5} \}$$

The i subscript refers to the position along the distribution at which the function is evaluated, usually at the ventile points, where S_i corresponds to values of x which are multiples of .05. However, it is necessary, as will be discussed later, to evaluate the function at other points in order to combine household sizes. In particular, it will be necessary to construct a more detailed "grid" which consists of 50 quadruplets containing corresponding values of x_i , y_{thi} , S_{thi} and T_{thi} . Here, the 50 values of x_i will range from .02 to 1, increasing by increments of .02. A_{th} and B_{th} are parameters which are determined historically by regression, and forecast in time-series.

The curve, then, starts with an exact duplication of the 1981 distribution, scales it by a factor of "A" and then adds or subtracts a fraction "B" of the skewed curve defined by the formula in the second coterm of equation 2.5.

This approach solves the problems of the first two, because first, it fits the history well, in fact perfectly for 1981 (with values of 1 for A and O for B) and second, it maintains a well defined, smooth and appropriately-shaped curve in forecasts and simulations, because it begins with a well-shaped curve and deviates from it by a scaled version

of another smooth, well-shaped curve.

Figures 2.2 and 2.3 show each of the two parts of equation 2.5 separately; the actual 1981 household size one distribution in figure 2.2 and the skewed deviations curve which can be scaled and added or subtracted in figure 2.3. Figure 2.4 shows the effects of scaling the actual curve, that is varying the A parameter only. Changes in the A parameter alone act to make the entire Lorenz curve more or less bowed. Figure 2.5 shows the effect of adding scaled versions of the skewed curve to an actual distribution (T81). Changes in the value of the B parameter act to skew the shape of the Lorenz curve to the left or the right.

Equation 2.5 could have had a third term which was the formula for the skewed curve with the exponents reversed. This would add another curve which was skewed to the left, or lower part of the distribution. But this extra term would be redundant in a regression determining the values of the three term's coefficients, meaning there would be near perfect multicollinearity between the second and third terms. A curve which could be represented as a linear combination of all three terms could also be represented as a linear combination of the first two, as in equation 2.5.

Figures 2.6 and 2.7 are evidence of this and of the versatility of the equation. Here, the parameters A and B are varied such that one end of the distribution is kept at its base level, while the other end becomes more or less skewed. In figure 2.6, where the lower end is unvaried, the parameters A and B move in opposite directions from their base values of 1 and 0 so that their effects cancel each other out in the lower part of the distribution. For example, the lower value of A

FIGURE 2.2

T & S FOR 1981 H.H. SIZE 1

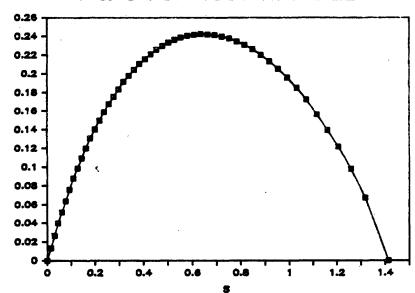


FIGURE 2.3

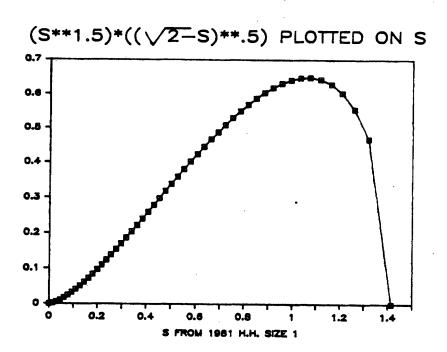


FIGURE 2.4

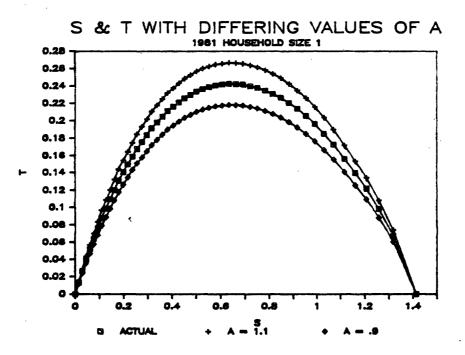


FIGURE 2.5

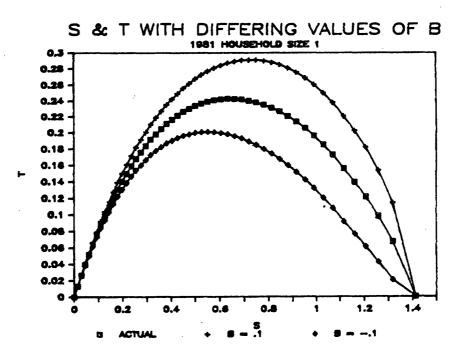
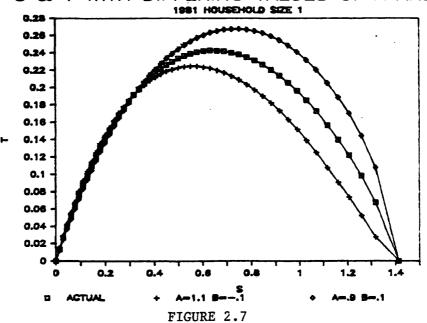
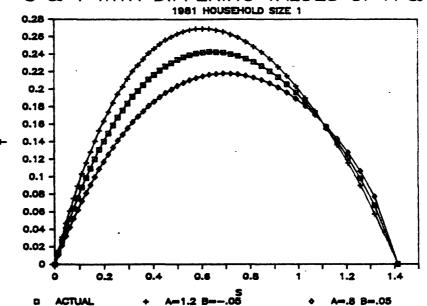


FIGURE 2.6

S & T WITH DIFFERING VALUES OF A AND B



S & T WITH DIFFERING VALUES OF A & E



might be cancelled by a positive value of B in the lower end, but at the upper end, the positive value of B would dominate, because the deviations curve is skewed more at the upper end. The result is an overall curve that is more skewed toward the upper end of the

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Figure 2.7 shows the effects of a stronger variation in parameter A in combination with a weaker deviation in parameter B. Again, both parameters move in opposite directions. In this case, parameter B is too weak to offset the effect of parameter A in the lower part of the distribution, but is able to offset it in the upper part of the distribution. The curves here are similar to the base curve in the upper part but more skewed toward the lower part. These two graphs should make it clear that virtually any well-shaped and reasonable Lorenz curve can be represented by linear combinations of the actual 1981 distribution, T81, and the skewed curve $S^{1.5}(\sqrt{2}-S)^{.5}$. It should be clear that the A and B parameters alone can accurately describe most well-shaped Lorenz curves. So it is the historical estimation and future forecasting of those parameters which are the essential parts of the income distribution model. The next section will describe the procedure

Estimation Procedure for A and B.

distribution.

The estimations are done in the cross-section. One curve is estimated for each household size and each year for which there is data. The data set includes 16 years, 1966 and 1968-1982, and six household sizes, one through five, and six and over. (1967 is left out because the data were not published by household size that year.) There are 96

(6x16) curves estimated in all. The equation is estimated in the form shown in equation 2.5. First, the variable T81 $_{\rm hi}$ must be created, that is to say, the 1981 distribution must be defined. But to do this, one must first create the observations on $x_{\rm thi}$ and $y_{\rm thi}$. The raw data from S0I are grouped according to income brackets with each distribution having between 15 and 31 published brackets. Let $r_{\rm thj}$ and $q_{\rm thj}$ be the number of returns and the amount of income published in bracket j. Let $R_{\rm th}$ and $Q_{\rm th}$ be the total number of returns and amount of income in year t, household size h. Then $x_{\rm thj}$ and $y_{\rm thj}$ are obtained by cumulating the observations and converting them to percentage terms.

$$x_{thj} = \sum_{n=1}^{3} r_{thn}/R_{th}$$

$$y_{thj} = \sum_{n=1}^{3} r_{thn}/Q_{th}$$

Linear interpolation is then used to get 40 values of yy_{thk} which correspond to 40 values of xx_k chosen to be .025, .05, .075...1.0. (k varies from 1 to 40). The linear interpolation is performed in the following manner. If the value of xx_k falls between x_{thj} and x_{thj+1} , then the value of yy_{thk} (which corresponds to the value of xx_k) would be calculated as

2.8)
$$yy_{thk} = \{(xx_k - x_{thj})/(x_{thj+1} - x_{thj})\} *(y_{thj+1} - y_{thj}) + y_{thj}$$

These 40 values of xx and yy for each year and household size are then used in equations 2.1 and 2.2 to obtain 40 corresponding values of $S_{\rm thk}$ and $T_{\rm thk}$. The values of $T_{\rm thk}$ for the year 1981 are then called $T81_{\rm hk}$. The procedure is followed for all the years in the sample. The values for $T_{\rm thk}$ are used on the left hand side of equation 2.5, and the values of $T81_{\rm hk}$ and $S_{\rm thk}$ are used on the right. Equation 2.5 is then estimated with ordinary least squares, using 40 observations for each of the 96 equations. The estimates of parameters $A_{\rm th}$ and $B_{\rm th}$ are thus

obtained. Table 2.1 shows the summary statistics for these estimations.

It should be noted here that because of the definition and structure of the data points, heteroscedasticity is necessarily present. No attempt was made to correct for this or for the possible correlation of error terms by using a generalized least-squares estimation technique. In their article, Kakwani and Podder did use four such techniques and found they made little difference in the estimated parameter values. The ordinary least-squares approach used here still generates unbiased parameter estimates. The use of 40 data points standardized by interpolation for the estimation procedure eliminated the inconsistencies in the number and location of the actual data points reported in SOI which varied significantly from year to year.

Table 2.1 shows that the parameter estimating equations fit the historical data very well. However, one must remember that these are equations relating T to S. How does this prodedure fit the Lorenz curve representation, which relates y to x? An even better question is how this method fits the data when examined in terms of the dollar amount of income in each ventile of each distribution. Table 2.2 shows just that, but before examining it we should discuss how the approach transforms values of A and B to dollars per ventile.

Once the parameters of the CES function have been estimated, a functional relationship between T and S is defined for each curve. However, the Lorenz curve must be defined in terms of a relationship between x and y. This is done numerically. Calculated values of S_{hg} , $T81_{hg}$, x_g and y_{hg} from the 1981 distribution are used. The g subscript refers to the position in a "grid" of 50 ordered quadruplets which was constructed in the same manner as the xx's and yy's. This grid is of

size 50, and the values of x_g are equally spaced at .02,.04,.06...1.0. The grid was constructed to facilitate this part of the procedure; that is, to numerically translate values of A and B to values of x and y.

The grid values of S from 1981 and T81 are inserted into equation 2.5 with the estimated values of A and B. The result is a new vector of values for T. These new T's and the S's used to generate them (the grid values of S from 1981) are inserted into equations 2.3 and 2.4 to get the "predicted" or fitted values for x and y for the history. These values for x are not equally spaced, however, so another linear interpolation must be performed. In this case, we seek to get values of y which correspond to twenty ventile values of x_i (x = .05, .1, .15, ... 1.0). The procedure, then, is to interpolate x_i between the grid values of x just calculated, just as the interpolation in equation 2.8 was performed. The size of fifty for the grid was chosen because it is large enough to give a very good approximation of the curvature of the Lorenz curve despite the use of linear interpolation. Experimentation with more detailed grids of size 100 and 200 did not change the results significantly.

Since the forecast values of x and y are in percentage terms, it is a simple matter to convert them to the number of people, $X_{\rm thg}$, and dollar amount of income $Y_{\rm thg}$, for year t, size h and grid cell g. The required pieces of data are the total population and AGI for each household size per year. The macro model determines both numbers in the aggregate, and the equations in tables 2.7 and 2.8 show how the aggregate is divided among the six household sizes. Let $R_{\rm th}$ be the number of people in household size h, year t, and $Q_{\rm th}$ be that group's adjusted gross income. $X_{\rm thi}$ and $Y_{\rm thi}$ are defined:

2. 9)
$$X_{thi} = (x_{thi} - x_{thi-1}) *R_{th} *H$$

$$Y_{thi} = (y_{thi} - y_{thi-1}) *Q_{th}$$

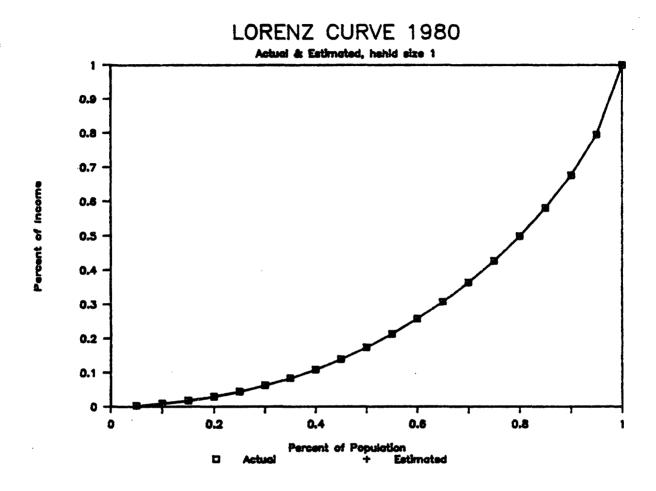
H = h, except when h = 6; then H is the overall average household size of the six and over household size group.

Table 2.2 shows the fitted data compared to the interpolated but not otherwise transformed data. Although the equations were estimated with 40 data points, in order to save space and be directly comparable to the CES method, table 2.2 condenses the distributions into 20 equally populated groups, or ventiles. The years 1966, 1970, 1975 and 1980 were chosen for display only because of their relative positions in the time-series, not because they had better or worse than average fits. The fit for 1981 is perfect by definition, because the values for A and B in 1981 are 1 and 0 for all household sizes. By comparing the percent residual columns of both table 2.2 and the CES table shown in table C.2 of appendix C, one can see that the fit improves with use of the derivations from base function over the CES function.

The first column of table 2.2 shows the horizontal coordinates, and the next two columns show the actual and estimated vertical coordinates. The fits appeared excellent when viewed this way. There is almost never a miss of over half a percent. Figure 2.8 shows a typical plot of an actual Lorenz curve against the estimated version. The two are nearly indistinguishable when viewed on this scale.

The third and fourth columns of table 2.2 show the same data, but the cumulative percentages of income are converted to number of people and dollars of income per ventile. The estimation is subtracted from the actual reported amount and shown as the residual in the last column of each table. The residuals, by construction, sum to zero in dollar

FIGURE 2.8



terms.

Interpretation and Forecast of the Parameters.

The parameters A and B have economic interpretations. As A increases, the Lorenz curve becomes more bowed overall. In other words, the distribution of income becomes more unequal. As B increases, the curve also becomes more bowed, but particularly at the upper end. That is, the high income people are getting more unequal among themselves. Values of A greater than one combined with negative values of B may mean the shape of the curve is getting more skewed or bowed toward the lower end, or that the lower income people may be getting less equal among themselves relative to 1981.

In a recently published Brookings Institution study, Pechman (1985) writes: "There was virtually no change in the distribution of income as defined in this study between 1966 and 1985. However, this income concept includes transfer payments, which rose dramatically during this period. As a result, the distribution of income from market activity (wages and salaries, interest, dividends, rents, and windfall profits) must have become more unequal." We should expect the data on income distribution here to tell a consistent story. That is, this study should provide supporting evidence of Pechman's conclusion; it should reveal that AGI, like "market income" has been getting less equally distributed. This study does provide such evidence, as will soon be discussed.

This study also offers some evidence on the cyclical determinants of the income distribution. It seems that the time-series of parameters A and B show not only a secular trend, but also have some correlation

with cyclical economic variables. The time-series of those parameters are shown in figures 2.9 and 2.10.

Making general statements about the equality or lack of equality of a particular income distribution is hazardous. Only in a very few special cases can it be said without ambiguity that one distribution is "more equal" than another. A convention will be adopted here, regarding the use of the term "equality," with the realization that it may not conform to other notions of equality. From here on, the equality of an income distribution over a certain range of income will be measured by the average length of "T" on the Lorenz curve over that income range. Lower values of parameter A, then for example, tend to make the length of T shorter, and the income distribution more equal.

The parameters are assumed to be linear functions of a constant term, the unemployment rate, UN, the percentage of aggregate personal income made up of net interest and dividend income, PCTINC, the percentage change in the GNP deflator from the previous year, INFL, and a time trend, TIME. Table 2.3 shows the historical values of these variables. The equations estimated for each household size are:

2.11)
$$A = c + d^{*}UN + e^{*}PCTINC + f^{*}INFL + g^{*}TIME$$

2.12)
$$B = c + d^{\#}UN + e^{\#}PCTINC + f^{\#}INFL + g^{\#}TIME$$

Before discussing the results of the equation estimations, we should establish what we expect the results to be, starting with the time trend. The income distribution has been getting less equal over time, at least according to the Brookings study. Therefore, one must expect the A parameter has been increasing over time, and that the estimated coefficient on the time trend variable will be positive. Interpreting the B coefficient is not as straight forward. A value less

FIGURE 2.9

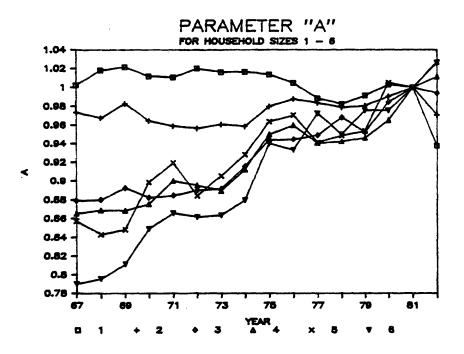
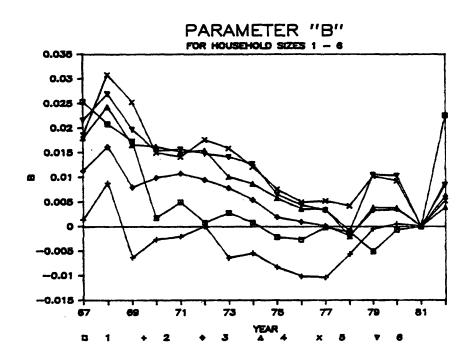


FIGURE 2.10



than 0 flattens the curve more at the top end than at the bottom, so a low value of B tends to skew the curve more towards the bottom end of the distribution. A high or positive value of B tends to skew the curve more toward the upper end. Since we believe the overall personal income distribution has been constant in the face of increasing welfare and transfer payments to poor people, we should believe that the AGI distribution has been getting more unequal - particularly at the lower end where the transfers have been accruing. Therefore, the coefficient on the time trend for parameter B should be negative in order to partially offset the increase in the upper part of the distribution due to the higher value of A, while allowing the increase in the lower part In other words, a negative value for the time trend to remain. coefficient for B would mean that the AGI distribution is getting relatively more bowed at the lower end. Indeed, as is apparent from figures 2.9 and 2.10, with few exceptions, the A parameters have been rising over time, while the B parameters have been flat or falling.

The unemployment rate should have an effect on the income distribution. Those who are laid off will have their incomes drastically reduced while the rest will not experience much change. While people at all income levels are affected by cyclical unemployment, those at the low end of the distribution are probably the most affected, because the last hired are usually the first fired, and those unfortunate ones are typically the lower paid junior employees. Therefore, we should expect the coefficient on the unemployment rate to be positive for parameter A and negative for parameter B.

The percent of personal income made up of interest and dividends has increased significantly over the sample period, while at the same

time, has shown considerable cyclicality. The variable, PCTINC, is measured in the aggregate, not according to income ventile. So, while it is true that some lower income households, such as those headed by retirees, have a large share of their income from assets, in the aggregate, those at the very top of the income distribution receive a disproportionate share. Therefore, an increase in this variable means more income is accruing primarily to households in the upper ventiles. Thus, an increase in this variable will tend to exacerbate the inequality of the income distribution as a whole, and it should skew it more toward the top. That is, we should expect the estimated coefficients on PCTINC to be slightly positive for parameter A and more strongly positive for parameter B.

It is not entirely clear that inflation should have much of an effect on the income distribution. The Lorenz curve is defined to be homogeneous of degree one in income. That is, in a fully indexed economy, pure price level induced changes in income will not affect the shape of the Lorenz curve. However, there may be an effect to the extent that the economy is not indexed. While indexing has become more prevalent recently, with COLA's on social security, welfare, and many private pensions, and even changes in the minimum wage, the sample begins back in the 1960's when indexing was not as prevalent. Those who are adversely affected by inflation would be primarily those on fixed incomes, some elderly retired persons, and even a few wage earners. These people tend to be at the lower end of the income scale. Therefore, if inflation is to have an impact, it should be a weak one making the overall distribution less equal, so its coefficient should be positive for paramter A. Since the effect should be largest at the

bottom end, we should expect B to be negative as well.

Table 2.4 shows the qualitative results from the regressions, including the prior expectations just discussed. Table 2.5 shows the quantitative results. Of the 48 parameters from the 12 equations, 42 have the expected signs. The ones with the unexpected signs were not statistically significant at the 5% level. Overall, 18 coefficients were statistically significant as measured by t-ratios. There might be some multicollinearity among the variables which would tend to produce estimated variances misleadingly high and therefore t-ratios misleadingly low. However, the coefficient estimates remain unbiased.

The time trend coefficient estimates back up the Brookings study providing additional evidence that the overall distribution of AGI or private income has recently gotten less equal, particularly at the lower end. The hypothesized effect of unemployment seems to be supported by these regressions as well. Also as expected, the inflation rate variable had little impact on the values of A and B. The results show a similarity among the household sizes in general. Household size one had the most signs contrary to expectations, (three), and household size 6-plus had two contrary coefficient signs. The equations fit least well in terms of corrected R-squared for household size two. That is because the parameters A and B show little movement over time and business cycles, indicating a fairly stable income distribution for that household size. The coefficients on the constant terms (shown in table 2.5) were mostly significant in the statistical sense.

Preparing the Data for Income Tax Calculation.

Once the function parameters are forecast for each year, they are

used to construct each household size's income distribution. As described above, the distributions are constructed by enumerating a grid of 50 corresponding quadruplets, each corresponding to equally spaced values of x_g between .02 and 1. Ultimately, the income distribution will be defined in terms of twenty equally populated ventiles (20 equally spaced values of x_i between .05 and 1) each including persons from all household sizes. At this stage of the procedure, however, the household sizes are separate.

The household sizes are combined by determining cutoff per capita incomes for the aggregate ventiles. Think of a cutoff per capita income as the per capita income which divides one income ventile from the next. Alternatively, it could be viewed as the highest income of any of the people in a given ventile. It is of course the same for each household size, since it is per capita income that is being calculated, and the ventiles contain persons from all household sizes.

The grid values of x and y are converted into number of people, X, and dollars of income Y, in the intuitive manner by equations M.11 and M.12, in the mathematical appendix. Per capita income for year t, household size h, and grid cell g is then defined as:

The cutoff per capita income between grid cell g and g+1 for year t, household size h, PCC_{thg} is obtained by:

The different household sizes are combined into a single distribution per year by an algorithm where first, a guess is made of ventile i's cuttoff per capita income PCC_{ti} (i = 1...20). Then the number of people from each household size whose income falls between

that guess and the previous ventile's cutoff per capita income, PCC_{thi-1} (this value is 0 for i=1) is estimated by interpolation. If the guess PCC_{ti} falls between the grid values of PCC_{thg} and PCC_{thg+1}, then the guess at the number of people in ventile i from household size h, year t is:

2.15) $X_{\text{thi}} = (PCC_{\text{ti}} - PCC_{\text{thg}}) / (PCC_{\text{thg}+1} - PCC_{\text{thg}}) / X_{\text{thg}} / X_{\text{thg}-1}$

At the same time, an estimate of each cell's contribution to dollar income, Y_{thi}, is calculated in the same way as in equation 2.15 except with Y substituted for X. Now the X_{thi}'s are summed over household sizes, h. If that sum is more than 5% of the total population for that year, the process is repeated with a lower guess at the per capita income cutoff, PCC_{ti}. If the sum over h of X_{thi} is less than 5% of the population, the process is repeated with a higher PCC_{ti}. The process is repeated until it converges, and the sum is within a specified range (100 persons) of the true ventile population. For the next ventile the previous ventile's cutoff serves as a lower limit, and the same procedure is applied. The top ventile, then falls out as a residual, given the total amount of adjusted gross income that is to be allocated. The resulting X_{thi}'s and Y_{thi}'s for 1981 are shown in table 2.10 along with their sums over household sizes.

This system has many advantages. It determines not only the income cutoffs for each ventile, which are used by the consumption part of the model, but also the total amount of income received in each ventile. Also determined are the shares of both income and population which come from the six different household sizes in each ventile and overall. While just the aggregate ventiles are used for the consumption part of the model, the detail shown in table 2.10 is retained for the

calculation of income tax liabilities. This is important data to have, because taxes are levied on a per household basis, not per capita, and household size is a significant factor in tax liability.

The determination of the income distribution is now complete. However, the description began by assuming that the adjusted gross income and population for each household size was given. Those numbers must be generated by the macro model. By the time the income distribution and taxes are to be estimated by the model, only an estimate of total personal income has been generated. The income distribution model must first convert personal income to AGI, and then split it up into the six household sizes. Similarly, the population must be converted to the number of taxpayers and allocated to the household sizes.

These steps of reconciliation between personal income and AGI will be described in Chapter 4, which explains the AGI-PI bridge. In fact, the first thing done by the income distribution model is to convert aggregate personal income to aggregate AGI. Then, after the distribution of AGI is determined, taxes are calculated. (Tax estimation is the subject of the next chapter.) Then, the after-tax distribution of AGI is converted back to a distribution of personal income, using the bridge described in Chapter 4.

The population base over which the income distribution model is estimated is the population of income tax filers with postive AGIs. The equation shown in table 2.6 determines this population base. IRS data only contain information on households who file tax returns. This subgroup of the overall population is referred to as "total exemptions" (other than age or blindness), and is the group over which the model

distributes adjusted gross income. While total exemptions is about ninety four percent of total population in 1982 and rising, a forecast of it must be made and is done via a regression equation with the noninstitutional population and time as the explanatory variables.

The share of income and exemptions going to each of the six household sizes must also be determined. This is explained by the inverse of the share of the population which is 65 years of age or older. As this variable increases, one would expect the share of small household sizes and their incomes to increase. Note that this variable is really little more than a time trend, especially in the forecast. Using the same set of independent variables for each equation in a system of share equations ensures that the predicted values will sum to 100 percent. The choice of this particular variable was due to its reasonable looking forecasts, and the fact that it was much easier to estimate and get the sums to be 100 percent than say, a logistic curve. The regression results are shown in tables 2.7 and 2.8. Finally, the average household size in the six and above group must be forecast. It is explained by a time trend and the results are shown in table 2.9.

TABLE 2.1

REGRESSION RESULTS.

```
YEAR 1967 HH SIZE 1 | YEAR 1967
                                                                                                                  HH SIZE 2 : YEAR 1967
RSG 0.9977 RBARSQ 0.9976 ! RSQ 0.9980 RBARSQ 0.9979 ! RSQ 0.9960 RBARSQ 0.9959
RHO 0.9191 AAPE 2.9376 | RHO 0.7895 AAPE 1 3637 | RHO 0.8620 AAPE 2.3768 A 1.0024 T-STAT 152.20 | A 0.9737 T-STAT 175.82 | A 0.8791 T-STAT 129.28
                                                                                         0.0013 T-STAT 0.60 | B 0.0113 T-STAT
            0.0254 T-STAT 8.24 | B
                                    HH SIZE 4 : YEAR 1967
                                                                                                                    HH SIZE 5 : YEAR 1967
                                                                                                                                                                                                  HH SIZE 6
RSQ 0. 9754 RBARSQ 0. 9754 | RSQ 0. 9763 RBARSQ 0. 9762 | RSQ 0. 9746 RBARSQ 0. 97948 RBARSQ 0. 97948 RBARSQ 0. 97949 RBARSQ 0
YEAR 1968 HH SIZE 1 | YEAR 1968 HH SIZE 2 | YEAR 1968 HH SIZE 3
RSQ 0.9989 RBARSQ 0.9989 | RSQ 0.9968 RBARSQ 0.9967 | RSQ 0.9913 RBARSQ 0.9910
RHO 0.8881 AAPE 1.5134 | RHO 0.8905 AAPE 1.6565 | RHO 0.9393 AAPE 3.1845
A 1.0181 T-STAT 228.22 | A 0.9676 T-STAT 138.08 | A 0.8801 T-STAT 87.97
B 0.0208 T-STAT 9.96 | B 0.0088 T-STAT 3.15 | B 0.0162 T-STAT 4.60
                                   HH SIZE 4 : YEAR 1968
                                                                                                                   HH SIZE 5 | YEAR 1968
YEAR 1968
                                                                                                                                                                                                  HH SIZE 6
RSQ 0.9916 RBARSQ 0.9914 | RSQ 0.9936 RBARSQ 0.9934 | RSQ 0.9917 RBARSQ 0.9915
RHO 0.8964 AAPE 2.9870 | RHO 0.8814 AAPE 2.5788 | RHO 0.9151 AAPE 3.2916
A 0.8688 T-STAT 87.55 | A 0.8430 T-STAT 92.66 | A 0.7956 T-STAT 77.93
B 0.0243 T-STAT 7.73 | B 0.0308 T-STAT 10.57 | B 0.0269 T-STAT 7.69
YEAR 1969 HH SIZE 1 ! YEAR 1969 HH SIZE 2 ! YEAR 1969 HH SIZE 3 RSQ 0.9987 RBARSQ 0.9987 ! RSQ 0.9949 RBARSQ 0.9948 ! RSQ 0.9903 RBARSQ 0.9900
RHO 0.9054 AAPE 1.6240 | RHO 0.9192 AAPE 2.0067 | RHO 0.9194 AAPE 3.2512
A 1.0215 T-STAT 213.01 | A 0.9828 T-STAT 114.38 | A 0.8924 T-STAT 84.93
B 0.0173 T-STAT 7.71 | B -0.0063 T-STAT -1.84 | B 0.0079 T-STAT 2.14
                                  HH SIZE 4 ! YEAR 1969
                                                                                                                  HH SIZE 5 ! YEAR 1969
                                                                                                                                                                                                   HH SIZE 6
RSQ 0. 9704 RBARSQ 0. 9701 | RSQ 0. 9708 RBARSQ 0. 9705 | RSQ 0. 9868 RBARSQ 0. 9864 RHO 0. 9324 AAPE 3. 1548 | RHO 0. 8665 AAPE 3. 1815 | RHO 0. 9132 AAPE 3. 9820 A 0. 8685 T-STAT 83. 46 | A 0. 8483 T-STAT 78. 81 | A 0. 8115 T-STAT 63. 96 B 0. 0166 T-STAT 5. 03 | B 0. 0253 T-STAT 7. 33 | B 0. 0197 T-STAT 4. 54
                                   HH SIZE 1 : YEAR 1970
                                                                                                                    HH SIZE 2 : YEAR 1970
RSQ 0.9993 RBARSQ 0.9992 | RSQ 0.9990 RBARSQ 0.9989 | RSQ 0.9979 RBARSQ 0.9979
RHO 0.8481 AAPE 1.0799 | RHO 0.7542 AAPE 1.2057 | RHO 0.8058 AAPE 1.9257 A 1.0118 T-STAT 287.17 | A - 0.9646 T-STAT 245.98 | A 0.8824 T-STAT 176.85 B 0.0017 T-STAT 1.05 | B -0.0026 T-STAT -1.67 | B 0.0099 T-STAT 5 62
                                                                                                                    HH SIZE 5 : YEAR 1970
 YEAR 1970
                                   HH SIZE 4 | YEAR 1970
                                                                                                                                                                                                   HH SIZE A
 RSQ 0.9978 RBARSQ 0.9977 | RSQ 0.9979 RBARSQ 0.9978 | RSQ 0.9977 RBARSQ 0.9976
RHO 0.6584 AAPE 1.6616 | RHO 0.6288 AAPE 1.3586 | RHO 0.6911 AAPE 2.0974
A 0.8755 T-STAT 166.01 | A 0.8985 T-STAT 165.83 | A 0.8491 T-STAT 150.29
B 0.0163 T-STAT 9.69 | B 0.0150 T-STAT 8.57 | B 0.0154 T-STAT 7.88
YEAR 1971 HH SIZE 1 : YEAR 1971 HH SIZE 2 : YEAR 1971 HH SIZE 3 RSQ 0.9993 RBARSQ 0.9993 ! RSQ 0.9988 RBARSQ 0.9987 ! RSQ 0.9982 RBARSQ 0.9982
RHO 0.8351 AAPE 1.0061 | RHO 0.8079 AAPE 1.4283 | RHO 0.7961 AAPE 1 3183
A 1.0106 T-STAT 294.19 | A 0.9590 T-STAT 223.78 | A 0.8844 T-STAT 191 79
B 0.0050 T-STAT 3.10 | B -0.0020 T-STAT -1.18 | B 0.0107 T-STAT 6 60
                                     HH SIZE 4 | YEAR 1971
                                                                                                                    HH SIZE 5 : YEAR 1971
RSQ 0.9981 RBARSQ 0.9980 | RSQ 0.9984 RBARSQ 0.9984 | RSQ 0.9979 RBARSQ 0.9978 RHO 0.5579 AAPE 1.4739 | RHO 0.4606 AAPE 1.1835 | RHO 0.6807 AAPE 2.1363 A 0.9000 T-STAT 180.83 | A 0.9194 T-STAT 194.81 | A 0.8658 T-STAT 158.26 B 0.0151 T-STAT 9.52 | B 0.0141 T-STAT 9.27 | B 0.0157 T-STAT 8.31
```

TABLE 2.1 (continued)

```
YEAR 1972 HH SIZE 1 : YEAR 1972
                                                                        HH SIZE 2 | YEAR 1972
RSQ 0. 7775 RBARSQ 0. 7775 ! RSQ 0. 7772 RBARSQ 0 7772 ! RSQ 0 7785 RBARSQ 0. 7784
RHO 0.8311 AAPE 1.3489 | RHO 0.7192 AAPE 1.1668 | RHO 0.8460 AAPE 1.7184
   YEAR 1972 HH SIZE 4 ! YEAR 1972 HH SIZE 5 ! YEAR 1972 HH SIZE 6 RSQ 0.9986 RBARSQ 0.9986 ! RSQ 0 9992 RBARSQ 0.9992 ! RSQ 0.9979 RBARSQ 0.9979
RHO 0.4009 AAPE 1.3960 | RHO 0.3375 AAPE 1.1064 | RHO 0.8013 AAPE 2.1303
A 0.8951 T-STAT 215.01 | A 0.8842 T-STAT 269.19 | A 0.8616 T-STAT 162.15
B 0.0155 T-STAT 11.66 | B 0.0176 T-STAT 16.68 | B 0.0148 T-STAT 8.05
YEAR 1973
                      HH SIZE 1 | YEAR 1973
                                                                         HH SIZE 2 | YEAR 1973
RSQ 0. 7975 RBARSQ 0. 7974 | RSQ 0. 7971 RBARSQ 0. 7970 | RSQ 0. 7978 RBARSQ 0. 9987 RBARSQ 0. 9988 RHO 0. 8335 AAPE 1.3485 | RHO 0. 8470 AAPE 1.1621 | RHO 0. 7979 AAPE 1. 4881 A 1.0163 T-STAT 333.80 | A 0. 9609 T-STAT 259.51 | A 0. 8916 T-STAT 221.60 B 0.0027 T-STAT 1.93 | B -0.0063 T-STAT -4.29 | B 0.0078 T-STAT 5.46
                      HH SIZE 4 ! YEAR 1973
                                                                         HH SIZE 5 : YEAR 1973
RSQ 0. 9781 RBARSQ 0. 9780 | RSQ 0. 9779 RBARSQ 0. 9779 | RSQ 0. 9775 RBARSQ 0. 9775 RHQ 0. 6354 AAPE 1.7425 | RHQ 0. 7287 AAPE 1. 4209 | RHQ 0. 8118 AAPE 1. 9108 A 0. 8894 T-STAT 184.83 | A 0. 9054 T-STAT 168.91 | A 0. 8635 T-STAT 148.29 B 0. 0101 T-STAT 6. 58 | B 0. 0159 T-STAT 9. 20 | B 0. 0141 T-STAT 7. 01
YEAR 1974 HH SIZE 1 : YEAR 1974 HH SIZE 2 : YEAR 1974 HH SIZE 3
RSQ 0.9997 RBARSQ 0.9997 : RSQ 0.9984 RBARSQ 0.9984 : RSQ 0.9976 RBARSQ 0.9975
RHO 0. 7210 AAPE 0. 9930 | RHO 0. 7617 AAPE 1. 3547 | RHO 0. 7666 AAPE 1. 7588
A 1.0165 T-STAT 476.32 | A 0.9587 T-STAT 200.89 | A 0.9155 T-STAT 168.71
B 0.0007 T-STAT 0.74 | B -0.0054 T-STAT -2.85 | B 0.0054 T-STAT 2.81
                      HH SIZE 4 : YEAR 1974
                                                                         HH SIZE 5 : YEAR 1974
                                                                                                                          HH SIZE 6
RSQ 0.9973 RBARSQ 0.9972 | RSQ 0.9970 RBARSQ 0.9970 | RSQ 0.9972 RBARSQ 0.9972
RHO 0.7173 AAPE 1.7248 | RHO 0.8084 AAPE 1.5627 | RHO 0.8221 AAPE 1.8918
A 0.9123 T-STAT 156.70 | A 0.9279 T-STAT 144.41 | A 0.8798 T-STAT 141.78
B 0.0086 T-STAT 4.65 | B 0.0121 T-STAT 5.84 | B 0.0127 T-STAT 5.91
YEAR 1975 HH SIZE 1 : YEAR 1975 HH SIZE 2 : YEAR 1975 HH SIZE 3
RSQ 0.9998 RBARSQ 0.9998 : RSQ 0.9989 RBARSQ 0.9989 : RSQ 0.9979 RBARSQ 0.9979
RHO 0.7668 AAPE 0.9102 | RHO 0.6911 AAPE 0.9148 | RHO 0.7985 AAPE 1.4767
A 1.0136 T-STAT 511.76 | A 0.9799 T-STAT 244.33 | A 0.9440 T-STAT 182.47
B -0.0022 T-STAT -2.36 | B -0.0083 T-STAT -5.15 | B 0.0019 T-STAT 1.03
                      HH SIZE 4 : YEAR 1975
                                                                         HH SIZE 5 | YEAR
                                                                                                           1975
RSQ 0.9975 RBARSQ 0.9974 | RSQ 0.9972 RBARSQ 0.9972 | RSQ 0.9969 RBARSQ 0.9968
RHO 0.7690 AAPE 1.3978 | RHO 0.8215 AAPE 1.4801 | RHO 0.8638 AAPE 1.9450
A 0.9501 T-STAT 165.44 | A 0.9637 T-STAT 151.75 | A 0.9401 T-STAT 138.06
B 0.0058 T-STAT 3.15 | B 0.0075 T-STAT 3.65 | B 0.0065 T-STAT 2.73
                      HH SIZE 1 : YEAR 1976
                                                                         HH SIZE 2 : YEAR 1976
HH SIZE 4 : YEAR 1976
                                                                         HH SIZE 5 ; YEAR 1976
RSQ 0. 9771 RBARSQ 0. 9770 | RSQ 0. 9775 RBARSQ 0. 9774 | RSQ 0. 9770 RBARSQ 0. 9769 RHO 0. 8159 AAPE 1. 7866 | RHO 0. 7795 AAPE 1. 2468 | RHO 0. 7857 AAPE 1. 7795 A 0. 9797 T-STAT 154. 91 | A 0. 9704 T-STAT 159. 45 | A 0. 9329 T-STAT 140 50 B 0. 0036 T-STAT 1. 79 | B 0. 0050 T-STAT 2. 52 | B 0. 0043 T-STAT 1. 88
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TABLE 2.1 (continued)

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YEAR 1977 HH SIZE 1 ! YEAR 1977
                                                                                         HH SIZE 2 : YEAR 1977
RSQ 0.9993 RBARSQ 0.9992 ! RSQ 0.9994 RBARSQ 0.9994 ! RSQ 0.9990 RBARSQ 0.9990
RHO 0 7929 AAPE 1.6768 | RHO 0 4026 AAPE 0.7927 | RHO 0.3608 AAPE 0 8879
A 0.9883 T-STAT 282.22 ; A 0.9834 T-STAT 327.04 ; A 0.9493 T-STAT 264.60 B -0.0002 T-STAT -0.12 ; B -0.0104 T-STAT -8.60 ; B 0.0001 T-STAT 0.07
YEAR 1977 HH SIZE 4 : YEAR 1977 HH SIZE 5 : YEAR 1977 HH SIZE 6
RSQ 0. 9980 RBARSQ 0. 9979 : RSQ 0. 9966 RBARSQ 0. 9966 : RSQ 0. 9979 RBARSQ 0. 9978
RHO 0.6634 AAPE 1.2446 | RHO 0.7337 AAPE 1.5245 | RHO 0.6181 AAPE 1.1751 A 0.9406 T-STAT 182.23 | A 0.9415 T-STAT 134.92 | A 0.9725 T-STAT 167.61 B 0.0035 T-STAT 2.12 | B 0.0052 T-STAT 2.32 | B 0.0033 T-STAT 1.63
                                                                                                                                                                 1. 1751
             1978
                            HH SIZE 1 | YEAR 1978
                                                                                             HH SIZE 2 : YEAR 1978
RSG 0.9995 RBARSG 0.9995 ! RSG 0.9990 RBARSG 0.9990 ; RSG 0.9986 RBARSG 0.9985
RHO 0.7160 AAPE 1.3619 | RHO 0.5786 AAPE 0.7821 | RHO 0.6492 AAPE 1.1773
A 0.9823 T-STAT 349.99 | A 0.9789 T-STAT 248.79 | A 0.9683 T-STAT 220.67
B -0.0011 T-STAT -0.88 | B -0.0056 T-STAT -3.56 | B -0.0019 T-STAT -1.24
YEAR 1978 HH SIZE 4 : YEAR 1978
                                                                                           HH SIZE 5 : YEAR 1978
TEAR 1978 HH SIZE 4 ; TEAR 1778 HH SIZE 5 ; TEAR 1778 HH SIZE 5 ; TEAR 1778 HH SIZE 6 ; 
YEAR 1979 HH SIZE 1 : YEAR 1979 HH SIZE 2 : YEAR 1979 HH SIZE 3 RSQ 0.9998 RBARSQ 0.9998 : RSQ 0.9994 RBARSQ 0.9994 : RSQ 0.9988 RBARSQ 0.9988
RHO 0.6773 AAPE 0.5128 | RHO 0.6534 AAPE 0.7935 | RHO 0.6711 AAPE 1.1275
A 0.9914 T-STAT 559.59 | A 0.9805 T-STAT 312.79 | A 0.9523 T-STAT 241.72
B -0.0051 T-STAT -6.23 | B -0.0005 T-STAT -0.39 | B 0.0033 T-STAT 2.34
                            HH SIZE 4 ! YEAR 1979
                                                                                            HH SIZE 5 : YEAR 1979
                                                                                                                                                          HH 517F 6
RSG 0.9977 RBARSG 0.9977 | RSG 0.9985 RBARSG 0.9984 | RSG 0.9985 RBARSG 0.9985
RHO 0.6138 AAPE 1.5121 | RHO 0.6322 AAPE 1.0149 | RHO 0.7019 AAPE 1.2856
A 0.9464 T-STAT 176.47 | A 0.9538 T-STAT 204.24 | A 0.9757 T-STAT 200.95
                                             2.24 : B
                                                                    0. 0102 T-STAT
                                                                                                         6.75 ; B
                                                                                                                                  0. 0105 T-STAT
         0. 0038 T-STAT
                            HH SIZE 1 | YEAR 1980
                                                                                            HH SIZE 2 : YEAR 1980
                                                                                                                                                          HH SIZE 3
RSQ 0.9999 RBARSQ 0.9999 : RSQ 0.9996 RBARSQ 0.9996 : RSQ 0.9992 RBARSQ 0.9992
RHO 0.3615 AAPE 0.3303 | RHO 0.3039 AAPE 0.5081 | RHO 0.3628 AAPE 0.6293
    1.0030 T-STAT 889.79 ! A 0.9906 T-STAT 384.88 ! A 0.9845 T-STAT 301.91
-0.0007 T-STAT -1.33 ! B 0.0005 T-STAT 0.50 ! B 0.0035 T-STAT 3.01
YEAR 1980 HH SIZE 4 ! YEAR 1980 HH SIZE 5 ! YEAR 1980 HH SIZE 6
RSQ 0.9984 RBARSQ 0.9983 ! RSQ 0.9990 RBARSQ 0.9990 ! RSQ 0.9992 RBARSQ 0.9992
                                                                                            HH SIZE 5 : YEAR 1980
RHO 0.5981 AAPE 1.1892 | RHO 0.5268 AAPE 0.6725 | RHO 0.5358 AAPE 0.8314
        0.9632 T-STAT 209.01 | A 1.0051 T-STAT 255.50 | A 0.9755 T-STAT 268.14
0.0037 T-STAT 2.53 | B 0.0092 T-STAT 7.21 | B 0.0103 T-STAT 8.08
                            HH SIZE 1 : YEAR 1982
                                                                                            HH SIZE 2 : YEAR 1982
RSQ 0.9968 RBARSQ 0.9967 | RSQ 0.9996 RBARSQ 0.9996 | RSQ 0.9994 RBARSQ 0.9994
RHO 0.8809 AAPE 3.4056 | RHO 0.5622 AAPE 0.8070 | RHO 0.4857 AAPE 0.9196
A 0.9377 T-STAT 124.89 | A 0.9707 T-STAT 364.66 | A 0.9938 T-STAT 327.55
B 0.0226 T-STAT 6.52 | B 0.0089 T-STAT 8.33 | B 0.0062 T-STAT 5.68
                             HH SIZE 4 | YEAR 1982
                                                                                            HH SIZE 5 ; YEAR 1982
                                                                                                                                                           HH SIZE 6
 YEAR 1982
RSQ 0,9993 RBARSQ 0,9993 : RSQ 0,9993 RBARSQ 0,9993 : RSQ 0,9994 RBARSQ 0,9994
 RHO 0.6251 AAPE 0.9040 | RHO 0.7719 AAPE 1 0147 | RHO 0.8720 AAPE 0.9410
       1. 0116 T-STAT 326 57 | A 1. 0269 T-STAT 305. 28 | A 1. 0259 T-STAT 313. 11 0. 0039 T-STAT 3. 92 | B 0. 0053 T-STAT 4. 80 | B 0. 0084 T-STAT 7. 29
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THE

YEAR 1980

HOUBEHOLD SIZE 1

.

YEAR 1980 HOUSEHOLD SIZE 2

	YEAR 1		OVBEHOLD			ı	YE	EAR 19	80 HD	USEHOLD		
						IACTUAL	I AC	CTUAL I	ESTIM.	I ACTUAL	I ESTIM.	IRESID.
X POP. I							1 %	AOI I	X AGI	I + ADI	I & AGI	1 %
						-						-
0. 050001						10. 05000						
0. 100001 0. 150001						10. 10000						
0. 200001						10. 15000				_		
0. 250001						10. 20000						
0. 300001						10. 25000						
0. 350001						10. 30000						
0. 400001						10. 35000						
0. 450001						10. 40000					,	
0. 500001						10. 45000						
0. 550001						10. 50000						
0. 600001						10. 55000						
0. 650001						10. 60000						
0. 700001						10. 65000						
0. 750001						10. 70000						
0. 800001						10. 80000						
0. 850001						10. 85000						
0. 900001				11170.		10. 90000						
0. 950001						10. 75000						
1. 000001						11.00000					1 16834. i	
1. 000001		1. 00000	# / VVG.	. 50773.	V. E.	11.00000		A0001	1. 000001	10000.	1 10034.	0. 2
•	YEAR 197		JBEHOLD 1					R 197		EHOLD 8		ECIN
ACTUAL I	ACTUAL IE	STIM. I	ACTUAL I	ESTIM. IF	REBID.	ACTUAL I	ACT	UAL IE	BTIM. IA	CTUAL I	ESTIM. IF	
ACTUAL I	ACTUAL IE	BTIM. I	ACTUAL I	ESTIM. IF	REBID.	ACTUAL I	ACT	UAL IE	BTIM. IA	CTUAL I	ESTIM. IF	%
ACTUAL I A	ACTUAL IE	BTIM. % AOI	ACTUAL!	ESTIM. IF	X	ACTUAL I X POP. I	ACT X A	UAL IE	BTIM. IA K AOI I	CTUAL I	EBTIM. IF	X
ACTUAL 1 6 % POP. 1 7 0.0500010.	ACTUAL 16 X AQI 1 	ETIM. % AGI 	ACTUALI \$ AQI I 896. I	ESTIM. (6	REBID. X 27. 2	ACTUAL I IX POP. I II IO. 05000 I	ACT % A 0. 00	UAL E	BTIM. 14 2 AOI 1 	CTUAL + ADI 1263.	EBTIM. IF 9 A01 I 1324. I	7. -4. B
ACTUAL 1 /2 POP. 1 /2	ACTUAL 18 X AQI 1 0049510	EBTIM, I % AQI I 0. 003601 0. 009141	876. I	653. I 1002. I	27. 2 -11. 8	ACTUAL I IX POP. I II IO. 05000 I IO. 10000 I	ACT % A 0. 00 0. 01	UAL JEI 101 1 1480 0. 1495 0.	005031 015381	1263. I 2669. I	EBTIM. IF • AOI 1324. 2722.	7. -4. 8 -2. 0
ACTUAL 1 /2 POP.	ACTUAL IE 2 A0I I 	EBTIM. % AQI 0. 00360 0. 00914 0. 01695	876. 1 876. 1 876. 1	653. I 1002. I 1416. I	27. 2 -11. 8 1. 8	ACTUAL I IX POP. I II IO. 05000 I IO. 10000 I	ACT % A 0. 00 0. 01 0. 02	UAL JE 101 1 1480 0 1495 0 1883 0	BTIM, IA 2 AOI I 005031 015381 029441	1263. 1 2669. 1 3653. 1	EBTIH. IF • A0I 1324. 2722. 3698.	7. -4. 8 -2. 0 -1. 2
ACTUAL I / 2 POP. I 7	ACTUAL IE X A0I I 	EBTIM. I X AQI I 	876. 1 876. 1 876. 1 1443. 1 2329. 1	EBTIM. IF • A01 • 53. 1002. 1416. 2234.	27. 2 -11. 8 1. 8 4. 1	ACTUAL I IX POP. I I	ACT 2 A 0. 00 0. 01 0. 02 0. 04	VAL IEI 101 1 1480 0 1495 0 1495 0 1607 0	BTIM. IA K AQI I 005031 015381 029441 046871	1263. I 2669. I 3653. I 4535. I	EBTIM. IF • A01 1324. 2722. 3698. 4586.	7. -4. 8 -2. 0 -1. 2 -1. 1
ACTUAL 1 / X POP. 1 : 2	ACTUAL IE X A0I I 	EBTIM. I % AQI I 0. 003601 0. 009141 0. 016951 0. 029281 0. 043011	876. 1 876. 1 876. 1 1443. 1 2329. 1	653. I 1002. I 1416. I 2234. I 2487. I	27. 2 -11. 8 1. 8 4. 1	ACTUAL I IX POP. I I	ACT % A 0. 00 0. 01 0. 02 0. 04 0. 06	WAL JES WI STANDARD	BTIM. IA K A01 I 00503I 01538I 02944I 04687I 06729I	1263. I 2669. I 3653. I 4535. I 5335. I	ESTIM. IF • A01 ! 1324. ! 2722. ! 3698. ! 4586. ! 5370. !	74. 8 -2. 0 -1. 2 -1. 1 -0. 7
ACTUAL 1 / X POP. 1 7	ACTUAL IE X A01 I 	EBTIM. X AQI 1	876. I 896. I 896. I 1443. I 2329. I 2329. I 3207. I	653. I 1002. I 1416. I 2234. I 2487. I 3176. I	27. 2 -11. 8 1. 8 4. 1 -6. 8 1. 0	ACTUAL I X POP. I I	ACT % A 0. 00 0. 01 0. 02 0. 04 0. 06 0. 09	WAL JES WI STANDARD	BTIM. A 2 AOI 00503 01538 02944 04687 06729 09092	1263. I 2669. I 3653. I 4535. I 5335. I 6232. I	ESTIM. IF • AOI ! 1324. ! 2722. ! 3698. ! 4586. ! 5370. ! 6219. !	74. 8 -2. 0 -1. 2 -1. 1 -0. 7 0. 2
ACTUAL 1 / X POP. 1 / 2	ACTUAL 18 X A01 1 	EBTIM. X A9I 1	ACTUAL I \$ A91 876. 876. 1443. 2329. 2329. 3207. 3886.	ESTIM. (6	27. 2 -11. 8 1. 8 4. 1 -6. 8 1. 0	ACTUAL I IX POP. I II IO. 05000 I IO. 15000 I IO. 20000 I IO. 25000 I IO. 35000 I IO. 35000 I	ACT X A 0. 00 0. 01 0. 02 0. 04 0. 06 0. 09 0. 11	WAL E WAL E WAS O. WAS O. 	BTIM. IA 2 AOI 	1263. 1269. 1269. 1269. 13653. 14535. 15335. 16232. 17175.	ESTIM. IF • A9I 1324. 2722. 3698. 4586. 5370. 6219. 7143.	74. 8 -2. 0 -1. 2 -1. 1 -0. 7 0. 2 0. 4
ACTUAL 1 / X POP. 1 : 2	ACTUAL IE X A01 I 	BTIM. X A91 X A91	ACTUAL I \$ A01 896. 896. 1443. 2329. 2329. 3207. 3886. 4226.	ESTIM. IF • AOI I • 533. I 1002. I 1416. I 2234. I 2487. I 3916. I 4447. I	27. 2 -11. 8 1. 8 4. 1 -6. 8 1. 0 -0. 8	ACTUAL I IX POP. I I	ACT X A 0. 00 0. 01 0. 02 0. 04 0. 06 0. 09 0. 11	WAL E WAL E WAS O. WAS O. 	BTIM. IA K AOI I 00503I 01538I 02944I 04687I 06729I 09092I 11808I 14864I	CTUAL # A01 1263 2669 3653 4535 5335 6232 7175 8109	EBTIM. IF • A01 I 1324. I 2722. I 3698. I 4586. I 5370. I 6219. I 7143. I 8040. I	7. -4. 8 -2. 0 -1. 2 -1. 1 -0. 7 0. 2 0. 4 0. 9
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7 POP. 1 0. 0500010 0. 1000010	ACTUAL I % A91 I 0. 006721 0. 020191 0. 038451	ESTIM. X A01 1	ACTUAL I • A01 I 665. I 1334. I	706. I	RESID. -6. 1 -2. 2 0. 3	IACTUAL % POP. 0. 05000 0. 10000	ACTUAL % A91 0. 00616 0. 01976 0. 03800	IESTIM. I % A01 I IO. 00749 IO. 02161 IO. 03974	ACTUAL 9 AQI 464. 1039.	BSTIM. + AQI + AQI	-21. 5 -2. 3 -0. 5
X POP. 1 0. 0500010 0. 1000010 0. 1500010	ACTUAL I 2 A91 I 0. 006721 0. 020191 0. 038451 0. 061221	ESTIM. X A01 1	ACTUAL I • A01 I 665. I 1334. I 1808. I	ESTIM. • A91 • 706. 1364. 1803.	-6. 1 -2. 2 0. 3 2. 2	IACTUAL X POP. 0.05000 0.10000 0.15000	ACTUAL % A91 0. 00616 0. 01996 0. 03800 0. 06020	EBTIM. X AQI 10. 00749 10. 02161 10. 03974 10. 06136	ACTUAL	EBTIM. \$ A91 364. 1063. 1345.	-21. 5 -2. 3 -0. 5
% POP. 	ACTUAL 2 A91 1	ESTIM. X A9I 0. 007131 0. 020901 0. 03911 0. 061391 0. 08741 1	ACTUAL I • A01 I 665. I 1334. I 1808. I 2255. I	FBTIM. • A91 706. 1364. 1803. 2206.	REBID. X -6. 1 -2. 2 0. 3 2. 2 0. 5	IACTUAL IX POP. I IO. 050001 IO. 100001 IO. 150001 IO. 200001	ACTUAL % A9I 0. 00616 0. 01976 0. 03800 0. 06020 0. 08543	ESTIN. % AGI 10. 00749 10. 02161 10. 03974 10. 06156 10. 08640	464. 1039. 1358. 1900.	ESTIM.	-21. 5 -2. 3 -0. 5 1. 7 1. 6
X POP. 	ACTUAL I % A01 I 0. 006721 0. 020191 0. 038451 0. 061221 0. 087371 0. 117221	ESTIM. X A9I 0. 007131 0. 020901 0. 03911 0. 061391 0. 08741 0. 117091	ACTUAL I A01 I 665. I 1334. I 1808. I 2255. I 2589. I	FBT1M. II	REBID. X -6. 1 -2. 2 0. 3 2. 2 0. 5 0. 6	IACTUAL IX POP. I I O O O O O O O O O	ACTUAL X A91 0. 00616 0. 01976 0. 03800 0. 06020 0. 08543 0. 11401	ESTIN. % AGI 10. 00749 10. 02161 10. 03974 10. 06156 10. 08640 10. 11441	ACTUAL	ESTIM.	7 -21.5 -2.3 -0.5 1.7 1.6 2.0
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% PDP. 	ACTUAL: % A91 I 	ESTIM. I % A91 I 	ACTUAL I • A01 I 645. (1334. I 1808. I 2255. I 2589. I 2956. I 3258. I	ESTIM. I • A91 I 706. I 1364. I 1803. I 2206. I 2576. I 2939. I 3243. I	-6. 1 -2. 2 0. 3 2. 2 0. 5 0. 6 0. 5	IACTUAL 1X POP, 1 1 1 1 1 1 1 1 1	ACTUAL X A91 0. 00416 0. 01976 0. 03800 0. 06020 0. 06020 0. 11401 0. 14563 0. 18017	IESTIN, I X A91 I	464. 1039. 1358. 1671. 1900. 2151. 2381. 2602.	564. 1063. 1063. 1365. 1643. 1670. 2108. 2344. 2578.	2.0 1.5 2.0 2.0 1.5 0.9
% POP. 	ACTUAL: % A01 I 0. 00672! 0. 02019! 0. 03849! 0. 06122! 0. 08737! 0. 11722! 0. 15012! 0. 18604! 0. 22474!	ESTIM. I % A9I I 	ACTUAL I • A01 I • 665. I 1334. I 1808. I 2255. I 2589. I 2956. I 3556. I	ESTIM. I 9 A91 I 706. I 1364. I 1803. I 2206. I 2576. I 2939. I 3243. I 3646. I 3844. I	-6. 1 -2. 2 0. 3 2. 2 0. 5 0. 6 0. 5 -2. 6 -0. 3	IACTUAL 1X POP. 1 1 1 1 1 1 1 1 1	ACTUAL X A91 0. 00616 0. 01796 0. 03800 0. 06020 0. 06543 0. 11401 0. 14563 0. 18017 0. 21778	IESTIN. X A01 0. 00749 0. 02161 10. 03974 0. 06156 10. 08640 10. 1441 10. 14555 10. 17979 10. 21811	ACTUAL	544. 1063. 1365. 1670. 1208. 12344. 12578. 12685. 12685.	21.5 -21.5 -2.3 -0.5 1.7 1.6 2.0 1.5 0.9 -1.9
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% POP.	ACTUAL: % A91 % A91 0.00672; 0.02019; 0.03845; 0.06122; 0.08737; 0.11722; 0.15012; 0.18604; 0.22474; 0.26796; 0.31648; 0.36500; 0.46204; 0.46204; 0.58332;	ESTIM. 1 X A9I 1 0. 007131 0. 029901 0. 039111 0. 061391 0. 087411 0. 117091 0. 186681 0. 225501 0. 266621 0. 314521 0. 362431 0. 465511 0. 525861 0. 586641	ACTUAL I • A01 I 665. I 1334. I 1808. I 2255. I 2589. I 2756. I 3256. I 3256. I 3256. I 34805. I 4805. I 4805. I 4805. I 6067. I 6140. I	ESTIN. I 9 A91 I 706. I 1364. I 1803. I 2206. I 2576. I 2939. I 3243. I 3646. I 3844. I 4072. I 4744. I 4744. I 486. I 5343. I 5976. I 6019. I	RESID. X -6. 1 -2. 2 0. 3 2. 2 0. 5 0. 6 0. 5 -2. 6 -0. 3 4. 9 1. 3 1. 3 -1. 3 -1. 2 1. 5 2. 0	IACTUAL IX POP.	ACTUAL X A91	IESTIN. X A91	ACTUAL	ESTIM.	2. 1. 5 -2. 3 -0. 5 1. 7 1. 6 2. 0 1. 5 0. 7 -1. 9 -0. 2 6. 3 1. 5 0. 5 -6. 4 -7. 1. 8
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% POP.	ACTUAL: % A91 % A91 0. 00672! 0. 02019! 0. 03845! 0. 06122! 0. 08737! 0. 11722! 0. 15012! 0. 22474! 0. 22474! 0. 36500! 0. 41352! 0. 58532! 0. 58532! 0. 58532! 0. 72769!	ESTIM. 1 X A91 1 	ACTUAL I • A01 I 	ESTIN. I 9 A91 I 706. I 1364. I 1803. I 2206. I 2576. I 2939. I 3243. I 3646. I 3844. I 4072. I 4744. I 4744. I 486. I 5343. I 5976. I 6019. I	RESID. 2 -6. 1 -2. 2 0. 3 2. 2 0. 5 0. 6 0. 5 -2. 6 -0. 3 4. 9 1. 3 -1. 3 -1. 2 1. 5 2. 0 0. 3 0. 1	IACTUAL I IX POP. I IX POP. I I IX POP. I I I I I I I I I I I I I I I I I I I	ACTUAL X A91	IESTIN, I X A91 X A91 1 10. 00749 10. 04154 10. 14555 10. 21811 10. 25870 10. 30140 10. 45411 10. 45411 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10. 51261 10.	ACTUAL	ESTIM.	2. 1. 5 -2. 3 -0. 5 1. 7 1. 6 2. 0 1. 5 0. 9 -1. 9 -0. 2 6. 3 1. 5 0. 5 -6. 4 -5. 7 1. 8 -0. 4 0. 2
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	YEAR 1		NUBEHOLD			1	YEAR 19		JBEHOLD (
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		10. 04450					10.06788				
		10. 062181					10. 09113				
		10. 082061					10. 11938				
		10. 10653					10. 15080				
		0. 13645					10. 18538				
		0. 16857					10. 22392				
		10. 20743					10. 26690				
		0. 25083					10. 31386				
		0. 30126					10. 36451				
		0. 35661					10. 41966				
		0. 42154					10. 480221				
		0. 494021					10. 346481				
		IO. 5771 81					10. 620891				
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	YEAR 19		WBEHOLD			1	YEAR 19		BEHOLD 6		
	ACTUAL	EBTIM.	ACTUAL I	ESTIM.	IRESID.	IACTUAL I	ACTUAL	ESTIM.	ACTUAL I	ESTIM.	
X POP.	ACTUAL X AGI	EBTIM.	ACTUAL!	EBTIM.	RESID.	IACTUAL I	ACTUAL!	EBTIM.	ACTUAL	ESTIM.	1 %
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% POP. 0. 05000	ACTUAL X A01	EBTIM. % A01 	ACTUAL I • AOI I 785. I	EBTIM. 4 AOI 916.	REBID. X 1	IACTUAL IX POP. IO. 05000	ACTUAL! 2 AGI ! 1!	EBTIM. 2 AOI	ACTUAL	ESTIM. • A01 1162.	X
X POP. 0. 05000 0. 10000	ACTUAL 2 A01 0.00749 0.02133	EBTIM. % A91	ACTUAL I • A01 I 785. I 1451. I	916.	REBID. X -16.7 -4.1	IACTUAL IX POP. I	ACTUAL! % AQI 0.00888 0.02531	EBTIM. % AQI 0. 01013 0. 02669	ACTUAL # A91 1018. 1984.	ESTIM. • A0I 1162. 1897.	1 X 1 1 -14. 1 1 -0. 8
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X POP. 0. 05000 0. 10000 0. 15000 0. 20000 0. 25000 0. 30000	ACTUAL X A01 0. 00749 0. 02133 0. 03964 0. 06129 0. 08675 0. 11613	EBTIM. X A01 X A01	ACTUALI • AOI 785. 1451. 1917. 2269. 2667. 3079.	916. 1910. 1921. 2262. 2626. 3004.	REBID. 1	IACTUAL 1% POP. 10. 05000 10. 15000 10. 25000 10. 25000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 30000 10. 300000 10. 30000 10. 300000 10. 300000 10. 300000 10. 300000 10. 300000 10.	ACTUALI 2 A91 3 10.00888 10.02531 10.04640 10.07171 10.07989 10.13100	EBTIM. X A01	ACTUAL	1162. 1099. 2370. 2817. 3194.	1 7 1 -14. 1 1 -0. 8 2. 0 1 2. 9 1 1. 2 1 0. 8
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X POP. 	ACTUAL X A01 0. 00749 0. 02133 0. 03964 0. 06129 0. 06479 0. 11613 0. 14874 0. 18379	ESTIM. 1 X A01 1 1 X A01 1 1 X A01 1 1 1 X A01 1 1 1 X A01 1 1 X A01 1 1 X A01	ACTUAL! • A01 785. 1451. 1917. 2269. 2667. 3079. 3416. 3672.	916. 1510. 1921. 2262. 2626. 3004. 3344. 3634.	REBID. 1 2 1 -16.7 1 -4.1 1 -0.2 1 0.3 1 .5 1 2.4 2 1	IACTUAL 1% PDP. (ACTUAL X A91 X A91	ESTIM. I X A01 I 0. 01013I 0. 02669I 0. 04736I 0. 07193I 0. 07979I 0. 13063I 0. 1650BI 0. 20272I	ACTUAL 6 A01 1018 1884 2419 2902 13232 3564 4035 4235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 14235 1423	1162. 1897. 2370. 2817. 3194. 3536. 3950. 4316.	1 7 14. 1 1 -0. 6 2. 0 1 2. 9 1 1. 2 1 0. 8 1 2. 1 -1. 9
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X POP. 1	ACTUAL X A91	IEBT1 I % / I IO. 00 IO. 01 IO. 02 IO. 05 IO. 05 IO. 10 IO. 12 IO. 12 IO. 23 IO. 24 IO. 34 IO. 35 IO. 55 IO. 55 IO. 55	IM. I AGI 1251 1251 12032 13010 1122 13616 13004 12766 13763 1322 13763 1322 13670 1324 13670 13724	ACTUAL	ESTIM. # A91 419. 556. 6520. 457. 4260. 4570. 4260. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 4570. 45	REBID. 35. 6 14. 7 16. 4 17. 3 18. 33. 3 19. 6 11. 1 19. 11. 1 2. 9 10. 8	IACTUAL IX POP. I	I ACTUAL I % A91 I IO. 00527 IO. 01512 IO. 02832 IO. 04464 IO. 06499 IO. 01525 IO. 11525 IO. 14490 IO. 26206 IO. 30852 IO. 30852 IO. 31843 IO. 41350 IO. 47370 IO. 54258 IO. 70024	10. 00535 10. 00535 10. 01556 10. 02922 10. 04610 10. 06640 10. 08933 10. 11644 10. 18101 10. 26049 10. 30782 10. 30782 10. 41286 10. 47260 10. 52038 10. 52038	ACTUAL 4 A91 4 A91 1194. 1194. 12739. 3347. 3590. 4420. 4626. 5104. 5626. 6044. 6668. 7289. 8425. 9403. 9403.	ESTIM. I # AQI I 647. I 1236. I 1634. I 2044. I 2776. I 3283. I 3599. I 4219. I 4582. I 5042. I 5731. I 5970. I 6748. I 7234. I 8700. I 8700. I	-1.5 -3.6 -3.5 -3.4 0.2 -1.4 1.9 -0.2 4.5 1.7 1.2 -1.9
X POP. 1	ACTUAL X A91	IEBT1 1	IM. I A91	ACTUAL	ESTIM. 419. 419. 419. 656. 1321. 6172. 1321. 6273. 1321. 6273. 1321. 6273. 1326. 13273. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 142600. 14260. 14260. 14260. 14260. 14260. 14260. 14260. 142600. 142	REBID. 35. 6 14. 5 6. 14. 5 7. 33. 3 3. 3 5. 8 -2. 5 -11. 1 -7. 8 3. 4 -3. 6 1. 2 1. 3 1. 6 1. 1 2. 7 -0. 8 -0. 0	IACTUAL IX POP. I	I ACTUAL I % A91 I I 0. 00527 I 0. 01512 I 0. 04464 I 0. 06499 I 0. 08761 I 0. 11525 I 0. 14490 I 0. 21990 I 0. 26206 I 0. 30852 I 0. 41350 I 0. 47370 I 0. 54493 I 0. 70024 I 0. 79266	10. 00535 10. 00535 10. 01556 10. 02922 10. 04610 10. 06640 10. 08933 10. 11644 10. 14616 10. 26049 10. 30782 10. 30782 10. 41286 10. 47260 10. 47261 10. 47261 10. 47261 10. 47261 10. 47261 10. 47261 10. 47261 10. 47261	ACTUAL 4 A91 4 A91 194. 1194. 12739. 2464. 2739. 3347. 3590. 4420. 4668. 5104. 5626. 6044. 6668. 7289. 8425. 9403. 11190.	ESTIM. I # AQI I 647. I 1236. I 1634. I 2044. I 2776. I 3283. I 3599. I 4219. I 4582. I 5042. I 5731. I 5970. I 6748. I 7234. I 8700. I 8700. I	7 -1.5 -3.6 -3.5 -3.4 -0.2 -1.4 1.9 -0.2 4.5 1.7 1.2 -1.9 -1.2 -0.8 -0.9 2.2 -3.2

YEAR 1966

HOUBEHOLD BIZE 3

	YEAR		OUBEHOLD								<i>I</i> BEHOLD		
ACTUAL	I ACTUA	LIESTIM.	I ACTUAL	ESTIM.	IRESID.	IACTUA	LI	ACTUAL	. IEST	1M. 1	ACTUAL	I ESTIM.	IRESID.
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	-	610.00889		692.									-12.1
		510. 02323											
		810. 04131											
		-						0. 04667					
		310.06242						0. 07094					
		410.0BB02		l 1993.				0. 10069				l 2389 .	
0. 30000	10. 1155	110. 1166B	l 2284.	l 2231.	1 2.4	10. 300	001	0. 13253	110. 1	32121	2650.	1 2601.	l 1.8
0. 35000	10. 1485	110.14877	1 2569.	1 2498.	1 2.7	10. 350	001	0. 16679	110. 1	66151	2852.	1 2832.	I 0. 7
0. 40000	10. 1850	710. 18420	2847.	2758.	3.2	10.400	100	0. 20433	10.2	0408	3124.	1 3157.	1 -1.1
		610. 22219						O. 24368					
		110. 26468						0. 2857 3					
		110. 30967						0. 20073 0. 33039					
		510. 35492			-		_						
								0. 37764		– – •			
		710. 40786						0. 42743					
		510. 462BB						D. 48558					
		l 10. 5247 0						D. 5483 9					
O. 80000	10. 5950	310. 59388	I 5463. I	5386.	1.4	10. 800	001	D. 61120	10. 6	07821	5228.	I 5 070.	3. 0
0. 85000	10. 6652	510. 66322	J 5463. I	5398.	1.2	10. 850	001	D. 67401	10. 67	72671	5228.	I 539B.	-3. 3
0. 90000	10. 73542	210. 73766	1 5463.	5795.	1 -6.1	10. 900	001	D. 73749	10. 74	41891	5283.	1 5761.	-9.0
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	YEAR 1	966 H	WEHOLD	BIZE 5							SEHOLD 1		
ACTUAL	ACTUAL	IESTIM.	ACTUALI	ESTIM. I	RESID.	IACTUAL	. 1	ACTUAL	EBTI	M. I	ACTUAL	EOTIM.	REBID.
Z POP.	ACTUAL	IEBTIM.	ACTUAL!	ESTIM.	RESID.	IACTUAL	- 1	ACTUAL % AOI	IEBTI	M. 1	ACTUAL # AOI	EBTIM.	X
% POP.	ACTUAL % AOI	IEBTIM.	ACTUALI	# ADI	RESID.	IACTUAL IX POP.	- -	ACTUAL % AOI	EBTI	M. 1	ACTUAL • AOI	E8TIM. \$ A01	X
% POP.	ACTUAL % AOI	IEBTIM.	ACTUALI	# ADI	RESID.	IACTUAL IX POP.	- -	ACTUAL % AOI	EBTI	M. 1	ACTUAL • AOI	E8TIM. \$ A01	X
% POP.	ACTUAL 2 A01 0.00956	EBTIM. % AQI 	# A01 539.	ESTIM. • AOI 	RESID. X -12.9	1ACTUAL 1% POP. 1		ACTUAL % A01). 01002	EBT X A 	M. 2591	ACTUAL 9 A01 540.	EBTIM.	-25. 6
7. POP. 0. 050001 0. 100001	ACTUAL 2 A01 0. 00956	IEBTIM. I X A91 IO. 01082 IO. 02832	539. I	608. I	RESID. X -12. 9 -1. 0	1ACTUAL 1% POP. 1		ACTUAL % A01 0. 01002 0. 02833	IEBTI I % A I IO. 01 IO. 03	M. 01 2591	940.	ESTIM. \$ AQI 	-25. 6 -3. 6
% POP. (0. 05000) 0. 10000) 0. 15000)	ACTUAL X A01 10. 00956 10. 02690 10. 04845	ESTIM. X ASI 10. 01082 10. 02832	ACTUALI	609. 1 984. 1	RESID. 2 -12.9 -1.0 0.8	1ACTUAL 1% POP. 1	- - 0010	ACTUAL 2 A01 0. 01002 0. 02833 0. 05160	IEBTI I X A I IO. 01 IO. 03 IO. 05	M. NOI N	940. 986. 1254.	ESTIM. + AOI 	-25. 6 -3. 6 1. 4
7 POP. 	ACTUAL X A01 10. 00956 10. 02690 10. 04845 10. 07382	1 X A91 1 X A91 10. 01082 10. 02832 10. 04968	ACTUALI	608. I 984. I 1201. I 1396. I	-12. 9 -1. 0 0. 0	IACTUAL IX POP. I IO. 0500 IO. 1000 IO. 1500 IO. 2000	- - 0010 0010	ACTUAL 2 A01 0. 01002 0. 02833 0. 05160 0. 07833	1	M. I. NOI NOI 12591 13541 154481 16431	940. 9 401 986. 1254.	EBTIM.	-25. 6 -3. 6 1. 4 2. 9
7 POP. 0. 050001 0. 100001 0. 150001 0. 200001 0. 250001	ACTUAL X A01 10. 00956 10. 02690 10. 04845 10. 07382 10. 10266	ESTIM. X A91 10. 01082 10. 02832 10. 04968 10. 07451 10. 10287	539. I 974. I 1211. I 1426. I 1623. I	608. I 984. I 1201. I 1396. I	7 -12. 9 -1. 0 0. 8 2. 1 1. 8	IACTUAL IX POP. I IO. 0500 IO. 1000 IO. 2000 IO. 2500	- - 	ACTUAL % A01 0. 01002 0. 02833 0. 05160 0. 07833 0. 10967	1	M. NOI 12591 1541 14481 10431	940. 1254. 1440.	EBTIM. • A01 678. 1021. 1236. 1378. 1586.	7 -25. 6 -3. 6 1. 4 2. 9 6. 1
7 POP. 0. 05000 0. 10000 0. 15000 0. 25000 0. 25000	ACTUAL X A91 	ESTIM. X A91 10. 01082 10. 02832 10. 04968 10. 07451 10. 10287 10. 13461	539. I 974. I 1211. I 1426. I 1623. I	609. 984. 1201. 1396. 1795.	72. 9 -12. 9 -1. 0 0. 9 2. 1 1. 8 2. 3	IACTUAI IX POP. I	- - 0010 0010 0010	ACTUAL X A01 2. A01 0. 01002 0. 02833 0. 05160 0. 07833 0. 10767 0. 14100	1	M. 101 257 154 1548 1643 1654	540. 986. 1254. 1440. 1688.	EBTIM.	725. 6 -3. 6 1. 4 2. 9 6. 1 2. 1
7 POP. 0. 05000 0. 10000 0. 15000 0. 25000 0. 25000 0. 35000	ACTUAL X A01 0. 00956 0. 02690 0. 04845 0. 07382 0. 10268 0. 13517	EBTIM. X AQI	ACTUALI	608. 608. 984. 1201. 1396. 1594. 1785. 1893.	-12. 9 -1. 0 0. 8 2. 1 1. 8 2. 3 -0. 1	FACTUAL 1% POP. 1 10. 0500 10. 1500 10. 2500 10. 2500 10. 3500 10. 3500	- i !- 0010 0010 0010 0010	ACTUAL 2 A01 0. 01002 0. 02833 0. 05160 0. 07833 0. 10967 0. 14100 0. 17492	IESTI I % A I IO. 03 IO. 05 IO. 06 IO. 10 IO. 14 IO. 17	M. 101 259 154 1448 1043 1054 1381	540. 986. 1254. 1440. 1688. 1827.	EBTIM.	725. 6 -3. 6 1. 4 2. 9 6. 1 2. 1 1. 9
7 POP. 0. 05000 0. 10000 0. 15000 0. 25000 0. 25000 0. 35000	ACTUAL X A01 0. 00956 0. 02690 0. 04845 0. 07382 0. 10268 0. 13517	ESTIM. X A91 10. 01082 10. 02832 10. 04968 10. 07451 10. 10287 10. 13461	539. I 974. I 1211. I 1426. I 1623. I 1892. I 2139. I	608. 608. 984. 1201. 1396. 1594. 1785. 1893.	-12. 9 -1. 0 0. 8 2. 1 1. 8 2. 3 -0. 1	IACTUAL IX POP. I IO. 0500 IO. 1000 IO. 2500 IO. 2500 IO. 3500 IO. 3500 IO. 4000	- i 	ACTUAL 2 A01 0. 01002 0. 02833 0. 05160 0. 07833 0. 10967 0. 14100 0. 17492 0. 20991	IESTI I X A I IO. 01 IO. 05 IO. 06 IO. 10 IO. 14 IO. 17 IO. 20	M. 	540. 986. 1254. 1440. 1688. 1827. 1885.	ESTIM. 4 A91 478. 1021. 1236. 1378. 1586. 1652. 1793. 1895. 1895.	-25.6 -3.6 1.4 2.9 6.1 2.1 1.9
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2 POP. 	0.00756 0.00756 0.00756 0.02670 0.04845 0.07382 0.10268 0.13517 0.16882 0.24490	1	539. I 974. I 1211. I 1426. I 1623. I 1827. I 1892. I 1893. I 2139. I 2378. I	ESTIM.	-12. 9 -12. 9 -1. 0 0. 8 2. 1 1. 8 2. 3 -0. 1 -0. 3 -1. 6 3. 5	IACTUAI IX POP. I IO. 0500 IO. 1000 IO. 2000 IO. 2000 IO. 3000 IO. 4000 IO. 4500 IO. 5000	- - 0010 0010 0010 0010 0010 0010	ACTUAL % A01	1 E	M.	540. 986. 1254. 1440. 1688. 1687. 1895. 2114. 2121.	EBTIM. \$ A01	25.6 -3.6 1.4 2.9 6.1 2.1 1.9 -0.5 -0.5
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2 POP. 	ACTUAL X A01 0.00956 0.02690 0.04845 0.10268 0.13517 0.16882 0.20686 0.24490 0.33015 0.37732	ESTIM. X A91 X A91	539. 1 974. 1 1211. 1 1426. 1 1623. 1 1627. 1 1892. 1 2139. 1 2139. 1 2415. 1 2652. 1	ESTIM.	-12. 9 -1. 0 -1. 8 -2. 3 -0. 1 -0. 3 -1. 6 -3. 5 -4. 4	IACTUAI IX POP. I		ACTUAL X A01 2. 01002 3. 02833 3. 05160 3. 10967 3. 14100 3. 17492 3. 20991 3. 24915 3. 24915 3. 33279 3. 37707	1 E	M.	540. 986. 1254. 1440. 1688. 1827. 1885. 1211. 12385. 12385.	EBTIM. \$ A01	225. 6 -3. 6 1. 4 2. 9 6. 1 2. 1 1. 9 -0. 5 -0. 5 -2. 0 3. 7 -3. 7
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2 POP. 0. 05000 0. 10000 0. 15000 0. 25000 0. 35000 0. 45000 0. 45000 0. 55000 0. 45000 0. 45000 0. 45000 0. 75000 0. 75000 0. 85000 0. 85000 0. 85000 0. 85000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 90000 0. 900	ACTUAL X A01	1	539. 1 974. 1 1211. 1 1426. 1 1623. 1 1627. 1 1892. 1 2139. 1 2139. 1 2415. 1 2652. 1 2697. 1 3333. 1 3401. 1 3401. 1 3661. 1	ESTIM.	-12. 9 -1. 0 -1. 0 -1. 1 -0. 3 -1. 6 -1. 5 -4. 4 -0. 5 -1. 1 1. 5 -2. 2 -2. 9 -6. 3	IACTUAI IX POP. I IO. 0500 IO. 1000 IO. 1500 IO. 2500 IO. 3500 IO. 4000 IO. 4500 IO. 5000 IO. 6500 IO. 6500 IO. 7500 IO. 7500 IO. 8000 IO. 8000 IO. 9000	- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	ACTUAL X A01 2 A01 3 0. 01002 0. 02833 0. 07833 0. 10767 0. 14100 0. 17492 0. 20991 0. 24915 0. 28852 0. 33279 0. 37707 0. 42631 0. 47756 0. 53967 0. 60178 0. 66389	IESTII X A 1	M. IIM. IIM. IIM. IIM. IIM. IIM. IIM. I	ACTUAL # A01 786. 1254. 1440. 1688. 1627. 1885. 2114. 2121. 2385. 2385. 23653. 2761. 3346. 3346. 3346.	EBTIM. \$ A01 678. 1021. 1236. 1398. 1586. 1652. 1793. 1895. 2165. 2296. 2472. 2629. 2844. 3261. 3272. 3348. 3470.	2. 5. 6 -3. 6 1. 4 2. 9 6. 1 2. 1 1. 9 -0. 5 -0. 5 -2. 0 3. 7 -3. 7 0. 9 -3. 0 2. 2 -0. 1
% POP.	ACTUAL X A01	ESTIM. X AQI X AQI	539. 974. 1211. 1426. 1623. 1827. 1892. 2139. 2139. 2415. 2652. 2697. 3333. 3401. 3401. 3461.	ESTIM.	-12. 9 -1. 0 0. 8 2. 1 1. 8 2. 3 -0. 1 -0. 3 -1. 6 3. 5 -1. 1 1. 5 2. 2 2. 0 -2. 9 -6. 3 -1. 8	IACTUAI IX POP. I IO. 0500 IO. 1000 IO. 1500 IO. 2500 IO. 3500 IO. 4000 IO. 4500 IO. 5000 IO. 6500 IO. 7500 IO. 7500 IO. 8000 IO. 9500 IO. 9500	- 1 - 1 - 1 - 1 - 0010 0010 0010 0010 00	ACTUAL X A01	IESTII X A I IO. 03 IO. 05 IO. 10 IO. 10 IO. 10 IO. 10 IO. 20 IO. 24 IO. 37 IO. 42 IO. 53 IO. 57 IO. 53 IO. 57 IO. 53 IO. 57 IO. 64 IO. 73 IO. 61 IO. 75 IO. 61 IO. 61 IO. 75 IO. 61 IO.	M. IIM. IIM. IIM. IIM. IIM. IIM. IIM. I	ACTUAL # A01 540. 986. 1254. 1440. 1688. 1627. 1885. 2114. 2121. 2385. 2653. 2761. 3346. 3346. 4639.	678. 1021. 478. 1236. 1398. 1586. 1652. 1793. 1895. 2124. 2124. 2429. 2472. 2629. 2844. 3261. 3278. 3378. 3378. 4714.	25.6 -3.6 1.4 2.9 6.1 2.1 1.9 -0.5 -0.5 -2.0 3.7 -3.7 0.9 -3.0 2.5 2.5 2.7
% POP.	ACTUAL X A01	EBTIM. X A9I X A9I	539. 974. 1211. 1426. 1623. 1827. 1892. 2139. 2139. 2415. 2652. 2697. 3333. 3401. 3401. 3461.	ESTIM.	-12. 9 -1. 0 0. 8 2. 1 1. 8 2. 3 -0. 1 -0. 3 -1. 6 3. 5 -1. 1 1. 5 2. 2 2. 0 -2. 9 -6. 3 -1. 8	IACTUAI IX POP. I IO. 0500 IO. 1000 IO. 1500 IO. 2500 IO. 3500 IO. 4000 IO. 4500 IO. 5000 IO. 6500 IO. 7500 IO. 7500 IO. 8000 IO. 9500 IO. 9500	- 1 - 1 - 1 - 1 - 0010 0010 0010 0010 00	ACTUAL X A01	IESTII X A I IO. 03 IO. 05 IO. 10 IO. 10 IO. 10 IO. 10 IO. 20 IO. 24 IO. 37 IO. 42 IO. 53 IO. 57 IO. 53 IO. 57 IO. 53 IO. 57 IO. 64 IO. 73 IO. 61 IO. 75 IO. 61 IO. 61 IO. 75 IO. 61 IO.	M. IIM. IIM. IIM. IIM. IIM. IIM. IIM. I	ACTUAL # A01 540. 986. 1254. 1440. 1688. 1627. 1885. 2114. 2121. 2385. 2653. 2761. 3346. 3346. 4639.	678. 1021. 478. 1236. 1398. 1586. 1652. 1793. 1895. 2124. 2124. 2429. 2472. 2629. 2844. 3261. 3278. 3378. 3378. 4714.	2. 1 -25. 6 -3. 6 1. 4 2. 9 6. 1 2. 1 1. 9 -0. 5 -2. 0 3. 7 -3. 7 0. 9 -3. 0 2. 5 2. 2 -0. 1 -9. 7

YEAR 1966 HOUSEHOLD BIZE 4

TABLE 2.3
HISTORY OF THE EXPLANATORY VARIABLES.

YEAR	UN		INC	INFL.					
	•	•		•					
67	4. 00	10. 9	_	3. 230 +				◆,	
68	3. 75	10. 9		4. 40 +				+	
69	3. 68	11. 1		5. 15 +	*			•	
70	5. 25	11. 3		5. 37				+	
71	6. 27	11. 2		4. 99	•	• .		+	
72	5. 89	11. 1		4. 16		•		•	
73	5. 11	11. 3	-	5. 69	* 1	•		+	
74	5. 89	12. 1	8	8. 7 3		•		•	•
75	8. 92	12. 1	8	9. 26			-4		+
76	8. 0 9	12. 2	13	5. 22			•		•
77	7. 41	12. 4	19	5. 84		• •			•
78	6. 31	12. 9	77	8. 45		•	•		+
79	6. 05	13. €	B1	7. 93		•	•		+
80	7. 35	14. 9	71	8. 7 8		•	•		•
81	7. 78	16. 3	31	11. 40		4	•		•
82	9. 82	16. 7	75	6. 60					
	•	4	•						
				3. 22	18	6. 106	8. 983	11.	B61 14. 739
UN									
1967	3.	998	3. 7	52	3. 682	5.	254	6. 274	
1972		887	5. 1	14	5. 687	8.	919	8. 093	
1977	7.	408	6. 3	10	6. 054	7.	347	7. 784	
1982	9.	819							-
PCT	INC								
1967	10.	908	10. 9	67 1	1. 129	11.	369	11. 289	
1972	11.	111	11. 3	75 1	2. 182	12.	165	12. 228	
1977	12.	488	12. 9		3. 811		907	16. 313	
1982	16.	754							
INF	1 .								
1967	_	228	4. 4	02	5. 149	5	369	4. 986	
1972		156			8. 733		257	5. 217	
1977		844	8. 4		7. 930		983	11. 401	
1982		605	٠. ٦	•	/50	0.	700	11. 401	
a 704	•.	500							

TABLE 2.4

PARAMETER EXPECTATIONS AND QUALITATIVE ESTIMATION RESULTS.

Variable	U	N	PCT	IN C	IN	FL	TI	ME
Parameter	A	В	A	В	A	• В	A	В
Expectation	+		+	+	+	-	+	-
household size								
1 2 3 4 5 6+	(-)* (-)* (+) + +	(-) (-) (-) (-) (-)	(-)* (+) (+) + (+) (-)*	+ + + + (+)	+ (+) (+) (+) (+) (-)*	(-) (-) (-) (-) (-)	(-)* (+) + + (+)	(-) - (-)

^{*} indicates the sign was contrary to expectations parentheses indicate the coefficient was not statistically different from 0 at the 5% level.

TABLE 2.5 TIME-SERIES REGRESSION RESULTS.

B1 is the intercept. B2 is the unemployment rate. B3 is the share of income in dividends and interest. B4 is the inflation rate. B5 is the time trend.

PARAM A	HH SIZE 1	1	PARAM B	HH SIZE 1	ı	PARAM A	нн з	SIZE 2
RSQ 0.7479	RBARSQ 0.6563	1	RSQ 0.7806	RBARSQ 0.7008	1	RSQ 0.3530	RB AR SQ	0.1177
RHO 0.1451	AAPE 0.8004	Í	RHO 0.1195	AAPE	ł	RHO 0.3659	AAPE	0.8714
B1 1.1106	T-STAT 44.36	Ì	B1 -0.0229	T-STAT -2.04	ı	B1 0.9346	T-STAT	37.85
B2 -0.0014	T-STAT -0.45	Ì	B2 -0.0000	T-STAT -0.00	İ	B2 -0.0009	T-STAT	-0.31
B3 -0.0083	T-STAT -2.15	i	B3 0.0086	T-STAT 4.97	ì	B3 0.0022	T-STAT	0.57
B4 0.0062	T-STAT 2.98	Ì	B4 -0.0023	T-STAT -2.49	ì	B4 0.0015	T-STAT	0.73
B5 -0.0017	T-STAT -0.87	Ì	B5 -0.0032	T-STAT -3.59	Ì	B5 0.0004	T-STAT	0.22
			_					
				HH SIZE 3				
				RBARSQ 0.9197				
RHO2788	AAPE	1	RHO 0.4500	AAPE 1.0322	1	RHO0078	AAPE	
B1 -0.0315	T-STAT -3.79	ı	B1 0.7144	T-STAT 28.09	-	B1 0.0093	T-STAT	1.70
B2 -0.0007	T-STAT -0.74	i	B2 0.0018	T-STAT 0.59	1	B2 -0.0002	T-STAT	-0.27
B3 0.0053	T-STAT 4.16	1	B3 0.0064	T-STAT 1.64	ı	B3 0.0024	T-STAT	2.82
B4 -0.0010	T-STAT -1.48	1	B4 0.0023	T-STAT 1.11	ı	B4 -0.0007	T-STAT	-1.64
B5 -0.0013	T-STAT -2.00	1	B5 0.0051	T-STAT 2.56	ı	B5 -0.0014	T-STAT	-3.11
				HH SIZE 4				
				RBARSQ 0.8664				
				AAPE				
				T-STAT 4.58				
B2 0.0105	T-STAT 5.29	Į	B2 -0.0001	T-STAT -0.13	Ī	B2 0.0142	T-STAT	4.42
B3 0.0077	T-STAT 3.00	ļ	B3 0.0023	T-STAT 2.67	į	B3 0.0049	T-STAT	1.18
Bt 0.0005	T-STAT 0.37	ŀ	B4 -0.0006	T-STAT -1.37	1	B4 0.0020	T-STAT	0.90
B5 0.0033	T-STAT 2.50	ı	B5 -0.0020	T-STAT -4.52	i	B5 0.0043	T-STAT	2.04
D1 D 1 W D			D4 D 444 4			24244	****	
				HH SIZE 6				
				RBARSQ 0.9740				
				AAPE 0.9067				
				T-STAT 24.03				
				T-STAT 3.02				
				T-STAT -0.59				
B4 -0.0006	T-STAT -0.85	!	84 -0.0007	T-STAT -0.32	į	84 -0.0008	T-STAT	-1.21
55 -0.0012	T-STAT -1.71	- 1	B5 0.0138	T-STAT 7.01	- 1	B5 -0.0017	T-STAT	-2.68

REGRESSION EQUATION FOR FORECASTING FEDERAL INCOME TAX POPULATION BASE.
(NUMBER OF EXEMPTIONS OTHER THAN AGE OR BLINDNESS)

TABLE 2.6

SEE =	1.6960 RSQ	R =	0.9926	RBARSQ =	0.9923	NOBS	= 26
RHO =	0.5131 DW	=	0.974	AAPE =	0.79		
VARIABLE	REGRES-COE	F T-V	ALUE EI	LASTICITY	ME XPL AV AL		ME AN
PT	0.86646	4 1	90.34	0.946	37 86 .6 1		205.3683
TIME	0.65586	9	12.04	0.054	165.35		15.5000
NEX	DEP	EN DEN	T VARIA	ABLE			188.11630

DATE	ACTU AL	PREDIC	MISS	_		_	_
	IS *	IS +	IS A-P *		*	•	•
57	154.68	152.38	2.30+*				
58	158.19	155.67	2.52 + *				
59	161.49	159.85	1.64 -	+#			
60	162.00	163.14	-1.14	*+			
61	165.30	166.44	-1.14	+			
62	168.54	169.73	-1.19	*	+		
63	171.60	172.15	- 0.55		+		
64	172.58	175.44	-2.8 6		* +		
65	176.17	177.86	-1.69		*+		
66	179.51	181.15	-1.64		* +		
67	182.71	183.57	-0.86		r +		
68	186.55	185.98	0.57			+	
6.9	189.51	188.40	1.11			+	
70	192.33	190.81	1.52			+*	
71	196.75	193.23	3.52			+ *	
72	195.10	195.64	-0.54			*+	
73	195.09	197.18	-2.09			* +	
74	197.57	199.59	-2.02			*+	
75	202.05	202.01	0.04			+	
76	205.17	203.54	1.63				+#
77	204.52	205.96	-1.44				#+
78	208.68	208.64	0.04				+
79	213.20	211.44	1.76				+*
80	215.89	214.34	1.55				+*
81	217.87	217.05	0.82				+
82	217.98	219.69	-1.71				* +
	IS *	IS +	IS A-P *	*	*	#	*
			152.379	166.7	00 181.02	1 195.342	209.663
				• •			

TIME = TIME TREND -- 1 IN 1955, 2 IN 1956 ETC... PT = NONINSTITUTIONAL POPULATION OF U.S. NEX = IRS REPORTED NUMBER OF EXEMPTIONS.

TABLE 2.7

REGRESSION EQUATIONS FOR FORECASTING THE SHARE OF TOTAL POPULATION FROM EACH OF THE HOUSEHOLD SIZE CATEGORIES (1-6+). (INCLUDES A FORECAST TO 1995)

SHPOPI-6 = THE SHARE OF POPULATION FROM EACH CATEGORY POPO = THE PERCENT OF THE POPULATION 65 YEARS OR OLDER

SEE =	0.4381 RSQR = 0.9442 RBARSQ = 0.9402 NOBS	= 16
RHO =	0.4084 DW = 1.183 AAPE = 2.41	
VARIABLE	REGRES-COEF T-VALUE ELASTICITY MEXPLAVAL	MEAN
INTERCEPT	41.416710 24.95 0.000 574.18	0. 0000
PQPO	-2. 639858 -15. 39 -1. 600 323. 24	9. 6548
SHPOP 1	DEPENDENT VARIABLE	15. 92937

						•	
DATE	ACTUAL	PREDIC	MISS				
	IS *	IS +	IS A-P *	*	*	*	#
67	13. 39	13. 29	0. 10+				
68	14. 13	13. 62	0.51 +	*			
69	14. 29	13. 79	0.50 +	*			
70	13. 61	14. 11	-0. 50 * ·	+			
71	13. 62	14. 44	-0.82 *	, +			
72	14. 61	14. 76	- 0. 15	#+			
73	15. 48	15. 26	0. 22		+#		
74	15.95	15. 65	0. 30		+ *		
75	15. 63	16. 14	- 0. 5 1		* +		
76	16. 17	16. 66	-0. 49		* +		
77	17. 27	17. 07	0. 20			+#	
78	17. 9 3	17. 43	0. 50			+ +	
79	18. 29	17. 77	0. 52			+ *	
80	18. 17	18. 04	0. 13			+	
81	18. 22	18. 29	-0. 07			+	
82	18. 11	18. 55	-0. 44			*	+
83	18. 31	18. 31	0. 00			+	
84	18. 63	18. 63	0. 00				+
85	18. 95	18. 95	0. 00				+
86	19. 18	19. 18	0. 00				+
87	19. 42	19. 42	0. 00				+
88	19. 61	19. 61	0. 00				* .
89	19. 77	19. 77	0. 00	•			+
90	19. 94	19. 94	0. 00				+
91	20. 04	20. 04	0. 00				+
92	20. 11	20. 11	0. 00				+
93	20. 12	20. 12	0. 00				+
94	20. 19	20. 19	0. 00				. +
95	20. 24	20. 24	0. 00				+
	IS *	1S +	IS A-P *	#	*	*	*
			13, 287	14. 76	7 16, 247	7* 17. 726	19. 206

TABLE 2.7 (continued)

VARIA INTER POPO SHPOP	CEPT	38	DW ≈ 1 ES-COEF T-VAL	. 64 0 000 . 48 -1 044	0. 79	, (C	16 0000 6548 95250
DATE 67	ACTUAL IS # 16.96	PREDIC IS + 16.90	MISS IS A-P * 0.06+	•	*	#	4
68	10. 70 17. 24	17. 16	0.08 +				
68 69		17. 10 17. 29	0.21 +	_			
70	17. 50 17. 48	17. 54	-0.05	# _			
71	17. 60	17.80	-0. 20	*			
72	18.08	18.05	0. 03	++			
73	18.67	18. 43	0. 24	+ +			
74	18. 39	18. 74	-0. 35	* +			
75	19.17	19. 12	0. 05		+		
76	19. 35	19.52	-0.17		*+		
77	19.71	19. 84	-0 13		*+		
78	20.11	20.12	- 0. 01			+	
79	20. 22	20.38	-0.16	•		* +	
80	20. 46	20. 59	-0.13			# +	
81	21.05	20. 78	0 27			+	*
85	21. 25	20 98	0. 27			•	*
83	20. 96	20. 96	0. 00			•	•
84	21. 10	21. 10	0. 00				•
85 86	21. 32 21. 48	21. 32 21. 48	0. 00 0. 00				T .
87	21. 45	21. 40 21. 67	0.00				T _
88	21.87	21.87	0.00				T
89	21. 94	21. 94	0.00				
90	22. 06	22.06	0.00				` .
91	22. 14	22.14	0. 00				
92	22. 20	22. 20	0. 00				· •
93	22. 21	22. 21	0.00				· +
94	22. 26	22. 26	0. 00				.
95	22. 30	22. 30	0. 00				+
•	IS *	IS +	IS A-P +	*	*	*	*
			16. 901	18.050	19. 1 99	20. 347	21. 496

TABLE 2.7 (continued)

VARIA INTER POPO SHPOP	CEPT	28		15 0.000 08 -0.778	= 0.73 TY MEXPLAV 0 1190 61	0	16 N . 0000 . 6548 . 01749
DATE	ACTUAL	PREDIC	MISS				
	IS *	IS +	IS A-P *	*	*	•	#
67	14. 79	14. 73	0. 0 5+				١
68	14. 85	14.89	-0.04 ++			•	
69	14. 77	14 98	-0.21+ +				
70	15. 01	15.13	-0.12 * + 0.17				
71 72	15. 46 15. 46	15. 29 15. 45	0.01	* *			
73	15. 94	15. 45	0.01	**			
74	15. 93	15 88	0. 05				
7 5	16. 16	16. 12	0.04				
76	16. 31	16.38	-0 07		*+		
77	16. 59	16. 58	0. 01				
78	16.40	16 75	-0.35			+	
79	16.89	16 91	-0. 02			*+	
80	17.15	17.05	0. 10			+#	
81	17. 40	17 17	0 2 3			+	#
82	17.17	17. 29	-0.12			* +	
83	17. 26	17 26	0.00			+	
84	17. 37	17. 37	0. 00				+
85	17. 50	17. 50	0. 00				+
86	17. 61	17 61	0. 00				+
87	17. 72	17. 72	0. 00		_		*.
88	17. 81	17 81	0. 00				*,
89 90	17.89	17.89	0. CO				*
90 91	17. 97	17. 97 18. 02	0. 00 0. 00				7
	18.02		0.00				T _
92 93	18. 05 18. 06	18. 05 18. 06	0.00				T
73 94	18.09	18.08	0.00				I
74 95	18. 12	18. 12	0.00				* _
73	IS *	IS +	IS A-P *	•	•		
	13 *	13 7	14 729	15. 451	16. 172	16. 894	17. 615

TABLE 2.7 (continued)

ACTUAL IS # 18.84 19.00 19.55 19.55	PREDIC IS + 18.93 19.09 19.17 19.32 19.47	DW = 1. ES-COEF T-VALU 240360 35. 249220 -13. DEPENDENT V MISS IS A-P * -0.09 *+ -0.17 * -1 0.23 0.08	34 0.000 25 -0.598	849 84	'AL ME I 3	AN G 0000 9 5548 0 17937
ACTUAL IS * 18.84 19.00 19.55 19.55 19.92	PREDIC IS + 18.93 19.09 19.17 19.32 19.47	MISS IS A-P * -0.09 *+ -0.17 * -0.23	34 0.000 25 -0.598 Ariable -	849 84	. 3	0 0000 9 6548
ACTUAL IS * 18.84 18.74 19.00 19.55 19.55 19.55	PREDIC IS + 18.93 19.09 19.17 19.32 19.47	MISS IS A-P + -0.09 ++ -0.17 + - 0.23	25 -0.598 ARIABLE -		3	9 0548
ACTUAL IS * 18.84 18.74 19.00 19.55 19.55 19.55	PREDIC IS + 18.93 19.09 19.17 19.32 19.47	MISS IS A-P + -0.09 ++ -0.35 + -0.17 + 0.23	ARIABLE -	# #		
ACTUAL IS * 18.84 18.74 19.00 19.55 19.55 19.55	IS + 18.93 19.09 19.17 19.32 19.47	MISS IS A-P + -0.09 ++ -0.35+ + -0.17 + + 0.23		•	- · · · · · ·	*
15 * 18.84 18.74 19.00 19.55 19.55 19.72	IS + 18.93 19.09 19.17 19.32 19.47	IS A-P * -0.09 *+ -0.35* + -0.17 * + 0.23	*	٠		
15 * 18.84 18.74 19.00 19.55 19.55 19.72	IS + 18.93 19.09 19.17 19.32 19.47	IS A-P * -0.09 *+ -0.35* + -0.17 * + 0.23	*	•	4	*
18. 84 18. 74 19. 00 19. 55 19. 55 19. 92	18.93 19.09 19.17 19.32 19.47	-0.09 #+ -0.35# + -0.17 # 4 0.23	*	*	#	*
18. 74 19.00 19.55 19.55 19.92	19. 09 19. 17 19. 32 19. 47	-0.35* + -0.17 * 4 0.23	• •			
19 00 19 55 19 55 19 92	19. 17 19. 32 19. 47	-0.17 + 4 0.23				
19 55 19 55 19 92	19. 32 19. 47	0. 23	· • •			
19.55 19.92	19.47		+ +			
19 92		0.08				
	19.63		++			
			* *			
			* *			
			`			
				· ·	Ť.,	
				•	•	
					* +	
					* +	,
						+ *
-						+
						+
						+
						•
						+
			1			+
				•		+
						+
					•	+
						+
		0. 00				+
22. 19	22.19	0. 00				+
22. 22	22. 22	0 00				+
IS *	IS +	IS A-P +	•	*	4	#
		18 740	19 480	20 221	20 961	21 702
	19. 72 19. 94 20. 67 20. 90 20. 73 20. 75 21. 08 20. 93 20. 94 21. 61 21. 64 21. 63 21. 72 21. 83 21. 72 22. 16 22. 16 22. 16 22. 16 22. 16 22. 17 22. 22	19 92 19.63 19.72 19.86 19.94 20.05 20.67 20.28 20.90 20.53 20.73 20.72 20.75 20.89 21.08 21.05 20.93 21.18 20.94 21.30 21.61 21.42 21.44 21.44 21.50 21.50 21.63 21.63 21.72 21.72 21.83 21.83 21.92 21.92 22.00 22.00 22.08 22.08 22.12 22.12 22.16 22.16 22.16 22.16 22.16 22.16 22.16 22.16 22.17 22.19 22.22	19 92	19 92	19 92	19 92

TABLE 2.7 (continued)

VARIA INTER POPO SHPOP	CEPT	-0	DW = 1.6 ES-CDEF T-VALUE 581119 -0.6 495678 21 1 DEPENDENT VA	E ELASTICIT 87 0 000 77 1 042	5 69	9	N 0000 4548 85937
DATE 67 68 69	ACTUAL IS + 15.34 15.06	PREDIC IS + 15.36 15.17 15.07	MISS IS A-P * -0.02 -0.11 -0.33	•	•	•	* *+ *+
70	14. 93	14.89	0. 04				+
71	15.05	14. 70	0 35				+ *
72	14. 71	-14. 52	0. 19				+ *
73	14.06	14. 24	-0 18			* *	
74 7 5	14. 05 13. 77	14. 02 13. 74	0. 03 0. 03	•		**	
76	13.77	13. 74	0. 25		+	•	
77	13. 17	13. 21	-0.04		#+		
78	12.91	13.01	-0 10		* +		
79	12. 72	12. 82	-0.10	**	•		
80	12.76	12. 66	0 10	+ 4	•		
81	12. 63	12. 52	0. 11	++			
85	12. 16	12. 38	-0. 22	* +			
83	12. 37	12. 37	0. 00				
84	12. 29	12. 28	0. 00	. +			
85 86	12. 13 12. 01	12. 13 12. 01	0. 00 0. 00				
87	11.88	11.88	0.00 +	•			
88	11, 77	11.77	0 00 +				
89	11.68	11.68	0.00 +				
90	11. 59	11. 59	0.00 +				
91	11. 53	11. 53	0.00 +				
92	11.49	11. 49	0.00+				
93	11.48	11.48	0.00+				
94	11.45	11.45	0.00+				
95	11. 42	11. 42	0 00+				
	IS +	IS +	IS A-P # 11.416	* 12. 2 54	13. 093	# 13. 931	14 770

TABLE 2.7 (continued)

VARIA INTER POPO SHPOP	CEPT	-40		51 0 000 20 3.667	= 1 36 Y MEXPLAV 1013.80	AL MEA	16 0.0000 0.6548 0.06625
DATE	ACTUAL	PREDIC	MISS				-
	IS +	IS +	IS A-P *	*	*	*	*
67	20.68	20. 79	-0 11				*+
68	19.98	20. 07	-0 09				+
69	19. 71	19.70	0. 01				+
70	19. 42	19 01	0 41				++
71	18. 73	18. 30	0. 43				+*
72	17. 22	17. 60	-0. 38			*	• •
73 74	16. 12 15. 75	16. 52 15. 67	-0 40 0 08			*+	
7 5	14. 59	14.61	-0 05			+	
76	13. 58	13. 47	0.11		_	•	
77	12. 52	12. 58	-0.06				
78	11. 90	11.82	0.08				
79	10.80	11.08	-0. 2B				
80	10. 53	10.50	0. 03	**			
81	9. 75	9 95	-0. 20	4+			
82	9 78	9. 39	0 39	+#			
83	9. 55	9.55	0 00	+			
84	9.06	9.06	0. 0C	+			
85	8 45	8. 45	0 00	+			
86	8.00	8.00	0 00	+			
87	7 49	7. 49	0.00 +				
88	7.08	7.08	0.00 +				
89	6. 73	6. 73	0.00 +				•
90	6. 38	6. 38	0 00 +				
91	6.16	6 16	0 00 +				
92	6. 01	6. 01	0.00+				
93	5. 98	5. 98	0.00+				
94	5. 84	5. 84	0 00+	*			
95	5. 72	5. 72	0.00+				•
	IS *	IS +	IS A-P +	*	*		*
			5. 718	8. 926	12. 133	15. 341	18. 549
,							

TABLE 2.8

REGRESSION EQUATIONS FOR FORECASTING THE SHARE OF TOTAL AGI FROM EACH OF THE HOUSEHOLD SIZE CATEGORIES (1-6+). (INCLUDES A FORECAST TO 1995)

SHINC1-6 = SHARE OF INCOME FROM EACH CATEGORY.
POPO = THE PERCENT OF THE POPULATION 65 YEARS OR OLDER.

SEE =	0.3727 RSQR = 0.9713 RBARSQ = 0.9693 NDBS	= 16
RHO =	0.6137 DW = 0.773 AAPE = 1.63	
VARIABLE	REGRES-COEF T-VALUE ELASTICITY MEXPLAVAL	MEAN
INTERCEPT	49, 988019 35, 39 0, 000 851, 08	0. 0000
POPO	-3,178889 -21,78 -1,591 490,59	9. 6548
SHINCI	DEPENDENT VARIABLE	19. 29643

DATE	ACTUAL	PREDIC	MISS				
	IS *	IS +	IS A-P *		•	*	*
67	16.60	16.11	0.48+ *				
68	17. 02	16. 52	0.51 + +				
69	17. 04	16. 72	0.32 . + *				
70	17. 04	17. 11	- 0. 07 +				
71	16. 94	17. 50	- 0. 56 *	+			
72	17. 79	17. 89	- 0. 10	, +			
73	18. 07	18. 49	-0. 42	* +			
74	19.00	18. 96	0. 04	+	#		
75	19. 02	19. 55	- 0. 53		* +		
76	19. 58	20. 18	-0. 60		* . +		
77	20. 52	20. 68	- 0. 15		#4	•	
78	21. 13	21.10	0. 02			+*	
79	21.73	21. 51	0. 22			+*	
80	21. 98	21.84	0. 15			+	
81	22. 52	22. 14	0. 38			+ +	<i>t</i>
83	22. 77	22. 45	0. 32			•	+ ★
83	22. 58	22. 58	0. 00				+
84	22. 76	22. 76	0. 00				+ ,
85	23. 05	23. 05	0. 00				+
86	23. 27	23. 27	0. 00				+
87	23. 53	23. 53	0. 00				+
88	23. 75	23. 75	0. 00				+
89	23. 94	23. 94	0. 00				+
90	24. 13	24. 13	0.00				+
91	24. 25	24, 25	Q. 00				+
92	24. 33	24. 33	0. 00				+
93	24. 34	24. 34	0. 00				+
94	24. 43	24, 43	0. 00				+
95	24. 49	24, 49	0.00				+
_	IS *	IS +	IS A-P *	*	•	*	#
			16. 114	17, 896	19. 679	21.461	23. 243

TABLE 2.8 (continued)

VARIA INTER POPO SHINC	CEPT	43	DW = 1 ES-COEF T-VAL	71 0.000 .30 -0.600	= 0.68 TY MEXPLAY 0 1205.54	(16 AN 0 0000 7 6548 7 39130
DATE	ACTUAL	PREDIC	MISS				
	IS *	IS +	IS A-P +	#	*	*	#
67	25. 72	25. 69	0. 03+				
68	25. 90	25. 90	- 0. 01 +				
69	26. 38	26. 01	0. 37 +	*			
70	25. 96	26. 22	-0. <u>26</u> *	+			
71	26. 36	26. 43	-0. 07	•			
72	26. 62	26. 64	-0. 02	+			
73 74	27. 30	26. 96	0. 35	+ +	•		
74 75	27. 01	27. 21	-0. 20	* +			•
76	27. 58 27. 63	27. 53 27. 87	0. 06 -0. 23	•	+		
70 77	27. 83 27. 97	29.13	-0. 23 -0. 16		* +		
78	28. 20	28. 36	-0. 16 -0. 16		* *		
79	28. 31	28. 58	-0. 27		`	**	
80	28. 62	28. 75	-0. 13			* *	
81	29. 13	28. 91	0. 22			* *	
82	29. 56	29. 08	0. 48			` 4	
83	29. 13	29. 13	0. 00	•			+
84	29. 19	29. 19	0. 00				+
85	29. 36	29. 36	0. 00				+
86	29. 49	29. 49	0.00				+
87	29. 65	29. 65	0. 00				+
88	29. 77	29. 77	0. 00				+
89	29. 87	29. 87	0. 00				+
90	29. <i>9</i> 8	27. 98	0. 00				+
91	30. 04	30. 04	0. 00				+
92	30.08	30.08	0. 00				•
93	3 0. 09	30. 09	0. 00				+
94	30. 14	30. 14	0. 00				+
95	30. 17	30. 17	0.00				• •
	IS *	IS +	IS A-P *	•	*	#	#
			25. 688	26. 642	27. 596	28. 550	29. 504

TABLE 2.8 (continued)

	RHO =	0. 1349	DW =	1.730 AA	MPE = 0	. 69		
VARIA	BLE	RECR	ES-COEF T-VA	LUE ELAST	ICITY MEXP	LAVAL	MEAN	
INTER	CEPT	18	604428 3	33.71 0	0.000 806	. 58	0 0000	
POPO		-0	195297 -	3.42 -0). 113 35.	. 5 7	9. 654B	
SHINC	3		DEPENDENT	. VARIABLE	:		16. 71887	
	•							
DATE	ACTUAL	PREDIC	MISS					
	IS +	IS +	IS A-P *	*	*	*	*	
67	16. 5 7	16. 52	0. 04		+ *			
68	16. 42	16. 55	-0.13	•	+			
69	16. 29	16. 56	− 0. 27*		+			
70	16. 53	16. 58	- 0. 05		* +			
71	16.82	16. 61	0. 21		+		*	
72	16. 59	16. 63	- 0. 04		* +			
73	16. 90	16. 67	0. 23			+	*	
74	16. 77	16. 70	0. 07			+ +		
75	16. 83	16. 73	0. 10			+	*	
76	16. 88	16. 77	0.11			+	*	
77	16. 79	14. 80	- 0. 01			#4	•	
78	16. 59	16. 83	-0. 23		*		+	
79	16. 93	16.86	0.08				+ *	
80	16. 91	16. 87	0. 03			•	+ +	
81	16. 94	16. 89	O. Q5				+ 、 *	
82	16. 73	16. 91	-0. 18		*	₩.,	+	
83	16.88	16.88	0. 00				+	
84	16. 92	16. 92	O. Q O				+	
85	16. 94	16. 94	0. 00				+	
86	16. 96	16. 96	0.00				+	
87	16. 98	16. 98	O. QQ				+	
88	16. 99	16. 99	0. 00				+	
89	17.00	17.00	0.00				+	
90	17. 02	17. 02	0.00				. +	
91	17. 02	17. 02	0.00				•	+
92	17.03	17.03	0 . 00					+
93	17.03	17. 03	0.00					+
94	17. 03	17 03	0.00					+

TABLE 2.8 (continued)

	SEE =	0. 1964		749 RBARSQ =		i = 16
	RHO =	0. 4144		171 AAPE =		
VARIA	BLE	REGR	ES-COEF T-VALU	E ELASTICITY	MEXPLAVAL	MEAN
INTER	CEPT	20	. 255278 27. 3	22 0.000	634. 26	0.0000
POPO		-0	. 232433 -3. (02 -0.125	28 55	9 6548
SHINC	4		DEPENDENT V	ARIABLE		18.01118
				•		
DATE	ACTUAL	PREDIC	MISS			
	15 *	IS +	IS A-P +	*	* *	#
67	17. 71	17. 78	- 0. 0 7	* +		
68	17. 54	17. 81	~ 0. 2 7 *	•		
69	17. 60	17. 82	-0. 22 *	+		
70	18.09	17. 85	0. 23	+	. *	
71	17. 90	17.88	0 02		++	
72	18. 02	17. 91	0. 11		+ *	
73	17. 87	17, 95	-Q. OB		* +	
74	17. 99	17. 99	0. 01		+	
75	18. 33	18.03	0. 30		+	*
76	18. 33	18.08	0. 25		+	*
77	18.19	18.11	0.08		•	. 4
78	18. 27	18. 14	0. 13			+ +
79	18. 28	18. 17	0. 10			+ +
80	18. 17	18. 20	~ 0. 0⊋			#+
81	17. 82	18. 22	-0. 40			, +
82	18.06	18. 24	-0.18		#	+
83	18. 16	18. 16	0. 00			+
84	18. 22	18. 22	0. 00			· •
85	18. 27	18. 27	0. 00			+
86	18. 29	18. 29	0.00			+
87	18. 32	18. 32	0. 00			+
88	18. 33	18. 3 3	0.00			. +
89	18. 35	18. 35	0. 00			+
90	18. 36	18. 36	0.00			+
91	18. 37	18. 37	0. 00			+
92	18. 38	18.38	0.00			+
93	18. 38	18. 38	0.00		•	. •
94	18. 39	18. 39	0. 00			+
95	18.39	18. 39	0. 00			+
, ,	IS *	IS +	IS A-P +	*	* *	*
			17. 541	17. 722	17. 903 18. 0	983 18, 264
			17. 541	a / . / ===	10.	10.207

TABLE 2.8 (continued)

RSGR = 0.9818 RBARSG = 0.9805 NOBS =

		-6	ES-COEF T-VAL .711601 -10	0.625 AAPE = UE ELASTICITY 0.74 0.000 7.45 1.645 VARIABLE		9	N 0000 . 6548 . 39756	
DAT		PREDIC	MISS					
	IS *	IS +	IS A-P #	•		*	#	
67		12. 17	-0. 22				* +	•
68		11. 95	-0. 0B				*+	
69		11.83	-0.17				* +	
70		11.62	0 . 00				+	
71		11. 40	0. 16				+#	
72		11. 18	0. 12		,		+#	
73		10.85	-0. 01			+	•	
74		10.58	0. 09			•		
75		10 26	0. 11		+ -	*		
76		9. 90	0. 18		+ +			
77		9. 63	0. 23		+ +			
78		9. 39	0. 11		+*			
79		9. 16	-0. 03	+				
80		8. 98	0. 02	++				
81	8. 71	8. 81	-0. 10	**				
82		8. 64	-0. 40	* +				
83		8. 40	0. 00	. +				
. 84		8. 35	0. 00					
85		8. 22	0.00	•				
86		8. 12	0.00	. •				
87 88		7. 99 7. 88	0.00 +	•				
89		7. 55 7. 79	0.00 + 0.00 +					
90		7. 7 7 7. 69	0.00 +					
91		7. 63	0.00 +					
71 92		7. 53 7. 58	0.00+					
7£ 93		7. 58 7. 58	0.00+				•	
73 94		7. 58 7. 53	0.00+					
74 95		7. 53 7. 50	0.00+					
73	7. 30 IS *	7. 50 IS +	IS A-P #			_	_	
	15 *	13 7	7. 499	B. 493	9. 488	10. 482	11. 476	

TABLE 2.8 (continued)

VARIA INTER POPO SHINC	CEPT	-25		92 0 000 18 4 171	1.34	9	16 0 0000 0 6548 3. 18475
DATE	ACTUAL IS #	PREDIC IS +	MISS IS A-P *			_	
67	11. 45	11.72	-0. 27	•	▼ ,	•	
68	11. 25	11.28	-0. 02				_ * ·
69	11.02	11.05	-0. 03				•
70	10. 76	10. 62	0.14				**
71	10. 43	10. 18	0. 25				++
72	9. 48	9.75	-0. 07				**
73	9. 02	9. 09	-0.06			•	
74	8. 55	8. 56	-0. 01			**	
75	7. 87	7. 90	-0.03			+	
76	7. 49	7. 20	0. 29		+*		
77	6. 67	6.65	0. 02	,	+		
78	6. 31	6. 18	0. 14		+		
79	5. 62	5. 72	-0.10	+			
80	5. 32	5. 36	-0. 04	+			
81	4. 87	5. 02	-0.15	*+			
82	4. 63	4. 68	- 0. 05	+			
83	4. 74	4. 74	0. 00	+			
84	4. 47	4. 47	0. 00	+			
85	4. 10	4. 10	0.00	+			
86	3. 82	3. 82	0.00	*			
87	3. 50	3. 50	0.00 ◀	•			
88	3. 25	3. 25	0.00 +				
89	3. 03	3. 03	0.00 +				
90	2. 81	2. 81	0.00 +				
91	2. 68	2. 68	0.00 +				
92	2. 5 9	2. 59	0. 00+		•		
93	2. 57	2. 57	0. 00+				
94	2. 48	2. 48	0.00+				
95	2. 41	2. 41	0. 00+				
	IS +	IS +	IS A-P + 2. 408	+ 4. 3 9 0	* 6. 372	* 8. 355	# 10. 337
			∠. →98	4. 370	o. 3/€	s. 333	10. 33/

TABLE 2.9

REGRESSION EQUATION FOR FORECASTING THE AVERAGE HOUSEHOLD SIZE
IN THE SIX AND OVER CATEGORY.

VARIA INTER YNG HHZ6		5	DW = 1 ES-COEF T-VAL .492552 73	.9528 RBARSQ .492 AAPE .UE ELASTICI 3.05 0.00 .20 0.18 VARIABLE -	= 0.24 TY MEXPLAV 0 1928.42	AL MEA O O	15 .0000 .3463 .70760	
DATE	ACTU AL	PREDIC	MISS					
	IS #	IS +	IS A-P #	#	*	#	#	
68	6.81	6.82	-0.01				* +	
69	6.84	6.81	0.03				+	#
70	6.82	6.80	0.02				+ *	
71	6.78	6.79	- 0.01				*+	
72	6.78	6.77	0.01	•			+ #	
73	6.74	6.76	- 0.02			* +		
74	6.71	6.74	-0.02			* +		
75	6.73	6.72	0.01			+*		
76	6.70	6.70	0.01		+	*		
77	6.65	6.67	-0.02		* +			
78	6.63	6.65	-0.02		* +			
79	6 .6 1	6.63	-0.02	# 4	-			
80	6.61	6.61	0.00	+				
81	6.61	6.59	0.02	+ *				
82	6.58	6.57	0.02	+ *	•			
	IS #	IS +	IS A-P *	*	*	#	*	
			6.525	6.592	6.660	6.727	6.795	

YNG = PERCENTAGE OF PERSONS AGED 16 AND UNDER IN POPULATION HHZ6 = AVERAGE SIZE OF HOUSEHOLD IN THE SIX AND OVER CATEGORY (HHZ6 GOES TO 6.5 BY 1995 IN A TYPICAL FORECAST)

TABLE 2.10
POPULATION AND INCOME DISTRIBUTION
BY VENTILE AND HOUSEHOLD SIZE - 1981.

Househo			Other th	nan Age or 3	Blindnes	ss in Thou 5	sands 6	TOTAL
	enti				٠,	9		TOTAL
V (4500 0		4044 4	4 14 2 1	10126	10702 6
	1	2588.8	1582.8	1584.8	1811.1	1412.4		107 93 .6
	2	1632.9	1358.2	1490.4	1788.4	1585.3	2938.3	107 93 .6
	3	1614.4	1239.0	1570.1	1968.7	1767.1	2634.3	107 93 .6
	4	1573.8	1284.0	16 47 .5	2160.8	1879.4	2248.2	10793.6
	5	1538.6	1343.3	1730.0	2332.6	1956.7	1892.4	10793.6
	6	1521.2	1411.3	17 92 .6	2491.2	1986 • 9 .		107 93 .6
	7	1514.5	1488.8	1850.9	26 26 .4	1973.1	1339.9	107 93 .6
	8	1520.1	1576.6	1905.4	2737.1	1920.0	1134.5	10793.6
	9	1534.2	1679.9	1956.7	2820.3	1835.3	967.2	10793.6
	10	1566.5	1800.1	2009.5	2872.0	1726.5	818.9	10793.6
	11	1608.2	1939.7	2056.6	2890.2	1596.8	702.0	107 93 .6
	12	1671.5	2102.7	2106.6	2862.7	1449.6	600.5	107 93 .6
	13	1752.9	2293.4	2144.5	2792.0	1294.2	516.7	107 93 .6
	14	1855.4	2518.8	2179.5	2672.4	1139.2	428.3	107 93 •6
	15	1988.1	2774.5	2193.5	2492.5	972.6	372.4	107 93 •6
	16	2156.1	3085.6	2178.7	2258.8	820.1	294.2	107 93 •6
	17	2383.5	3431.3	2119.8	1954.2	663.2	241.6	107 93 .6
	18	26 80 .2	3827.7	1982.4	1594.8	519.8	188.7	107 93 .6
	19	3100.8	4216.3	1727.2	1234.9	383.6	130.7	107 93 .6
	20	3624.2	4459.2	1334.7	875.1	329.2	171.2	107 93 .6
TOTALS		39425.8	45413.0	37561.4	45236.4	27210.9	21024.1	215871.4
Househo		Size 1	2	3	in Million 4	ns of Doll 5	ars. 6	TOTAL
Househo. Ven	tile	Size 1	2	3	4	5	6	
	tile 1	Fize 1 713.9	2 1010.7	3 1000.3	4 1157.2	5 940 .8	6 1277.4	6100.3
	til 6 1 2	713.9 2578.5	2 1010.7 2273.6	3 1000.3 2459.2	4 1157.2 2973.8	5 940.8 2534.1	6 1277.4 4601.1	6 100 · 3 17 420 · 2
	til 6 1 2 3	713.9 2578.5 3668.3	2 1010.7 2273.6 2875.7	3 1000.3 2459.2 3581.9	4 1157.2 2973.8 4489.5	5 940.8 2534.1 4018.4	6 1277.4 4601.1 5938.6	6100.3 17420.2 24572.5
	til e 1 2 3 4	713.9 2578.5 3668.3 4484.4	2 1010.7 2273.6 2875.7 3650.5	3 1000.3 2459.2 3581.9 4648.6	1157.2 2973.8 4489.5 6135.1	940.8 2534.1 4018.4 5308.8	6 1277.4 4601.1 5938.6 6337.7	6 100 .3 17 420 .2 24572 .5 3056 5 .2
	tile 1 2 3 4 5	713.9 2578.5 3668.3 4484.4 5124.7	2 1010.7 2273.6 2875.7 3650.5 4489.9	3 1000.3 2459.2 3581.9 4648.6 5784.4	1157.2 2973.8 4489.5 6135.1 7785.6	5 940.8 2534.1 4018.4 5308.8 6521.6	6 1277.4 4601.1 5938.6 6337.7 6293.8	6100.3 17420.2 24572.5 30565.2 35999.9
	tile 1 2 3 4 5 6	713.9 2578.5 3668.3 4484.4 5124.7	2 1010.7 2273.6 2875.7 3650.5 4489.9 5399.1	3 1000.3 2459.2 3581.9 4648.6 5784.4 6859.3	1157.2 2973.8 4489.5 6135.1 7785.6 9524.3	5 940.8 2534.1 4018.4 5308.8 6521.6 7587.4	6 1277.4 4601.1 5938.6 6337.7 6293.8 6058.5	6100.3 17420.2 24572.5 30565.2 35999.9 41200.4
	tile 1 2 3 4 5 6 7	713.9 2578.5 3668.3 4484.4 5124.7 5771.8 6545.3	2 1010.7 2273.6 2875.7 3650.5 4489.9 5399.1 6399.2	3 1000.3 2459.2 3581.9 4648.6 5784.4 6859.3 7950.8	1157.2 2973.8 4489.5 6135.1 7785.6 9524.3 11276.9	940.8 2534.1 4018.4 5308.8 6521.6 7587.4 8478.0	6 1277.4 4601.1 5938.6 6337.7 6293.8 6058.5 5745.0	6 100 · 3 17 420 · 2 2457 2 · 5 3056 5 · 2 35999 · 9 41 200 · 4 46 395 · 3
	1 2 3 4 5 6 7 8	713.9 2578.5 3668.3 4484.4 5124.7 5771.8 6545.3 7243.5	2 1010.7 2273.6 2875.7 3650.5 4489.9 5399.1 6399.2 7512.2	3 1000.3 2459.2 3581.9 4648.6 5784.4 6859.3 7950.8 9101.6	1157.2 2973.8 4489.5 6135.1 7785.6 9524.3 11276.9 13080.1	940.8 2534.1 4018.4 5308.8 6521.6 7587.4 8478.0 9169.5	6 1277.4 4601.1 5938.6 6337.7 6293.8 6058.5 5745.0 5407.5	6 100 · 3 17 420 · 2 2457 2 · 5 3056 5 · 2 35999 · 9 41 200 · 4 46 395 · 3 5151 4 · 4
	tile 1 2 3 4 5 6 7 8 9	713.9 2578.5 3668.3 4484.4 5124.7 5771.8 6545.3 7243.5 8096.8	2 1010.7 2273.6 2875.7 3650.5 4489.9 5399.1 6399.2 7512.2 8862.1	3 1000.3 2459.2 3581.9 4648.6 5784.4 6859.3 7950.8 9101.6 10317.2	1157.2 2973.8 4489.5 6135.1 7785.6 9524.3 11276.9 13080.1 14854.8	940.8 2534.1 4018.4 5308.8 6521.6 7587.4 8478.0 9169.5 9669.9	6 1277.4 4601.1 5938.6 6337.7 6293.8 6058.5 5745.0 5407.5 5083.0	6 100.3 17 420.2 24572.5 30565.2 35999.9 41200.4 46395.3 51514.4 56883.7
	tile 1 2 3 4 5 6 7 8 9 10	713.9 2578.5 3668.3 4484.4 5124.7 5771.8 6545.3 7243.5 8096.8	2 1010.7 2273.6 2875.7 3650.5 4489.9 5399.1 6399.2 7512.2 8862.1 10457.8	3 1000.3 2459.2 3581.9 46 48.6 57 84.4 6 85 9.3 7 950.8 9101.6 10317.2 116 33.2	1157.2 2973.8 4489.5 6135.1 7785.6 9524.3 11276.9 13080.1 14854.8 16649.5	940.8 2534.1 4018.4 5308.8 6521.6 7587.4 8478.0 9169.5 9669.9	6 1277.4 4601.1 5938.6 6337.7 6293.8 6058.5 5745.0 5407.5 5083.0 4745.7	6 100 · 3 17 420 · 2 2457 2 · 5 3056 5 · 2 35999 · 9 41 200 · 4 46 3 95 · 3 51 51 4 · 4 56 883 · 7 6 25 47 · 9
	tile 1 2 3 4 5 6 7 8 9 10 11	713.9 2578.5 3668.3 4484.4 5124.7 5771.8 6545.3 7243.5 8096.8 9066.7	2 1010.7 2273.6 2875.7 3650.5 4489.9 5399.1 6399.2 7512.2 8862.1 10457.8 12341.1	3 1000.3 2459.2 3581.9 46 48.6 57 84.4 6 85 9.3 7 950.8 9101.6 10317.2 116 33.2 13092.4	1157.2 2973.8 4489.5 6135.1 7785.6 9524.3 11276.9 13080.1 14854.8 16649.5 18376.0	940.8 2534.1 4018.4 5308.8 6521.6 7587.4 8478.0 9169.5 9669.9 9995.0	6 1277.4 4601.1 5938.6 6337.7 6293.8 6058.5 5745.0 5407.5 5083.0 4745.7 4456.8	6 100 · 3 17 420 · 2 24572 · 5 30565 · 2 35999 · 9 41 200 · 4 46 3 95 · 3 51 51 4 · 4 56 883 · 7 6 25 47 · 9 6 86 56 · 0
	tile 1 2 3 4 5 6 7 8 9 10 11 12	713.9 2578.5 3668.3 4484.4 5124.7 5771.8 6545.3 7243.5 8096.8 9066.7 10247.0 11658.4	2 1010.7 2273.6 2875.7 3650.5 4489.9 5399.1 6399.2 7512.2 8862.1 10457.8 12341.1 14670.4	3 1000.3 2459.2 3581.9 4648.6 5784.4 6859.3 7950.8 9101.6 10317.2 11633.2 13092.4 14686.0	1157.2 2973.8 4489.5 6135.1 7785.6 9524.3 11276.9 13080.1 14854.8 16649.5 18376.0	940.8 2534.1 4018.4 5308.8 6521.6 7587.4 8478.0 9169.5 9669.9 9995.0 10142.7 10108.1	6 1277.4 4601.1 5938.6 6337.7 6293.8 6058.5 5745.0 5407.5 5083.0 4745.7 4456.8 4180.0	6 100 · 3 17 420 · 2 2457 2 · 5 3056 5 · 2 35999 · 9 41 200 · 4 46 395 · 3 51 51 4 · 4 56 883 · 7 6 25 47 · 9 6 86 56 · 0 7 52 84 · 3
	tile 1 2 3 4 5 6 7 8 9 10 11 2 13	713.9 2578.5 3668.3 4484.4 5124.7 5771.8 6545.3 7243.5 8096.8 9066.7 10247.0 11658.4 13455.6	2 1010.7 2273.6 2875.7 3650.5 4489.9 5399.1 6399.2 7512.2 8862.1 10457.8 12341.1 14670.4 17630.1	3 1000.3 2459.2 3581.9 46 48.6 5784.4 6 859.3 7950.8 9101.6 10317.2 11633.2 13092.4 14686.0 16479.8	4 1157.2 2973.8 4489.5 6135.1 7785.6 9524.3 11276.9 13080.1 14854.8 16649.5 18376.0 19981.5 21438.5	940.8 2534.1 4018.4 5308.8 6521.6 7587.4 8478.0 9169.5 9669.9 9995.0 10142.7 10108.1 9928.5	6 1277.4 4601.1 5938.6 6337.7 6293.8 6058.5 5745.0 5407.5 5083.0 4745.7 4456.8 4180.0 3945.2	6 100 · 3 17 420 · 2 2457 2 · 5 3056 5 · 2 35999 · 9 41 200 · 4 46 395 · 3 5151 4 · 4 56 883 · 7 6 25 47 · 9 6 86 56 · 0 75 284 · 3 82 877 · 7
	tile 12345678910112314	713.9 2578.5 3668.3 4484.4 5124.7 5771.8 6545.3 7243.5 8096.8 9066.7 10247.0 11658.4 13455.6 15760.6	2 1010.7 2273.6 2875.7 3650.5 4489.9 5399.1 6399.2 7512.2 8862.1 10457.8 12341.1 14670.4 17630.1 21391.1	3 1000.3 2459.2 3581.9 46 48.6 57 84.4 6 859.3 7950.8 9101.6 10317.2 11633.2 13092.4 146 86.0 16 479.8 184 95.7	1157.2 2973.8 4489.5 6135.1 7785.6 9524.3 11276.9 13080.1 14854.8 16649.5 18376.0 19981.5 21438.5 22664.6	940.8 2534.1 4018.4 5308.8 6521.6 7587.4 8478.0 9169.5 9669.9 9995.0 10142.7 10108.1 9928.5 9644.0	6 	6 100 .3 17 420 .2 24572 .5 30565 .2 35999 .9 41 200 .4 46 395 .3 5151 4 .4 56 883 .7 6 25 47 .9 6 86 56 .0 75284 .3 82 877 .7 91 593 .0
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	tile 1 2 3 4 5 6 7 8 9 10 11 2 3 14 15 16	713.9 2578.5 3668.3 4484.4 5124.7 5771.8 6545.3 7243.5 8096.8 9066.7 10247.0 11658.4 13455.6 15760.6 18787.4 23020.0	2 1010.7 2273.6 2875.7 3650.5 4489.9 5399.1 6399.2 7512.2 8862.1 10457.8 12341.1 14670.4 17630.1 21391.1 26258.9 32917.8	3 1000.3 2459.2 3581.9 46 48.6 57 84.4 6 859.3 7950.8 9101.6 10317.2 11633.2 13092.4 146 86.0 16 479.8 184 95.7 207 21.7 23227.5	1157.2 2973.8 4489.5 6135.1 7785.6 9524.3 11276.9 13080.1 14854.8 16649.5 18376.0 19981.5 21438.5 22664.6 23525.1 24025.3	940.8 2534.1 4018.4 5308.8 6521.6 7587.4 8478.0 9169.5 9669.9 9995.0 10142.7 10108.1 9928.5 9644.0 9178.3 8704.9	6 1277.4 4601.1 5938.6 6337.7 6293.8 6058.5 5745.0 5407.5 5083.0 4745.7 4456.8 4180.0 3945.2 3637.2 3482.9 3136.2	6 100 .3 17 420 .2 24572 .5 30565 .2 35999 .9 41 200 .4 46 3 95 .3 51 51 4 .4 56 883 .7 6 25 47 .9 6 86 56 .0 7 5284 .3 82 877 .7 91 593 .0 101 95 4 .2 11 50 31 .7
	tile 1 2 3 4 5 6 7 8 9 10 11 2 13 14 15 16 17	713.9 2578.5 3668.3 4484.4 5124.7 5771.8 6545.3 7243.5 8096.8 9066.7 10247.0 11658.4 13455.6 15760.6 18787.4 23020.0 29227.3	2 1010.7 2273.6 2875.7 3650.5 4489.9 5399.1 6399.2 7512.2 8862.1 10457.8 12341.1 14670.4 17630.1 21391.1 26258.9 32917.8 42142.5	3 1000.3 2459.2 3581.9 46 48.6 57 84.4 6 85 9.3 7 950.8 9101.6 10317.2 116 33.2 130 92.4 146 86.0 16 47 9.8 184 95.7 207 21.7 23 227.5 25 96 8.1	1157.2 2973.8 4489.5 6135.1 7785.6 9524.3 11276.9 13080.1 14854.8 16649.5 18376.0 19981.5 21438.5 22664.6 23525.1 24025.3 23900.1	940.8 2534.1 4018.4 5308.8 6521.6 7587.4 8478.0 9169.5 9669.9 9995.0 10142.7 10108.1 9928.5 9644.0 9178.3 8704.9 8085.7	6 1277.4 4601.1 5938.6 6337.7 6293.8 6058.5 5745.0 5407.5 5083.0 4745.7 4456.8 4180.0 3945.2 3637.2 3482.9 3136.2 2929.8	6 100 · 3 17 420 · 2 24572 · 5 30565 · 2 35999 · 9 41 200 · 4 46 395 · 3 5151 4 · 4 56 883 · 7 6 25 47 · 9 6 86 56 · 0 75284 · 3 82 877 · 7 91 593 · 0 101 95 4 · 2 1150 31 · 7 132253 · 4
	tile 1 2 3 4 5 6 7 8 9 10 11 2 13 14 15 6 17 18	713.9 2578.5 3668.3 4484.4 5124.7 5771.8 6545.3 7243.5 8096.8 9066.7 10247.0 11658.4 13455.6 15760.6 18787.4 23020.0 29227.3 39217.3	2 1010.7 2273.6 2875.7 3650.5 4489.9 5399.1 6399.2 7512.2 8862.1 10457.8 12341.1 14670.4 17630.1 21391.1 26258.9 32917.8 42142.5 55976.6	3 1000.3 2459.2 3581.9 46 48.6 57 84.4 6 85 9.3 7 950.8 9101.6 10317.2 116 33.2 130 92.4 146 86.0 16 47 9.8 184 95.7 207 21.7 23 227.5 25 96 8.1 28 882.8	1157.2 2973.8 4489.5 6135.1 7785.6 9524.3 11276.9 13080.1 14854.8 16649.5 18376.0 19981.5 21438.5 22664.6 23525.1 24025.3 23900.1 23171.3	940.8 2534.1 4018.4 5308.8 6521.6 7587.4 8478.0 9169.5 9669.9 9995.0 10142.7 10108.1 9928.5 9644.0 9178.3 8704.9 8085.7 7481.1	6 1277.4 4601.1 5938.6 6337.7 6293.8 6058.5 5745.0 5407.5 5083.0 4745.7 4456.8 4180.0 3945.2 3637.2 3482.9 3136.2 2929.8 2677.9	6 100 · 3 17 420 · 2 24572 · 5 30565 · 2 35999 · 9 41 200 · 4 46 395 · 3 5151 4 · 4 56 883 · 7 6 25 47 · 9 6 86 56 · 0 75284 · 3 82 877 · 7 91593 · 0 101 95 4 · 2 1150 31 · 7 132253 · 4 157 406 · 9
	tile 1234567890112 1314 1567890112	713.9 2578.5 3668.3 4484.4 5124.7 5771.8 6545.3 7243.5 8096.8 9066.7 10247.0 11658.4 13455.6 15760.6 18787.4 23020.0 29227.3 39217.3 58203.6	2 1010.7 2273.6 2875.7 3650.5 4489.9 5399.1 6399.2 7512.2 8862.1 10457.8 12341.1 14670.4 17630.1 21391.1 26258.9 32917.8 42142.5 55976.6 78911.7	3 1000.3 2459.2 3581.9 46 48.6 57 84.4 6 85 9.3 7 950.8 9101.6 10317.2 116 33.2 13092.4 146 86.0 16 47 9.8 184 95.7 207 21.7 23 227.5 25 96 8.1 28 882.8 31 984.0	1157.2 2973.8 4489.5 6135.1 7785.6 9524.3 11276.9 13080.1 14854.8 16649.5 18376.0 19981.5 21438.5 22664.6 23525.1 24025.3 23900.1 23171.3 22567.6	940.8 2534.1 4018.4 5308.8 6521.6 7587.4 8478.0 9169.5 9669.9 9995.0 10142.7 10108.1 9928.5 9644.0 9178.3 8704.9 8085.7 7481.1 6921.7	6 1277.4 4601.1 5938.6 6337.7 6293.8 6058.5 5745.0 5407.5 5083.0 4745.7 4456.8 4180.0 3945.2 3637.2 3482.9 3136.2 2929.8 2677.9 2207.5	6 100 · 3 17 420 · 2 24572 · 5 30565 · 2 35999 · 9 41 200 · 4 46 395 · 3 5151 4 · 4 56 883 · 7 6 25 47 · 9 6 86 56 · 0 75284 · 3 82 877 · 7 91593 · 0 101954 · 2 115031 · 7 132253 · 4 157 406 · 9 2007 96 · 0
	tile 1 2 3 4 5 6 7 8 9 10 1 12 13 14 15 6 17 8 19 20	713.9 2578.5 3668.3 4484.4 5124.7 5771.8 6545.3 7243.5 8096.8 9066.7 10247.0 11658.4 13455.6 15760.6 18787.4 23020.0 29227.3 39217.3 58203.6 129084.5	2 1010.7 2273.6 2875.7 3650.5 4489.9 5399.1 6399.2 7512.2 8862.1 10457.8 12341.1 14670.4 17630.1 21391.1 26258.9 32917.8 42142.5 55976.6 78911.7 166316.5	3 1000.3 2459.2 3581.9 46 48.6 57 84.4 6 85 9.3 7 950.8 9101.6 10317.2 116 33.2 130 92.4 146 86.0 16 47 9.8 184 95.7 207 21.7 23 227.5 25 96 8.1 28 882.8	1157.2 2973.8 4489.5 6135.1 7785.6 9524.3 11276.9 13080.1 14854.8 16649.5 18376.0 19981.5 21438.5 22664.6 23525.1 24025.3 23900.1 23171.3 22567.6 31789.7	940.8 2534.1 4018.4 5308.8 6521.6 7587.4 8478.0 9169.5 9669.9 9995.0 10142.7 10108.1 9928.5 9644.0 9178.3 8704.9 8085.7 7481.1 6 921.7 12361.1	6 	6 100 · 3 17 420 · 2 24572 · 5 30565 · 2 35999 · 9 41 200 · 4 46 395 · 3 5151 4 · 4 56 883 · 7 6 25 47 · 9 6 & 56 · 0 75284 · 3 82 877 · 7 915 93 · 0 101 95 4 · 2 1150 31 · 7 132253 · 4 157 406 · 9

CHAPTER 3

THE INCOME TAX MODEL.

This chapter describes a procedure developed for modeling the federal income tax. The procedure is dependent on and consistent with the income distribution model described in the previous chapter. The income tax model generates forecasts of the total amount and distribution of taxes. These data as well as forecasts of the amount and distribution of disposable income are used in the Inforum model.

The technique used to estimate the size distribution of AGI has been described in Chapter 2. As it enters the tax model, the distribution is defined in terms of twenty equally populated ventiles containing persons from all six household sizes. The method yields estimates for the total dollar amount of AGI for each ventile, the dollar amount of AGI accruing to each household size within each ventile, and the number of persons from each household size within each ventile. The ventiles are arranged in ascending order according to per capita income, so that a person from household size five with family income of fifty thousand is in the same ventile as a single person with a ten thousand dollar income. The income distribution so defined for the year 1981 is shown in table 2.10. While the data are calculated and arranged in ventiles, each household size's contribution to its ventile's income and population are calculated and maintained separately. In other words, the household sizes are combined while being kept track of separately.

Household sizes are kept separate because tax liability is calculated on the basis of household income. An estimate of average

household income is obtained for 120 groups. These 120 groups are homogeneous in that they contain people from the same household size and in the same ventile. The average household income for these groups is obtained by dividing their total income by number of people and then multiplying by household size. These average household incomes are then applied to the tax laws to obtain tax liabilities and after-tax incomes. The tax laws applied are the rate schedules, the earned income credit, (all income at the lower end of the distribution is assumed to be "earned,") the personal exemption amount, the standard deduction, or zero bracket amount, and an abbreviated way to account for all other provisions such as itemized deductions.

Applying the Tax Laws.

The first step is to convert average AGI from each group to taxable income. The average per household AGI for each household size and each ventile is first reduced by the household size times the personal exemption amount. This amount is \$1,000 per exemption in 1984, and is indexed to inflation beginning in 1985. (For example, the personal exemption amount was \$1,040 in 1985.) The amount resulting from the subtraction is called taxable income and is applied to the legislated tax rate schedule. The procedure used takes the average income in the ventile and finds the appropriate legislated tax bracket, and calculates the tax from the Internal Revenue Service tax table. The taxes calculated in this manner will be referred to as "standard" taxes because they are the taxes that would be paid on the average income if the standard deduction were taken and no advantage was taken of any other special provisions in the tax law. Note that as of yet, there has

not been any attempt to take into account itemized deductions, tax credits, or other special provisions in the tax code. These adjustments will be made later.

For the groups in the household size of one, the single rate schedule, IRS schedule X, is applied, while the married filing joint schedule, IRS schedule Z, is applied to the remaining returns. Taxpayers who are married but file separate returns are subject to the higher rates of schedule X, but these only amounted to 1.2 percent of tax returns in 1982, and therefore are treated as if they file jointly. Qualifying widows and widowers account for less than 0.2 percent of returns, and are treated as single. The other filing status, head of household, accounts for about nine percent of returns. Their tax rate schedule (schedule Y) is lower than the single rates but higher than married rates, but because the reported data don't sufficiently distinguish heads of household by household size and income interval, they are assumed to pay the slightly lower tax rates in the married schedule.

For low income households, the earned income credit is subtracted from tax liability. It is assumed for the purposes of this model that all income is earned when calculating the earned income credit. A policy simulation lever is built in here, where additive credits or surcharges which change tax liability by a fixed dollar amount per return, and multiplicative credits or surcharges which change tax liability by a fixed percentage of original tax liability can be added to the standard tax liabilities.

The standard taxes must then be converted to effective taxes, which are the estimates of actual tax liability from each group. This step

relaxes the assumption that the standard deduction is taken by all taxpayers. It also allows for tax credits and other tax preferences to be taken into account. The difference between standard and effective taxes arises from many provisions in the tax code. The provisions fall into the following classes:

- 1) Itemized deductions (interest, taxes, medical expenses, etc.)
- 2) Tax credits (child care, residential energy, political contribution, investment tax credit, credit for the elderly, etc.)
- 3) The extra personal exemptions for elderly and/or blind taxpayers.
- 4) Other special provisions (maximum tax, income averaging, etc.)
- 5) The additional taxes (minimum and alternative taxes, recapture of investment credit, self-employed tax, etc.)

Note that the special tax provisions which exempt certain types of income from taxation are not listed above. The exclusions such as interest from state and local bonds, transfer, payments and other specially sheltered investment income account for some of the difference between AGI and personal income. Other sources of the difference between personal and adjusted gross income are the statutory adjustments, such as moving and other employee business expenses, IRA deposits and the like. These exclusions and adjustments are explicitly taken into account when aggregate AGI is determined (see Chapter 4). The income tax model as described in this chapter, only deals with forecasts of the AGI and its distribution.

The difference between standard and effective taxes is for practical purposes independent of the definition of AGI. Standard taxes are lowered to effective taxes by provisions such as tax credits and deductions, not by statutory adjustments or exclusions from gross income

in determining AGI. In other words, if there were no itemized deductions or tax credits, standard taxes would always equal effective taxes, no matter what the definition of AGI. Effective taxes are expected to be less than standard taxes. While some provisions take the form of additional taxes which work in the opposite direction, tending to make effective taxes higher relative to standard taxes, these are not as important as the tax-reducing provisions.

Conversion of Standard to Effective Tax Rates.

Standard tax rates are converted to effective tax rates by equations that were estimated over the 1966-1982 period. The mathematical appendix describes how historical observations on effective tax rates were obtained. Briefly, the ventiles were constructed as before, and effective tax rates were derived for each ventile. Because the income intervals published do not correspond to income ventiles, the effective rates by ventile could only be approximated by interpolating the IRS data. The effective tax rates were calculated at the household size level, and aggregated to the ventile level with each household size's weight in proportion to the shares of each household size in the corresponding ventile.

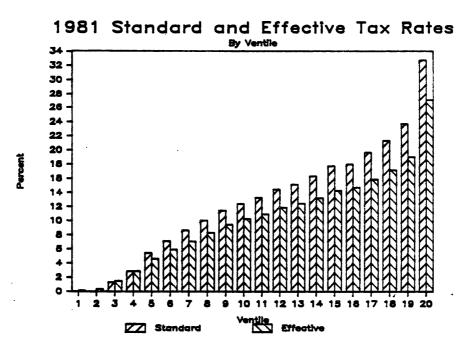
Standard tax rates for the historical period were calculated with help from the above method. The average household incomes were calculated as above for each of the 120 groups. These incomes were then applied to the tax rate schedules, the personal exemption amount, the standard deduction amount, and surcharges and per capita credits were varied according to the particular year's tax laws. The earned income credit was added to the calculations starting in 1976. These also

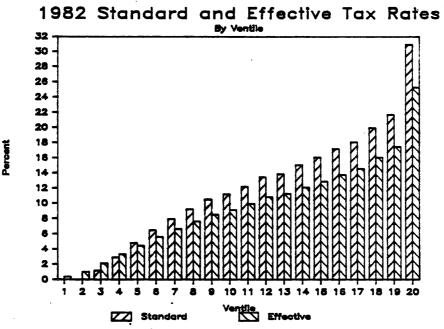
included the Vietnam war temporary surtax and the special schedule for low income earners, which was the predecessor of the earned income credit. In other words, every effort was made for the calculation of standard taxes to take into account all provisions of the historical tax laws which were universally available to taxpayers, and as long as they only affected standard taxes. Those other provisions, such as itemization of income deductions, which are optional in nature are the primary determinant of the difference between standard and effective tax rates, and therefore are irrelevant to the estimation of historical standard tax rates.

Effective taxes are almost always either the same or lower than standard taxes. Therefore, effective tax rates are easily expressed as a fraction of the computed standard rates. The fraction varies according to income ventile because a household's relative position in the income distribution determines in part the tax preferences available. One would expect that a higher income would result in a larger difference between standard and effective tax rates. This is because high income earners typically spend more on deductible items such as state income taxes. These households, because of their high tax brackets also have the most to gain by channeling their spending to the tax preferred items so as to minimize their taxes.

Figure 3.1 displays the standard and effective tax rates per ventile calculated for the years 1981 and 1982. Except for the lowest ventiles, effective rates are below the standard tax rates. Note that the largest difference is in ventile 20, but the ratio of the two rates for the last ventile is not much different than in the other ventiles.

The fraction of effective over standard varies over time. This





variation is the result of three processes. First, inflation has caused nominal incomes to rise over time, thus increasing the tax-reducing value of deductions and other items. Any given ventile's average per capita income has increased over time, so because of the resulting bracket creep due to inflation and the progressive tax rate schedule, a constant amount deducted in real terms will mean an increasing tax break relative to income. Second, real incomes have also been rising. results not only in bracket creep as above, but also results in increasing propensity to spend on deductible items and an increasing incentive to avoid taxes. In other words, as real income increases, not only can a family more easily afford tax shelters, it has more incentive to shelter its higher income. This incentive is also experienced when inflation causes nominal incomes only to rise. Finally, the tax code has not been constant over the sample period. It may have been relatively easier for certain income groups to avoid taxes in the later years of the sample as the code became more complex. effects were captured econometrically by estimating a time trend in the ratio of effective to standard tax rates.

The transformation of standard to effective tax rates was modeled in the following way: it was assumed that effective rates were a fraction of standard rates, that is:

$$ETR_{i} = b_{i} *STR_{i}$$

where ETR_i are the effective tax rates for ventile i and STR_i are the standard tax rates. The coefficients b_i represent the amount of standard taxes which cannot be reduced by the special provisions. It was further assumed that the b_i's vary over time according to

3.2)
$$b_i = c_i + d_i *TIME$$

This second equation is substituted into the first and the c's and d's are estimated with ordinary least squares. The equations estimated are of the form

3.3)
$$ETR_{i} = c_{i} *STR_{i} + d_{i} *TIME_{i} *STR_{i}$$

The results of the estimation of these equations are shown in table 3.1. One equation was estimated for each ventile. That is, the historical tax rates were aggregated by household size. A ventile's tax rate is a weighted average of its six household size's tax rates where the income shares for each household size per ventile serve as the weights.

These equations fit the data very well for such a simple specification. This indicates that the method used in calculating standard taxes is a good one. The middle ventiles have especially good fits as indicated by their low average absolute percentage errors. The term labled "TREND" in the charts of table 3.1 is TIME*STR₁. Its coefficient d is related to the b's by $b_1 = c_1 + d_1$ "TIME. The pattern of the estimated b's is shown in table 3.2. This table corresponds to the estimated STR/ETR ratios for 1982, and the numbers are calculated as $c + d^*TIME_{1982}$.

The equations were also estimated at the disaggregated household size level, that is, for the 120 income groups as displayed in table 2.10. It might be expected that household size would be a factor in a family's ability to avoid taxes. This might be the case for families with small children because they may have higher medical bills, or may be more likely to be homeowners with large mortgage interest deductions. It turned out that this influence of household size was of some significance. Especially for the upper ventiles, the pattern of

effective-to-standard tax ratios varied over household size with the larger sizes having, on average, a slightly better ability to avoid taxes. Table 3.3 shows the estimated ratios of standard to effective taxes for 1982 both at the aggregate ventile level and the household size level.

However, estimation at the household size level may not be the most reliable method. The disaggregated groups at the household size level tend to have highly variable effective and standard tax rates in the low ventiles (in relative terms). The effective rate may be two percent one year and only one-half of one percent the next year. This volatility can result in questionable estimates of the time-adjusted effective to standard tax rate ratios. In addition, 120 standard-to-effective tax rate equations are considerably more cumbersome to work with than are twenty. They must be estimated and used to forecast, and they would be particularly cumbersome for policy simulation exercises, where each one would have to be judgmentally altered on an individual basis. The forecast uses just the twenty aggregate equations.

The bottom of each page of tables 3.1 shows the historical standard and effective rates by ventile. Effective tax rates vary quite closely with the computed standard tax rates. It is also obvious that the ratio of effective and standard tax rates do vary over time. Over time, the gap has narrowed in the lower ventiles, while it has widened in the upper ventiles. This can also be seen by the values of the d_i's which are the coefficients for the "TREND" term in table 3.2. Those coefficients are positive in the lower ventiles, indicating a decreasing gap, and negative in the upper ventile indicating a widening gap between standard and effective tax rates over time. This can be explained by

the argument outlined below.

One might easily think that for the lower ventiles, standard taxes would be equal to effective taxes. However, there are tax avoidance opportunities which are available to some taxpayers regardless of their For example, taxpayers over the age of 65 are allowed an extra income. personal exemption, and are eligible for an additional tax credit for the elderly. The other tax credits available independently of income such as the residential energy, child care, and political contributions credits have dollar ceiling amounts which apply regardless of income. These and other similar tax avoidance items are available to low income taxpayers, and could represent a large percentage savings in their tax liabilities. These same items are available to high income taxpayers, but represent a much lower percent of tax savings. If these limited-amount items were the only tax avoidance items, then one would expect the lower ventiles to have low ratios of effective to standard tax rates, with the ratios rising towards unity in the highest ventiles. In other words, what is the same dollar amount of tax avoidance for the fourth ventile and the sixteenth ventile is a much larger share of taxes and income in the fourth ventile, and the equations are indeed estimated in terms of tax shares of income.

There are, however, other tax avoidance items which come into play as incomes rise. For example, a married taxpayer filing jointly must have at least \$3,400 of itemized deductions before they reduce his tax bill. There is no dollar limit on most of those deductions. These and other items like income averaging and maximum tax become relatively more important as income rises. In 1982 only about 35% of families itemized deductions, and in 1979 the percentage was 28.5. While there are

taxpayers in all ventiles who benefit from itemizing, that opportunity is probably not widely used until around the fourteenth ventile. This is a crude estimate, because to be sure, there are itemizers in all ventiles and of all household sizes. But if only the top 35% in per capita income recipients itemize, that would be from ventile 14 and above. The higher the ventile, the more tax avoidance incentive and opportunities. Therefore, the ratio of effective to standard tax rates begins to decline with income in the higher ventiles, where these avoidance items become important.

The effects of the additional taxes must also be taken into These taxes include the self-employment tax, recapture of investment credit, FICA tax on gratuity income, and the minimum and alternative minimum taxes. The minimum tax is a fifteen percent charge on certain tax preferences, primarily business-related items like accelerated depreciation, amortization, bad debt, and research expenses. Self-employed persons frequently occupy the lower ventiles because a very high proportion of their income is deductible as business expense. They are frequently required to pay the additional minimum tax. additional taxes help explain the fact that all the lowest income intervals reported in SOI, even those with negative AGI report some taxes paid. These additional taxes also resolve the seemingly odd fact that in the lower ventiles, estimated effective taxes sometimes exceed standard taxes. Again, these taxes affect the low ventiles much more relative to their incomes. But the effect is in the opposite direction of the limited tax avoidance items available to low income earners discussed above. The effect of the additional taxes, in fact, seems to dominate in the lower ventiles, resulting in high ratios of effective to standard taxes.

Table 3.3 shows the estimates of the b's (the ratios of effective to standard tax rates) for both the aggregate level and the household size equations. The pattern of the ratios indicates the effects of both types of tax avoidance items as well as the additional taxes. Except for the lowest ventiles in the small household sizes, the ratios follow a pattern that is rising somewhat with respect to income, but with a slight decrease in the higher ventiles. The effects of the widely available but limited-amount avoidance items are canceled out by the additional taxes in the low ventiles, and the ratios begin to decline in the higher ventiles, where the more income-dependent and open-ended tax avoidance items become more important. Though the table only shows the 1982 estimated ratios, the pattern of rising then falling ratios is universal throughout the sample.

As mentioned before, there is a related pattern revealed in the time trend coefficient, d, of the estimated equations, shown in table 3.2. For the lowest ventiles, the gap between standard and effective tax rates seems to have narrowed over time, and for the middle and higher ventiles, the gap seems to have widened. (Parameter d is positive in the lower ventiles and negative in the higher ones.) Incomes, both real and nominal, have been rising. By the argument from the previous page, the gap should shrink with rising incomes in the lower ventiles, and widen in the upper ventiles. The narrowing gap in the lower ventiles over time indicates the process of increasing incomes making the limited avoidance items, which are fixed in dollar terms, become relatively less important. The widening gap in the upper ventiles reflects the process of itemized deductions and the like, which

are limited only by AGI, becoming relatively more important as incomes increase.

If these equations were used for forecasting, then, the gap between standard and effective taxes would shrink for the lower ventiles and widen for the upper ones. However, when the tax system became indexed in 1985, the inflation portion of bracket creep was eliminated. Both the bracket bounds and the personal exemption amount will be indexed. So the only source of possible gap widening, then, is real growth, which was probably the weakest. Therefore, in the forecasting model, it was decided that the best long-term forecast properties will be achieved if the coefficients reported in table 3.2 are taken as constants. eliminating the time trend. This procedure will assure the ratios of effective-to-standard tax rates will remain at their estimated 1982 levels. Note that what is used is not the actual vector of ratios. but the estimated vector of ratios fit to the data in 1982. Those estimated coefficients are used rather than the actual calculated ratios in order to eliminate any random component of the observed ratios which might be peculiar to the year 1982.

At this point, one may be asking why not just estimate a simple linear regression equation of the effective tax rates on the standard ones? This was indeed the first method tried. The results of those estimations, reported in table 3.4 were encouraging at first glance. The slope term on standard tax rates declined steadily with increasing ventiles, indicating rising opportunity and incentive for tax avoidance. The fits are even better than the specifications used above. The problem, however, lies in the simulation properties of that specification. One of the reasons for building the tax model was to

perform tax reform simulations. The equation parameters in table 3.4 typically have high intercept terms, and low slope terms. Take, for example, ventile 20 where the slope term is about .48. This means that if the standard tax rate for that ventile were raised, about 60% of the extra tax burden to those households could be avoided by deductions. Likewise, a tax cut in the form of lower marginal rates in the schedule would only actually accrue to those households in the amount of 40% of the rate cuts in a simulation. That simulation property seemed unreasonable, especially in light of the fact that even the highest ventile actually pays close to 80% percent of its standard taxes. While the fit of those equations is good, the values of the parameter estimates make little economic sense in a policy simulation context.

Determination of the Distribution of Disposable AGI.

An estimate of disposable income is necessary for the tax model to be of use in forecasting consumption. The removal of taxes from income is fairly intuitive. However, some assumptions must be made about taxes other than the federal income tax. In addition, the resulting distribution of disposable income must be expressed in the index form used in the personal consumption part of the model.

The average effective tax rate per ventile and household size is applied to each group's average AGI, and the federal income tax is subtracted out. Four other types of personal taxes must be removed before disposable income can be determined. These are state and local income taxes, state and local other taxes, and nontaxes from both the federal and state and local levels. All these taxes except the state and local income taxes are assumed to be an exogenously set flat

percentage of personal income determined by historical percentages. State and local income taxes are assumed to be an exogenously set percentage of the federal income tax liability. These other taxes are then subtracted. Estimates of total disposable AGI in each of the twenty ventiles are the result.

The cutoff levels of disposable per capita AGI are estimated by first taking the pre-tax AGI cutoff points already determined, and applying the appropriate average federal income tax rates to those The appropriate federal rates are not the ventile cutoff incomes. effective tax rates whose derivations have just been described. rates represent the rate on the average income in each ventile, not the effective rate on the cutoff income. The appropriate tax rates for the cutoff incomes are linear interpolations of the average ventile rates. The interpolations of the tax rates are based on the positions of the cutoff AGIs relative to the ventile average AGIs. After the federal tax rates are determined for the cutoff levels of AGI, the other taxes on the cutoff incomes are determined as flat percentages of the cutoff income as before, and a distribution of disposable AGI is obtained. the tables of Chapters 1 and 5 for illustrations of the output and capabilities of the income tax model.

Advantages of the Framework.

The tax system can easily be indexed to inflation under this framework. Indexation, as defined by the current tax law, requires that the bracket boundaries and the personal exemption amounts are changed every year in proportion to the inflation rate. Note that the standard deduction amount does not have to be separately indexed, because it is

incorporated into the rate schedule as the upper boundary of the zero tax bracket. The bracket boundaries are read in with the tax rate schedule, and the personal exemption amounts are also read in as data. These variables can then be easily set to grow with the GNP price deflator beginning in any year one desires. As one can imagine, indexation, whether full or partial, makes a large difference in the forecast of taxes collected, and hence, the outcome of the interindustry model.

Changes in the definition of adjusted gross income can also be modeled. One must first determine how much the change will affect the total amount of AGI. Then one must either fix AGI to be that amount, or alter the AGI determination procedure described in Chapter 4 so that it produces the desired results. Next, one must decide how that change will affect the distribution of income, if at all. If the change will not affect how AGI is distributed then no further modifications to the model are necessary. However, if the distribution is to be affected, one must change the AGI of each ventile and household size individually.

The framework is particularly well-suited for modeling changes in the marginal tax rates. These rates are just read in from the entire tax schedules for single and married taxpayers, and can be easily changed.

Changes in tax credits and deductions and other tax preference items affect the relation of standard taxes to effective taxes. The relationship is just read in as the data from table 3.2. These numbers can easily be changed. The difficult part is in determining how to change them. An obvious example would be that the ratios should all be 1.0's if all deductions, credits, etc., were eliminated. Then effective

taxes would equal standard taxes.

Examples of all of the changes discussed in the previous four paragraphs can be found in the simulation study of tax reform done with this model. That study, the subject of Chapter 5, analyzed the distributional effects of the tax burden under current tax law and the proposed version of tax reform. This study well illustrates the flexibility of this income tax modeling framework.

The results of the work as described thus far are estimates of the amount and distribution of taxes and the amount and distribution of disposable AGI. This is not quite the concept of income that the consumption section of the model was built to use. Disposable AGI must be converted to disposable personal income. Estimates of the amounts and distribution of transfer payments and the other differences between personal income and AGI must be made and incorporated into the model. This is the subject of the next chapter.

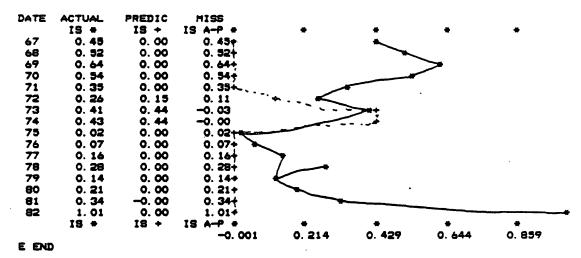
TABLE 3.1

EQUATIONS AND PLOTS FOR STANDARD AND EFFECTIVE TAX RATES.

REGRESSION VENTILE 2

1 SEE =	0.4179 RSGR = -1.9070 RBARSG = -2.1146 NOB	5 = 16
RHO =	0.8747 DW = 0.251 AAPE = 84.51	
VARIABLE	REGRES-COEF T-VALUE ELASTICITY MEXPLAVAL	MEAN
STR2	3. 736800 0. 17 0. 670 0. 10	0. 0654
TREND	-0. 142159 	1. 2678
ATR2	DEPENDENT VARIABLE	0. 36444
NE 22		

RECRESSION VENTILE 2



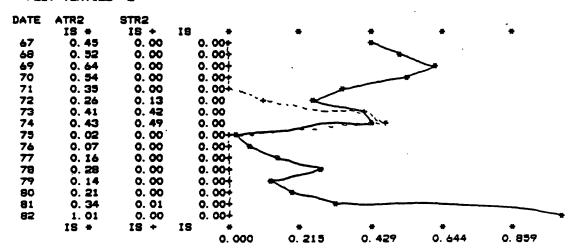


TABLE 3.1 (continued)

1 SEE =	0.6531 RSGR = -	D. 5083 RBARSG =	-0. 6160 NDBS	= 16
RHO =	0.4864 DW =	1.027 AAPE =	47. 64	
VARIABLE	REGRES-COEF T-V	ALUE ELASTICITY	MEXPLAVAL	MEAN
STR3	0. 351 29 6	0. 62 0. 338	1. 38	1. 3232
TREND	0. 024244	0. 83 0. 457	2. 40	25. 9596
ATR3	DEPENDEN	T VARIABLE		1. 37681
NE 22				

REGRESSION VENTILE 3

DATE	ACTUAL	PREDIC	MISS				
	is •	IS +	IS A-P +	•	•	•	
67	1. 07	0. 02	1. 05+		-		
68	1. 79	1. 33	0. 46				
69	2. 13	1. 78	0. 35			````\\`\``\`\\\\\\\\\\\\\\\\\\\\\\\\\\	>
70	1. 90	1. 11	0. 78		•	M	
71	1.61	0. 74	0. 87	4- -	***	_	
72	1. 30	1. 79	-0. 50			***	
73	1.67	2. 31	- 0. 63			*	*+
74	1. 87	2. 66	-0. 79				
75	0. 42	0. 00	0. 42ゃくてご				
76	0. 63	1. 03	-0 . 40				
77	0. 75	0. 08	0.67 4	1			
78	1. 18	0. 49	0.69	**	—		
79	0. 99	0. 74	0. 25	` ` •			
80	1. 07	0. 92	0. 15	```	• }		
81	1. 52	1. 33	0. 19				
82	2. 14	1. 16	0. 98		# P		◄
	IS +	IS +	IS A-P +	•	•	•	*
	•		0. 000	0. 566	1. 132	1. 698	2. 264
E 500			-,				

DATE	ATR3	STR3						
	IS *	IS +	IS	•		•	•	*
67	1. 07	0. 03	0.	00+				
68	1. 79	1. 92	0.	.00	_		-	
69	2. 13	2. 49	0.	.00			>	-
70	1. 90	1. 50	0.	00		ت سو		
71	1. 61	0. 97		00	*	= =		
72	1. 30	2. 28	· 0.	00		~		_
73	1. 67	2. 84		00				· •
74	1. 87	3. 18		00			.	
75	0. 42	0. 00		00+				
76	0. 63	1. 16		00	2 2 2 m			
77	0. 75	0. 09		00 +	- 1			
78	1. 18	0. 53		00	• •	*		
79	0. 99	0. 77		00	•			
80	1. 07	0. 94		.00	· ' - ' - ' - ' - ' - ' - ' - ' - ' - ' - '			
81	1. 52	1. 32	0.	. 00	• ,	12		
82	2. 14	1. 13		00	•	~		
	18 +	IS +	IS	•	•	•	•	•
				0. 000	0. 677	1. 354	2. 030	2. 707

TABLE 3.1 (continued)

1 SEE =	0. 6077 RSGR	= 0.1695 RBARSG	- 0.1102 NOBS	= 16
RHO =	0. 2216 DW	= 1.557 AAPE :	20. 94	
VARIABLE	REGRES-COEF	T-VALUE ELASTICIT	Y MEXPLAVAL	MEAN
STR4	0. 420441	1. 92 0. 498	12. 45	3. 1845
TREND	0. 019606	1. 75 0. 459	10. 41	63. 0171
ATR4	DEPE	NDENT VARIABLE -		2. 69112
NF 22				

RECRESSION VENTILE 4

DATE	ACTUAL	PREDIC	Hiss				
	is *	18 +	IS A-P +	•	•	•	*
67	2. 03	1. 23	ر ≥0+ر _				
68	3. 20	2. 94	0. 26		_		
69	3. 69	3. 62	0.08			~~	
70	3. 47	3. 01	0. 46		_		
71	2. 92	2. 17	Q. 75	4	m~::::		
72	2. 60	3. 29	-0. 70		~		4
73	3. 01	3. 74	-0. 74			3	~ ~ *
74	3. 36	3. 83	-0. 46				-بدر بر بر
75	1. 51,	1. 36	0.15 🕶 🔫		~ ~ ~ .		
76	1. 70	2. 91	-1. 21		/ = -	راو سو	
77	1.88	1. 30	0.58 🗢 🤝			_	
78	2. 47	1. 79	Q. 68				
79	2. 30	2. 10	O. 20	,~~.	. <		
80	2. 61	2. 43	0. 18		سعيره راست		
81	2. 96	2. 75	0. 21			4 1	
82	3. 35	2. 72	0. 63			+	→
	IS +	IS +	IS A-P *	•	•	•	*
			1. 232	1. 784	2. 335	2. 687	3. 439

E END

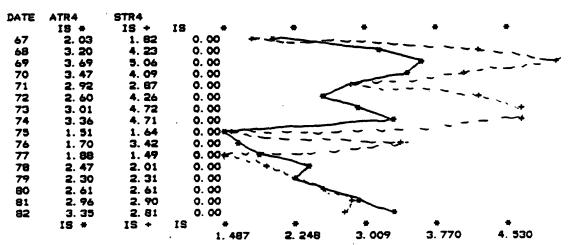


TABLE 3.1 (continued)

RECRESSION VENTILE 5

1 SEE	- (). 5342 RSGR	a 0. 3974	RBARSQ =	0. 3543 NOBS	3 = 16
RHO		D. 0092 DW	= 2.018	AAPE =	10. 65	
VARIABLE		REGRES-COEF	T-VALUE E	LASTICITY	MEXPLAVAL	MEAN
STR5		0. 581961	4. 74	0. 701	61. 32	4. 8082
TREND		0. 011717	1. 93	0. 284	12. 56	96. 73 65
ATRS		DEPE	NDENT VARI	ABLE		3. 99387
NE 22						

RECRESSION VENTILE 5

DATE	ACTUAL	PREDIC	miss					
	IS •	IS +	IS A-P *		•	•	•	
67	3. 19	2. 95	0. 24	←				
68	4. 53	4. 39	0. 14			- T		
69	5. 03	5. 05	-0. 02					,
70	4.74	4. 47	0. 27			_ 4	-	
71	4. 06	3. 49	0. 57		4-4	ستستبتث		
72	3. 70	4. 04	-0. 34					
73	4. 19	4. 50	-0. 31			- ·	~	
74	4. 47	4. 92	-0. 45					
75	2. 63	2. 54	0.10					
76	3. 17	4. 58	-1.41	-			فد	
77	3. 17	2. 45	0. 73te		_ ~ ~ -			
78	3. 93	3. 14	0. 79	~~~		•		
79	3. 64	3. 29	0. 35		. _	=		
80	4. 20	3. 95	0. 25	•				
81	4. 66	4. 76	-0. 10				~	
82	4. 58							
92		4. 38	0. 20			_	•	
	18 +	is +	is a-p +	*	•	*		
			2. 448	3. 002	3. 556	4. 109	4. 663	
E END								

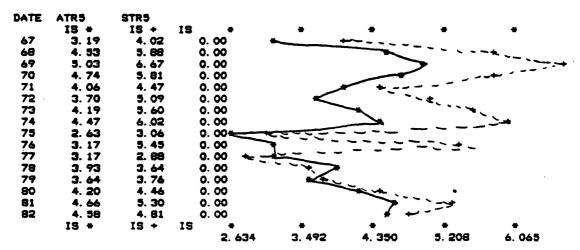


TABLE 3.1 (continued)

1 SEE	49	0. 5028 RS	QR =	0. 4153	RBARSQ =	0. 3736 NOE	IS = 1	6
RHO	-	0. 0103 D	W =	2. 021	AAPE =	7. 37		
VARIABLE		REGRES-CO	EF T-V	ALUE EL	ASTICITY	MEXPLAVAL	MEAN	
STR6		0. 6941		7. 65	0. 839	127. 69	6. 2	750
TREND		0. 0062	36	1. 43	0. 153	7. 02	127. 7	487
ATR6		DE	PENDEN	IT VARIA	BLE		5. 1	9375
NF 22								

REGRESSION VENTILE 6

DATE	ACTUAL	PREDIC	MISS					
	IS +	IS +	IS A-P +	*	•	•		
67	4. 21	4. 10	0. 11			_		
68	5. 69	5. 58	0. 12			-		
69	6. 31	6. 20	0. 11					
70	5. 76	5. 52	0. 24					
71	5. 04	4. 60	0. 44	* <	سيتست			
72	4. 74	5. 04	- 0. 30		The same of the sa			
<i>7</i> 3	5. 30	5. 71	-0. 41					
74	5. 57	5. 9 2	~ 0. 35					
75	4. 18	4. 04	0.14				-	
76	4. 45	5. 80	~1.36		~~~~		*	
77	4. 39	3. 73	0 664 :-				-	
78	5. 11	4. 29	0. 82	· · - +	-			
79	5. 08	4. 79	0. 29			_		
80	5. 52	5. 33	0. 1 9		~~-	· · · · · · ·		
3:	6. 03	6. 17	-0. 13			• • •	**-*	
82	5. 71	5. 61	0. 10			+ 1	بالميسم	
	IS +	IS +	IS A-P +	•	•	•	•	
			3. 730	4. 279	4. 828	5. 378	5. 927	
-							- :	

E END

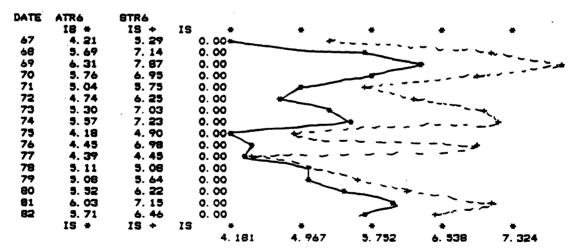


TABLE 3.1 (continued)

1 SEE =	0. 4629 RSQF	= 0.5464	RBARSQ =	0. 5141	NCBS = 16
RHC =	-0.1577 DH	= 2.315	AAPE =	5 . 22	
VARIABLE	REGRES-COEF	T-VALUE .E	LASTICITY	MEXPLAVAL	MEAN
STR7	0. 748409	10. 54	0. 900	198. 92	7. 4590
TREND	0. 003834	1. 14	0. 095	4. 50	152. 8879
ATR7	DEPE	INDENT VARI	ABLE		6. 20224
NE 22					

REGRESSION VENTILE 7

DATE	ACTUAL	PREDIC	MISS				
	is •	IS +	IS A-P *	*			*
67	5. 07	5. 01	0.06		•		
68	6. 66	6. 52	0. 14				
69	7. 20	7. 25	- 0. 05			•	```
70	6. 59	6. 40	0. 19				3
71	5. 83	5. 46	0. 38	¥ 5	J. T.		
72	5. 67	5. 85	-0. 18		£2	_	
73	6. 31	6. 53	-0. 22			- Tall Ye	
74	6. 69	7. 04	-0. 35				`_^_`÷
75	5. 13	4. 93	' 0. 19	-			_
76	5. 52	6. 7 9	-1. 28			`_`_	.
77	5. 51	4. 76	0.76+-	/ *	_ ~ ~ `		
78	6. 22	5. 50	0. 72			•	
79	6. 12	5. <i>9</i> 7	0. 15				
80	6. 69	6. 55	0. 14			and the same	
81	7. 26	7. 36	- 0. 10				
92	6. 75	6. 77	-0. 02				-
	I8 +	I8 +	IS A-P *	•	•	•	*
			4. 755	5. 310	5 . 864	6. 418	6. 973
E END							

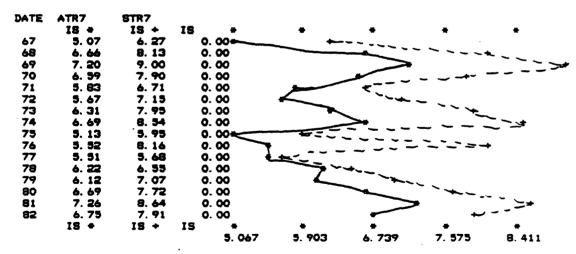


TABLE 3.1 (continued)

. 1 SEE =	0. 3750 RSQR	= 0.7128	RBARSQ =	0. 6923 NOB	S = 16
RHO =	-0. 0437 DH	= 2.087	AAPE =	3. 64	
VARIABLE	REGRES-COEF	T-VALUE EL	ASTICITY	MEXPLAVAL	MEAN
STR8	0. 761804	15.00	0. 914	313. 29	8. 5309
TREND	0. 003385	1. 41	0. 083	6. 86	175. 3692
ATRE	DEPE	NDENT VARIA	ABLE		7. 11143
NE 22					

REGRESSION VENTILE 8

DATE	ACTUAL	PREDIC	MISS					
	IS *	IS +	IS A-P +	•	•	•	*	
67	5. 87	5. 71	0. 16+					
68	7. 47	7. 36	0. 11			The state of the s		
69	8. 04	8. 06	-0. 02					
70	7. 29	7. 24	0. Q 5		تستسد ۔ ۔	SE STATE OF THE SECOND		
71	6. 75	6. 49	0. 26	+				
72	6. 52	6. 72	-0. 20			- _		
73	7. 13	7. 40	-0. 28		-	*		
74	7. 56	7. 68	-0. 12					
75	6. 10	6. 10	-0. 00	-				
76	6. 49	7. 52	-1. 02			リンチ		
77	6. 47	5. 80	0.67 **					
78	7. 07	6. 52	0. 55		~			
79	` 7. 21	7. 00	0. 20 •		+ <i></i>	-		
80	7. 7 8	7. 65	0. 13			-		
81	8. 32	8. 36	- 0. 04					4
82	7. 72	7. 86	∸ 0. 14			•		
	is +	IS +	IS A-P +	*	•	•	*	
			5. 712	6. 274	6. 837	7. 400	7. 962	
E END								

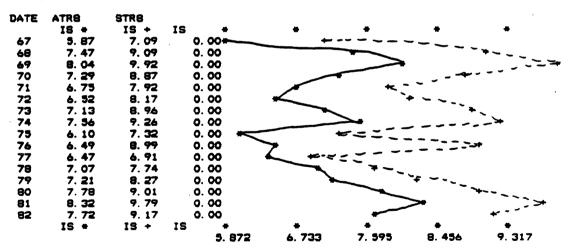
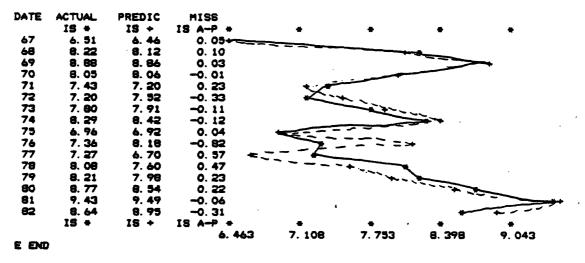


TABLE 3.1 (continued)

1 SEE =	0. 3282 RSGR	= 0.8247	RBARSQ =	0. 8122 NOBS	3 = 16
RHO =	-0. 0278 DW	= 2.056	AAPE =	2. 98	
VARIABLE	REGRES-COEF	T-VALUE EL	ASTICITY	MEXPLAVAL	MEAN
STR9	0. 792148	19. 73	0. 945	436. 75	9. 4772
TREND	0. 002175	1. 15	0. 054	4. 65	195, 5774
ATR9	DEPE	NDENT VARIA	BLE		7. 94443
NF 22		•			- · · · · · · · -

REGRESSION VENTILE 9



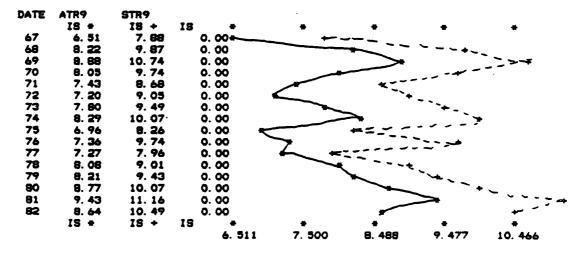


TABLE 3.1 (continued)

1 SEE =	0. 2576 RSQR	= 0.8957 RBA	RSQ = 0.8883	NOBS = 16
RHO =	0.1561 DW	= 1.688 AA	PE = 2.13	
VARIABLE	REGRES-COEF	T-VALUE ELAST	ICITY MEXPLAVA	L MEAN
STR10	0. 812132	27. 91 0	. 964 652. 62	10. 3347
TREND	0. 001437	1.06 0	. 035 3. 91	213. 6876
ATR10	DEPE	NDENT VARIABLE		8. 70680
NE 22				

REGRESSION VENTILE 10

DATE	ACTUAL	PREDIC	MISS				
	IS #	IS +	IS A-P +			*	•
67	7. 18	7. 19	-0. 01+	-			
68	8. 95	8. 87	0. 0 9				
69	9. 51	9. 53	- 0. 01				
70	8. 70	8. 73	-0. 03				
71	8. 10	7. 96	0. 14	سمتارع			
72	7. B6	· 7. 98	- 0. 12				
73	8. 47	8. 58	-0 . 11		7		
74	8. 93	9. 03	-0. 09			•	
75	7. 83	7. 87	- 0. 04				
76	8. 24	8. 82	- 0. 59	-	77 77 14		
77	8. 29	7. 81	0. 48				
78	8. BQ	8. 41	0. 39		*		
79	9. 10	8. 60	0. 30		<u>`</u> "→_`		
80	9. 77	9. 63	0. 14		•		*
81	10. 31	10. 45	- 0. 14				>x>+
83	7. 26	9. 54	- 0. 28			+-	
	is +	IS +	IS A-P *		•		•
			7. 183	7. 877	B. 572	9. 266	9. 961
E END		•					

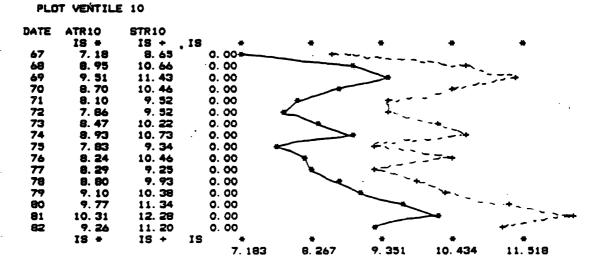
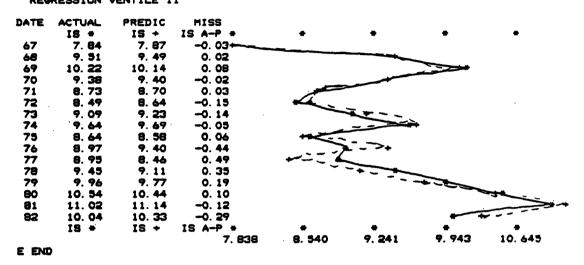


TABLE 3.1 (continued)

1 SEE =	0.	2242 RSQR	= 0. 9258	RBARSQ =	0. 9205 NOBS	= 16
RHO =	· · O.	1333 DW	= 1.733	AAPE =	1. 71	
VARIABLE		REGRES-COEF	T-VALUE E	LASTICITY	MEXPLAVAL	MEAN
STR11		0. 842082	35. 50	0. 993	853. 93	11.0864
TREND	1	0. 000281	0. 25	0. 007	0. 23	229. 6351
ATR11		DEPE	NDENT VARI	ABLE		9. 40493
NE 22						

REGRESSION VENTILE 11



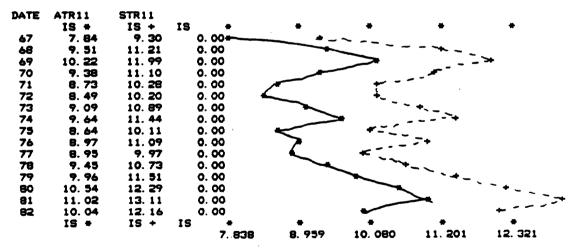


TABLE 3.1 (continued)

1 SEE =	0. 2183 RSGR	= 0.9406 RBARSQ =	0. 9364 NOBS	= 16
RHO =	0. 11 7 7 DW	= 1.765 AAPE =	1. 70 `	
VARIABLE	REGRES-COEF	T-VALUE ELASTICITY	MEXPLAVAL	MEAN
STR12	0. 859933	39. 85 1. 010	969. 79	11.8496
TREND	-0. 000447	-0. 45 -0. 011	0. 71	245. 8107
ATR12	DEPE	NDENT VARIABLE		10.08568
NE 22				

REGRESSION VENTILE 12

DATE	ACTUAL	PREDIC	MISS				
	IS +	IS +	IS A-P +	•	•		•
67	8. 39	8. 54	-0. 15				
68	10. 23	10.09	0. 13		-		
49	10. 88	10. 94	-0. 06				
70	10. 02	10. 13	-0 . 11				
71	9. 33	9. 25	Q. 08	-			
72	9. 12	9. 22	- 0. 10	4			
73	9. 76	9. 81	-0. 05		*		
74	10. 19	10. 21	-0. 02	_			
75	9. 32	9. 20	0. 12				
76	9. 63	9. 95	- 0. 31				
77	9. 55	9.06	0. 5 0				
78	10. 27	10. 04	0. 22		water the		
79	10. 58	10. 34	0. 24		~ · ·	7	
90	11. 23	11.11	0. 13			~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ 	
81	11. 78	12. 14	-0. 16				
82	10. 88	11. 25	- 0. 37			+	
	IS +	IS +	IS A-P +	₩.	•	•	*
			8. 373	9. 190	9. 988	10. 785	11. 582
E END)						

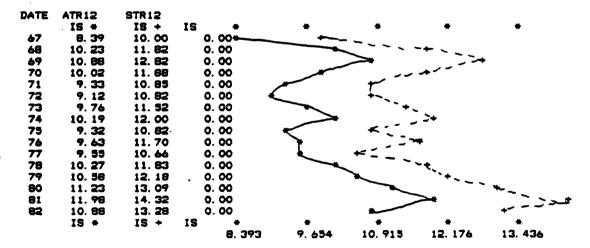


TABLE 3.1 (continued)

1 SEE =	0. 1886 RSGF	e = 0.9560 RBARSQ	- 0. 9529 NOBS	= 16
RH0 =	0. 1160 DH	= 1.768 AAPE	= 1. 20	
VARIABLE	REGRES-COEF	T-VALUE ELASTICIT	Y MEXPLAVAL	MEAN
STR13	0. 978241	49.64 1.028	1230. 51	12. 5567
TREND	-0. 00118	5 ~ 1. 44 ~ 0. 029	7. 18	260. 6453
ATR13	DEPE	ENDENT VARIABLE -		10. 72424
NE 22				

REGRESSION VENTILE 13

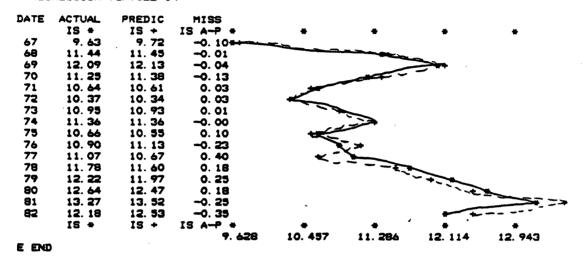
DATE	ACTUAL.	PREDIC	MISS					
	IS +	IS +	IS A-P +	•	•	•		
67	9. 00	9. 00	0. 01					
68	10. 88	10. 89	-0. 01 '		-			
69	11. 46	11. 58	-0. 12			—		
70	10. 59	10. 67	~O. OB		-			
71	9. 77	9. 91	0. 07	-				
72	9. 82	9. 82	- 0. 00	~~~				
73	10. 27	10. 28	-0. 01		~			
74	10. 82	10. 84	-0. 02	_				
75	9. 98	9. 89	0. 09	عسته				
76	10. 16	10. 46	-0. 30	7	` →	*		
77	10. 35	9. 93	0. 42	حرب	la .			
78	10. 9 3	10.76	0. 17	-		_		
79	11.34	11.04	0. 30		``	+		
80	12. 21	12. 19	0. 02					
81	12. 46	12. 61	-0. 15	•	•			÷
82	11. 34	11. 63	-0. 29			-		
	IS .	IS +	IS A-P +	•	•	•	•	
			8. 778	9. 766	10. 534	11. 303	12. 071	
E END	ı			_				

DATE	ATR13	STR13					
	is +	IS +	IS *	•	•	•	*
67	9.00	10. 43	0. 00				
68	10. 88	12. 64	0. 00			- - - .	
69	11. 46	13. 46	0. 00		> •	` ` ` > ×	•
70	10. 59	12. 42	. 0.00			A	
71	9. 99	11. 55	0. 00	*		• •	
72	9. 82	11.46	0. 00		- €		
73	10. 27	12. 01	0. 00				
74	10. 82	12. 68	0. 00	~	_	77+	
73	7. 98	11. 59	0. 00	-	***	₹.	
76	10. 16	12. 28	0. 00		-	•	
77	10. 35	11. 67	0. 00	L	***		
78	1093	12. 66	0. 00			~ ~ 4	
79	11. 34	13. 01	0. 00		*	*	(
80	12. 21	14. 39	0.00			_	e
81	12. 46	14. 90	0. 00			>	***
82	11. 34	13. 76	0. 00		-		+
	IS *	15 +	IS +	₩.,	•	•	•
			9. 004	10. 258	11. 513	12. 767	14. 022

TABLE 3.1 (continued)

1 SEE =	0. 1928 RSQR	= 0. 9567	RBARSQ =	0. 9536 NOBS	6 = 16
RHO =	0. 2856 DW	= 1.429	AAPE =	1. 23	
VARIABLE	REGRES-COEF	T-VALUE E	LASTICITY	MEXPLAVAL	MEAN
STR14	0. 900539	52. 67	1. 053	1311. 27	13. 3287
TREND	-0. 002182	-2. 76	-0. 053	24. 24	277. 1324
ATR14	DEPE	NDENT VARI	ABLE		11, 40274
NE 22					

RECRESSION VENTILE 14



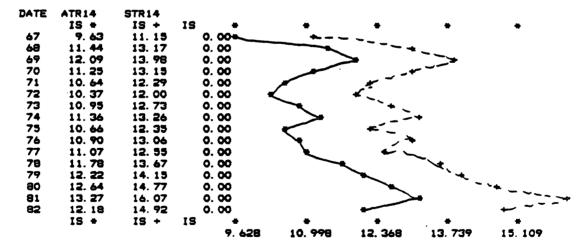


TABLE 3.1 (continued)

1 SEE =	0. 2139 RSQR	= 0.9539 RBARSQ =	0. 9506 NOBS	= 16
RHO =	0. 3463 DW	= 1.307 AAPE =	1. 37	
VARIABLE	REGRES-COEF	T-VALUE ELASTICITY	MEXPLAVAL	MEAN
STR15	0. 915948	51. 13 1. 067	1270. 19	14. 1172
TREND	-0. 002780	-3. 36 -0. 067	34. 46	293. 8911
ATR15	DEPEN	IDENT VARIABLE		12. 11999
ME 22				

REGRESSION VENTILE 15

DATE	ACTUAL	PREDIC	MISS				
,	18 •	IS +	IS A-P .	•	•	•	•
67	10. 23	10. 36	-0. 13				
68	12. 13	12. 15	-0. 02		The contract of the contract o		
69	12.77	12. 98	-0. 21			>>>	
70	11. 94	12. 02	-0. 08		ALTON .		
71	11. 25	11. 16	0. 09	J. Salar			
72	11.01	11.00	0. 01				
73	11. 57	11. 57	-0. 00	-	_		
74	11. 99	11. 82	0. 18	•			
75	11. 51	11. 33	O. 18	*			
76	11. 56	11. 76	-0. 20	*	•		
77	11. 97	11. 58	0. 39	′يب			
78	12. 49	12. 33	0. 16	_			•
79	12. 71	12. 40	0. 31		₩.		
80	13. 60	13. 51	0. 09				
81	14. 24	14. 51	-0. 27				→
82	12, 95	13. 34	-0. 39			-	
	IS .	IS +	IS A-P +	•	•	•	◆ ~
		_	10. 234	11. 144	12. 055	12. 965	13. 875
E END	1		3	· - · ·		· · - -	

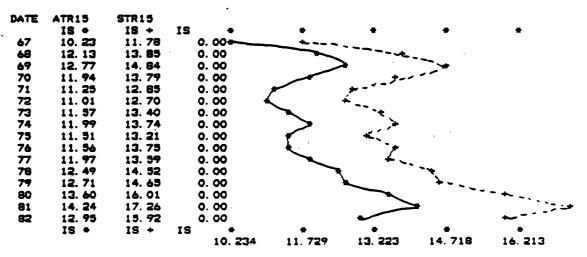


TABLE 3.1 (continued)

i SEE =	0. 2234 RSQR	= 0. 9545 RI	BARSQ =	0. 9513 NO	BS = 16
RHO =	0. 3553 DW	= 1.289	AAPE =	1. 34	
VARIABLE	REGRES-COEF	T-VALUE ELAS	STICITY	MEXPLAVAL	MEAN
STR16	0. 941037	53. 11	1. 093	1322. 99	14. 9871
TREND	-0. 003844	-4. 72	-0. 093	60. 95	312. 6180
ATR16	DEPE	VDENT VARIABL	LE		12. 90818
NE 33					

REGRESSION VENTILE 16

DATE	ACTUAL	PREDIC	MISS				
	IS *	IS +	IS A-P +	•		*	*
67	10. 94	11. 04	-0. 10****				
68	12. 61	12. 95	-0. 14		-		
69	13. 42	13. 58	-0. 16			}•	
70	12. 64	12. 72	-0. 08		وسينوا		
71	11. 76	11. 96	0. 00	-			
72	11.67	11. 67	0. 01	*			
73	12. 33	12. 13	0.19				
74	12. 8 0	12. 72	0.08	-			
75	12. 30	12. 09	0. 22	~ €			
76	12. 51	12. 70	-0. 19		**************************************		
77	12. 61	12. 17	0. 44	* _	-		
78	13. 32	13. 20	0. 13			*	
79	13. 7 9	13. 56	0. 23			, while	
90	14. 46	14. 29	0. 17				7
81	15 . 01	15. 24	-0. 22				
82	13. 95	14. 42	-0. 47			-	* "
	IS +	IS +	IS A-P +	•	•	•	•
			10. 94 1	11. 855	12. 768	13. 682	14. 596
E END							

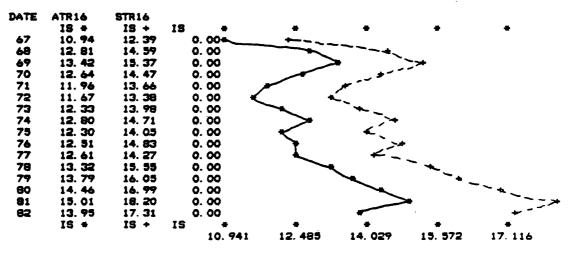


TABLE 3.1 (continued)

1 SEE =	0. 2017 RSQR	= 0.9653 RBARSQ	- 0. 9628 NOBS	5 = 16
RHO =	0. 3874 DW	= 1.225 AAPE	= 1.19	
VARIABLE	REGRES-COEF	T-VALUE ELASTICIT	Y MEXPLAVAL	MEAN
STR17	0. 960518	63. 13 1. 105	1590. 24	15. 8589
TREND	-0. 004387	' -6. 27 -0. 10 5	95. 23	330. 9772
ATR17	DEPE	NDENT VARIABLE -		13. 76855
NF 22				

REGRESSION VENTILE 17

DATE	ACTUAL	PREDIC	miss				
	IS +	IS +	IS A-P *	•	#	•	•
67	11. 79	11. 72	-0. 13 ***	<u> </u>			
68	13. 59	13. 72	-0. 13				
69	14. 29	14. 52	-0. 23			~_+	
70	13. 32	13. 44	-0. 12				
71	12. 66	12. 55	0. 11	والمستحدث وسو			
72 '	12. 5 8	12. 45	0. 13	44			
73	13. 15	13. 05	0. 10		_		
74	13. 65	13. 53	0. 12		~ >		
75	13. 39	13. 15	0. 25	· +/			
76	13. 25	13. 19	0. 06	\$4			
77	13. 71	13. 42	0. 30	`	2		
78	14. 61	14. 66	-0. 05			=	
79	14. 62	14. 30	0. 33		+ .		
80	15. 49	15. 50	-0. 02				~
81	15. 93	16. 32	-0. 39 ·				→
82	14. 59	14. 79	-0. 20				
	IS .	18 +	18 A-P +	•	•	•	•
			11. 789	12, 753	13. 718	14. 682	15. 647
E END							

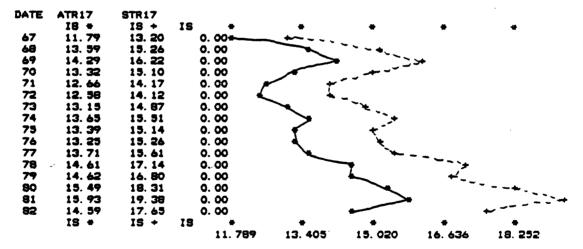


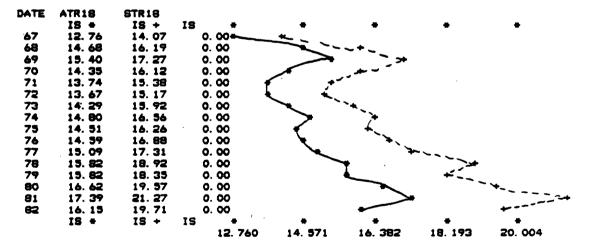
TABLE 3.1 (continued)

1 SEE	- 0	. 2387	RSGR	= (). 959	3 RBARSQ	=	0. 9564	NOBS	#	16
RHO	* (. 2595	DW	-	1.48	1 AAPE	-	1. 37			
VARIABLE		REGRES	-COEF	T-VA	LUE	ELASTICI	TY	MEXPLAVAL		MEAN	j
STRIB		0. 9	75757	:	59. 51	1. 14	2	1493. 64		17.	1854
TREND		-0. 00	05950	-	-7. 78	-0.14	3	130. 63		359.	6185
ATR18			DEPEN	IDEN1	VAR	IABLE -	_			14.	98067
NE 22										•	

REGRESSION VENTILE 18

DATE	ACTUAL	PREDIC	MISS				
	IS +	IS +	IS A-P +	•	•	*	*
67	12. 76	12. 92	-0. 16**				
68	14. 68	14. 77	-0. 09		-		•
69	15. 40	15. 45	-0. 25			>	
70	14. 35	14. 52	- 0. 17	رمو			
71	13. 74	13. 76	-0. 02	A CONTRACTOR OF THE PARTY OF TH			
72	13. 67	13. 48	0. 19	*CX			
73	14. 29	14. 05	Q. 24	130	_		
74	14. 80	14. 52	Q. 28		*>		
75	14. 51	14. 16	0. 35	*(<		
76	14. 59	14. 60	- 0. 01	_	- }		
77	15. 09	14. 87	0. 22		JA JA		
78	15. 82	16. 14	-0. 31			- t >+	
79	15. 82	15. 54	0. 28			42.	•
80	16. 62	16. 46	0. 15				٠
81	17. 39	17. 76	-0. 37				← روخخ
82	16. 15	16. 34	-0. 19			-	
	IS +	18 +	IS A-P +	•	•		*
			12. 760	13. 825	14. 889	15. 954	17. 019
E 610							

E END



RECRESSION VENTILE 19 TABLE 3.1 (continued)

1 SEE =	0. 2203 RSQR	= 0.9720 RBARSQ =	0. 9699 NOBS	= 16
RHO =	0. 2962 DH	= 1.408 AAPE =	1. 13	
VARIABLE	REGRES-COEF	T-VALUE ELASTICITY	MEXPLAVAL	MEAN
STR19	1. 007091	72. 27 1. 163	1834. 19	19. 2102
TREND	-0. 006735	-10. 60 -0. 163	200. 33	402. 6417
ATR19	DEPE	NDENT VARIABLE		16. 64055
NE 22				

DATE	ACTUAL	PREDIC	MISS				
	IS *	IS +	IS A-P +	*		*	*
67	14. 34	14. 58	-O. 24*	<u> </u>			
68	16. 14	16. 31	-0. 17		-		
69	16. 74	16. 97	-0. 23				
70	15. 81	15. 76	0. 05	مستهور	-		
71	15. 26	15. 07	0. 19	# F			
72	15. 27	14. 96	0. 32,	٤_ الح			
73	15. 78	15. 59	0. 20	- T. W.			
74	16. 34	16. 38	-0. 04		~		
75	16. 21	16. 08	0. 13	*	*		
76	14. 31	16. 38	-0. 07		Jan .		•
77	16. 83	16. 71	0. 12		2		
78	17. 79	17. 9 7	-0. 18				
79	17. 75	17. 33	0. 42			2-7	
80	18. 74	18. 62	0. 11				
81	19. 22	19. 52	-0. 30				>>> >>
82	17. 71	17. 94	-0. 23			-	
_ _	IS +	IS +	IS A-P +		•	•	•
			14. 338	15. 441	16. 544	17. 647	18. 749
E END	,		3 222	, , ,			

DATE	ATR19	STR19					
	IS •	IS +	is •	•	•	•	*
67	14. 34	15. B6	0.00	<u></u>			
68	16. 14	17. 86	0.00		* * 4 .		
69	16. 74	18. 73	0. 00	_			
70	15. 81	17. 52	0. 00		•		
71	15. 26	16. 89	0.00 💉	- +			
72	15. 27	16. 88	0.00	.			
73	15. 78	17. 73	0. 00	`	~ ♠ .		
74	16. 34	18. 77	0. 00	>	` * **		
75	16. 21	18. 57	0. 00	₹	- €		
76	16. 31	19. 07	0. 00	•	•		
77	16. 83	19. 61	0. 00		``	~ _	
78	17. 79	21. 25	0. 00		→	~ ~ ~ ~ , *	
79	17. 75	20. 66	0. 00		L	4	_
80	18. 74	22. 38	0. 00				*****
81	19. 22	23. 65	0. 00				>>+
82	17. 71	21. 91	0. 00				+
	IS +	IS +	is +		•	•	•
			14. 338	16. 320	18. 303	20. 285	22. 267

TABLE 3.1 (continued)

1 SEE =	0. 3102 RSGR	= 0.9673 RBARS	2 = 0.9650 NOBS	16
RHO =	-0. 0031 DW	= 2.006 AAPE	= 1.00	
VARIABLE	REGRES-COEF	T-VALUE ELASTIC	TY MEXPLAVAL	MEAN
STR20	1. 043870	76. 32 1. 24	11 1942.06	27. 9057
TREND	-0. 009644	-15. 50 -0. 24	41 326. 10	385. 9646
ATR20	DEPE	NDENT VARIABLE -	'	23. 47973
NF 22				

REGRESSION VENTILE 20

DATE	ACTUAL	PREDIC	MISS				
	19 +	19 +	IS A-P +	•	•	•	*
67	20. 72	20. BO	-0.09+				
68	23. 54	23. 17	0. 37		-35		
69	23. 93	23. 90	0. 03				•
70	22. 17	22. 20	-0. 03	- Aller Street			
71	21. 48	21. 36	0. 12	+			
72	21. 55	21.45	0. 10	De la companya dela companya dela companya dela companya de la companya de la companya de la companya dela companya			
73	22. 04	22. 24	-0. 20	The second			
74	22. 76	22. 90	-0. 14		₩ →		
75	22. 75	22. 81	-0. 07		4		
76	23. 21	23. 36	-0. 15		Andrew		•
77	23. 93	24. 34	-0.41				
78	24. 84	25. 30	-0. 46			1	•
79	25. 50	24. B6	0. 64			+<-	
80	26. 32	25. 93	0. 39				- +
81	26. 34	26. 74	-0. 40				
82	24. 60	24. 30	0. 30	•		* *	
	IS •	IS +	IS A-P *	•	•	•	•
			20. 71	6 21. 997	23. 279	24. 560	25. 841
E END	١٠						•

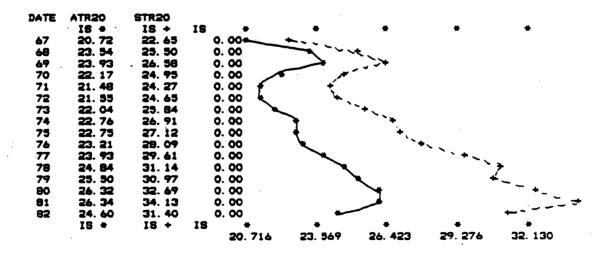


TABLE 3.2
ESTIMATED RATIOS OF EFFECTIVE-TO-STANDARD TAX RATES.

	F	Ratio Estimate	(b) c	d	R-sq.	Durbin-Watson
Vent	1	*	#	#	*	*
Vent	2	#	#		#	*
Vent	3	1.03012	.3513	.0242	*	1.027
Vent	4	0.96940	.4204	.0196	.16 95	1.557
Vent	5	0.91004	.5820	.0117	•3974	2.018
Vent	6	0.86870	.6 941	•0062	.4153	2.021
Vent	7	0.85577	•7484	.0038	•5464	2.315
Vent	8	0.85658	.7618	.0034	.7128	2.087
Vent	9	0.85305	.7921	.0022	.8247	2.056
Vent	10	0.85236	.8121	.0014	.8957	1.688
Vent	11	0.84995	.8421	.0003	.9258	1.733
Vent	12	0.84741	.8599	0004	•9406	1.765
Vent	13	0.84505	.8782	0012	.9560	1.768
Vent	14	0.83944	.9005	0022	•9567	1.429
Vent	15	0.83810	.9159	0028	•9539	1.307
Vent	16	0.83339	.9410	0038	•9545	1.289
Vent	17	0.83769	.96 05	0044	•96 53	1.225
Vent	18	0.82915	•9958	0060	•95 93	1.481
Vent	19	0.81852	1.0071	0067	.9720	1.408
Vent	20	0.77384	1.0439	0096	.9673	2.006

^{* -} The equation is incalculable or misleading because the standard tax rates on the right hand side are either zero or very small.

This is the system of equations being estimated.

3.1)
$$ETR_{i} = b_{i} *STR_{i}$$

3.2)
$$b_{i}=c_{i}+d_{i}$$
*TIME

The equations estimated are of the form:

3.3)
$$ETR_{i} = c_{i} *STR_{i} + d_{i} *TIME_{i} *STR_{i}$$

TABLE 3.3
ESTIMATED RATIOS OF EFFECTIVE-TO-STANDARD TAX RATES BY HOUSEHOLD SIZE.

17	ALL	1	2	3	4	5	6
Ven	T *	*********		*			
1	#	*	₩	*	*	*	*
2		*		#	*	#	#
3	1.03012	*	*	#	•	0.86639	0.91238
4	0.96 940	*	*	#	0.85347	0.85265	0.87740
5	0.91004		0.40536	0.94907	0.85160	0.85644	0.87207
6	0.86870	0.30550	0.56057	0.90429	0.87984	0.85759	0.84554
7	0.85577	0.59220	0.67571	0.91947	0.86726	0.85972	0.82635
8	0.85658	0.69651	0.77047	0.93374	0.86 991	0.85524	0.80305
9	0.85305	0.75869	0.83763	0.91719	0.87423	0.83759	0.77759
10	0.85236	0.79588	0.87776	0.90886	0.86789	0.82467	0.75700
11	0.84995	0.82940	0.90890	0.90922	0.85167	0.80430	0.73758
12	0.84741	0.86496	0.92487	0.90603	0.83782	0.78604	0.72449
13	0.84505	0.89374	0.92471	0.89833	0.81574	0.77043	0.71185
14	0.83944	0.91882	0.93087	0.88470	0.79443	0.75223	0.69035
15	0.83810	0.93508	0.94242	0.86616	0.77560	0.73979	0.67038
16	0.83339	0.94599	0.93922	0.84139	0.75584	0.70999	0.65030
17	0.83769	0.95351	0.92535	0.81721	0.73800	0.68029	0.64158
18	0.82915	0.95593	0.89820	0.79258	0.70238	0.65322	0.64651
19	0.81852	0.94268	0.856 42	0.75150	0.66810	0.65406	0.64014
20	0.77384	0.87189	0.78402	0.71053	0.66 980	0.65316	0.63750

^{* -} The ratio is undefined or distorted because the standard tax rate in the denominator is zero or very small (less than .01 of income).

TABLE 3.4
ESTIMATION RESULTS OF ETR = a + b*STR

		Intercept	Slope	R-Square	Durbin-W.
Vent	1	· •	***		-
Vent	2	0.35763	0.10418	.0044	0.814
Vent	3	0.89552	0.36374	.4566	0.785
Vent	4	1.39477	0.40708	. 5286	0.997
Vent	5	1.75323	0.46600	.5671	1.019
Vent	6	2.05956	0.49972	. 5714	1.132
Vent	7	2.03996	0.55802	.6608	1.423
Vent	8	1.59851	0.64623	.7330	1.360
Vent	9	0.93072	0.74006	.8224	1.563
Vent	10	0 . 50 <i>5</i> 65	0.79355	.8908	1.410
Vent	11	0.54332	0.79933	.9289	1 .6 16
Vent	12.	0.85839	0.77870	•9479	1.760
Vent	13	1.17500	0.76049	•96 40	1.771
Vent	14	1.63588	0.73277	•95 98	1.398
Vent	15	2.16781	0.70497	.96 19	1.547
Vent	16	2.87772	0.66 927	.9605	1.435
Vent	17	3.43977	0.65255	•9744	1.314
Vent	18	4.56018	0 .6 06 36	•9666	1.565
Vent	19	5.40212	0.58502	.9679	1.165
Vent	20	10.02125	0.48229	.8972	0.991

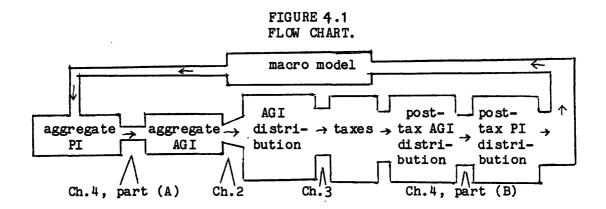
Ventile 1 was not estimable.

CHAPTER 4

THE RECONCILIATION OF ADJUSTED GROSS INCOME AND PERSONAL INCOME.

The purpose of this chapter is to describe the reconciliation of the distribution of personal income (PI) and adjusted gross income (AGI) in the model. Recall that the consumption part of the model requires a distribution of disposable PI, while the tax model calculates taxes based on a model of the distribution of AGI. This chapter consists of two parts which correspond to the two directions of conversion: part (A), the conversion of PI to AGI in the aggregate, and part (B), the conversion of AGI back to PI in the form that is disaggregated by income ventile. The conversions must be done in both directions.

The starting point for the tax calculations is an estimate of PI obtained from the macro model. Before taxes can even be calculated, this estimate of PI must be converted to an estimate of AGI (part A). When this is done, the distribution of AGI by ventile is calculated as described in Chapter 2. Then taxes are estimated and we obtain an estimate of the post-tax distribution of AGI by ventile as described in Chapter 3. This must be converted to a post-tax distribution of PI (part B) which is compatible with the parameters and concepts of the consumption model. Figure 4.1 illustrates how the two processes described in this chapter relate to the models described in Chapters 2 and 3, and the structure of the entire macro model.



Part (A): Conversion of PI to AGI in the Aggregate.

PI is a measure of all income accruing to households including all labor compensation, transfer payments less payroll taxes, interest and dividend income less corporate profits, net interest, and imputations. (Gains from the sale of assets are not counted in PI or GNP.) AGI is the income tax base. It excludes many items which are in PI such as transfers, fringe benefits, and interest from state and local governments. It also includes some items not counted in PI such as capital gains and personal contributions for social insurance.

Table 8.14 in the National Income and Product Accounts provides a detailed reconciliation between PI and AGI. That table, reproduced in figure 4.2, breaks the difference down into 13 categories. Those 13 categories are subsequently rearranged into 12 reconciliation categories by aggregating some and splitting up others. Even though here in part (A), we are not concerned with the ventile distribution of income categories, we will be very much concerned about it in part (B). Therefore it was very important that those 12 categories were constructed on the basis of how they are distributed among the twenty

FIGURE 4.2

NIPA TABLE 8.14

March 1986

Table 8.14.-Comparison of Personal Income in the National Income and Product Accounts (NIPA's) with Adjusted Gross Income as Published by the Internal Revenue Service (IRS)

[Billions of dollars]

	Line	1982	1983	1984
Personal income, NIPA's	1	2,670.8	2,836.4	3,111.5
Less: Portion of personal income not included in adjusted gross income.	2	802.3	883.0	
Transfer payments except taxable military retirement and taxable government pensions.	3	361.1	388.0	
Other labor income except fees	4	161.4	176.9	<u> </u>
Imputed income in personal income	5	47.5	53.6	57.6
Investment income of life insurance carriers and private noninsured pension plans 1.	6	72.9	78.5	
Investment income received by nonprofit institutions or retained by fiduciaries.	7	30.5		}
Differences in accounting treatment between NIPA's and tax regulations, net.	8	40.3	1	
Other personal income exempt or excluded from adjusted gross income.	9	88.7	108.7	
Plus: Portion of adjusted gross income not included in personal income.	10	191.0	224.8	ļ
Personal contributions for social insurance	111	112.3	119.8	132.
Net gain from sale of assets		35.0	50.6	
Taxable private pensions.		41.5	49.5	<u>[</u>
Small business corporation income		9	2.0	L
Other types of income	15	3.0	1	
Equals: BEA-derived adjusted gross income	1	1	2.178.2	i
Adjusted gross income, IRS	1	1,852.1	1,942.6	1
Adjusted gross income (AGI) gap 2	18	207.3	235.6	ļ
AGI gap (line 18) as a percentage of BEA-derived AGI (line 16).	19	10.1		ļ
AGI of IRS (line 17) as a percentage of BEA-derived AGI (line 16).	20	89.9	89.2	

^{1.} Equals imputed interest received by persons from life insurance carriers and private noninsured pension plans as shown in table 8.8 (line 50).

2. Consists of income earned by low-income individuals who are not required to file income tax returns, unreported income that is included in the NIPA measure, and gross errors and omissions in lines 2 through 15. Also includes the net effect of errors in the IRS adjusted gross income (line 17) and NIPA personal income (line 1) measures. Such errors can arise from the sample used by IRS to estimate line 17 and from the data sources used by BEA to estimate line 1.

FIGURE 4.3 NIPA TABLE 3.11

March 1986

Table 3.11.—Government Transfer Payments to Persons

(Billions of dollars)

	Line	1982	1983	19a.
Government transfer payments to persons	1	396.2	126.6	137
	2	316.3	340.0	
				341
Benefits from social insurance funds		273.6	294.5	29>
Old-age, survivors, and disability insurance	4	153.7 50.8	164.4	173
Hospital and supplementary medical insurance		25.2	57.2	6
Unemployment insurance		23.4	26.4	10
State			20.2	1:
Railroad employees		.4	-4	
Federal employees		1.1	.4	
Special unemployment benefits	10	35.2	5.5	
Federal employee retirement	12	19.9	37.5 21.2	3
Civilian ¹	12	15.4	16.3	2
		5.8		1.
Railroad retirement	15	1.4	6.0 I	
Veterans life insurance	16	.9	,	
Workers' compensation Military medical insurance 3	17	.5	.9	
Veterans benefits.	1 1	14.9	15.0	
Pension and disability	19	13.3	13.7	1
Readjustment	20	1.6	1.4	1.
Other 4	21	1.0	1.4	
Food stamp benefits	22	9.9	11.1	1
Black lung benefits		1.7	1.7	•
Supplemental security income	24	6.9	7.4	
Direct relief	25			
Earned income credit	26	1.2	1.2	
Other ^a	27	8.2	9.1	
itate and local	28	79.9	86.6	9
Benefits from social insurance funds		23.0	25.2	2
State and local employee retirement	30	19.3	21.2	2
Temporary disability insurance	31	1.0	1.0	
Workers' compensation	32	2.7	3.0	
Public assistance	33	51.8	56.1	6
Medical care	34	31.7	34.8	3
Aid to families with dependent children	35	13.3	14.2	1
Supplemental security income	36	2.1	2.0	
General assistance	37	1.9	2.0	
Energy assistance		1.6	1.7	
Other •		1.2	1.3	
Education		2.7	2.9	
Employment and training	41	1.1	1.0	
Other 7	42	1.3	1.4	1

^{1.} Consists of civil service, foreign service, Public Health Service officers, Tennessee Valley Authority, and several small retirement programs.

2. Includes the Coast Guard.

3. Consists of payments for medical services for dependents of active duty military personnel at nonmilitary facilities.

4. Consists of mustering out pay, terminal leave pay, and adjusted compensation benefits.

5. Consists largely of payments to nonprofit institutions, aid to students, and payments for medical services for retired military personnel and their dependents at nonmilitary facilities.

6. Consists of emergency assistance and medical insurance premium payments paid on behalf of indigents.

7. Consists largely of foster care, veterans benefits, Alaska dividends, and crime victim payments.

income ventiles. For example, the first reconciliation item in the NIPA table is Transfer payments, line 3. Since different types of transfers, like Social security and Unemployment compensation, are likely to be distributed differently among the income groups, those items are handled separately. Conversely, other items listed separately in the NIPA's such as Investment income of life insurance carriers, line 7, and Investment income received by fiduciaries, line 8, were combined here because they were either distributed similarly, or their distribution was not known. What follows is a list of the 12 reconciliation items used in the model, their relation to the NIPA table 8.14, and how they are estimated by the model. These items make up the entire difference between PI and AGI. Table 4.1 provides a summary of the relation between the reconciliation items and the NIPA accounts. The transfer payments detail is derived from NIPA table 3.11, which is reproduced in figure 4.3.

The first item is OASDI - Old age, survivors and disability insurance. Its value is shown on line 4 of NIPA table 3.11, which is a part of NIPA table 8.14, line 3, Transfer payments except taxable military retirement and taxable government pensions. Its value is determined in the macro model as a function of time, the price level, and the population aged 65 and over. The parameters and estimation results of this and the other equations discussed in this section are found in table 4.2.

The second item, also included in line 3 of the NIPA table 8.14 is HI - Hospital and supplementary medical insurance, found on line 5 of NIPA table 3.11. HI primarily consists of Medicare and Medicaid. It is determined in the macro model as a function of time, the price level,

and the population aged 65 and over. Like all the other types of transfers listed here, HI is subtracted from PI in the process of determing AGI.

The next item, also a transfer payment, is UI - Unemployment insurance, table 3.11, line 6. It is calculated in the macro model as a function of time, the number of unemployed and the price level. It includes state, federal, railroad, and special unemployment benefits.

The fourth item, RET, consists of the tax-free portion of retirement income and other items. This is also included in line 3 of table 8.14 as a transfer payment. This category is meant to capture the non-means-tested transfer payments other than social security. It includes one half the retirement income (representing the tax-free portion) of federal, state and local, and railroad retirees. It also includes Veteran's benefits, and State and local transfers for Education, Employment and training, and Other. RET's value is one half of NIPA table 3.11 line 11,14,18 and 29, plus all of lines 40,41, and 42. All those items are calculated in the macro model as a function of time, population over 65, and the price level.

The last transfer category, and the fifth, overall is WELF - which contains Welfare and all the other means-tested transfer programs. It includes Food stamps, Black lung, Supplemental security income, Direct relief, Other, and state and local Public assistance, table 3.11, lines 22 through 27 and line 33. These items, which are distributed primarily to low income families, are subtracted from PI on the way to getting AGI, just like the other transfer items. These items are calculated separately by the macro model as a function of time, population, and the price level.

The sixth reconciliation item is OLI - Other labor income (8.14, line 4). It consists of employer provided fringe benefits such as pension and profit sharing, group health and life insurance, worker's compensation, supplemental unemployment, and other. Its value is found in NIPA table 2.1, line 8. It is calculated by the macro model as a function of income. Since it is a part of PI but is not taxable, it is subtracted when estimated AGI. It is estimated as fixed percentages of labor compensation for private workers, federal workers and state and local government workers. Those labor compensation categories are forecast in the macro model.

The next item is IMPU- Imputed income in personal income (8.14, line 5). It consists primarily of rental income imputed to homeowners when they occupy their own homes, and interest income accrued, but not realized by owners of securities which pay only at wide intervals, or upon maturity, such as savings bonds. This item, which is also subtracted from PI in calculating AGI, is estimated as a function of interest income, the mortgage rate and time.

The 8th reconciliation item is VESI- retained Investment and other income. It consists of several categories of income (8.14, lines 6,7,13,14 & 15). There was no available data on the size distribution of these items, but it is likely that their distribution is similar. This item includes investment income retained by life insurance carriers and private noninsured pension funds, received by nonprofit institutions, or retained by fiduciaries. These incomes are included in PI but not AGI, and thus are subtracted in the reconciliation process. This category also includes taxable private pensions, small business corporate income and other income which is part of AGI but not a part of

PI, and thus is added to PI in the reconciliation process. This category is calculated as a function of t-bill rate, personal income and time.

It is acknowledged that these last two items in particular may not belong in the income measure as it is being used here in this model. All the income being distributed among the income classes is later being distributed again among consumption goods and services as if it were discretionary income. Obviously, imputed rent and imputed services of fiduciaries are not discretionary, but are imputed to specific categories. A more accurate modeling approach would be to subtract such items from the definition of income and add them directly to consumption. This was not done here because it would require changes in the structure of the interindustry model which are beyond the scope of this study.

The 9th item is EXCL - which includes other items which are exempt or excluded from AGI (and thus are subtracted from PI). This item includes from table 8.14 both line 8 which is accounting differences and line 9 which is other items exempt or excluded from AGI. The accounting differences include some unrealized investment income, inventory valuation adjustment for nonfarm, noncorporate business, depletion allowances, defaulter's gain, capital consumption adjustment for farms and proprietors and landlords, IRA and Keogh plan interest received, and other. The exemptions and exclusions include statutory adjustments like moving expenses, tax-free dividends and interest, and tax free military pay. This item was calculated as a fixed percentage of PI.

The next item is CONTR - Personal contributions for social insurance. Since this item is taxable income included in AGI, but is

not in PI, it is added to PI in the reconciliation process. This item which is mostly payroll taxes, is calculated by the macro model as percentage of private labor compensation. The percentage applied varies according to the legislated social security contribution rates.

The 11th item is capital gains, CAPG. These represent the taxable portion of capital gains (40% until 1987), and because they are not a part of PI, they are added to PI in getting AGI. These are reported in 8.14, line 12, Net gain from sale of assets, and also in SOI. Capital gains are forecast with a regression equation using as regressors the AAA bond rate minus the lagged percent change in the GNP deflator, and PI.

The last reconciliation item is GAP, the AGI gap. This item, reported in 8.14, line 18, is described by BEA in The Survey of Current Business, May, 1986, as a measure of noncompliance. See Park (1986). It includes things like unreported income included in the NIPA estimate of AGI. It also includes sampling errors, other errors and omissions, and income earned by low income individuals who are not required to file income tax returns. The AGI gap is estimated to be a flat percentage of PI based on recent historical magnitudes, and is added to PI in getting AGI.

Part A is complete when all 12 reconciliation items are forecast in the aggregate and subtracted from (or added to) the aggregate calculation of PI. The result is aggregate AGI which is then split up into the twenty ventiles in the income distribution model described in Chapter 2. Taxes are calculated as described in Chapter 3, with the result being a twenty ventile distribution of taxes and disposable AGI. Now we are ready for part (B) of this chapter, which is to go the other

way, and convert AGI back into PI, but this time in the disaggregated twenty ventile distribution form. The procedure is to allocate the 12 reconciliation items among the ventiles, and add them to the post-tax AGI distribution to get the post-tax PI distribution.

Part (B): The AGI-PI Bridge.

The macro model needs to have the PI distribution defined in terms of an index of the cutoff incomes in each ventile. A cutoff income represents the border income between its ventile and the next ventile. (The top ventile is represented by its percentage of aggregate income rather than the highest single per capita income in the economy.) Chapters 2 and 3 described how both the amount of AGI per ventile and each ventile's cutoff AGI was determined. Here, the reconciliation items per ventile, and the per capita reconciliation cutoffs for each ventile must be determined and added to the AGI amounts and cutoffs to get the distribution of PI.

The allocation of each of the 12 AGI-PI reconciliation items to the twenty income ventiles is done by constructing a 20x12 bridge or matrix whose columns contain the share of each item going to each ventile. The bridge, which is shown in table 4.3, is constructed in terms of coefficients rather than flows, so that the sum of each of the twelve columns is one. Each column's coefficients are multiplied by each year's value for the items to get each ventile's dollar share of each item. The twelve dollar flows for each ventile are then summed so that we are left with the dollar difference between AGI and PI for each ventile. That dollar amount is then added to the dollar amount of post-tax AGI from each ventile calculated earlier in the income

distribution and tax models to get the dollar amount of AGI per ventile. In matrix notation, let AGI (20x1) be the vector of AGI per ventile, P (20x12) be the AGI-PI bridge, RI (12x1) be the vector of aggregate reconciliation items, RV (20x1) be the dollar amount of reconciliation per ventile, and let PI (20x1) be the vector of PI per ventile. The procedure thus far, then, can be shown as:

$$4.1) RV = P \times RI$$

$$4.2) PI = AGI + RV$$

Next, the cutoffs for personal income are estimated by adding the cutoffs for the reconciliation items to the AGI cutoffs calculated in the income distribution model and tax model. The reconciliation cutoffs are determined as follows: since the cutoffs are defined in terms of per capita incomes, each ventile's reconciliation item total is first divided by ventile population to get the per capita totals by ventile. Then, the per capita reconciliation that occurs at the border between ventiles is estimated based on the relationship between average and cutoff AGI. For example, if the ventile cutoff AGI is two thirds of the way between the average per capita AGI in two ventiles, then the per capita cutoff reconciliation will be estimated as being two thirds of the amount of average per capita reconciliation between the two ventiles. That amount is then added to the AGI cutoff calculated by the income distribution model. (See equations M.30 - M.36 in the mathematical appendix.)

A numerical example would be useful here. The results of the

models described in Chapters 2 and 3 give us values for AGI and the cutoff AGIs for each ventile. Suppose that the values for the average per capita AGIs in two adjacent ventile were \$1,000 and \$2,000, and that the cutoff income of the lower ventile was \$1,667 (two thirds of the distance between the averages). Now, suppose the AGI-PI bridge gives us values of average per capita reconciliation items of \$100 and \$400 for those two ventiles. The per capita cutoff would be calculated as two thirds of the distance between those averages, or \$300. The \$300 would be added to the AGI cutoff of \$1,667, so that the estimated per capita cutoff of PI for the lower of the two ventiles would be \$1,967.

The ventile cutoffs for disposable personal incomes are created in exactly the same way. The same per capita cutoff reconciliation amount just calculated is added to the previously calculated per capita cutoff of disposable AGI. 1

Indexes of disposable PI are then created by dividing the cutoff incomes by the mean income for the first mineteen ventiles. The top ventile is not represented by a cutoff, but by an overall percentage of the total income. These index numbers will be referred to as the PI distribution indexes.

A problem arises here because of differences in the coverage of AGI and PI. The income distribution model is based on AGI and was constructed from IRS data on income tax filers. The ventiles represent persons in families with positive AGIs who file income tax returns. It turns out that about 7.5% of the population has, by necessity, been left out of the AGI distribution because either they did not file income tax returns, or they had negative AGI (actually, 7.2% in 1982 and 7.6% in 1983). The consumption part of the model calls for a forecast of the

personal income distribution for the entire population, and thus will not be consistent with an income distribution which does not include persons in nonfiling or negative AGI families.

The problem is that while we have good estimates of how income is distributed among almost 93% of the population, we are forced to make an educated guess of how that income is distributed among the entire population. The fact that we know the missing 7+% is made up of persons from either nonfiling or negative AGI families helps determine the appropriate course of action. In order to compensate for this problem, an adjustment to the per capita disposable PI cutoffs is made.

The adjustment employs the assumption that the persons missing from the AGI sample have incomes lower than those in the sample. This assumption combined with the information already contained in the estimate of the unadjusted PI distribution makes possible an appropriate adjustment. This is accomplished in two steps: first, the calculated ventile cutoffs must be expanded so they each contain 5% of the entire population rather than 5% of the filing population, and second, they must be moved up the distribution in relative location to accommodate the assumption that the extra people are at the bottom.

The adjustment procedure is illustrated in table 4.4. Ignoring the first ventile for a moment, the general notion of the adjustment is as follows: since the population to be covered by the adjusted ventiles is about 7.5% larger, the cutoff income for the 19th ventile is lowered by .075 of the distance between the originally calculated borders of the 18th and 19th ventiles. The 18th ventile's cutoff income is adjusted downward by a factor of .15 between the original 17th and 18th, and so on, until the second ventile is .65 the size of the originally

calculated first ventile cutoff personal income. Then the index is created as before using the entire population rather than only the filers in calculating per capita incomes. The adjustment can be expressed as follows where v_i^* denotes the adjusted cutoff income for ventile i, and v_i is the unadjusted cutoff income.

$$v_2^* = .65v_2$$

4.4) for i=3,6
$$v_i^* = v_{i-1} - (.075(20-i)-1)*(v_{i-1}-v_{i-2})$$

4.5) for i=7,19
$$v_i^* = v_i - (.075(20-i))*(v_i - v_{i-1})$$

The top ventile, which is the share of the total is increased by the appropriate factor (about 7%) to account for its having some people in it that were previously in the 19th ventile.²

The adjustment makes the index have a character similar to one estimated with Census data on money income. Table 4.5 shows the index of money income defined in terms of ventile cutoff per capita incomes. ³ The entire population was used in this sample. It was this data that was used to determine what the appropriate adjustment for the first ventile would be.

Theoretically, the only difference between these numbers and the numbers obtained from the procedure described in this chapter including the adjustment lies in the definitions of money income and personal income. Neither definition includes capital gains. However, unlike personal income, money income does not include in-kind transfer payments and other reconciliation items such as medicare (HI), fringe benefits (OLI), social insurance contributions (CONTR), or imputed income (IMPU). Of these four items, only HI is assumed to be distributed more equally than personal income. The model assumes the other items are distributed like AGI, which is to say less equally than personal income. Therefore,

a distribution such as money income which does not contain those four items, will show more equality, which it does. Of course there are other possible reasons for the differences, which include errors, omissions and inconsistencies in either data set, or in the estimation procedures.

The data on the distribution of money income does provide a kind of check on the entire reconciliation precedure described in this chapter. The similiarity of the two distributions as shown in table 4.5 is on the whole, encouraging. The patterns are the same with PI being distributed a little less equally; both indexes reach the mean income in the 13th ventile. The largest discrepancies occur in the lowest ventiles (2 through 4). This could be the result of inaccuracy of the assumption regarding the 7.5% of the population not covered by the AGI sample, but there is not enough evidence to suggest further adjustments.

This distribution of personal income may be unique in its coverage of all types of income. It is unique in its definition of income being in terms of per capita cutoff income by ventile. While the numbers themselves may not reveal any surprises as to the shape or equality of the income distribution, such a model can be useful for forecasting the effects of tax reform or reform in transfer programs on the income distribution. The difference between the AGI distribution and that of personal income also shown in table 4.5 is noteworthy. It shows that the definition of income used in making inferences about the distribution of income in the United States does indeed make a difference.

The indexes representing the distribution of personal income and disposable personal income are shown in table 4.6. It is true that the

numbers are not very sensitive to changes in the AGI-PI bridge, however, the tax system does affect the income distribution in a significant way. As this and other studies have shown, the federal income tax system is largely progressive, particularly at the ends, and proportional in the middle. This characteristic can be seen by comparing the index numbers before and after taxes. Table 4.7 illustrates this point by showing the ratio of the post-tax indexes to the pre-tax indexes. The lower ventiles improve their relative position while the upper ventiles are relatively worse off after taxes. The indexes measure the position of the ventile cutoffs relative to the mean per capita incomes, not the absolute levels of ventile incomes, so they are appropriate for indicating the progressivity of the tax system.

The Construction of the AGI-PI Bridge.

This section will explain how the AGI-PI bridge was constructed. The object of the procedure is to take a scalar representing the value of one of the twelve reconciliation items and convert it into a vector of length twenty, with each entry representing the portion of that item going to each income ventile. These vectors are the columns of the AGI-PI bridge. For three of the items, it was assumed that the distribution was identical to the distribution of AGI. For four others it was necessary to guess at the distribution. But for the other five categories, there were data provided either by SOI or by the the Census Money Income reports. The SOI had data on the distribution by AGI bracket for Capital gains, Pension income, and Unemployment insurance. The census data showed the distribution of Social security income and Public assistance and welfare by money income category. Because the

data showed only the distribution of these items by per household income group, they had to be converted to per capita income ventiles. This process which converts the SOI per household income groups to ventiles will now be described.

It was possible to apply this procedure to the three reconciliation categories reported in SOI, namely UI, CAPG, and RET. The data were reported in SOI by AGI bracket. The dollar amount of each item going to each ventile was determined in a straight-forward way. First, the amount going to each income bracket as reported in the 1982 SOI was allocated among the six household sizes according to the relative share of persons from each household size in the brackets. Then, those values were allocated linearly among the ventiles covered by the SOI brackets. For example, the first SOI bracket is from 0 to \$5,000 per household. That would include people in the first seven ventiles who live alone, and people in the first three ventiles from a household size of two. Therefore, the amount from that bracket attributed to household size one was divided evenly among the first seven ventiles and the amount allocated to household size two was split evenly among the first three ventiles. This procedure was followed for all the data, and then each ventile's total was obtained by adding the six household size values. Finally, the numbers were converted to shares to form the columns of the AGI-PI bridge. The ventile bounds were estimated from a simulation of the income distribution model for 1982, using as much actual data as was available for the exogenous variables.

The distributions of OASDI and WELF were obtained by a process in the spirit of that just described, but not identical due to the way in which the data were reported by the Census Bureau and Social Security Administration. The distributions of these items were reported by money income, not AGI. The census data on the distribution of money income was decomposed as above to get estimates of the shares of money income, social security, and welfare going to each ventile. Then the results for social security and welfare were scaled according to the relative amount the money income shares differed from the AGI shares. The distribution of OASDI was checked with another, less detailed data source and found to be in general consistency. 5

The distribution of HI, EXCL, VESI, and CNTR were estimated without benefit of hard data. HI (Medicare and Medicaid) was assumed to go in equal shares to each ventile. EXCL (exclusions) was assumed to be distributed similarly, but not quite so unequally as capital gains. CNTR (contributions for social insurance) was assumed to be distributed much like AGI, but with less coming from the top two ventiles. VESI (retained investment income) was assumed to be distributed like pension and annuity income. OLI, IMPU, and GAP were assumed to be distributed like AGI. Table 4.3 shows the AGI-PI bridge. While it is true that some of these estimates are rough approximations at best, the overall distribution of disposable PI and hence the goods mix of consumption expenditures is not very sensitive to small changes in the coefficients of the AGI-PI bridge.

Endnotes

- 1. It is conceivable that the addition of transfers to the distribution of AGI might result in a re-ordering of some ventiles. In other words, a situation is possible in which two or more adjacent ventiles might have a different order when ranked according to PI or according to AGI. For example, a large transfer program whose benefits accrue to only the lowest AGI ventile might result in that ventile having a larger income and higher income cutoff than some higher AGI ventiles. The result would be an ill-defined PI distribution. While it is true that transfers, on the whole, tend to equalize the income distribution, particularly at the lower end, it is fortunate that the extent of the equalization using our best estimate of the incidence of the reconciliation items does not make this theoretical re-ordering occur.
- 2. This adjustment makes the theoretical re-ordering problem of endnote 1 even less likely. The adjustment essentially converts the smaller AGI ventiles into PI ventiles which contain more people. The conversion takes place after the reconciliation items are added to the AGI ventiles. One might think the more logical sequence would be to first make the adjustment, then add the reconciliation items to the adjusted PI ventiles. Again, the reason relates to the reported form of the data. For five of the reconciliation items, the distributions among the ventiles were based on "hard" data reported in the SOI by AGI category even though the items themselves are not part of AGI. For these items, it only makes sense to distribute them to AGI ventiles because we have precise estimates of the borders of those ventiles. For

the other reconciliation items not reported by AGI group, we are as unsure of their distribution among return filing ventiles as we are among ventiles of the whole population.

- 3. This index was calculated from the 1978 data on money income by Devine (1983).
- 4. See U.S. Census, current population reports, series P-60.
- 5. The distribution of OASDI was also reported in Grad (1984).

TABLE 4.1

THE RELATION OF THE 12 RECONCILIATION ITEMS TO THE NIPA TABLES.

Reconciliation Item	NIPA Table and Line No.
OASDI	table 3.11 line 4 & table 8.14 line 3 (part)
HI	table 3.11 line 5 & table 8.14 line 3 (part)
UI	table 3.11 line 6 & table 8.14 line 3 (part)
RETO	table 3.11 1/2 lines 11,14,18 and 29 plus
,	lines 40,41, and 42 & table 8.14 line 3 (part)
WELF	table 3.11 lines 22 through 27 and 33 & table 8.14
	line 3 (part)
OLI	table 8.14 line 4
IMPU	table 8.14 line 5
VESI	table 8.14 lines 6 and 7 minus lines 13,14 and 15
EXCL	table 8.14 lines 8 and 9
CONTR	table 8.14 line 11
CAPG	table 8.14 line 12
SD	table 8.14 line 18

TABLE 4.2
REGRESSION RESULTS OF EQUATIONS USED TO FORECAST RECONCILIATION ITEMS.

		IMPU -		forecasting e				
	SEE =	1.4282		0.9838 RBARSQ		NOBS	= 19	•
	RHO =	-0.0272			= 3.08			
VARIA				ALUE ELASTICIT		L	ME AN	
IN TER	CE PT		.046 912	3.33 0.000			0.00	000
YPIN	•		.06 03 87	5.70 0.298	• • •		171.75	
RCMOR	(T-1)			-2.02 -0.239			9.01	
TIME		1	•033450	5.37 0.623	70.99		21.00	
IMPU			DE PEN DEN	T VARIABLE -			34.81	579
DATE	ACTU AL	PREDIC	MISS					
	IS *	IS +	IS A-P *	*		*		*
66	21.10	20.92	0.18	+#				
67	22.40	21.81	0.59	+				
68	22.90	. 22.96	-0.06	+				
69	24.10	24.00	0.10	+				
70	25.50	24.79	0.71	+				
71	26.10	25.58	0.52	+*				
72	26.20	27.62	-1.42	+				
73	28.10	29.57	-1.47	+				
74	30.60	31.41	-0.81	+				
75	33.40	32.23	1.17	+*				
76	34.40	33.75	0.65	+	•			
77	33.40	35.96	-2.56	*+	_			
78	40.60	38.77	1.83	+				
79	43.40	41.69	1.71		+*			
80	45.10	44.70	0.40		+		•	
81	45.50	47.92	-2.42		#+ *			
82 82	47.50	49.26	-1.76		w.			
83 84	53.60	50.96	2.64		+*			
85	57.60	57.60 50.70	0.00					
86	0.00 0.00	59.70 64.12			•	_		
87	0.00	68.37				+ .		
88	0.00	72.80				+ .		
89	0.00	77.03				+		
90	0.00	81.52					+.	
90 91	0.00	86 .66					∓	
91 92	0.00	91.89					+	_
93	0.00	97.22						T
93 94	0.00	103.06						→
9 5	0.00	109.69						*
90	IS *	IS +	IS A-P *			*		*
		10 T		0 00 000	11C CDC	50 04		

IMPU is Imputations in Personal Income from NIPA table 8.14 line 5. YPIN is personal interest income.

23.338

46.676 70.014

93.352

0.000

RCMOR (T-1) is the mortgage interest rate lagged one year.

TIME is time with a value of 1 in 1966.

The forecast to 1995 was done with values of the exogenous variables from a typical forecast done with the INFORUM macro model.

TABLE 4.2 (continued) VESI Forecasting Equation.

```
1.6845
                            RSQR = 0.9911 RBARSQ =
                                                       0.9892
                                                                NOBS =
                                                                          18
      RHO =
                 0.0739
                                     1.852 AAPE =
                            DW =
                                                        11.17
VARIABLE
                    REGRES-COEF T-VALUE ELASTICITY MEXPLAVAL
                                                                     ME AN
INTERCEPT
                      12.638373
                                     2.90
                                                                        0.0000
                                              0.000
                                                        26.51
RTB(T-1)
                       1.757714
                                     5.74
                                              0.574
                                                        83.10
                                                                        6.9195
PIZ
                       0.037237
                                    11.28
                                              2.561
                                                       217.65
                                                                     1458.2644
TIME
                      -2.824218
                                    -7.27
                                             -2.730
                                                       118.45
                                                                       20.5000
VESI
                           DEPENDENT VARIABLE
                                                                       21.20555
DATE
      ACTU AL
                PREDIC
                           MISS
       IS #
                 IS +
                         IS A-P *
66
        6.40
                           -1.67
                   8.07
67
        7.80
                   8.50
                           -0.70
68
        9.60
                  7.03
                            2.57
69
        9.60
                  8.44
                            1.16
 70
        9.30
                 10.16
                           -0.86
71
        8.40
                  9.27
                           -0.87
72
        7.60
                  6.00
                            1.60 +*
 73
        8.10
                  7.16
                            0.94
 74
       11.40
                 13.59
                           -2.19
 75
       14.10
                 16.10
                           -2.00
 76
        16.60
                 14.81
                            1.79
 77
       17.50
                 16.31
                            1.19
78
       21.10
                 21.60
                           -0.50
 79
       28.00
                 30.45
                           -2.45
 80
       42.10
                 40.96
                            1.14
 81
       51.50
                 50.44
                            1.06
 82
       59.80
                 57.68
                            2.12
 83
       52.80
                 55.14
                           -2.34
 84
        0.00
                 58.80
 85
        0.00
                 64.78
 86
        0.00
                 67.37
 87
        0.00
                 71.02
 88
        0.00
                 76.31
 89
        0.00
                 81.85
 90
        0.00
                 89.72
 91
        0.00
                 99.72
 92
        0.00
                110.31
 93
        0.00
                120.65
 94
        0.00
                131.64
 95
        0.00
                145.73
        IS *
                 IS +
                                0.000
                                          31.006
                                                     62.012
                                                                93.018
                                                                          124.024
```

VESI is investment income from NIPA table 8.14, lines 6 & 7. RTB (T-1) is the interest rate on treasury bills lagged one year.

PIZ is personal income

SEE =

TIME is time with a value of 1 in 1966.

The forecast to 1995 was done with values of the exogenous variables from a typical forecast done with the INFORUM macro model.

TABLE 4.2 (continued) CAPG Forecasting Equation.

	SEE =	2.6057		9392 RBARS	Q = 0.9	311 NOBS	3 = 18
	RHO =	0.0834		.833 AAPE		•33	
VARIA	BLE	R EG R	ES-COEF T-VAL			L AV AL	ME AN
IN TER	CEPT	0	.470743 C	0.0		.30	0.0000
REAL A	(T-1)	-2		1.74 0.2	39 58	.12	2.3064
PIZ		-0		.42 0.7	83 211	.36	1458.2644
CA PG			DE PEN DEN T	VARIABLE			-21.16667
D 4 M M	A COMPT AT	DD DD 7.0	WTOO .				
DATE	ACTUAL IS #	PREDIC	MISS				
66	-9.90	IS + -11.42	IS A-P *	•	•	•	
67	-9.90 -13.60	-11.42 -11.03	1.52				+- *.
68	_		-2.57				* .
69	-18.00 -14.60	-13.07 -12.20	-4.93 -2.40				- + a.
70	-8.90	-13.11	4.21				
70 71	-13.10	-15.55	2.45				
72	-17.30	- 15.95	-1.35				∓- #⊥
73	-17.10	-18.76	1.66				∓ #
74	-13.90	-17.13	3.23				
75	-14.20	-14.10	-0.10				Ψ".
76	-18.70	-15.09	-3.61				* ±
77	-21.40	-24.86	3.46				_ #
78	-24.50	-24.92	0.42				+
79	-29.40	-27.88	-1.52			#4	•
80	-29.70	-30.03	0.33			•	
81	-31.10	-31.44	0.34			+#	
82	-35.00	- 36 . 60	1.60			+*	
83	-50.60	-47.87	-2.73		* +	•	
84	0.00	-51.04	_1,5		+		
85	0.00	-55.97		4	•		
86	0.00	-56 .95		+			
87	0.00	-55.68		4	•		
88	0.00	-54.45			+		
89	0.00	- 56 . 18		4	•		
90	0.00	- 60 . 33		+			
91	0.00	-64.31		+			
92	0.00	- 68.26		+			
93	0.00	-71.60		+			
94	0.00	- 75 . 52	+				
95	0.00	-81.23	+				
	IS *	IS +	IS A-P *	*	#	#	#
			-81.229	-63.946	-46 .66	3 -29.3	81 -12.098
24 52						0 46 7 .	. 4 ^

CAPG is net gain from sale of assets from NIPA table 8.14 line 12. REALA is the treasury bill rate minus the % ch. in the GNP deflator. PIZ is Personal Income.

The forecast to 1995 was done with values of the exogenous variables from a typical forecast done with the INFORUM macro model.

TABLE 4.2 (continued)

REGRESSION RESULTS OF EQUATIONS USED TO FORECAST TRANSFER PAYMENT COMPONENTS.

1. OAS - the dependent variable is Old-age, survivors, and disability insurance per person aged 65 and over divided by the PCE deflator.

0.2095 RSQR = 0.9776 RBARSQ = 0.9767 NOBS =26 SEE = RHO = 0.7856 DW = 0.429 AAPE = REGRES-COEF T-VALUE ELASTICITY MEXPLAVAL VARIABLE ME AN 0.0000 INTERCEPT 0.726827 6.83 0.000 71.53 TIME 0.181129 32.40 0.813 568.79 17.5000 OAS DEPENDENT VARIABLE - - -3.89658

2. HI - The dependent variable is Hospital and supplementary medical insurance per capita divided by the PCE deflator.

SEE = 0.0989 RSQR = 0.9656 RBARSQ = 0.9636 NOBS =19 RHO = 0.5750 DW = 0.850 AAPE = 15.10 REGRES-COEF T-VALUE ELASTICITY MEXPLAVAL ME AN VARIABLE 0.0000 INTERCEPT -0.76 9923 -8.33 0.000 125.36 1.650 21.0000 TIME 0.093103 21.85 439.35 HI DEPENDENT VARIABLE - - -1.18523

3. UI - The dependent variable is Unemployment insurance per capita divided by the PCE Deflator.

SEE = RSQR = 0.1493 RBARSQ = 0.1124 NOBS = 0.4222 25 RHO = 0.876 AAPE = 13.46 0.5619 DW = REGRES-COEF T-VALUE ELASTICITY MEXPLAVAL ME AN VARIABLE INTERCEPT 1.797100 8.14 0.000 96.94 0.0000 TIME 0.024034 2.01 0.185 8.42 17.0000 DEPENDENT VARIABLE - - -2.20568 UI

4. RET - The dependent variable is Civilian and railroad retirement income per capita divided by the PCE deflator.

RSQR = 0.9682 RBARSQ = 0.9668 NOBS =26 SEE = 1350.2004 DW = 0.173 AAPE = 12.43 RHO = 0.9136 VARIABLE REGRES-COEF T-VALUE ELASTICITY MEXPLAVAL ME AN INTERCEPT -2771.116758 -4.04 0.000 29.61 0.0000 1.194 17.5000 TIME 973.638229 27.02 460.53 DEPENDENT VARIABLE - - - - -RET 14267.55078

TABLE 4.2 (continued)

5. MR - The dependent variable is Military retirement per capita divided by the PCE Deflator.

701.4397 RSQR = 0.9781 RBARSQ = 0.9772 NOBS =RHO = 0.7463 DW = 0.507 AAPE = 10.29 REGRES-COEF T-VALUE ELASTICITY MEXPLAVAL VARIABLE INTERCEPT -2209.925312 -6.20 0.000 61.30 0.0000 TIME 613.023293 32.75 1.259 575.88 17.5000 MR DEPENDENT VARIABLE - - - - -8517.98047

6. VET - The dependent variable is Veteran's benefits per capita divided by the PCE deflator.

RSQR = 0.4403 RBARSQ = 0.4170 NOBS =SEE = 2515.6138 RHO = 0.9145 DW = 0.171 AAPE = 13.15 VARIABLE REGRES-COEF T-VALUE ELASTICITY MEXPLAVAL ME AN INTERCEPT 7.33 0.000 79.91 0.0000 9365.551726 17.5000 TIME 291.723122 4.35 0.353 33.67 VET . DEPENDENT VARIABLE - -14470.70508

7. SSI - The dependent variable is Benefits from social insurance funds per capita divided by the PCE deflator.

RSQR = 0.9854 RBARSQ = 0.9848 NOBS = 26SEE = 792.0486 RHO = DW = 0.245 AAPE = 7.21 0.8773 REGRES-COEF T-VALUE ELASTICITY MEXPLAVAL MEAN VARIABLE INTERCEPT -1338.119546 -3.32 0.000 20.86 0.0000 TIME 851.428416 40.28 1.099 728.25 17.5000 SSI DEPENDENT VARIABLE - - - - -1356 1.876 95

8. FST - The dependent variable is Food stamp benefits per capita divided by the PCE deflator.

SEE = 1169.1084RSQR = 0.9165 RBARSQ = 0.9130 NOBS =DW = 0.463 AAPE = \$375392RHO = 0.7686 VARIABLE REGRES-COEF T-VALUE ELASTICITY MEXPLAVAL ME AN INTERCEPT -46 81 .3 88536 **-7.88** 0.000 89.41 0.0000 506.452098 2.120 246.09 TIME 16.23 17.5000 FST DEPENDENT VARIABLE - - - - -4181.52246

TABLE 4.2 (continued)

9. SIO - The dependent variable is Veterans life insurance and workers' compensation per capita divided by the PCE deflator.

SEE = 198.4212 RSQR = 0.0027 RBARSQ = -0.0388 NOBS =26 AAPE = RHO = 0.3134 DW = 1.373 6.59 REGRES-COEF T-VALUE ELASTICITY MEXPLAVAL ME AN VARIABLE IN TERCE PT 2160.179577 21.43 0.000 348.63 0.0000 0.26 TIME 1.354639 0.011 0.14 17.5000 SIO DEPENDENT VARIABLE - -2183.88574

10. SLTO - The dependent variable is State and local Education, Other, and Employment and training per capita divided by the PCE deflator.

656.9319 RSQR = 0.8800 RBARSQ = 0.8750 NOBS =SEE = RHO = 0.7807 DW = 0.439 AAPE = VARIABLE REGRES-COEF T-VALUE ELASTICITY MEXPLAVAL ME AN INTERCEPT -810.356430 -2.43 0.000 11.60 0.0000 232.593860 17.5000 TIME 13.27 1.249 188.68 SLTO DEPENDENT VARIABLE - -3260.03564

11. TOTH - The dependent variable is Black lung benefits, Supplementary security income, Direct relief, Earned income credit, Military medical insurance and Other per capita divided by the PCE deflator.

RSQR = 0.8970 RBARSQ = 0.8927NOBS = 26 16 . 9985 SEE = 77.18 RHO = 0.7562 DW = 0.488 AAPE = REGRES-COEF T-VALUE ELASTICITY MEXPLAVAL MEAN VARIABLE 0.0000 INTERCEPT **-7860.244982** -5.91 0.000 56.71 TIME 1009.493803 14.45 1.802 211.52 17.5000 DEPENDENT VARIABLE - -9805.89648 TOTH

12. DR - The dependent variable is State and local Public assistance per capita divided by the PCE deflator.

26 3234.5708 RSQR = 0.9598 RBARSQ = 0.9582 NOBS =SEE = 0.313 AAPE = RHO = 0.8433 DW = REGRES-COEF T-VALUE ELASTICITY MEXPLAVAL ME AN VARIABLE INTERCEPT -3471.964420 -2.11 0.000 8.90 0.0000 TIME 2067.193378 23.95 1.106 398.94 17.5000 DR DEPENDENT VARIABLE - -32703.91797 Aul TABLE 4.3 Disposable

THE ADJUSTED GROSS IN COME - PERSONAL IN COME BRIDGE.

VN	OASDI	HI	UI	RET	WELF	OLI#	IMPU #	VESI	EXCL	CNTR	CAPG	GAP*
1	8.18	7.00	15.43	2.09	19.70	0.43	0.43	2.09	0.00	0.00	3.12	0.43
2	7.36	7.00	14.79	3.37	12.20	0.93	0.93	3.37	0.00	1.00	1.99	0.93
3	7.82	7.00	11.27	3.77	12.10	1.30	1.30	3.77	0.00	2.00	1.67	1.30
4	7.05	7.00	9.97	4.97	10.00	1.64	1.64	4.97	0.00	2.00	1.55	1.64
5	6 .85	7.00	7.90	3.83	8.60	1.98	1.98	3.83	0.00	2.00	1.35	1.98
6	6.44	5.00	6.77	5.02	6.80	2.30	2.30	5.02	1.00	3.00	1.55	2.30
7	6.07	5.00	6.53	5.06	5.80	2.62	2.62	5.06	1.00	3.00	1.66	2.62
8	5.26	5.00	3.45	4.85	4.50	2.95	2.95	4.85	2.00	3.00	1.16	2.95
9	4.26	5.00	3.45	4.85	4.50	3.29	3.29	4.85	2.00	4.00	1.16	3.29
10	4.34	5.00	3.45	4.82	4.30	3.63	3.63	4.82	3.00	5.00	1.39	3.63
11	3.64	5.00	3.05	4.84	3.50	4.01	4.01	4.84	3.00	6.00	1.57	4.01
12	3.29	5.00	2.12	4.00	3.50	4.40	4.40	4.00	4.00	7.00	1.23	4.40
13	3.39	5.00	2.05	4.36	2.50	4.84	4.84	4.36	4.00	7.00	1.40	4.84
14	3.17	5.00	2.05	4.66	1.50	5.38	5.38	4.66	5.00	7.00	2.25	5.38
15	3.54	5.00	2.21	5.29	0.50	5.99	5.99	5.29	5.00	8.00	2.33	5.99
16	3.47	3.00	2.16	5.90	0.00	6.78	6.78	5.90	6.00	8.00	2.49	6.78
17	3.50	3.00	1.16	5.85 _.	0.00	7.78	7.78	5.85	7.00	8.00	2.92	7.78
18	4.18	3.00	1.68	6.90	0.00	9.21	-	6.90	8.00	8.00	4.54	9.21
19	3.36	3.00	0.51	6.33	0.00	11.64	11.64		10.00	9.00	6.03	11.64
20	4.83	3.00	0.00	9.24	0.00	18.91	18.91	9.24	39.00	10.00	58.66	18.91

denotes the item is distributed like AGI.

TABLE 4.4
AN ILLUSTRATION OF THE ADJUSTMENT PROCEDURE.

The example assumes for illustrative purposes a population of 215 million, 200 of which are income tax filers with positive AGI's. The actual values generated by the model will differ. The ventiles of filers estimated in the income distribution model each contain 10 million people. They are adjusted to include the entire population, making 10.75 million people per ventile.

Rank of person at ventile border		Rank of person at ventile border		er file	r cut	
(filers)	•	(population).	(population).		mes a	
	ventile		Assume 1st 15 mill people are not fil		just	ed.
	AGUETT	;	beobre are noc rr	. 01.2.		
10	1	10.75		set by	cens	us data
20	2	21.50	6.50	.65 of	1st v	ventil e
30	3	32.25	17.25	.725 be	twee	n 1&2
40	4	43.00	28.00	.80 be	twee	n 2&3
50	5	53.75	38.75	.875	Ħ	3&4
60	6	64.50	49.50	•950	n	4&5
70	7	75.25	60.25	.025	11	6&7
80	8	86.00	71.00	.100	11	7& 8
90	9	96 . 75	81 •7 5	.175	11	8&9
100	10	107.50	92.50	.250	n	9&10
110	11	118.25	103.25	•325	11	10&11
120	12	129.00	114.00	.400	11	11&12
130	13	139.75	124.75	•475	11	12&13
140	14	150.50	135.50	•550	11	13&14
150	15	161.25	146.25	. 6 25	11	14&15
160.	16	172.00	157.00	.700	11	15&16
170	17	182.75	167 .7 5	•775	11	16 & 17
180	18	193.50	178.50	.850	n	17&18
1 90	19	204.25	189.25	•925	n	18&19
200	20	215.00	200.00			

TABLE 4.5
THE INDEXES OF INCOME DISTRIBUTION BEFORE AND AFTER NONFILER ADJUSTMENT BEFORE TAXES - 1978.

	AGI	PI NO ADJ	PI ADJ	MON EY IN COME
Ventile	AUI	NO ADO	ADO	(census data)
1	15.71	40.16	17.19	17.29
2	24.01	44.52	30.97	
3	30.88	45.25	46.36	34.87
4	37.69	48.43	48.27	41.89
5	44.25	52.28	51.39	48.19
6	50.53	56. 79	55.73	54.31
7	56.80	60.81	60.87	60.41
· 8	63.39	65.64	65.58	66.38
9	69.99	70.89	71.22	72.78
10	76.92	75.75	77.15	79.80
11	84 .60	82.10	83.26	87.06
12	92.65	88.88	90.75	95.02
13	102.23	96.70	99.08	103.81
14	113.40	106.67	109.34	113.96
15 .	126.97	119.09	122.44	125.87
16	144.70	134.71	139.13	141.11
17	168.21	155.33	161.24	161.99
18	205.22	188.19	196.09	191.56
19	276.94	257.60	270.06	245.56
20	18.30	17.35	18.56	17.74

AGI - Adjusted Gross Income - distributed among filers with positive AGI. PI - NOADJ - The distribution of Personal Income among filers with

positive AGI after including all reconciliation items.

PI - ADJ - The distribution of Personal Income among the total population.

Money Income - distributed among the census sample of total population.

TABLE 4.6
INDEX OF VENTILE LIMITS FOR PERSONAL INCOME.

		IDEX OF VENT			•		•
	1 977	1984	1986	1988	1991	1993	1995
						~	
Ventile				Pre-Tax			
1	17.88	17.46	17.62	17.75	17.19	17.02	16.90
2	29.06	28.37	28.63	28.85	27.94	27.65	27.45
3	47.83	46 .68	46.96	47.08	45.85	45.34	45.02
1 ‡	49.32	48.01	48.19	48.25	47.31	46.86	46.62
5 6	52.16	50.83	50.89	50.98	50.29	49.97	49.80
6	56.29	54.95	54.89	55.00	54.50	54.29	54.21
7	61.30	59.98	59.96	60.18	59.84	59.74	59.75
8	65.84	64.69	64.70	65.00	64.80	64.81	64.87
9	71.38	70.08	70.01	70.34	70.22	70.30	70.41
10	77.26	76.03	76.00	76.44	76.46	76.63	76.80
11	83.27	82.15	82.20	82.77	.82.90	83.16	83.38
12	90.70	89.61	89.62	90.26	90.47	90.83	91.10
13	98.97	97.70	97.86	98.64	98.96	99.40	99.73
14	109.20	107.60	107.82	108.68	109.03	109.55	109.91
15	122.22	120.51	120.74	121.84	122.24	122.86	123.25
16	138.85	136 • 56	136.67	137.95	138.40	139.14	139.55
17	160.85	157.38	157.64	159.05	159.44	160.27	160.66
18	195.55	189.88	190.13	191.67	191.92	192.71	192.88
19	26 9.01	262.31	261.78	265.24	265.95	267.62	267.87
20	18.32	20.20	20.08	19.52	19.66	19.49	19.40
Personal		per capita					
	7.30	13.13	14.60	16.01	18.77	21.29	23.90
				Post-Ta		,	-5:5:
1	20.41	19.87	20.19	20.35	19.85	19.72	19.62
2	33.16	32.29	32.82	33.07	32.25	32.04	31.88
3	54.57	52.93	53.60	53.73	52.61	52.20	51.92
4	56.09	53.88	54.37	54.42	53.56	53.19	52.98
	58.78	56.28	56.55	56.62	56.03	55.79	55.66
5 6	62.66	60.05	60.17	60.25	59.89	59.77	59.73
7	67.35	64.85	65.01	65.19	65.03	65.02	65.07
8	71.30	69.17	69.29	69.53	69.48	69.57	69.67
9	76.25	74.09	74.07	74.30	74.34	74.48	74.62
10	81.49	79.58	79.57	79.91	80.07	80.27	80.47
11	86.83	85.14	85.15	85.57	85.80	86.07	86.30
12	93.60	92.07	91.99	92.43	92.73	93.07	93.34
13	101.09	99.50	99.51	100.04	100.40	100.79	101.09
14	110.41	108.59	108.58	100.04	109.47	100.79	110.18
	122.32			-			
15 16		120.63	120.57	121.32	121.69	122.18	122.50
	137.36	135.45	135.17	136.02	136.36	136.95	137.30
17	156.82	154.16	153.89	154.82	154.96	155.55	155.81
18	186.71	182.42	181.81	183.14	183.15	183.65	183.68
19	247.68	245.50	244.18	247.88	248.41	249.76	249.95
20	16.20	18.38	18.34	17.91	18.02	17.88	17.80
nrabosap		onal income					55 55
	6.29	11.27	12.44	13.64	16.09	19.93	20.08

The numbers are indexes (mean=100) of the cutoff income between ventiles. entile 20 has that group's share of all income.

TABLE 4.7 - RATIO OF POST-TAX TO PRE-TAX INCOME INDEXES - PERSONAL INCOME.

			E Est	COCHAT TA	COPE.		
	1986	1988	1988	1991	1991	1995	1995
		BASE	REFORM	BASE	REFORM	BASE	REFORM
Ventile							
1	1.1459	1.1465	1.1399	1.1498	1.1485	1.1609	1.1548
2	1.1464	1.1463	1.1401	1.1500	1.1486	1.1614	1.1554
3	1.1414	1.1412	1.1393	1.1436	1.1465	1.1533	1.1522
4	1.1282	1.1279	1:1329	1.1292	1.1379	1.1364	1.1403
5	1.1112	1.1106	1.1177	1.1120	1.1190	1.1177	1.1198
6	1.0962	1.0955	1.0972	1.0969	1.0973	1.1018	1.0983
7	1.0842	1.0833	1.0791	1.0846	1.0805	1.0890	1.0818
8	1.0709	1.06 97	1.0638	1.0705	1.06 51	1.0740	1.0662
9	1.0580	1.0563	1.0506	1.0571	1.0522	1.0598	1.0530
10	1.0470	1.0454	1.0403	1.0458	1.0415	1.0478	1.0417
11	1.0359	1.0338	1.0295	1.0340	1.0302	1.0350	1.0293
12	1.0264	1.0240	1.0203	1.0241	1.0204	1.0246	1.0191
13	1.0169	1.0142	1.0109	1.0137	1.0104	1.0136	1.0090
14	1.0070	1.0042	1.0012	1.0035	1.0005	1.0025	0.9992
15	0.9986	0.9957	0.9927	0.9951	0.9928	0.9939	0.9922
16	0.9890	0.986,0	0.9840	0.9874	0.9841	0.9839	0.9832
17	0.9762	0.9734	0.9736	0.9722	0.9717	0.9698	0.9690
18	0.9562	0.9555	0.9579	0.9548	0.9560	0.9523	0.9535
19	0.9328	0.9345	0.9398	0.9347	0.9399	0.9331	0.9399
20	0.9133	0.9175	0.9244	0.9183	0.9247	0.9175	0.9272

CHAPTER 5

SIMULATION OF A TAX REFORM PROPOSAL.

During the past few years, a consensus developed around the belief that the federal income tax code needed reform. Tax reformers argued that the code was far too complex, requiring too much time to prepare the returns; the code was unfair in that people earning similar incomes can end up paying quite different amounts of taxes; the high marginal tax rates acted as a disincentive for persons to work; and the many special provisions tended to distort the allocation of resources, thereby keeping the economy from operating efficiently.

While tax reform will arguably confer benefits upon the economy in each of the four areas outlined above, changes will occur in more easily observed, but no simpler to predict, areas of the economy. This chapter will use the model constructed in the previous chapters to simulate the major effects of a tax reform proposal. The benefits of simpler returns, horizontal equity, higher work incentives, and fewer allocational distortions are not explicitly modeled. However, this chapter will explore the likely effects of tax reform on two of the most important and visible areas of the economy; the size and distribution of the personal income tax burden, and the effects of tax reform on equipment investment by businesses.

The method employed fits in closely with the structure and capabilities of the model. The model is well-suited for simulating the major provisions of the tax reform plans which have gained the most support recently from legislators. In addition to the personal tax model which is the main topic of this thesis, the major provisions of

the changes in the corporate tax laws will also be simulated.

Since the personal income tax model has already been described in detail, it is only necessary to describe how the built-in flexibility of that model is used for the simulation. The focus of the corporate tax reform analysis is its effects on equipment investment. Therefore, a brief description of the investment model is required and provided in appendix "A" to this chapter.

The purpose of this exercise is to estimate the effects of the major provisions of the tax reform plan that goes into effect in 1987. Because the tax reform proposal has major changes in both the personal and corporate tax laws, both of these must be simulated together to present a reasonable picture of the plan's likely overall effects. The tax reform simulation is meant to capture the spirit of the specific plan passed by the Joint Committee on Taxation in August of 1986. The tax reform package is lengthy and extremely detailed. Where possible, the exact provision will be simulated, but of course, the model does not have the capability of simulating many of the lesser provisions. This is true of both the personal and corporate proposals.

The simulation exercise will contrast forecasts of the U.S. economy under both current law and the tax reform proposal. The strengths of the model will be highlighted. In particular, forecasts of the level and distribution of income tax collections will be forecast under both plans. Business responses to tax-induced changes in investment incentives will be discussed. Finally, the combination of these changes will affect the macro economy in specific ways, in both the intermediate and long runs.

The Tax Reform Plan.

There have been at least a half-dozen serious proposals for tax reform. They have varied considerably in detail, but they all have centered around three prevailing themes: a simpler tax code which promotes horizontal equity, a broader tax base, and lower marginal rates.

The tax reform plan is much simpler, at least on the personal side. While the fact that the plan features fewer brackets does not appreciably simplify the calculation of taxes, there are other more simplifying characteristics of the plan. There will be fewer exclusions, adjustments, credits and deductions allowable which will make for simpler returns and a lower accounting and preparation burden. Complications such as income averaging will be repealed, and because of the higher standard deduction (\$5,000 for joint returns), fewer taxpayers will benefit from itemization of their deductions. Tax shelters will be significantly curtailed. The two tax brackets are 15% and 28% bracket. The zero bracket amount will be incorporated back into the standard deduction.

The corporate returns will retain their current structure for the most part. Only the rates will change. The most notable exceptions, however, are the repeal of the investment tax credit (ITC), the deductibility of only 80% of certain business expenses, and the change in the depreciation schedules of some capital investments.

The tax base will be made much broader, especially for the personal income tax. Exclusions such as 60% of long term capital gains will be eliminated. Adjustments such as IRA contributions and certain tax shelter losses will be significantly curtailed. Certain tax credits

such as the ITC and the political contributions credit will be repealed. Several deductions, such as non-mortgage interest and state and local sales taxes will be disallowed. On the corporate side, besides elimination of the ITC, travel and entertainment expense deductions will be limited to 80%, and the amount of tax liablility to which tax credits may be applied will be cut back.

The base expansion not only makes for simpler tax returns, but more importantly, it makes room for reductions in marginal tax rates in a revenue neutral plan. The top personal rate will be lowered from 50% to 28%, while the corporate rate is lowered from 46% to 34%. The personal rate of 28% is a bit misleading, however, because the benefits of the 15% rate on low income and personal exemptions are phased out over a large range of personal income. Higher income families in the phase-out range will face effective marginal rates of about 33% on average. See table 5.1 for a summary of the main provisions of the tax reform plan which were simulated, and how they compare to the current law.

Putting the Tax Reform Provisions in the Model.

1. The Rates.

This section will describe how the provisions of the tax reform proposal are simulated within the framework of the model. Changes in the rate schedule, the standard deduction, and the personal exemption amount are exactly what the model was designed to simulate. Because of the work that went into the design of the model in Chapters 2 and 3, this part of the simulation is simple. The tax rate schedules are read directly into the model as data. The same is true for the standard deduction amount since it can be incorporated directly into the

schedule. The personal exemption amounts are also read in as data. These items are read from an exogenous data file which contains their values for each year of the forecast. Note that differences in the rate schedules and standard deductions for single and married taxpayers are fully taken into account since the model estimates income distributions and tax liabilities for each household size. Households of size greater than one are assumed to file joint returns.

The model also takes into account changes in the earned income credit (EIC), and the indexing provisions. The EIC test is applied to all income of household sizes three or more. This is because the model cannot distinguish between earned and nonearned income. The parameters of the EIC, which include the maximum amount, the income range over which it applies and the phase-in and phase-out rates, are all fed in as data. Indexing is modeled automatically by saving the inflation rate in the previous year's GNP deflator and applying it to both the tax bracket boundaries (including the zero-bracket amount) and the personal exemption amount. The indexing switch in the model can be turned on at any year in the forecast, and there is a separate switch for the tax brackets and the personal exemption amount.

2. Accounting for Tax Base Expansion Under Tax Reform.

The tax reform proposal seeks to change the definition of the income tax base, or AGI. The following items which are currently exempt will be included in the tax base: The dividend exclusion, capital gains, IRA deductions, moving expenses, the deduction for working married couples, and unemployment compensation. Together, these items totaled 3.9% of personal income in 1982, according to SOI. The base was

expanded in the simulation by adding that amount to the value of AGI determined by the model. The new value of AGI was then used for the calculations. The procedure used assumes implicitly that the additions to the tax base are distributed in the same way as the old AGI. This turns out to be a reasonable assumption for most of these items. However, capital gains are distributed heavily toward the upper incomes. This is partially offset by the inclusion of unemployment compensation, which accrues primarily to the lower incomes.

According to SOI, the relative magnitude of each item in 1982 was as follows:

	(\$bill.)	%of PI		
Dividend Exclusion	1.9	0.1		
Capital Gains (excluded)	51 .6	1.9		
Unemp. Compensation (excl.)	12.7	0.5	•	
IRA Deductions if AGI<50K	25.6	1.0	(adjusted for	inflation)
Moving expense	3.7	0.1		
Marriage Deduction	9.0	0.3		
Total	104.5	3.9		

3. The Conversion from Standard to Effective Tax Under Tax Reform.

Itemized deductions and tax credits affect the relation between standard and effective tax rates. The tax reform plan eliminates all credits and many deductions. Because of this, and the fact that the standard deduction is raised by the plan, substantially fewer taxpayers will find it advantageous to itemize. Using data from 1982 tax returns, a new relationship between standard and effective taxes, reflecting these changes was estimated for each ventile.

The tax reform proposal will alter the relationship between standard and effective taxes in three important ways. First, the tax reform proposal will eliminate about 25% of amount of what were

previously allowable deductions. The statistics from SOI indicate that itemized deductions are distributed remarkably like the income distribution itself for those who itemize. The deductions account for about 22-25% of AGI for those who itemize in all of the reported income groups. Overall, deductions account for about 15% of AGI. Second, the zero bracket amount rises from \$2300 and \$3400 for single and joint returns to \$3000 and \$5000 under the proposal, which raises the lower bound for the amount of deductions necessary to benefit from itemizing. Finally, almost all tax credits are eliminated. These credits account for about 3% of tax liability.

The procedure which estimates the change in the ratio of effective-to-standard tax liabilities per ventile is outlined in the steps below. Simply put, the procedure estimates the tax value of deductions under the new plan for the different income groups and uses those amounts as the differences between standard and effective taxes.

- 1. The number of returns, the "standard tax" under tax reform, and the average per household AGI (base definition) were saved from a run of the tax model with the reform proposal's tax rate schedule. Values for each of these three items were saved for each household size in each ventile for 1988.
- 2. The total deductions for each of the 120 groups (6 household sizes in each of the 20 ventiles) were then estimated based on the percentages reported in 1982 SOI, table 1.2. For household incomes of \$20 thousand or less, 8.6% of AGI is taken in itemized deductions; 13.2% for AGI of \$20-25 thousand; 15.1% for \$25-30; 17.6% \$30-40; 20% for \$40-50; and 21% for AGI above \$50 thousand per household. The resulting figures were then reduced by 25% to account for the fewer

deductions allowed under tax reform.

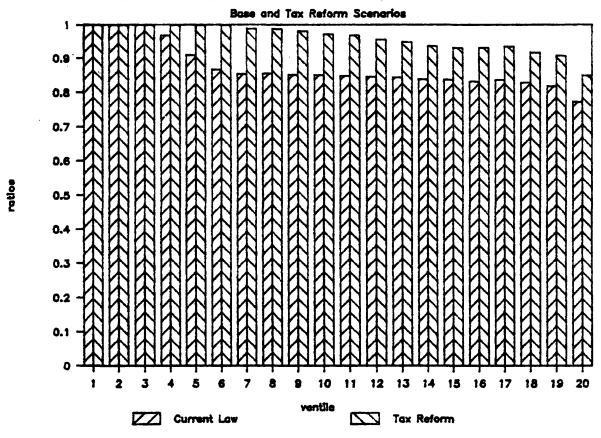
- 3. Next, the effective tax for each group under the new plan (NTAX) was calculated as the standard tax (ST) minus the marginal rate (MR, either 15%, 28%, or 33% depending on the group's average AGI) times the deductions estimated in step 2 (DED) minus the zero bracket amount (ZBA); NTAX = ST (MR*(DED-ZBA)) when (DED-ZBA)⁺.
- 4. The difference between the new tax and the standard tax was calculated where the new tax was less than the base. This represents the savings per household from itemization under tax reform.
- 5. The taxes and savings from itemization under tax reform per ventile were calculated by aggregating the household sizes in each ventile; The per household taxes and savings were multiplied by the number of returns for each group (calculated as population per group divided by household size).
- 6. The saving from itemization as a share of standard taxes for each ventile represents the standard-to-effective tax ratios used for the tax reform simulation.

Figure 5.1 shows the factors used for converting standard tax rates to effective tax rates for both the base and the tax reform proposal. The numbers are shown in table 5.2.

Simulating Corporate Tax Reform.

The proposal for reforming the corporate income tax will undoubtedly affect the way businesses make their investment decisions. The current law is considered inequitable by many because effective tax rates vary widely among industries. The proposed changes are designed to help eliminate these inequities, and to remove many of the existing

STANDARD-TO-EFFECTIVE TAX RATIOS



distortions in investment incentives. Removal of these distortions will supposedly allow the economy to operate more efficiently.

This section is an attempt to analyze and simulate the effects of the proposed changes in the corporate tax law on equipment investment. The scope of the study is limited to equipment investment only, and does not address investment in structures under the new tax proposal, although there may be significant macroeconomic effects due to the new treatment of certain commercial structures which previously served as tax shelters.

The entire tax reform package contains three major separate pieces which will affect equipment investment. The plan proposes to (1) lower the basic corporate tax rate from 46% to 34%, (2) eliminate the investment tax credit, and (3) change allowable depreciation schedules to slightly longer tax lives with more accelerated write-offs. Each of these will be more thoroughly discussed in turn, outlining the change, and its likely effects on investment.

Tax changes directly affect investment through changes in the cost of capital. The cost of capital is the return that an investment earns in order to be profitable. It is the return an asset must yield in order to pay taxes, recoup real depreciation, and cover the interest costs of financing its purchase. Naturally, a higher cost of capital will tend to depress investment incentives. The interindustry model determines investment, employment and energy use simultaneously, with investment being determined by each industry's output and its relative cost of capital. See appendix "A" for a more detailed and technical discussion of the determination of investment in the model, and appendix "B" for a description and derivation of the cost of capital formula.

The formula for capital cost is:

5.1)
$$UCC = P(r + dep) * (1 - T*Z - C)/(1 - T)$$

The model forecasts investment for 55 industries based on costs of capital, labor and energy, as well as industry output. A different cost of capital is calculated for each industry. This cost of capital formula is used in the model as the price of capital equipment facing firms. It assumes 100% debt financing. The user cost will vary among investing industries in the model only because P, which is the price of the equipment bought, and the economic depreciation, dep, will vary. Each industry is assumed to use the same discount rate r, and each faces the same tax rate T and investment tax credit, C. Economic depreciation and the tax depreciation, Z will depend on the type of equipment bought. These simulations take this into account when estimating the economic depreciation, but not for the tax depreciation. The present value of the depreciation write-off is calculated assuming that all industries invest in equipment that has economy-wide average tax lives. The capital flow data show this to be a reasonable assumption.

The first piece of proposed legislation is the reduction of the top corporate tax rate from 46% to 34%. This change will have two effects on the cost of capital, each in an opposite direction. The lower tax rate will act to increase the overall after-tax return on capital, thus lowering the cost of capital. However, a lower tax rate will reduce the tax savings from deductions, particularly the depreciation deduction, which enters the cost of capital formula. The first effect dominates, ceteris paribus, so the net effect of the rate reduction is to lower the

cost of capital. From a base of current law, changing only the corporate tax rate would lower the cost of capital by around 4% for all industries. Although this change will help stimulate investment, it will actually not have much effect on revenue, because deductions of business expenses will be significantly curtailed, thus increasing the corporate income tax base. The accounting changes which increase the tax base will have little or no effect on investment because they have no bearing on the marginal cost of capital.

The piece of the proposal with the biggest negative impact on investment is the repeal of the investment tax credit. The credit is a reduction of tax bills by 10% of the price of qualified equipment. It appears with a negative sign in the cost of capital formula. Elimination of the credit significantly raises the cost of capital. Although the tax credit is legislated to be ten percent, few studies use that rate as the true effective rate in the aggregate. This study is no exception. There are several reasons to believe the proper value to apply in cost of capital calculations is substantially lower.

To begin with, the law states that if the ITC is claimed, the equipment's basis for depreciation must be lowered by half the amount of the ITC. This means that the firm's depreciation stream will be 5% less each period. The amount it costs the firm in taxes is the tax rate times 5%, discounted over the depreciation schedule. The firm is given an option of reducing its ITC by two percentage points (to 8%) or taking the basis reduction, which works out to about 1.85% for the average equipment of a firm in the 46% tax bracket.

Equipment which can be written off in three years is only eligible for a 6% ITC (4% in lieu of basis reduction). The equipment, which

includes autos, light trucks and research and equipment for experimentation makes up over 10% of all equipment purchases. Adjustment for this lowers the effective ITC by another .4%.

Numerous types of equipment are not eligible at all for the ITC. Such equipment includes most property used for long-term lodging, child care, tax-exempt, and government organizations, property used outside the country, and frequently replaced livestock. If equipment is sold or disposed of before its tax life expires, the firm must repay the ITC taken. Finally, the limit on the ITC is \$25 thousand per year per firm, plus 85% of the firm's tax liability over that amount. It is tempting to ignore this limitation because the ITC can be carried back 3 years and forward 15 years, but many firms with little or no tax liability may go bankrupt before they can claim the whole ITC. Firms probably consider this in their investment decisions. It is estimated that this last group of provisions will subtract 1% from the aggregate effective ITC rate. Therefore the calculations and simulations use 6.7% as the effective investment tax credit rate, not the legislated rate of 10%. This may be the main reason the results from this study are different from other studies which adopt the same approach. If the elimination of the investment tax credit were the only change in the tax law, the cost of capital would increase by about 12%.

The tax reform package proposes to make the tax depreciation schedule more accelerated. Instead of the current 150% declining balance method of depreciation, the proposal will allow the faster double declining balance method. The current law has three classes of equipment with tax lives of three, five and ten years. Automobiles, light trucks and research and experimentation equipment fall into the

three-year category, while except for a small group, the remainder fall into the five-year class. The faster depreciation will dampen the rise in the cost of capital due to the repeal of the ITC.

The tax proposal will lengthen the tax lives of certain classes of equipment. What was previously three-year equipment becomes five-year, and what was five-year, stays at five-year equipment. The tax lives of what was previously ten-year equipment gets lowered to seven. Other tax-life categories are added to the schedule for investments which are nonbuilding structures like sewage treatment plants, barns, and certain utility facilities. In the aggregate, and as far as equipment only is concerned, the effect will be small, and so it is ignored in the simulation. In a careful industry analysis, it would be possible, using available capital flow data, to construct an average service life for each industry, and calculate the present value of the depreciation deduction in that manner. For this simulation, however, it is assumed all industries average equipment tax life is five years under both If shifting from 150% to double declining balance were the only change in the tax law it would lower the cost of capital by about 1.5%. The present value of depreciation of a five year piece of equipment costing one dollar under current law would be .796, while it would be .816 under tax reform with double-declining balance if both the expected real rate of return and expected inflation rate were 4%.

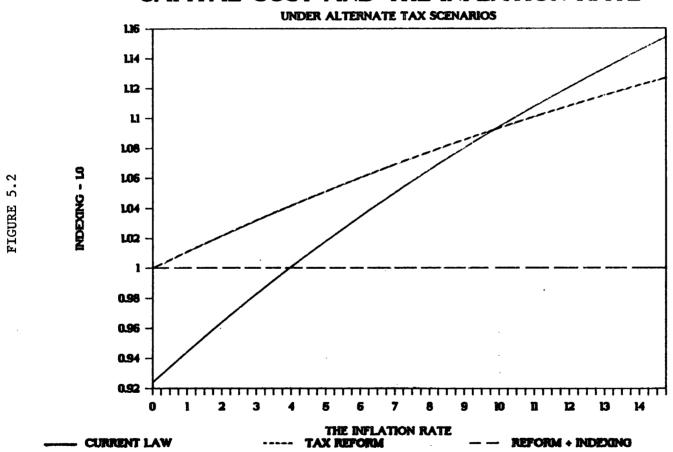
A most equitable major piece of tax reform was deleted from the tax reform proposal. That was the provision of indexation of the depreciable tax basis of capital purchases to inflation. Under current law, the depreciation allowed is based on the original purchase price of the equipment, without regard to current replacement cost. Indexation

would have allowed the depreciable basis to be increased each year by the change in the price level over the previous year. The impact could be modeled in the capital cost framework by discounting the depreciation stream by the real, or inflation-adjusted interest rate instead of the nominal rate. Using this lower discount rate will raise the present value of the depreciation and thus lower the cost of capital. The higher the inflation rate, the more valuable to business this part of the tax law would be.

One very important point about this analysis is that the cost of capital under current law and the tax reform proposal is very sensitive This is because the real present value of the to inflation. depreciation stream, if it is not indexed, will decline as inflation rises, thus raising the cost of capital. Figure 5.2 illustrates how important inflation projections are to this analysis. It shows capital costs under current law, the tax reform proposal and the reform proposal including indexation. For every percentage point the inflation rate rises, the cost of capital under current law and reform increases by almost two percentage points. The cost of capital would be invariant to inflation if depreciation were indexed. The indexing provision alone, if it were enacted, would lower capital costs by about 7% if inflation were 4%. The inflation rate at which tax reform with indexing and the current law yield the same cost of capital is just over 4%. inflation sensitivity of capital costs without indexing is a crucial point to consider when evaluating the effects of tax reform.

Table 5.3 shows the percentage change in capital cost from enacting various combinations of the pieces of the tax reform package. Shown are the impacts of tax changes on the cost of capital assuming no other

CAPITAL COST AND THE INFLATION RATE



changes or feedback effects in the economy. The overall package increases the cost of capital by 4.3% if expected inflation is 4% and the real rate of return is 4%.

Provisions not Modeled.

Of course there are many provisions in the tax reform package that are not modeled. It will be useful to list the most important ones here, starting with those on the personal income tax side.

- 1. The distribution of the base expansion is assumed to be like the distribution of the old definition of AGI. That is, the model can only forecast the distribution of the old definition of AGI, because that is what the equations have been historically estimated to forecast. Once those distributions are forecast, the estimated discrepancy between the old AGI and new AGI is added to each group's share of income in proportion to their share of old AGI. While it is true that this method can lead to distortions because certain income such as capital gains and income from defunct tax shelters accrues at the upper end of the income distribution, other items which tax reform adds to the definition of AGI, such as unemployment compensation and the elimination of the marriage deduction, accrue more toward the lower end, thus offsetting somewhat the potential distortion.
- 2. It should be pointed out that this model is not able to simulate many of the individual behavioral repsonses to tax reform that may occur at the microeconomic level. In particular, the tax reform package will alter the after-tax price of many items, particularly those items which are currently deductible, but will not be under the new plan. Those items may become less attractive. When these incentives

are discussed, it is often thought that resources will shift into the expenditures that are still deductible, and thus any static revenue prediction of tax reform will be overestimated. What is not usually mentioned is that with the lower tax rates, there is less incentive to alter puchases for tax avoidance purposes. Thus the price effects argument may be overstated. Nonetheless, these effects, if they exist, are not simulated. The deductions estimated for tax reform, which are reflected in the predicted relation between standard and effective tax rates, are based on the static analysis of historical data described above. Price-type effects could be estimated separately with the proper data, however, and incorporated into the forecast. But this simulation is static with regard to the individual price-type responses.

3. On the corporate side, the income tax is not modeled in enough detail to provide accurate revenue projection. Therefore revenues had to be taken from the joint committee's static estimates. The plan was passed under the assumption that it would be revenue neutral over the first five years. Since the plan results in a personal tax cut, the corporate revenue increase is fixed to be equal to the cut in personal taxes. The cut in personal taxes was estimated with a separate, completely static simulation of the personal income tax model. The simulation, which was designed to reflect the Joint Committee static method, used only the income distribution and tax model. Revenue estimates were compared under current law and tax reform assuming the same level of GNP and personal income. The difference in the estimates was then fed in as the difference in corporate revenue for the dynamic simulation with the complete model. This gave the macro simulation the property of static revenue neutrality that the legislators mandated.

- 4. Under current law, 46% of business expenses are paid by the federal government because they are deductible. Under the new plan, the subsidy would be reduced to 34%. For business meals and entertainment expenses, the subsidy would only be 80% of that, or about 27%. The effect of these changes would seem to reduce these expenses, but the magnitude, if any, is unknown. If they were estimated separately, they could be incorporated into the simulation by making the appropriate changes in the intermediate coefficient matrix. Also the research and development credit will be reduced from 25 to 20%. No effort has been made to take these effects into account for the current simulation.
- 5. Investment in structures is being treated differently under tax reform. Tax lives will be lengthened from 19 to 31.5 years. Unlike equipment investment, the investment in structures is not modeled in a user cost framework. The result of repeated experiments here was that business construction depended on output and interest rates, but not on any price or tax parameters. There is some disagreement with this view among economists, particularly regarding tax sheltering and commercial structures.

The Results of the Simulation.

The overall plan was designed by the Joint Committee on Taxation to be revenue neutral. This simulation was designed to capture that spirit, however, with a dynamic forecasting model. The personal tax model was first simulated alone in a pure static framework, using the income and other variables exogenous to the pure income tax calculation from a base run of the complete model. The difference in revenue calculated in this manner was then added to the corporate income tax

revenue forecast while the complete dynamic simulation was being done. Alternatively, the model could have been adjusted to be revenue neutral in the dynamic simulation, but this would not have been an appropriate scenario.

The scenario that was run, then, is revenue neutral in a static simulation, but not in a dynamic one. When the tax burden is shifted from the personal income tax to the corporate tax, aggregate spending is affected. In particular aggregate spending will increase with dollar for dollar shifts in this manner, thus stimulating the economy, increasing income and tax revenue. The stimulus occurs in the simulation because personal consumption is more responsive to changes in income than business spending. When personal taxes are cut, about 93% of the extra disposable income is spent. When corporate taxes rise, corporate spending falls, but not as much as 93% of the tax hike. In particular, dividend payouts, especially in the short and intermediate term, are historically not as sensitive to profits as PCE is to disposable personal income. Profits, and retained earnings act as a buffer for corporate spending. The result is more aggregate spending and economy-wide stimulus. This effect outweighs the depressing effect that higher capital costs have on equipment investment (to be discussed later).

The static simulation results year by year are shown in table 5.4. Once the tax reform plan goes into full effect, (it will be phased-in during 1987) personal tax revenue will fall by about 6% per year, about \$20 billion in 1988. For the first five years, the tax cut would be about 5% according to the static simulation. Shifting that amount of taxes from persons to corporations is not neutral with respect to

overall economic activity, as explained above. The revenue estimates from the full dynamic simulation show less of a tax cut, reflecting the stronger economy's higher incomes.

TABLE 5.4
SIMULATED PERSONAL INCOME TAX REVENUE.
(Billions of Current Dollars)

	BASE	TAX REFORM (static)	TAX REFORM (dymnamic)
1986	363.4	363.4	363.4
1987	388.0	386.1	387.7
1988	406.2	382.8	385.8
1989	431.8	407.8	411.8
1990	468.3	442.6	445.9
1991	518.0	487.8	492.0
1992	564.8	530.6	536 .4
1993	606.8	570.0	5 76 . 7
1994	652.1	611.9	620.1
1995	700.6	6 56 .2	665.9

Also of interest is the effect of tax reform on the income elasticity of revenue. Using static simulation, where only aggregate personal income is changed, the current law yields an elasticity of 1.73. Under tax reform, the elasticity would be 1.69. The lower elasticity is due to the slightly less progressive rate structure. These estimates are the results of experiments with the model which raised personal income, and transfer payments both 10%. The multiplier would be slightly lower for smaller increases because of progressivity.

The tables at the end of this section show the results of the simulations in terms of the distribution of the tax burden. The simulation takes into account the phase-in of the tax rates in 1987 while assuming the new relation of standard and effective tax rates for

that year and beyond. The results show income per ventile, and cutoff incomes using the new expanded AGI, the tax rates and tax liabilities, and the after-tax income distribution.

Table 5.5 shows how adjusted gross income is distributed among the twenty ventiles under each scenario for 1988,1991 and 1995. The table shows AGI both before and after all personal taxes. Remember that the definition of AGI is broader under tax reform than under current law.

Table 5.6 shows the cutoff point between ventiles in thousands of dollars per capita. Again, the definition of AGI varies across scenarios. There is no cutoff calculated for the top ventile because that number would represent the per capita AGI of the country's highest earner for that year, a meaningless statistic.

Table 5.7 shows the tax rates, both standard and effective. These tax rates are average rates, not the marginal rates which appear in the tax schedules. Again the rates are applied to different income bases according to the definition of AGI. Note that the standard and effective tax rates are equal for the lowest six ventiles under the tax reform proposal. This is because households in these groups will not benefit from itemization.

The most interesting table is table 5.8 because it shows the amounts of federal income tax liability for each ventile. The tax reform plan shows a reduction in personal income tax liabilities from the current law. In 1988, the plan shows a tax cut of about 5%. The ventiles which enjoy larger tax reductions than the overall average for each plan are marked with an asterisk. The bottom 5 or 6 ventiles get a bigger than average tax cut in percentage terms, except the lowest ventile, which pays no tax under either plan, and therefore gets no tax

cut at all. The top 2 ventiles also receive more than the proportional tax cut. In fact, in dollar terms for 1988, the top 10% of taxpayers get about one-half of the total tax cut. So the people at the bottom and the top get the biggest percentage tax cuts, while no groups will pay higher taxes. This could be one reason for tax reform's political support.

Table 5.9 shows the indexes of after-tax disposable personal income by ventile. These numbers come from the static simulation. The dynamic simulation showed variation in the ventile cutoff incomes which was due not only to the change in the tax law, but also changes in the economic variables which determine the income distribution. Recall from Chapter 2 that the income distribution depends on the unemployment rate, the share of income in interest and dividends, the inflation rate and time. The first two of these variables changed enough in the dynamic simulation as to overwhelm the effect that tax reform had on the ventile borders. An inspection of the values in table 5.9 shows that the pure effect of tax reform on the distribution of personal income is small relative to the total amount of personal income. However, recall from table 4.7 that the effect of the overall tax system on the income distribution is quite significant.

In table 5.9, it is clear which ventiles benefit in relative as opposed to absolute terms. The numbers represent the percent of the overall average per capita after-tax income received by the highest person in the ventile. Note that the lowest ventiles were hurt in relative terms. That is not because the tax proposal raises their taxes, but because they pay either no taxes, in which case they receive no tax cut, or they pay so little in taxes that when their taxes are

cut, it amounts to so few dollars that they are made relatively worse off when other groups enjoy a more substantial tax cut.

The changes may seem small, but they are calculated correctly. Take the values for the twentieth ventile which is the group most affected by tax reform in 1988. The difference in tax liablility between the base and reform scenario is about \$6 billion. That amounts to only about .0018 of total disposable personal income (\$3340 billion). Six billion dollars in a ventile translates to about \$500 per person, which is 3.6% of \$13,800, which is overall per capita income for 1988. However, the indexes are constructed to measure the relative position of persons. If all persons got an across-the-board increase in their disposable incomes in percentage terms, the indexes would not change. For the indexes to change, there must be shifts in the relative positions of people. That is why the pure tax-induced changes in the indexes in the static tax reform simulation are small even though the tax cut is significant.

Except for the very lowest ventiles, the tax reform proposal will make the low income groups better off both absolutely and relatively. This is because of the doubling of the personal exemption amount, and substantial increase in the standard deduction. The middle and upper middle income groups will benefit in absolute terms, but enjoy a smaller tax cut than the other groups, and therefore are made relatively worse off. The upper two income groups are made better off because of the lower marginal tax rates.

The results of this simulation indicate that the tax proposal will not alter the distribution of federal income tax liability very much.

The difference is that the tax system becomes somewhat less progressive

at the upper end, but more progressive at the lower end.

Because of the small relative shift in the shape of the income distribution as measured by the indexes, the proposed version of tax reform is not a particularly illuminating scenario under which to demonstrate the considerable abilities of the consumption model. For this reason no more will be said, other than to point out that the model does provide some useful evidence; namely, that changes in the distribution of tax liability under tax reform will be small enough to ignore when analyzing the proposal's effect on the goods distribution of consumption.

The effect on investment behavior is shown in tables 5.10 and 5.11. Table 5.10 shows the change in user cost by industry. The units of the user cost of capital are irrelevant, but not the percentage changes. The units depend on a weighted price index of the new capital goods purchased by the industries. The costs are comparable between the runs as the overall price deflators are not affected by tax reform according to the model. Table 5.11 shows capital equipment purchases in constant dollars by industry. The 5% rise in after-tax capital costs results in about a 2.5% decline in equipment purchases.

The overall macro effects as projected by the INFORUM model are summarized in table 5.12. Note that aggregate consumption increases, but not by 94% (1 minus the savings rate) of the tax cut. This is because dividends are part of income, and those were cut back somewhat by the higher corporate tax. Note that the percent fall in dividends is quite large (17.5) by 1995. Dividends are estimated in the model primarily on the basis of after-tax corporate profits with a smoothing lag structure. The large fall reflects the large (over 25%) percentage

increase in corporate tax revenue that the simulation generates. The rise in consumption is also tempered by a rise in the savings rate. Since the savings rate is a negative function of the unemployment rate, among other things, the stronger economy and lower unemployment rate act to dampen the rise in consumption. Inflation was not affected by the proposal, and interest rates rose only slightly.

It would appear that in drafting the proposal, the analysts succeeded in coming up with simpler tax laws which will not drastically alter the distribution of the tax burden. A major criticism of the current system, besides its complexity and high marginal rates, is that it is horizontally inequitable. A person's tax bill depends not so much on the quantity of income he or she receives, but on the form of his or her income and the items it is spent on. Although this is one area which cannot be addressed by this study, it is hoped that this legislation will go a long way in correcting these inequities. In so doing, there will naturally be individual winners and losers in each group, but it does not appear that any income group as a whole will lose The other main result of this simulation exercise is that while much. the tax reform legislation will redistribute resources from investment-oriented industries and activities to those more oriented toward consumption, there will be virtually no impact on the overall growth of the economy.

TABLE 5.1

A SUMMARY OF THE TAX REFORM PLAN.

I. The tax rates:

These rates apply to AGI less personal exemption and standard deduction.

15% -- on individual AGI up to 17,850; joint AGI up to \$29,750.

28% -- on AGI in excess of \$17,850 and \$29,750.

II. Exemptions, deductions, and phase-outs:

The personal exemption amount is \$1,900 in 1987 and \$2,000 thereafter, indexed to inflation. The standard deduction is \$3,000 for single, and \$5,000 for married filing joint.

There will be a phase-out of the benefits to high income earners of the 15% rate on a portion of their income. The phase-out occurs between \$43,150 and \$89,560 for singles, and between \$71,900 and \$149,250 for joint returns.

In addition, the personal exemption will be phased out at a rate of five percent for adjusted gross incomes between \$89,560 and \$129,560 for single and over \$145,320 for joint returns. Both these phase-outs raise the effective marginal tax rate to 33% over their ranges.

III. Deductions:

The retained deductions include:

- 1) first and second home mortgage interest.
- 2) state and local income and property taxes.
- 3) charitable contributions.
- 4) medical expenses exceeding 10% of AGI.
- 5) child care expenses.

The repealed deductions include:

- 1) consumer interest payments.
- 2) investment interest if more than investment income.
- 3) state and local sales tax.
- 4) medical expenses less than 7.5
- 5) miscellaneous deductions such as union dues and employee business expenses under 2% of AGI.

TABLE 5.1 (continued)

IV. Other items changed:

- 1) IRA deductions severly limited.
- 2) two-earner deduction repealed.
- 3) political contributions credit repealed.
- 4) income averaging repealed.
- 5) capital gains exclusion repealed.
- 6) unemployment insurance exclusion repealed.
- 7) real estate related tax shelters severly limited.
- 8) moving expenses treated as miscellaneous deductions.
- 9) Earned Income Credit expanded.

V. Major changes in the business tax provisions of the tax reform plan:

- 1) Investment Tax credit repealed.
- 2) Depreciation service lives lengthened marginally for equipment, significantly for real estate and structures. This effect is offset by double declining balance instead of 150% for equipment.
- 3) Top corporate tax rate lowered from 46% to 34%. Income up to \$75,000 subject to lower rates, but phased-out so that companies earning more than \$350.000 will pay a flat rate of 34%.
- 4) Limited business expense deductions, particularly for travel and entertainment.
- 5) Maximum tax rate of 28% on corporate capital gains.
- 6) Alternative minimum tax added for corporations.
- 7) Research purchases tax credit reduced from 25 to 20%.

TABLE 5.2

STANDARD-TO-EFFECTIVE TAX RATIOS - BASE AND REFORM.

Ventile	Current Law	Tax Reform
1	1.00000	1.00000
2	1.00000	1.00000
3	1.00000	1.00000
4	0.96 940	1.00000
. 5	0.91004	1.00000
6	0.86870	1.00000
7	0.85577	0.98979
8	0.85658	0.98849
9	0.85305	0.98232
10	0.85236	0.97363
11	0.84995	0.97024
12	0.84741	0.95704
13	0.84505	0.94917
14	0.83944	0.93714
15	0.83810	0.93146
16	0.83339	0.93215
17	0.83769	0.93588
18	0.82915	0.91731
19	0.81852	0.90862
20	0.77384	0.85088

TABLE 5.3

PERCENT CHANGE IN AGGREGATE CAPITAL COST FROM CURRENT LAW BASE *

- T -- Change in the corporate tax rate from 46% to 34%.
- C -- Change in the effective investment tax credit from 6.7% to 0.
- Z -- Accelerate depreciation from 150 to 200% declining balance.
- I -- Indexing the depreciation basis to inflation (assumed to be 4%).

Change	nominal i = 8%	nominal i = 6%
T only	-4.4 11.8	-3.1 12.3
C only Z only	-1.6	-1.3
I only	-7. 6	-8.6
T & C	5.3	6.9
T & Z	-5.4	-3.9
T & I	-9.0	-8.3
T, C & I	0.7	1.8
T, Z & I	-9.5	-8.6
C & Z	10.2	10.9
C & I	4.3	3.7
C, Z & I	3.3	3.2
Z & I	-8.5	ļ -9. 1
T, C, Z, &I	0.1	1.5
The entire tax reform proposal (T, C, & Z)	+4.3	+6 .1
The entire proposal if expected inflation is 5%. (See Figure 5.2)	+3.5	+5.2

^{*} The calculations assume that expected inflation is 4%, thus the first column assumes the ex ante real rate of return to be 4%, and the second column assumes a real rate of 2%.

TABLE 5.5
DISTRIBUTION OF AGI. (billion \$)

		DIST	KIROLION	OF AGI.	(Diffion	Φ)	
Pre-Tax							
	BASE	BASE	REFORM	•	REFORM		REFORM
Ventile	1986	1988	1988	1 1991	1991	1 1995	1995
1	11.28	11.89	12.66	14.32	15.21	17.62	18.80
2	23.53	25.60	27.17	31.14	33.02	39.68	42.22
3 .	32.51	35.65	37.81	43.49	46.12	55.98	59.54
4	40.98	45.28	47.97	54.95	58.21	71.02	75.48
5 6	49.38	54.66	57.89	66.59	70.55	86.21	91.58
	57.31	63.58	67.33	77.43	82.02	100.51	106.77
7	65.21	72.68	76.93	88.50	93.72	115.20	122.34
.8	73.43	81.82	86. 60	99.64	105.53	129.94	137.98
9	81 .56	90.95	96.26	110.93	117.47	144.68	153 . 6 1
10	90.13	100.86	106.71	123.02	130.26	160.74	170.63 °
11	99.52	111.36	117.84	135.82	143.82	177.47	188.42
12	109.12	122.13	129.22	148.95	157.70	194.98	206.98
13	120.23	134.79	142.56	164.51	174.18	215.66	228.90
14	133.26	149.44	158.17	182.25	192.98	238.60	253.25
15	147.95	166.10	175.65	202.66	214.55	265.59	281.87
16	167.22	187.96	198.78	229.17	242.61	300.05	318.44
		214.69		26 1.26	276.66	342.17	363.19
17	191.47	_	227.13				
18	225.49	253.32	267.91	308.42	326.58	403.46	428.27
19	282.16	316.34	334.58	384.60	407.41	501.51	532.51
20	463.36	496.18	532.35	605.97		773.84	827.23
Total	2465.09	2735.29	2901.52	3333.59	3536.47	4334.92	4608.01
		•	AFTER	-TAX AGI.			•
Ventile						_	,
1	10.06	10.53	11.32	12.74	13.65	15.63	16 .83
2	21 .6 1	23.48	25.27	28.46	30.77	36.17	39.36
3	29.88	32.65	35.72	39.53	43.42	50.65	55.65
4	37.04	40.82	44.75	49.20	53.92	63.22	69.21
5	44.05	48.64	52.94	58.86	63.68	75.75	82.02
6	50.57	55.96	60.10	67.75	72.61	87.39	93.85
7	56.97	63.32	67.72	76.59	81.89	99.02	106.12
8	63.43	70.43	75.30	85.09	91.03	110.14	118.21
9	69.55	77.29	82.74	93.59	100.32	121.13	130.19
10		84.98	91.07	102.83		133.16	143.47
	76.21						
11	83.29	92.78	99.58	112.13	120.57	145.15	156.30
12	90.36	100.72	108.31	121.82	130.93	157.87	170.30
13	98.90	110.35	118.51	133.34	143.52	172.98	186.79
14	108.25	120.72	130.17	145.70	157.12	188.66	204.12
15	119.17	133.21	143.32	160.83	173.51	208.27	226.06
16	133.29	148.94	160.50	179.70	194.44	232.87	253.24
17	150.66	168.12	182.05	202.09	219.35	261.62	284.94
18	174.34	194.85	211.57	234.23	254.45	302.51	329.32
19	210.70	236.68	258.48	284.77	312.02	367.50	404.51
20	317.21	340.16	382.04	409.34	460.18	516.84	583.60
Total	1945.47	2154.55	2341.38	2598.48	2827.57	3346 .41	36 53 . 97
	1 272 071					JJ .5 1 1 1	J- JJ • J 1

TABLE 5.6
UPPER LIMITS FOR PER CAPITA AGI. (thousand \$)

Pre-Tax					•	.,	
	BASE	BASE	REFORM	BASE	REFORM	BASE	REFORM
	1986	1988	1988	1991	1991	1995	1995
Ventile							
1	1.59	1.68	1.78	1.97	2.09	2.41	2.56
2	2.45	2.63	2.79	3.10	3.29	3.84	4.08
3	3.20	3.45	3.66	4.07	4.32	5.06	5.38
4	3.94	4.26	4.52	5.03	5.33	6.28	6.68
5	4.65	5.05	5.34	5.95	6.31	7.45	7.92
6	5.34	5.80	6.14	6.86	7.26	8.60	9.13
7	6.04	6.59	6.97	7.78	8.24	9.78	10.38
8	6.75	7.37	7.80	8.70	9.22	10.94	11.62
9	7.47	8.17	8.64	9.66	10.23	12.17	12.92
10	8.26	9.05	9.57	10.70	11.33	13.49	14.32
11	9.09	9.95	10.53	11.77	12.46	14.84	15.76
12	9.97	10.93	11.56	12.93	13.69	16.33	17.34
13	11.04	12.11	12.81	14.33	15.17	18.11	19.22
14	12.22	13.40	14.18	15.85	16.78	20.03	21.26
15	13.71	15.07	15.94	17.82	18.86	22.52	23.90
16	15.54	17.08	18.06	20.19	21.37	25.51	27.07
17	18.04	19.82	20.96	23.39	24.77	29.53	31.35
18	21.89	24.03	25.42	28.33	30.01	35.66	37.86
19	29.09	31.88	33.72	37.62	39.88	47.31	50.27
Limits f	for Dis	posable AGI	[.	1			
1	1.44	1.51	1.63	1.78	1.92	2.17	2.35
2	2.25	2.41	2.61	2.83	3.08	3.49	3.81
3	2.92	3.14	3.43	3.67	4.03	4.54	4.98
4	3.54	3.82	4.17	4.48	4.88	5.56	6.05
5	4.13	4.47	4.83	5.24	5.64	6.51	7.02
6	4.69	5.08	5.45	5.97	6.39	7.44	7.98
7	5.25	5.71	6.10	6.69	7.16	8.35	8.95
8	5.80	6.30	6.74	7.39	7.91	9.22	9.90
9	6.35	6.91	7.40	8.11	8.70	10.14	10.91
10	6.95	7.58	8.13	8.89	9.55	11.11	11.96
11	7.57	8.25	8.86	9.67	10.39	12.08	13.02
12	8.23	8.98	9.65	10.53	11.33	13.17	14.21
13	9.02	9.85	10.60	11.54	12.43	14.42	15.59
14	9.89	10.79	11.63	12.63	13.62	15.78	17.09
15	10.98	12.01	12.94	14.06	15.19	17.57	19.09
16	12.32	13.46	14.54	15.73	17.04	19.66	21.39
17	14.08	15.39	16.69	17.95	19.48	22.38	24.37
18	16.66	18.25	19.88	21.27	23.20	26.47	28.96
19	21.21	23.21	25.48	27.08	29.86	33.64	37.29
						•	

TABLE 5.7
TAX RATES. (Percent)

"Standard	Deduction	Tax Rat	es				
	BASE	BASE		BASE	REFORM	BASE	REFORM
	1986	1988	1988	1 1991	1991	1 1995	1995
Ventile							
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.65	0.63	0.00	1.05	0.00	1.28	0.00
3	2.37	2.57	0.50	3.25	0.86	3.62	1.43
4	4.43	4.58	2.07	5.15	2.67		3.46
5	6.23	6.41	3.98	6.99	4.98	7.48	5.57
6	7.69	7.87	5.94	8,39	6.57		7.09
7	8.79	9.01	7.15	9.59	7.72		8.24
8	9.94		8.21	10.88	8.79		9.28
9	11.09	11.36	9.13	11.97			10.15
10	11.90	12.17	9.81	12.83			10.88
11	12.85	13.20	10.61	13.95	_	_	11.93
12	13.75	14.07		14.74			12.67
13	14.40	14.76	12.09	15.57	_		13.41
14	15.54	15.97	13.00	16.79	13.77	17.65	14.48
15	16.23	16.56	13.69	17.39	14.33	18.32	14.92
16	17.18	17.63	14.45	18.45	14.98	19.24	15.52
17	18.12	18.48	14.92	19.42	15.68	20.30	16.41
18	19.70	20.09	16.31	21.06	17.25	22.02	18.15
19	22.63	22.48	18.01	23.26	18.62	24.03	19.18
20	30.19	30.05	24.16	31.11			25.32
					•		
Effec	ctive Tax F	Rates					
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.65	0.63	0.00	1.05	0.00	1.28	0.00
3	2.37	2.57	0.50	3.25	0.86	3.62	1.43
4	4.29	4.44	2.07	5.00	2.67	5.46	3.46
5	5.67	5.83	3.98	6.37	4.98	6.81	5.57
6	6.68	6.83	5.94	7.29	6.57	7.75	7.09
7	7.52	7.71	7.07	8.21	7.64	8.70	8.15
8	8.51	8.74	8.11	9.32	8.69	9.85	9.18
9	9.46	9.69	8.97	10.21	9.43	10.74	9.97
10	10.14	10.37	9.55	10.94	10.10	11.55	10.59
11	10.92	11.22	10.29	11.85	10.85	12.49	11.57
12	11.66	11.92	10.86	12.49	11.52	13.17	12.12
13	12.17	12.48	11.47	13.16	12.08	13.85	12.73
14	13.04	13.41	12.18	14.10	12.91	14.82	13.57
15	13.60	13.88	12.75	14.58	13.35	15.35	13.90
16	14.32	14.69	13.47	15.38	13.96	16.04	14.46
17	15.18	15.48	13.97	16.27	14.68	17.01	15.35
18	16.34	16.65	14.96	17.46	15.82	18.26	16.65
19	18.53	18.40	16.37	19.04	16.92	19.67	17.43
20	23.37	23.25	20.56	24.08	21.16	24.69	21.54
			-			-	•

TABLE 5.8

FEDERAL INCOME TAX LIABILITY. (billion \$)

	BASE 1986	BASE 1988	REFORM 1988	BASE 1991	REFORM 1991	BASE 1995 	REFORM 1995
Ventil	е						
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.15	0.16	0.00*	0.33	0.00*	0.51	0.00
2 3	0.77	0.92	0.19#	1.41	0.40*	2.03	0.85*
4	1.76	2.01	0.99#	2.75	1 •56 *	3.88	2.62
5 6	2.80	3.19	2.30*	4.24	3.51*	5.87	5.10*
6	3.83	4.35	4.00*	5.64	5.39	7.79	7 • 57
7 8	4.91	5.60	5.44	7.26	7.16	10.02	9.97
8	6.25	7.15	7.03	9.29	9.17	12.80	12.66
9	7.71	8.81	8.63	11.32	11.08	15.54	15.32
10	9.14	10.46	10.19	13.45	13.16	18.57	18.07
11	10.87	12.50	12.13	16.10	15.61	22.17	21.80
12	12.72	14.56	14.04	18.61	18.16	25.67	25.10
13	14.63	16.82	16.36	21 .6 4	21.04	29.88	29.13
14	17.38	20.03	19.27	25.69	24.91	35.36	34.37
15	20.12	23.06	22.40	29.54	28.63	40.77	39.17
16	23.94	27.61	26.77	35.24	33.87	48.12	46.06
17	29.06	33.23	31.72	42.50	40 .6 1	58.19	55.76
18	36.84	42.19	40.07	53.85	51.68	73.66	71.32
19	52.27	58.22	54.76 *	73.23	68.93*	98.65	92.80#
20	108.27	115.37	109.46#	145.90	137.10*	191.09	178.22*
Total	363.41	406 .24	385.75	518.00	491.97	700.57	665.88

^{* -} Denotes groups which receive a larger tax cut than the overall average in percentage terms.

TABLE 5.9

INDEX OF VENTILE LIMITS FOR DISPOSABLE PERSONAL INCOME.

(From a "Static" Simulation of the Model)

	BASE 1986	BASE 1988	REFORM 1988	BASE 1991	REFORM 1991	BASE 1995	REFORM 1995
Ventil							
1	20.109	20.204	20.077	19.611	19.492	19.490	19.372
2	35.497	35.446	35.395	34.624	34.621	34.264	34.244
3	53.418	53.426	53.282	52.101	52.016	51 .6 16	51.514
4	54.234	54.178	54.383*	53.160	53.402*	52.705	52.850*
· 5	56.445	56.431	56.752*	55.723	55.936#	55.431	55.522*
6	60.090	60.114	60.170*	59.672	59.551	59.576	59.374
7	64.947	65.090	64.796	64.858	64.462	64.950	64.496
8	69.261	69.447	69.042	69.376	68.894	69.602	69.084
9	74.058	74.273	73.819	74.294	73.814	74.598	74.091
10	79.567	79.886	79.445	80.051	79.588	80.453	79.976
11	85.166	85.571	85 . 181	85.826	85.409	86.309	85.838
12	92.012	92.461	92.131	92.819	92.431	93.400	92.963
13	99.557	100.104	99.743	100.538	100.121	101.199	100.768
14	108.633	109.224	108.842	109.649	109.229	110.340	109.950
15	1 20 .6 45	121.444	121.006	121.939	121.566	122.734	122.499
16	135.271	136.205	135.852	136.724	136 •500	137.657	137.544
17	154.037	155.082	155.037	155.456	155.359	156.315	156.172
18	182.027	183.551	183.983*	183.911	184, 195*	184.484	184.657*
19	244.477	248.858	250.283*	250.091	251.670*	252.149	253.903*
20	18.344	17.906	18.053*	17.982	18.158*	17.720	17.919
Di em	sahla nam	sonal inc	ome per ca	nite mes	n (in \$th	nuganda) •	
DISPO	12.44	13.64	13.78	16.09		20.08	20.36
	16.77	13.04	13.10	10.09	10 12	20.00	20.00

The numbers are indexes (mean=100) of the cutoff income between the ventile shown and the next ventile. Ventile 20 has that group's

share of all income.

^{*} Denotes groups made relatively better off by tax reform.

TABLE 5.10
USER COST OF CAPITAL BY INDUSTRY.

		BASE BASE 1986 1988	REFORM 1988	BASE 1991	REFORM 1991	BASE 1995	REFORM 1995
Inc	dustry						
1	Agriculture	385.51 390.93	412.07	427.88	450.20	500.63	526.73
2	Crude oil & gas	443.84 447.64	471.77	484.20	509.36	549.05	577.34
3	Mining	492.71 499.49	526.43	545.52	573.93	636.28	669.37
4	Construction	511.95 520.62	548.71	572.24	602.04	672.10	706.98
5	Food, tobacco	424.03 428.57	451 .6 2	465.54	489.76	537.10	564.90
6	Textiles	393.18 396.27	417.67	428.36	450.73	492.57	518.25
7	Knitting	382.59 384.75	405.57	414.52	436.21	474.15	498.94
8	Apparel&textile		431.04	439.98	462.86	499.31	525.12
9	Paper	389.12 393.22	414.30	425.96	448.05	490.31	515.62
10	_	421.56 423.56	446.41	454.91	478.65	516.19	542.97
11	Ag. fertilizer	387.98 393.81	414.86	428.60	450.79	497.50	523.16
12	Other chemicals		415.11	425.46	447.56	487.90	513.14
13	Petrol refining		416.06	426.17	448.28	486.30	511.40
14	Rubber, plastic		407.66	414.92	436 .6 1	471.72	496.34
15	Shoes, Leather	417.61 416.22	438.68	442.54	465.62	492.57	518.05
16	Lumber	444.21 450.98	475.28	494.89	520.64	579.06	609.01
17	Furni ture	424.30 427.82	450.89	463.75	487.91	532.82	560.44
18	Stone, clay, glas		438.94	450.54	474.02	517.34	544.22
19	Iron & steel	385.76 389.09	409.97	420.55	442.36	482.78	507.76
20	Non-fer metals	383.60 387.34	408.08	419.63	441.34	483.31	508.24
21	Metal products	404.99 407.67	429.67	440.51	463.47	504.81	531.04
22	Engine, turbine		408.40	408.92	430.23	450.54	473.82
23	Ag. machinery	382.21 381.05	401.63	404.63	425.74	451.27	474.69
25	Metalworkg mach		400.12	406.29	427.53	460.02	484.04
27	Spec ind mach	388.12 388.80	409.79	416.22	437.94	470.72	495.23
28	Mis n-elec mach		408.72	412.83	434.36	462.22	486.21
29	Computrs, office		399.77	405.40	426.40	456.24	479.74
30	Servic ind mach		415.74	421.36	443.34	474.63	499.32
31	Comm, elec comp		395.48	400.18	420.89	448.78	471.87
32	Elec app, distrb		398.47	404.72	425.69	457.12	480.71
33	Household appl	400.49 402.94	424.63	434.37	456.98	496.82	522.67
34	Elec light, wire		397.59	404.75	425.77	459.66	483.49
35	TV, radio, phono	371.38 370.49	390.33	393.53	413.88	438.28	460.79

TABLE 5.10 (continued)

USER COST OF CAPITAL BY INDUSTRY.

	BASE BASE		SE REFORM	BASE	REFORM
Industry	1986 1988		91 1991	1995	1995
_	•	•		464.74	489.10
36 Motor vehicles	377.72 378.99		_	•	-
37 Aerospace	375.18 372.34		.32 412.75	431.44	453.73
38 Ships & boats	387.62 388.52	-	.95 437.58	469.38	493.71
39 Other transp eq	387.90 388.88	409.80 416	.38 438.03	469.94	494.31
40 Instruments	401.48 400.77	422.40 426	.72 448.95	476.79	501.44
41 Misc mfg.	407.26 408.58	430.65 438	3.86 46 1.76	497.92	523.80
42 Railroads	320.59 325.37	342.91 357	.89 376.62	419.44	441.49
43 Air transport	538.62 548.98	578.65 611	.54 643.76	727.20	766.26
44 Truckg, oth trns	445.36 452.11	476 .55 499	.10 525.25	585.76	6 16 .55
45 Communic serv	386.42 392.79	413.39 429	450.89	501.25	526.53
46 Elec utilities	394.87 400.65	422.01 438	3.35 460.93	511.97	538.17
47 Gas, water, sewer	416.63 422.13	444.85 457	481.91	531.47	559.28
48 Whl & ret trade	489.63 495.13	521.74 539	9.43 567.47	622.24	654.30
49 Finance & ins	419.13 412.90	435.23 430	.53 453.03	463.14	486.94
50 Real estate	419.21 427.04	449.93 470	1.19 494.63	553.65	582.32
51 Hotels, repairs	475.52 483.22	509.12 530	.15 557.75	621.03	653.19
52 Business serv	426.74 422.65	445.47 444	1.44 467.62	484.67	509.59
53 Auto repair	495.13 503.69	530.85 555	.82 584.72	652.00	685.62
54 Movies, amusemts	424.05 430.61		2.57 497.23	554.53	583.36
55 Medic, educ, npo	441.35 449.07		.95 515.38	572.56	602.23
JJ uto, caac, npo	111100	., 5001 403	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	J 1 - 1 J 0	J

TABLE 5.11 EQUIPMENT INVESTMENT BY INDUSTRY. (billions of 77\$)

			rous or			_	
		BASE					
Industry	1986	1988	1988	1991	1991	1995	1995
All industries		205.78		•		•	
	_,,,,,	_0,00		-5-0.5			5 .00
Ag, min, const	45.63	42.69	41.10	46.82	44.86	52.20	49.71
						_	
1 Agriculture	10.53	11.04	10.80	12.99	12.71	14.05	13.66
2 Crude oil & gas 3 Mining	3.75	3.91	3.75	4.68	4.41	5.82	5.40
3 Mining	6.27	6.18	5.87	6.78	6.36	7.26	6.73
4 Construction	25.08	21.56	20.68	22.37	21.39	25.06	23.92
Non-durable goods	29.41	25.87	25.28	28.51	27.66	31.26	30.02
5 Food, tobacco	5.47			5.80	5.60	6.74	6.46
6 Textiles	1.29	1.24	1.22	1.37	1.31	1.22	1.16
7 Knitting		0.19		0.21	0.21	0.18	
8 Apparel&textile				0.52	0.52	0.49	0.48
9 Paper		4.06	2 07	4.44	ול כיול) OO	1172
10 Printing		2.35				2.79	
11 Ag. fertilizer				0.81			
12 Other chemicals				7.48			
13 Petrol refining	3.00	2.83	2.75	3.19	3.05	3.69	3.47
14 Rubber, plastic	1.78	1.63	1.60	2.02	1.97	1.95	1.90
15 Shoes & leather	0.18	0.13	0.13	0.12	0.12	0.11	
_							
Durable Goods	30.79	28.73	27.95	34.87	33.75	38.38	36.88
16 Lumber		1.56		-		1.63	
17 Furniture		0.33		0.41		0.39	
18 Stone, clay, glass					2.04	2.17	_
						•	
19 Iron & steel		2.35		2.43		2.47	
20 Non-ferr metals		0.94		1.14		1.40	
21 Metal products	_	2.35	2.29	2.72	2.63	2.73	
22 Engine, turbine	0.49	0.45	0.43	0.56	0.53	0.60	0.57
23 Ag. machinery	0.34	0.41	0.40	0.40	0.39	0.47	0.45
25 Metalworkg mach	0.64	0.58	0.56	0.70	0.68	0.75	0.71
		0.21	0.20	0.26	0.25	0.25	
28 Misc n-elec mach				2.70			
29 Computers, office			2.29	3.57			4.71
30 Service ind mach							
31 Comm, elec comp	3.14	3.17	3.08	4.37	4.23	5.00	4.79
32 Elec appl, distb		0.66	0.64	0.79	0.78	0.81	0.80
33 Household appl	0.31	0.28	0.28	0.30	0.30	0.27	0.27
34 Elec light, wire	0.63	0.63	0.61	0.76	0.73	0.77	0.74
35 TV, radio, phono		0.12	0.13	0.19	0.19	0.17	0.17
36 Motor vehicles	5.38	4.57	4.56	5.87	5.82	6.50	6.46
37 Aerospace	1.48	1.29	1.27	1.48	1.44	1.53	1.48
- · · · · ·							
38 Ships & boats	0.05	0.26	0.24	0.24	0.22	0.28	0.25
39 Other transp eq	0.11	0.12	0.12	0.15	0.14	0.15	0.14
40 Instruments	1.12	1.15	1.10	1.37	1.31	1.60	1.51
41 Misc Mfg	0.39	0.41	0.41	0.46	0.46	0.45	0.45

TABLE 5.11 (continued)

EQUIPMENT INVESTMENT BY INDUSTRY. (billions of 77\$)

Industry	BASE 1986	BASE 1988	REFORM 1988	•	REFORM 1991	BASE 1995	REFORM 1995
Transportation 42 Railroads 43 Air transport 44 Truckg, oth tran	12.99 4.46 3.99	13.17 4.28 4.16 4.74	12.99 4.19 4.20 4.59	15.48 5.33 4.97 5.19	15.03 5.11 4.98 4.95	15.39 4.88	14.74 4.61 5.14 4.99
Utilities 45 Communic servic 46 Elec utilities 47 Gas, water, sewer	29.55 18.39 7.40 3.76	31.81 20.92 7.31 3.57	31.52 20.73 7.30 3.48	36.65 24.37 8.49 3.80	35.97 23.87 8.46 3.64	41.25 27.14 10.05 4.06	40.25 26.38 10.02 3.85
48 Whl & ret trade	30.12	29.13	27.99	31.28	29.58	32.41	29.95
Fin, ins, real est 49 Finance & ins 50 Real estate	11.70 6.68 5.01	11.99 6.85 5.14	11.85 6.74 5.11	12.98 7.42 5.56	12.70 7.19 5.51	14.30 8.17 6.13	13.83 7.80 6.04
Services 51 Hotels, repair 52 Business service 53 Auto repair 54 Movies, amusemts 55 Medic, educ, npo	2.32	21.19 2.86 7.00 2.35 2.40 6.58	20.71 2.82 6.84 2.27 2.29 6.50	24.40 2.98 8.61 2.79 2.61 7.42	23.47 2.90 8.29 2.64 2.44 7.21	27.83 3.15 10.77 3.11 2.77 8.04	26.52 3.01 10.23 2.92 2.57 7.80
Miscellaneous 56 Personal autos 57 Sales of used eq	0.85 9.50 -8.65	1.20 9.47 -8.27	1.14 9.47 -8.33	1.42 9.77 -8.35	1.39 9.77 -8.38	1.80 9.92 -8.13	1.76 9.92 -8.16

TABLE 5.12

THE IMPACT OF TAX REFORM ON SELECTED ECONOMIC VARIABLES.

(Changes in percentages and billion dollars)

Economic Variable	19	88	1	995
	pet. e	h. \$ ch.	pet.ch.	\$ ch.
Gross national product (7	2\$) + 0.3	+ 6.1	+ 0.3	+ 5.5
Personal consumption (7	(2\$) + 0.8	+ 9.5	+ 0.9	+ 13.5
Equipment investment (7	(2\$) - 2.6	- 3.7	- 4.4	- 7.9
Structures (7	(2\$) + 0.4	+ 0.6	+ 0.1	+ 0.2
Inventory change (7	(2\$) + 0.2	+ 0.0	- 2.7	- 0.3
Exports (7	(2\$) + 0.1	+ 0.2	+ 0.2	+ 0.4
Imports (7	(2\$) + 0.3	+ 0.5	+ 0.2	+ 0.4
Government (7	(2\$) + 0.0	+ 0.0	+ 0.0	+ 0.0
Unemployment rate (po	t.) - 0.3		- 0.3	
Inflation (GNP Deflator) (po	t.) + 0.0		+ 0.0	-
AAA bond yield (basis poin	nts) + 2		+ 27	
10 year T-bond yld. (basis poin	nts) + 3	***	1 + 14	
Savings rate (pct. of disp. in	10.) + 0.4		+ 0.4	
Labor productivity (inc	iex) + 0.0		+ 0.0	
Cost of capital (avg.inc	lex) + 5.4		+ 5.2	
Fed. personal tax revenue (c	u\$) - 5.0	- 20 . 5	- 5.0	- 34.7
Disposable personal income (c	eu\$) + 1.0	+35.1	1 + 1.4	+ 72.6
Corporate profits after tax (c	u\$) - 5.0	-12.2	- 1.0	- 3.5
Personal dividend income (d	u\$) - 5.8	- 5.2	-17.5	- 20.6

APPENDIX A

THE INFORUM INVESTMENT EQUATIONS.

The INFORUM investment equations have been estimated for 53 industries as part of a joint estimation of investment, employment and energy demand within the framework of a Generalized Leontief Cost Function, (GLCF), also known as the Diewert function. The GLCF was chosen because of its flexibility, and the fact that factor demand equations, such as that for investment, can be derived directly. estimation imposes consistency upon the behavior of factor demands. Thus, if the investment equation for an industry indicates that an increase in the price of labor relative to capital will stimulate investment, the employment equation for that industry will indicate that this same price change will reduce the demand for labor. The equations assume that once investments have been made, businessmen cannot instantly adjust the size of their capital stock to changes in relative prices. For instance, if the relative cost of capital rises, the existing capital stock will not be reduced all at once, but old investment goods will be allowed to depreciate, and new investment in capital can be curtailed. However, investment will respond fairly rapidly to changes in output, since this implies a need for expansion of capacity. This approach results in a set of investment equations that are more sensitive to changes in output in the short run, but that reflect trends in relative prices in the long run (the time it takes to replace old equipment).

The theory underlying these investment equations assumes a well-behaved (twice differentiable, continuous and concave) production

function in which output(Q) in each industry can be expressed as a function of the capital stock(K), labor inputs(L) and energy inputs(E):

$$(A.1) Q = F(K, L, E)$$

Associated with this production function is a twice continuous, linearly homogeneous, monotonic and concave cost function. We use the cost function referred to above as the Generalized Leontief Cost Function (GLCF). Microeconomic theory states that from this cost function we can derive a set of factor demand functions for capital, labor and energy. In this framework, factor demands are based on output, relative prices of the three inputs, and a time trend for each input representing productivity growth. The expression for the demand for capital in year t arising from the GLCF is:

(A.2)
$$K_t = e^{-a_K t} *Q * \{b_{KL}(P_L/P_K)^{.5} + b_{KE}(P_E/P_K)^{.5} + b_{KK}\}$$

where: e = the base of natural logarithms

a_K = time trend for capital productivity

 P_{I} = the price of labor, the wage level

 P_{K} = the price of capital, or cost of capital

P_E = the price of energy

Q = output

 b_{Kj} = parameters to be estimated, for j=K, L, E

The b_{Kj} 's determine the degree of complementarity or substitutibility among inputs. If b_{KL} is positive, then capital and labor are

substitutes. If b_{KE} is negative, then capital and energy are complements. The time trend, a_K, accounts for all other factors that affect the level of capital required, and which move slowly over time. The form in which output enters the equation imposes constant returns to scale. This means that if the time trend were zero, and relative prices didn't change, a 1% increase in output would be associated with a 1% increases in the optimal capital stock.

The equation determines the optimal capital stock for each industry, based on outputs and relative prices. This demand for an optimal capital stock then translates into a demand for investment, depending on how the current capital stock compares to what is optimal. Total or gross investment can be viewed as consisting of two parts, net investment and replacement investment. Net investment is the net increase or decrease (almost always an increase) in the capital stock and is considered new investment. Replacement investment is funded out of depreciation, and replaces lost capacity due to worn out or obsolete equipment. Capacity is defined here as the ability to produce output, assuming the optimal capital-output ratio. So if the price of labor relative to capital rises, implying an increase in the optimal capital-output ratio, then more capital is required to replace the same amount of lost capacity than if prices had remained constant. through this process that relative prices affect the size of the capital The price of capital is determined by the cost of capital stock. formula defined and explained in the text.

Equations for investment, employment and energy demand have been estimated jointly for 55 industries comprising the U.S. economy. Table A.1 displays a summary of the estimated parameters, in the form of price

elasticities and elasticities of substitution. The own-price elasticity of capital is displayed in the 1st column. A value of -.335 in AGRICULTURE(1) means that all else equal, a 1% increase in the price of capital will result in a .335% decrease in the optimal capital stock desired by firms (or farms) in the agricultural sector. The 2nd and 3rd columns show the elasticity of capital with respect to prices of labor and energy. A 1% increase in wages relative to the cost of capital in the agriculture sector will result in a .345% increase in the optimal capital stock, and a 1% increase in the price of energy will result in a .010% decrease. In other words, labor and capital are substitutes in this industry, whereas energy and capital are slightly complementary. A quick perusal of the table will indicate that industries vary widely in their responses to changes in the price of capital, labor and energy. CRUDE PETROLEUM(2), MINING(3) and SHIPS AND BOATS(38) show a marked response to the cost of capital and labor, whereas HOUSEHOLD APPLIANCES(33), MOTOR VEHICLES(36) and ELECTRIC UTILITIES(46) show very little response. Most sectors show capital and energy as slight complements. In AGRICULTURAL FERTILIZERS(11), ENGINES & TURBINES(22) and AIR TRANSPORT(43) complementarity is more pronounced, while in STONE, CLAY & GLASS(18) and PETROLEUM REFINING(13), capital and energy are substitutes.

Table A.1 shows the estimated elasticities of investment with respect to the cost of capital and the cross-price elasticities with respect to labor and energy. The last column shows the change in investment by industry between the base and tax reform complete dynamic model simulation.

TABLE A.1

PRICE ELASTICITIES AND SIMULATION RESULTS.

	in du stry	PK	PKL	PKE	INVSTMT in '95 bil 77\$	% CH. from Cur. Law
1	AG RICULTURE	- 0.335	0.345	-0.010	13.66	- 2.8
		-0.669	0.674	-0.006	5.40	- 72
	MINING	-0.610	0.707	-0.097	6.73	- 7.3
_	CONSTRUCTION	-0.541	0.519	0.022	23.92	- 4.5
	FOOD, TOBACCO	-0.539	0.458	0.081	6.46	- 4.2
6	TEXTILES	-0.640	0.638	0.001	1.16	- 4.9
7	KNITTING, HOSIERY	-0.366	0.089			- 0.0
_	APPAREL	-0.295	0.322	-0.028	0.48	- 2.0
9	PA PER	-0.274	0.203	0.071	4.72	- 3.7
10	PRINTING	-0.557	0.581	-0.023	2.62	- 6.1
11	AGRI. FERTILIZER	-0.699	0.860	-0.161	0.78	-13.3
12	OTHER CHEMICALS	-0.198	0.163	0.035	8.14	- 2.0
_	PETRO. REFINING	-0.440	0.254	0.186		- 6.0
	RUBBER & PLASTIC	-0.244		-0.025	-	- 2.6
15	FOOTWEAR & LEATHER	-0.366		-0.033	0.11	- 0.0
	LUMB ER	-0.582		0.012		- 6.7
•	FU RN ITU RE	-0.168		-0.021	0.38	- 2.6
	STONE, CLAY & GLASS	-0.291		0.134		- 4.1
_	IRON & STEEL	-0.272		-0.104		- 4.5
	ENGINES & TURBINES	-0.319		-0.122	0.57	- 5.0
		-0.204		-0.038		- 4.3
_	METALWORKING MACHIN	-0.251	0.279	- 0.028		- 5.3
-	SPECIAL INDUSTRY	-0.221	0.247	-0.025		- 4.0
	MISC. NONELEC. MACH	-0.558	0.576	-0.018		- 9.9
	COMPUTERS	-0.284	0.334	-0.049		- 4.8
_	SERVICE IND MACH	-0.025		-0.083	_	- 0.0
	COMMUNICATIONS MACH	-0.174	0.181	-0.007	4.79	- 4.2
	HEAVY ELECTRICAL	-0.000	0.012	-0.012	0.80	- 1.2
	HOUSEHOLD APPLIANCES	0.000	0.028	-0.028		0.0
	ELEC. LIGHT & WIR	-0.251	0.276	-0.025	0.74	- 3.9
35	RADIO, T. V. RECEIVER	0.000	0.087	-0.087	0.17	0.0
	MOTOR VEHICLES	-0.000	0.000	0.000	6.46	- 0.6
	AEROS PA CE	-0.160	0.170	-0.011	1.48	- 3.3
_	SHIPS & BOATS	-0 .6 93	0.687	0.006		-10.7
39	OTHER TRANS. EQUIP	-0.262		-0.020		- 6.7
40	Instruments	-0.372		-0. 062	1.51	- 5.6
41	MISC. MFG.	-0.195	0.214	-0.019	0.45	- 0.0

TABLE A.1 (continued)

	INDUSTRY	PK	PKL	PKE	INVSTMNT in '95 bil 77\$	% CH. from CUR. LAW
42	RAIL ROADS	-0.202	0.191	0.011	4.61	- 5.5
43	AIR TRANSPORT	0.000	0.132	-0.132	5.14	0.4
44	TRUCKING & OTHER	-0.453	0.404	0.049	4.99	- 7.4
45	COMMUNICATIONS SERV	-0.055	0.054	0.001	26.38	- 2.8
46	ELECTRIC UTILITIES	-0.003	0.001	0.002	10.02	- 0.3
47	GAS, WATER & SANIT	-0.415	0.292	0.124	3.85	- 5.2
48	WHOLESALE & RETAIL	-0.461	0.663	-0.202	29.95	- 7.6
49	FINANCE, INSURANCE	-0.380	0.417	-0.036	7.80	- 4.5
50	REAL ESTATE	-0.201	0.223	-0.023	6.04	- 1. 5
51	HOTELS & REPAIRS	-0.389	0.580	-0.191	3.01	- 4.4
52	BUSINESS SERVICE	-0.341	0.440	-0.098	10.23	- 5.0
53	AUTO REPAIR & RENTAL	-0.287	0.336	-0.049	2.92	- 6.1
54	MOVIES & AMUSEMENTS	-0.400	0.505	-0.106	2.57	- 7.2
55	MEDICAL & ED. SERV	-0.058	0.092	-0.034	7.80	- 3.0
	TOTAL				243.66	- 4.4

APPENDIX B

THE USER COST OF CAPITAL.

Tax changes directly affect investment through changes in the user cost of capital. The user cost of capital is the return that an investment must earn in order to be profitable; it is the minimum return an asset must yield in order to pay taxes, recoup real depreciation, and cover the interest costs of financing its purchase. Naturally, a higher user cost of capital will tend to depress investment incentives. A profit-maximizing competitive firm will continue to invest until its marginal return to capital is equal to the user cost.

In a tax-free world, the user cost of an infinite lived asset would be the asset's price, P, times the expected market real rate of return, r, which represents the real financing cost of the asset.

Pr

Of course, actual capital assets decline in value over time, so to recoup this decline in value, the depreciation rate, d, times the price must be added to the user cost leaving:

UCC = P(r + d)

Now, suppose that a subsidy of C times the price were awarded to the investor. This would have the same effect as lowering the price of the asset, and therefore the entire user cost by C percent, resulting in the formula:

$$UCC = P(r + d)(1 - C)$$

Think of C as the subsidy provided by the investment tax credit. In the real world, the tax credit can only be applied against tax liabilities, so now the effects of taxes on the user cost of capital must be introduced.

A tax on corporate profits certainly will increase the return an asset must generate in order to pay for itself. If the expenditure on the asset is included in profits, (i. e. not deductible) the user cost must increase by a factor of 1/(1 - T), where T is the corporate tax rate. At a tax rate of fifty percent, the before tax rate of return must double in order to pay the taxes. If there is no deductibility, the user cost formula is:

$$UCC = P(r + d)(1 - C)/(1 - T)$$

If the initial expenditure on the asset is fully deductible, the amount of taxes saved is the tax rate times the asset price, so the user cost would be reduced accordingly. Under full deductibility, the formula is:

$$UCC = P(r + d)(1 - C - T)/(1 - T)$$

If half the asset purchase were deductible the tax rate term in the numerator would be multiplied by .5. In the actual corporate tax code the deduction for the purchase is taken in the form of depreciation deductions. Although the full purchase price is eventually deductible,

the present discounted value of the deductions is less than the purchase price because it is spread out over the "tax life" of the asset. The present values of the depreciation deductions vary greatly according to the asset's tax life and the discount rate used. Under current law, depreciation is based on historical costs which have not been adjusted for inflation, meaning that the expected nominal interest rate is appropriate for discount, and therefore the expected inflation rate will also greatly affect the present value of depreciation deductions. The present value of the depreciation stream is some fraction, Z, of the original purchase price of the asset, so Z should be multiplied by the tax rate T in the numerator, yielding the final form of the user cost formula:

$$UCC = P(r + d)(1 - TZ - C)/(1 - T)$$

The user cost varies among investing industries because the price of the equipment bought and the economic depreciation varies. Each industry is assumed to perceive the same market rate of return and each faces the same tax rate and investment tax credit. Economic depreciation and the tax depreciation depend on the type of equipment bought. The model simulations take into account the differing values for economic depreciation, but not the tax depreciation. The present value of the depreciation deduction is calculated assuming that all industries invest in equipment that has economy-wide average tax lives. The capital flow data show that this is a reasonable assumption.

Appendix C.

The CES Income Distribution Model.

This appendix describes the work done in fitting a constant elasticity of substitution (CES) function to the Lorenz curve of income distribution. This procedure is identical to the one described in the text up to the point of defining the function in equation 2.5 of Chapter 2. The CES function is depicted below in equation C.1. Kakwani and Podder show that the necessary restrictions of the Lorenz curve are met with the CES production function. Think of T as the "output" and S and $(\sqrt{2} - S)$ as the "factors". The function takes the form:

C.1)
$$T = a(dS^{-p} + (1-d)(\sqrt{2}-S)^{-p})^{-v/p}$$

The parameters are a,d,v, and p, and all must be positive, with 0 <= d <= 1. Their interpretations are analogous to those in the production function literature, and will be discussed later.

Estimation Procedure.

The estimations are done as before, in the cross section with grouped data. One curve is estimated for each household size and each year for which there are data. The data set includes 16 years, 1966 and 1968-1982, and six household sizes, one through five and six and over. There are 96 (6x16) curves estimated in all. The estimation is done as suggested by Kmenta: The equation C.1 is expressed in log form, then a Taylor series expansion of Log T is done around p=0, and the terms which contain p to a power greater than 1 are dropped. The resulting form is a linear approximation of the CES function and is estimated with ordinary least squares. The equation estimated is of the form:

C.2) Ln T = b1 + b2LnS + b3 Ln(
$$\sqrt{2}$$
-S) + b4(LnS- Ln($\sqrt{2}$ -S))² where antilog b1 = a; b2/(b2+b3) = d; b2+b3 = v; and -2b4(b2+b3)/b2b3 = p.

(See Kmenta p. 463)

The data presented in SOI are the amount of AGI and number of people in each income category. The data were adjusted so that there were 21 income categories for each year, so i varies from 1 to 21. Let agi thn and rthn be the amount of income and people in income category n, where the categories, n, are in ascending order according to income. AGI and R are total income and population for each household size. ythi and xthi are the percent cumulations of income and population. As before -

$$y_{thi} = \sum_{n=1}^{i} agi_{thn} / AGI_{th}$$

$$x_{thi} = \sum_{n=1}^{i} r_{thn}/R_{th}$$

The 21 S's and T's are generated by applying the x's and y's to the Lorenz curve transformation described in equations M.1 and M.2 from the mathematical appendix. They are used in the regression equation C.2 to estimate the parameters a, d, v & p. The number of data points reported per year varies from 18 to 31 (subscript n) according to the published detail. The observations were consolidated so that each year's data were divided into the same 21 income groups. For example, the data for 1979 thru 1981 have an income group for every thousand dollars between the ten and twenty thousand levels, while the groups for the other years are defined every five thousand dollars over that interval. The data

were consolidated because the parameter estimates were affected by the number and distribution of the observations used. Standardizing the data increases confidence that variations in the estimated parameters reflect changes in the income distribution, rather than changes in the grouping of the data. The data were grouped according to the following group boundaries in thousand of dollars: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, 50, 100, 200, 500, one million, and one million and over. Note that these numbers are not indexed to inflation. This means that there were more people in the lower groups in the earlier years, and more people in the upper groups in the later years. There is no inherent bias with this because the Lorenz curve is defined in percentage terms. Its just that the data points to which the curves are fit tend to move along the curve as the different years are estimated. Table C.1 shows the results of the estimations of equation C.2.

Once the parameters of the CES function have been estimated, the functional relationship between T and S is defined for each curve. However, the Lorenz curve must be defined in terms of a relationship between x and y. Due to the nature of the CES function and the Lorenz curve transformation, one cannot construct a function relating x to y. It must be solved numerically. This is done by setting up a sufficiently detailed grid relating chosen values of x to the corresponding values of y. Then to get the y corresponding to any x, a linear interpolation is performed between the points established in the grid. The grid was constructed by taking fifty equally spaced values of S (points along the line of equal distribution), and evaluating the function to get the corresponding values of T. The corresponding values for x and y are then easily gotten by equations M.3 and M.4. The

segments of the curve between the enumerated points are assumed to be linear. Linear interpolations are performed to obtain the specific points needed. For example, if the desired valuation of x is one-fourth of the way between two values for x established in the grid, then the value for y is taken to be one-fourth of the way between the two grid values for y. The size of fifty for the grid was chosen because it is large enough to give a very good approximation of the curvature of the Lorenz curve despite the use of linear interpolation. Experimentation with more detailed grids of size 100 and 200 did not change the results appreciably.

How well does this function really fit the income distribution data? Table C.1 shows that the parameter estimating equations fit the data very well. However, one must remember that these are the equations relating T to S. Table C.2 shows the results of taking the parameter estimates and constructing Lorenz curves. Then, the points along the horizontal axis, that is, the percentage population points were matched up to points at equally spaced intervals of 5% of the total, and the corresponding percent income points on the vertical axis were found. The first column shows the horizontal coordinates, and the next two columns show the actual and estimated vertical coordinates. The fits appear to be quite good when viewed this way. There is almost never a miss of over one percent, and the miss is usually smallest around the middle where most of the people are.

The third and fourth columns of table C.2 show the same data, but the cumulative percentages of income are converted to dollars of income per interval. The estimation is subtracted from the actual amount and shown as the percent residual in the last column per table. The residuals in dollar terms sum to zero by construction. At first glance, one might not be impressed with the relative size of the residuals. Particularly near the tails of the income distribution, the residuals are sometimes quite large in relation to income. Table C.2 shows the fit for the years 1966, 1970, 1975 and 1981. These years were chosen because of their chronological spacing only, and may be regarded as a representative sample of the procedure's fit for all years.

Unfortunately, the actual data are not reported in the ventile form. To convert the IRS reported data to ventiles in table C.2, a linear interpolation had to be done. The method used was equivalent to assuming that the persons in each interval were uniformly distributed over it, and then the persons were cumulated progressively to form the ventiles. The estimates, however, are results of the estimation procedure described above. In other words, they are derived from the grid constructed with the estimated CES parameters.

Within the Lorenz curve framework, there are many different types of functions which could be used to relate T to S. For example, a Cobb-Douglas function has all the desirable properties of the CES with one less parameter. That form was first estimated, but the CES was found to fit better. The Linear approximation of the CES function which was used in the estimation is identical to the estimation form of the Cobb-Douglas, but has included the substitution term. The substitution parameter was significant in improving the performance of the CES function.

There may be other functional forms which do as well as the CES function. Plotting T against S must yield an inverted U-shaped curve where the slope is never greater than forty five degrees. The obvious

function to try to fit to data like this is a polynomial. A second degree polynomial was first tried, but a third degree polynomial fit the data much better.

The alternative was of the form:

$$T = b1 + b2*S + b3*S^2 + b4*S^3$$

This specification is comparable to the CES function in that both estimate four parameters. The polynomial has the disadvantage of not restricting the ends of the estimated Lorenz curve to intersect (0,0) and (1,1), however, the estimated parameters come fairly close to the true end points. Overall, the fit was comparable to that of the CES function, but a careful examination of the residuals (estimated minus actual) of the noncumulated income in each IRS reported income interval reveals the superiority of the CES function.

The estimation of the cubic function yields high R-squared values, and estimates of b1 close to zero, indicating that the curve begins as it should, near the origin. The estimation of the cubic function and its reasonable fit to the data shows the flexibility of the approach taken for modeling the income distribution. There are, of course, many additional functional forms that could have been tried but were not. It would be worthwhile to continue trying different forms, but one should not judge the form by its ability to fit the data alone. The CES function has other desirable properties as well. 1) It is relatively easy to estimate its linear approximation with ordinary least squares.

2) The form assures that the estimated Lorenz curve has all the correct properties, such as always sloping upwards, and beginning and ending in the corners as it should. 3) The parameters of the CES funtion have economic interpretations. However, as we shall see, the interpretation

sometimes are not independent of one another, and therefore there is some ambiguity. The deviations from base function used and presented in the text avoids these ambiguities in the interpretation of the parameters. In addition, it was judged to be more elegant and simple, and it fit the data better with fewer parameters and therefore was chosen over the CES form.

Interpretation of the Parameters of the CES Function.

The parameters of the CES function (equation 2) can now be interpreted. In the production function literature, the parameters have the following interpretation:

- a is the efficiency parameter.
- d is the distribution parameter.
- v is the returns-to-scale parameter.
- p is the substitution parameter.

In a CES production function, output corresponds to the length T, which is a measure of inequality, while the inputs capital and labor correspond to S and $\sqrt{2}$ -S which is the position of point D along the line of equal distribution, that is, how far up the income scale the function is being evaluated.

Making general statements about the equality or lack of equality of a particular income distribution is hazardous. Only in a very few special cases can it be said without controversy that one distribution is "more equal" than another. A convention will be adopted here, regarding the use of the term "equality," with the realization that it may not conform to other notions of equality. From here on, an income distribution will be referred to as "more equal" over a certain range of

income if the length of the construct "T" of the Lorenz curve is on average shorter over that income range.

The parameter "a" indicates the efficiency of the inputs in producing the output, so therefore, a ceteris paribus increase in "a" would result in a longer length T, that is, a more bowed Lorenz curve. The more bowed the curve, the less equal the income distribution. Of the coefficients estimated in the equations (3), only b1 affects the size of "a," since a = antilog b1.

The returns-to-scale parameter, v, also affects how much the curve bows out. Because v enters the CES function with a negative sign, the curve bows out less as v increases, and vice versa. As the sum of b2 and b3, v will increase when either of those coefficients increase. However, the parameters s and p also vary with b2 and b3, so their effect on the shape of the curve can be ambiguous with regard to the overall equality of the income distribution.

The distribution parameter, d, is a measure of skewness of the function. If d is greater than 1/2, the Lorenz curve is skewed towards (1,1), meaning that the upper end of the distribution is more unequal than the lower end. As shown in the table below, d varies directly with b2 and inversely with b3. Because both b2 and b3 affect the values of both d and v, their effects on the equality of the income distribution depend on the location in that distribution.

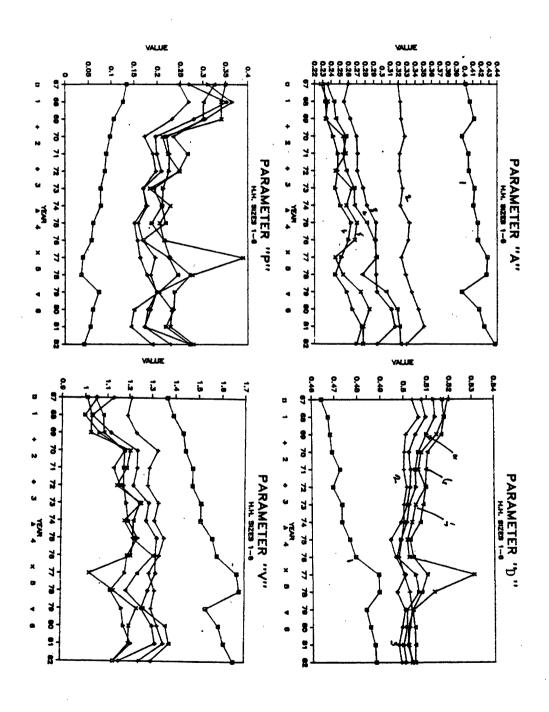
Finally, p, the substitution parameter would measure at what ratios capital and labor could be substituted for one another while keeping output constant. There is no direct analogy to this concept with the Lorenz curve since there can be no "isoquant" along which T is kept constant. However, changes in p do make differences in the shape of the

Lorenz curve. For example, as p increases (decreases), the distribution becomes more equal (unequal) at each end of the distribution, while not being affected much in the middle. The parameter p varies inversely with b2, b3, and b4.

The parameters b1 thru b4 have been estimated for 16 years of data at 6 household sizes. Cyclical or secular changes in these numbers are of considerable interest because once they are converted into the CES function parameters they allow inferences about movements in the income distribution over time. Figures C.1 to C.4 show the historical pattern of change in those parameters. Parameter "a", while having been relatively trendless for household size two, has been rising, especially in the larger household sizes, indicating a trend towards more unequal distributions. The v parameter shows an upward trend for all household sizes, indicating that the trend evident from the efficiency parameter is somewhat offset. The movements in parameter "d" would seem to indicate that the small asymetry in the Lorenz curves is being diminished. The decline in parameter "p" means that the income distribution is getting less equal within both the top and bottom end of

FIGURES C.1-4

TIME SERIES OF PARAMETERS A,D,V,AND P.



the income scale.

Because of the interaction of the four parameters on the shape of the curve, the trends in the parameters do not necessarily reflect unambiguous changes in the equality of the distribution. This especially holds true here, where the trends in "a" and "v" offset one another in terms of equality. Again, it is not easy to generalize about the equality of income distributions, but based on the same concepts discussed previously, some observations can be made. Enumerating the income distributions defined by the estimated parameters reveals that for household size one, AGI has been becoming more equally distributed over the sample period, especially at the bottom end. Household size two has also been getting more equal, but the trend is very small. The AGIs of the other household sizes have been getting slightly less equally distributed, however.

These time-series of parameters offer a special opportunity to study trends in the distribution of AGI. Of special interest is what affects the income distribution, and how it can be forecast. The most important determinants of income distribution are institutional in nature, and are very difficult, if not impossible to capture in an econometric model. It was hypothesized that some cyclical and secular economic variables have an effect on the Lorenz curve parameters. The variables thought to have an effect are the unemployment rate, the inflation rate, and the percent of personal income made up of interest and dividends.

A higher unemployment rate would be expected to make the income distribution more unequal. The people holding on to their jobs will continue earning their usual incomes, while those laid off will have

significant income cuts. Furthermore, these effects will be most pronounced at the lower end of the income distribution because most layoffs occur at the low end of the wage scale, and the laid off person will most likely end up in the lower income ventiles. Thus, a higher unemployment rate would be expected to have a positive influence on the efficiency parameter and a negative influence on the other three. The regression results are shown in table C.3. The unemployment rate had the expected signs for parameter "a" except for household size two where the coefficient was nearly zero. The signs were correct on the distribution parameter except for household size one. The signs were all as expected for the substitution parameter. However, the signs were not as expected for the returns-to-scale parameter, offsetting the effect from the efficiency parameter.

The percent of income mede up of interest and dividends is measured in the aggregate, not according to income ventile. So, while it is true that some lower income households, such as those headed by retirees, have a large share of their income from assets, the aggregate nature of the variable means that it is measuring income which is accruing primarily to households in the upper ventiles. Thus, an increase in this variable will tend to exacerbate the inequality of the income distribution as a whole. The influence on parameter a should be positive, and on parameter v, it should be negative. These signs are indeed the results of the regression equations, except for parameter v, household sizes one and six. More income in the form of interest and dividends will tend to make the lower end of the distributions more equal, since it brings up the income of retirees more to the levels of the working poor. At the same time the upper end will be made more

unequal as the high asset dominated incomes pull further away from high earned incomes. Therefore the expected sign for this variable on parameter d is positive, as the distribution becomes more skewed towards the upper end, while for parameter p, there is no a priori expectation, as the two ends are changing in opposite direction in terms of their equality. All the estimated coefficients for parameter s have the expected sign, while parameter p has one zero, four positive, and one negative coefficient.

The inflation rate is expected to influence the distribution of income because, due to institutional factors, some incomes are fixed, or not tied in any way to the general price level. These incomes will tend to fall behind in inflationary periods, making the distribution more skewed (assuming that persons on fixed incomes also occupy the lower end of the distribution). While it is true that the distribution would also become more skewed in disinflationary periods, no such periods occurred during the sample. At a stable price level, fixed and indexed incomes will not change relative to each other, so a more equal distribution would be expected. Thus the expected influence on parameters a and v are positive and negative, respectively. They turned out to be positive for both (except for parameter a, household size 1). To the extent that fixed incomes are at the lower end of the distribution, one would expect the inflation rate to influence parameters s and p in a negative way. This turns out to be the case, with one statistically insignificant exception.

The expectations of the signs in general were pretty much borne out by the regressions, except for the signs on the returns-to-scale parameter, v. Only the share of income in dividends and interest influences v in the expected direction. Even the historical time-series are somewhat paradoxical in that "a" and v exhibit trends which send conflicting signals about changes in the overall equality of the income distribution.

The unemployment rate and inflation rate have both been rising over the sample period, and are most responsible for explaining the trends of the parameters. These results are not inconsistent with the conclusion drawn in Chapter 2, with the possible exception of the inflation rate which did not have a statistically significant effect on the parameters in the functional form used there. Again here, it is interesting to note the differences in income distribution among the various household sizes. Single person households seem to be the most diverse, while households of five seem to have the most uniform incomes.

TABLE C.1
ESTIMATION RESULTS OF THE CES INCOME DISTRIBUTION MODEL.

```
YEAR 1967 HH SIZE 1 : YEAR 1967 HH SIZE 2 : YEAR 1967 HH SIZE 3
RSQ 0.9997 RBARSQ 0.9997 : RSQ 0.9997 RBARSQ 0.9996 : RSQ 0.9998 RBARSQ 0.9997
 RHO 0. 5824 AAPE 0. 7773 | RHO 0. 6756 AAPE 0. 8384 | RHO 0. 6241 AAPE 0. 7295 B1 -0. 9131 T-STAT -31. 39 | B1 -1. 1401 T-STAT -47. 10 | B1 -1. 3477 T-STAT -61. 32 B2 0. 6338 T-STAT 17. 31 | B2 0. 6096 T-STAT 24. 83 | B2 0. 5729 T-STAT 28. 81 B3 0. 7312 T-STAT 26. 82 | B3 0. 6005 T-STAT 24. 03 | B3 0. 5552 T-STAT 27. 08 B4 -0. 0228 T-STAT -6. 68 | B4 -0. 0375 T-STAT -11. 18 | B4 -0. 0379 T-STAT -15. 15
 YEAR 1967 HH SIZE 4 : YEAR 1967 HH SIZE 5 : YEAR 1967 HH SIZE 6
RSQ 0.9998 RBARSQ 0.9997 : RSQ 0.9993 RBARSQ 0.9992 : RSQ 0.9989 RBARSQ 0.9987
  RHO 0.5662 AAPE 0.6192 | RHO 0.6736 AAPE 1.0601 | RHO 0.7160 AAPE 1.4023
 B1 -1. 4634 T-STAT -59. 90 | B1 -1. 4793 T-STAT -37. 01 | B1 -1. 4476 T-STAT -29. 31
B2 0. 5411 T-STAT 24. 90 | B2 0. 5219 T-STAT 14. 55 | B2 0. 5435 T-STAT 12. 49
B3 0. 5132 T-STAT 22. 74 | B3 0. 4873 T-STAT 12. 98 | B3 0. 5029 T-STAT 10. 98
B4 -0. 0409 T-STAT -15. 02 | B4 -0. 0442 T-STAT -9. 64 | B4 -0. 0424 T-STAT -7. 74
                                                                                                                                                                                                HH SIZE 3
  YEAR 1968
                                     HH SIZE 1 : YEAR 1968
                                                                                                                     HH SIZE 2 ! YEAR 1968
  RSQ 0.9997 RBARSQ 0.9997 ; RSQ 0.9998 RBARSQ 0.9997 ; RSQ 0.9999 RBARSQ 0.9998
  RHO 0.6161 AAPE 1.0615 : RHO 0.6921 AAPE 0.7039 : RHO 0.5826 AAPE 0.5173
  HH SIZE 4 ! YEAR 1968
                                                                                                                     HH SIZE 5 : YEAR 1968
   RSQ 0. 9997 RBARSQ 0. 9997 | RSQ 0. 9989 RBARSQ 0. 9987 | RSQ 0. 9983 RBARSQ 0. 9980
  RHO 0.5864 AAPE 0.5778 | RHO 0.7552 AAPE 1.3099 | RHO 0.7828 AAPE 1.6547 | RHO 0.5864 AAPE 0.5778 | RHO 0.7552 AAPE 1.3099 | RHO 0.7828 AAPE 1.6547 | RHO 0.7828 AAPE 1.654
                                     HH SIZE 1 : YEAR 1969
                                                                                                                     HH SIZE 2 : YEAR 1969
                                                                                                                                                                                                HH SIZE 3
   YEAR 1949
   RSQ 0.9997 RBARSQ 0.9996 | RSQ 0.9996 RBARSQ 0.9996 | RSQ 0.9998 RBARSQ 0.9998
   RHD 0.6439 AAPE 1.0965 ; RHD 0.7301 AAPE 0.8282 ; RHD 0.7367 AAPE 0.6008
   B1 -0.8875 T-STAT -29.19 | B1 -1.1294 T-STAT -39.81 | B1 -1.3381 T-STAT -61.57
  B2 0. 6710 T-STAT 18. 06 | B2 0. 6175 T-STAT 21. 09 | B2 0. 5637 T-STAT 27. 13
B3 0. 7625 T-STAT 25. 86 | B3 0. 6152 T-STAT 20. 41 | B3 0. 5527 T-STAT 25. 77
B4 -0. 0189 T-STAT -4. 99 | B4 -0. 0357 T-STAT -8. 61 | B4 -0. 0390 T-STAT -14. 06
                                     HH SIZE 4 : YEAR 1969
                                                                                                                     HH SIZE 5
                                                                                                                                                   : YEAR 1969
   RSQ 0. 9999 RBARSQ 0. 9998 : RSQ 0. 9993 RBARSQ 0. 9992 : RSQ 0. 9990 RBARSQ 0. 9988
   RHO 0.4483 AAPE 0.4131 | RHO 0.7571 AAPE 1.0431 | RHO 0.7894 AAPE 1.2610
  B1 -1. 4496 T-STAT -72. 51 | B1 -1. 4550 T-STAT -32. 33 | B1 -1. 4047 T-STAT -25. 45
B2 0. 5418 T-STAT 29. 57 | B2 0. 5265 T-STAT 12. 61 | B2 0. 5398 T-STAT 10. 64
B3 0. 5209 T-STAT 27. 67 | B3 0. 4971 T-STAT 11. 48 | B3 0. 5241 T-STAT 9. 81
B4 -0. 0404 T-STAT -17. 16 | B4 -0. 0436 T-STAT -7. 95 | B4 -0. 0406 T-STAT -5. 89
   YEAR 1970 HH SIZE 1 : YEAR 1970 HH SIZE 2 : YEAR 1970 HH SIZE 3
RSQ 0.9997 RBARSQ 0.9996 : RSQ 0.9998 RBARSQ 0.9997 : RSQ 0.9999 RBARSQ 0.9998
                                                  1. 1421 : RHQ 0. 7147 AAPE 0. 7462 : RHQ 0. 6732 AAPE 0. 5654
   RHO 0. 6530 AAPE
B1 -0.9238 T-STAT -31.48 : B1 -1.1153 T-STAT -50.19 : B1 -1.3107 T-STAT -71.13 B2 0.6773 T-STAT 19.81 : B2 0.6634 T-STAT 30.82 : B2 0.6215 T-STAT 38.05 B3 0.7667 T-STAT 27.96 : B3 0.6628 T-STAT 29.66 : B3 0.6161 T-STAT 35.92 B4 -0.0175 T-STAT -5.16 : B4 -0.0287 T-STAT -9.98 : B4 -0.0303 T-STAT -14 70
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YEAR 1970 HH SIZE 4 ! YEAR 1970 HH SIZE 5 ! YEAR 1970 HH SIZE 6
RSQ 0.9999 RBARSQ 0.9999 ! RSQ 0.9998 RBARSQ 0.9997 ! RSQ 0.9995 RBARSQ 0.9994
RHO 0.5032 AAPE 0.3734 : RHO 0.5850 AAPE 0.6868 : RHO 0.6904 AAPE 0.9193
B1 -1.4176 T-STAT -88.33 : B1 -1.3709 T-STAT -50.98 : B1 -1.3567 T-STAT -34.04
B2 0.5969 T-STAT 44.06 : B2 0.6119 T-STAT 26.96 : B2 0.6014 T-STAT 16.60
B3 0.5822 T-STAT 40.80 : B3 0.5939 T-STAT 24.65 : B3 0.5771 T-STAT 15.36
B4 -0.0325 T-STAT -19.69 : B4 -0.0319 T-STAT -11.51 : B4 -0.0345 T-STAT -7.51
YEAR 1971 HH SIZE 1 ! YEAR 1971 HH SIZE 2 ! YEAR 1971 HH SIZE 3 RSQ 0.9997 RBARSQ 0.9997 ! RSQ 0.9998 ! RSQ 0.9999 RBARSQ 0.9998
RHO 0,6727 AAPE 1.1168 | RHO 0,7103 AAPE 0.6622 | RHO 0.7064 AAPE 0.5297
B1 -0. 9045 T-STAT -33.02 | B1 -1.1341 T-STAT -52.96 | B1 -1.3063 T-STAT -70.24
B2 0.6972 T-STAT 22.15 | B2 0.6453 T-STAT 30.65 | B2 0.6219 T-STAT 36.83
B3 0.7787 T-STAT 30.31 | B3 0.6454 T-STAT 29.35 | B3 0.6147 T-STAT 34.80
B4 -0.0164 T-STAT -5.16 | B4 -0.0308 T-STAT -10.66 | B4 -0.0308 T-STAT -14.20
YEAR 1971 HH SIZE 4 ! YEAR 1971 HH SIZE 5 ! YEAR 1971 HH SIZE 6
RSQ 0.9999 RBARSQ 0.9999 ! RSQ 0.9998 RBARSQ 0.9997 ! RSQ 0.9994 RBARSQ 0.9993
RHO 0.4479 AAPE 0.3337 ! RHO 0.5858 AAPE 0.5932 ! RHO 0.7630 AAPE 0.9530
B1 -1.3947 T-STAT -99.55 | B1 -1.3586 T-STAT -54.74 | B1 -1.3715 T-STAT -33.16
B2 0.5935 T-STAT 48.64 | B2 0.6026 T-STAT 27.72 | B2 0.5753 T-STAT 15.05
B3 0.5820 T-STAT 45.45 | B3 0.5879 T-STAT 25.52 | B3 0.5537 T-STAT 13.83
B4 -0.0332 T-STAT -21.80 | B4 -0.0331 T-STAT -12.05 | B4 -0.0375 T-STAT -7:45
                              HH SIZE 1 ! YEAR 1972
                                                                                            HH SIZE 2 : YEAR 1972
                                                                                                                                                         HH SIZE 3
RSQ 0.9997 RBARSQ 0.9997 | RSQ 0.9998 RBARSQ 0.9998 | RSQ 0.9998 RBARSQ 0.9998 RHO 0.6433 AAPE 1.0987 | RHO 0.7288 AAPE 0.6340 | RHO 0.7061 AAPE 0.5718
B1 -0. 9030 T-STAT -32. 70 ! B1 -1. 1355 T-STAT -52. 79 ! B1 -1. 3083 T-STAT -62. 43 B2 0.6920 T-STAT 21. 91 ! B2 0.6434 T-STAT 29. 90 ! B2 0.6132 T-STAT 32. 12 B3 0.7823 T-STAT 29. 58 ! B3 0.6400 T-STAT 28. 45 ! B3 0.6066 T-STAT 30. 32 B4 -0.0158 T-STAT -4. 75 ! B4 -0.0317 T-STAT -10. 54 ! B4 -0.0319 T-STAT -12. 90
 YEAR 1972 HH SIZE 4 ! YEAR 1972 HH SIZE 5 ! YEAR 1972 HH SIZE 6
RSQ 0. 9999 RBARSQ 0. 9999 ! RSQ 0. 9997 RBARSQ 0. 9996 ! RSQ 0. 9995 RBARSQ 0. 9994
 RHO 0.4328 AAPE 0.3353 | RHO 0.7042 AAPE 0.7314 | RHO 0.7845 AAPE 0.8918
B1 -1.3971 T-STAT -93.72 | B1 -1.4061 T-STAT -44.11 | B1 -1.3557 T-STAT -33.32 B2 0.5941 T-STAT 46.05 | B2 0.5832 T-STAT 20.95 | B2 0.5910 T-STAT 15.88 B3 0.5820 T-STAT 42.81 | B3 0.5617 T-STAT 19.09 | B3 0.5690 T-STAT 14.63 B4 -0.0331 T-STAT -20.49 | B4 -0.0355 T-STAT -10.05 | B4 -0.0357 T-STAT -7.32
                            HH SIZE 1 ! YEAR 1973
                                                                                            HH SIZE 2 : YEAR 1973
                                                                                                                                                       HH SIZE 3
 RSQ 0.9997 RBARSQ 0.9997 ! RSQ 0.9997 RBARSQ 0.9997 : RSQ 0.9998 RBARSQ 0.9998
 RHO 0. 6548 AAPE 1. 0873 : RHO 0. 7277 AAPE 0. 7667 : RHO 0. 6527 AAPE 0. 6166
B1 -0. 8863 T-STAT -34. 21 : B1 -1. 1234 T-STAT -45. 63 : B1 -1. 2819 T-STAT -63. 31
B2 0. 7155 T-STAT 24. 57 : B2 0. 6651 T-STAT 28. 17 : B2 0. 6463 T-STAT 37. 14
B3 0. 7961 T-STAT 32. 69 : B3 0. 6651 T-STAT 26. 77 : B3 0. 6428 T-STAT 34. 76
B4 -0. 0145 T-STAT -4. 84 : B4 -0. 0283 T-STAT -8. 90 : B4 -0. 0274 T-STAT -12. 71
 YEAR 1973 HH SIZE 4 ; YEAR 1973 HH SIZE 5 ; YEAR 1973 HH SIZE 6
RSQ 0.9999 RBARSQ 0.9999 ; RSQ 0.9998 RBARSQ 0.9997 ; RSQ 0.9995 RBARSQ 0.9994
```

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YEAR 1974 HH SIZE 1 : YEAR 1974 HH SIZE 2 : YEAR 1974 HH SIZE 3 RSQ 0.9997 RBARSQ 0.9997 : RSQ 0.9998 RBARSQ 0.9997 ! RSQ 0.9997 RBARSQ 0.9997
RSG 0. 9997 RBARSG 0. 9997 | RSG 0. 9997 RBARSG 0. 
YEAR 1974 HH SIZE 4 ! YEAR 1974 HH SIZE 5 ! YEAR 1974 HH SIZE 6
RSQ 0. 9999 RBARSQ 0. 9999 ! RSQ 0. 9999 ! RSQ 0. 9997 RBARSQ 0. 9996
  RHO 0.6034 AAPE 0.4839 | RHO 0.4171 AAPE 0.3767 | RHO 0.7003 AAPE 0.7333
 B1 -1.3828 T-STAT -74.06 | B1 -1.3556 T-STAT -72.31 | B1 -1.3188 T-STAT -41.89
B2 0.6004 T-STAT 37.96 | B2 0.5941 T-STAT 36.24 | B2 0.6195 T-STAT 22.54
B3 0.5973 T-STAT 35.36 | B3 0.5859 T-STAT 33.45 | B3 0.6025 T-STAT 20.51
B4 -0.0315 T-STAT -15.93 | B4 -0.0336 T-STAT -15.95 | B4 -0.0320 T-STAT -9.10
 YEAR 1975 HH SIZE 1 ! YEAR 1975 HH SIZE 2 ! YEAR 1975 HH SIZE 3 RSQ 0.9997 RBARSQ 0.9996 ! RSQ 0.9996 RBARSQ 0.9996 ! RSQ 0.9997 RBARSQ 0.9996
 RHO 0. 6693 AAPE 1.1107 | RHO 0.7643 AAPE 0.9555 | RHO 0.7217 AAPE 0.9018 B1 -0.8758 T-STAT -31.17 | B1 -1.0984 T-STAT -36.70 | B1 -1.2269 T-STAT -44.39 B2 0.7432 T-STAT 24.30 | B2 0.6757 T-STAT 23.11 | B2 0.6543 T-STAT 27.50 B3 0.8163 T-STAT 29.80 | B3 0.6788 T-STAT 21.91 | B3 0.6693 T-STAT 25.95 B4 -0.0119 T-STAT -3.43 | B4 -0.0271 T-STAT -6.73 | B4 -0.0251 T-STAT -8.25
                                                                                                                                                                                       HH SIZE 5 ! YEAR 1975
                                                                                                                                                                                                                                                                                                                 HH SIZE 6
                                                           HH SIZE 4 ! YEAR 1975
  RSQ 0. 9998 RBARSQ 0. 9998 | RSQ 0. 9998 RBARSQ 0. 9998 | RSQ 0. 9999 RBARSQ 0. 9999
 RHO 0.6916 AAPE 0.6356 | RHO 0.4727 AAPE 0.5261 | RHO 0.3500 AAPE 0.3151 | RHO 0.4727 AAPE 0.5261 | RHO 0.3500 AAPE 0.3151 | RHO 0.4727 AAPE 0.5261 | RHO 0.3500 AAPE 0.3151 | RHO 0.4727 AAPE 0.5261 | RHO 0.4727 AAPE 0.3151 | RHO 0.4727 | RHO
  84 -0.0293 T-STAT -11.56 | 84 -0.0315 T-STAT -13.96 | 84 -0.0332 T-STAT -15.66
                                                          HH SIZE 1 | YEAR 1976
                                                                                                                                                                                        HH SIZE 2 | YEAR 1976
                                                                                                                                                                                                                                                                                                                 HH SIZE 3
  RSQ 0.9997 RBARSQ 0.9996 ! RSQ 0.9996 RBARSQ 0.9995 ! RSQ 0.9996 RBARSQ 0.9995
  RHO 0. 6751 AAPE 1. 1106 | RHO 0. 7672 AAPE 0. 9663 | RHO 0. 7687 AAPE 0. 9484
 B1 -0.8761 T-STAT -32.02 | B1 -1.1037 T-STAT -34.00 | B1 -1.2295 T-STAT -38.85
B2 0.7565 T-STAT 26.13 | B2 0.6642 T-STAT 20.75 | B2 0.6546 T-STAT 23.57
B3 0.8225 T-STAT 31.07 | B3 0.6701 T-STAT 19.72 | B3 0.6640 T-STAT 22.15
B4 -0.0112 T-STAT -3.39 | B4 -0.0283 T-STAT -6.33 | B4 -0.0260 T-STAT -7.26
                                                          HH SIZE 4 ! YEAR 1976
                                                                                                                                                                                      HH SIZE 5 ! YEAR 1976
                                                                                                                                                                                                                                                                                                                 HH SIZE 6
  RSQ 0.9997 RBARSQ 0.9996 ! RSQ 0.9999 RBARSQ 0.9999 ! RSQ 0.9999 RBARSQ 0.9998 RHO 0.7859 AAPE 0.7442 ! RHO 0.3666 AAPE 0.4550 ! RHO 0.4301 AAPE 0.4280
 B1 -1.3473 T-STAT -46.42 | B1 -1.3188 T-STAT -71.90 | B1 -1.2335 T-STAT -61.99
B2 0.5933 T-STAT 23.26 | B2 0.6076 T-STAT 37.98 | B2 0.6597 T-STAT 37.70
B3 0.6007 T-STAT 21.88 | B3 0.6024 T-STAT 35.21 | B3 0.6492 T-STAT 35.72
B4 -0.0320 T-STAT -9.64 | B4 -0.0324 T-STAT -15.82 | B4 -0.0277 T-STAT -12.57
                                                                                                                                                                                        HH SIZE 2 ! YEAR 1977
                                                          HH SIZE 1 ! YEAR 1977
                                                                                                                                                                                                                                                                                                                  HH SIZE 3
   RSQ 0.9993 RBARSQ 0.9992 | RSQ 0.9994 RBARSQ 0.9993 | RSQ 0.9993 RBARSQ 0.9991
 RHO 0.4166 AAPE 1.4776 | RHO 0.6250 AAPE 0.9937 | RHO 0.7280 AAPE 1.1527 B1 -0.8489 T-STAT -20.35 | B1 -1.1282 T-STAT -29.58 | B1 -1.2274 T-STAT -28.94 B2 0.8144 T-STAT 18.37 | B2 0.6452 T-STAT 16.86 | B2 0.6602 T-STAT 17.45 B3 0.8511 T-STAT 20.77 | B3 0.6454 T-STAT 15.85 | B3 0.6590 T-STAT 15.97 B4 -0.0079 T-STAT -1.53 | B4 -0.0315 T-STAT -5.75 | B4 -0.0269 T-STAT -5.34
```

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YEAR 1977 HH SIZE 4 ! YEAR 1977 HH SIZE 5 ! YEAR 1977 HH SIZE 6
RSQ 0, 9998 RBARSQ 0, 9997 ! RSQ 0, 9984 RBARSQ 0, 9981 ! RSQ 0, 9997 RBARSQ 0, 9997
RHO 0, 5934 AAPE 0, 6279 ! RHO 0, 6532 AAPE 1, 4338 ! RHO 0, 4906 AAPE 0, 6292
B1 -1. 3790 T-STAT -52. 79 ! B1 -1. 4080 T-STAT -20. 12 ! B1 -1. 2248 T-STAT -44. 22
B2 0. 5976 T-STAT 26. 71 ! B2 0. 5426 T-STAT 8. 99 ! B2 0. 6324 T-STAT 25. 03
B3 0. 5859 T-STAT 24. 53 ! B3 0. 4793 T-STAT 7. 52 ! B3 0. 6077 T-STAT 22. 28
84 -0.0336 T-STAT -11.84 : 84 -0.0495 T-STAT -6.46 : 84 -0.0347 T-STAT -10.19
                                    HH SIZE 1 | YEAR 1978
                                                                                                                     HH SIZE 2 : YEAR 1978
YEAR 1978
                                                                                                                                                                                                   HH SIZE 3
RSQ 0.9993 RBARSQ 0.9992 ; RSQ 0.9997 RBARSQ 0.9996 ; RSQ 0.9995 RBARSQ 0.9994
RHO 0. 4494 AAPE 1. 4484 ; RHO 0. 5529 AAPE 0. 8088 ; RHO 0. 6686 AAPE 0. 9702 B1 -0. 8516 T-STAT -20. 78 ; B1 -1. 1119 T-STAT -37. 38 ; B1 -1. 2274 T-STAT -34. 15 B2 0. 8195 T-STAT 19. 15 ; B2 0. 6604 T-STAT 22. 21 ; B2 0. 6386 T-STAT 19. 68 B3 0. 8559 T-STAT 21. 08 ; B3 0. 6546 T-STAT 20. 69 ; B3 0. 6468 T-STAT 18. 37 B4 -0. 0072 T-STAT -1. 40 ; B4 -0. 0306 T-STAT -7. 23 ; B4 -0. 0286 T-STAT -6. 59
                                    HH SIZE 4 ! YEAR 1978
                                                                                                                     HH SIZE 5 : YEAR
                                                                                                                                                                                                   HH SIZE 6
                                                                                                                                                                           1978
RSQ 0. 9995 RBARSQ 0. 9994 | RSQ 0. 9998 RBARSQ 0. 9997 | RSQ 0. 9998 RBARSQ 0. 9998
RSQ 0.9995 RBARSQ 0.9994 ! RSQ 0.9998 RBARSQ 0.9997 ! RSQ 0.9998 RBARSQ 0.9999 RBARSQ 0.9999 RBARSQ 0.9999 RBARSQ 0.9998 RBARSQ 
                                                                                                                     HH SIZE 2 : YEAR 1979
YEAR 1979
                                    HH SIZE 1 ! YEAR 1979
                                                                                                                                                                                                   HH SIZE 3
RSQ 0. 7973 RBARSQ 0. 7972 | RSQ 0. 7978 RBARSQ 0. 7978 | RSQ 0. 7978 RBARSQ 0. 7977 RHO 0. 6186 AAPE | 1. 3151 | RHO 0. 5464 AAPE | 0. 5681 | RHO 0. 6573 AAPE | 0. 6566
B1 -0. 9244 T-STAT -23. 17 | B1 -1. 0913 T-STAT -49. 64 | B1 -1. 2243 T-STAT -49. 42 B2 0. 7405 T-STAT 17. 46 | B2 0. 6543 T-STAT 28. 70 | B2 0. 6295 T-STAT 27. 25 B3 0. 7911 T-STAT 18. 48 | B3 0. 6461 T-STAT 27. 63 | B3 0. 6289 T-STAT 26. 15 B4 -0. 0140 T-STAT -2. 41 | B4 -0. 0323 T-STAT -9. 86 | B4 -0. 0313 T-STAT -10. 15
 YEAR 1979
                                     HH SIZE 4 ! YEAR 1979
                                                                                                                      HH SIZE 5 ! YEAR 1979
 RSQ 0. 7978 RBARSQ 0. 7978 ! RSQ 0. 7978 RBARSQ 0. 7778 ! RSQ 0. 7977 RBARSQ 0. 7977
 RHD 0, 5923 AAPE 0, 5433 | RHD 0, 2270 AAPE 0, 4436 | RHD 0, 2379 AAPE 0, 3581
B1 -1. 3539 T-STAT -63. 83 | B1 -1. 2923 T-STAT -65. 53 | B1 -1. 1862 T-STAT -73. 24
B2 0. 5852 T-STAT 31. 62 | B2 0. 6229 T-STAT 36. 80 | B2 0. 6371 T-STAT 41. 10
B3 0. 5826 T-STAT 30. 43 | B3 0. 6137 T-STAT 35. 28 | B3 0. 6286 T-STAT 38. 82
B4 -0. 0346 T-STAT -14. 63 | B4 -0. 0313 T-STAT -14. 68 | B4 -0. 0321 T-STAT -14. 97
                                    HH SIZE 1 : YEAR 1980
                                                                                                                     HH SIZE 2 : YEAR 1980
 YEAR 1980
 rsq 0.7774 RBARSq 0.7773 | RSq 0.7778 RBARSq 0.7778 | RSq 0.7776 RBARSq 0.7775
RHO 0.6453 AAPE 1.3041 | RHO 0.5299 AAPE 0.5557 | RHO 0.7227 AAPE 0.8587 B1 -0.8729 T-STAT -23.36 | B1 -1.0671 T-STAT -49.20 | B1 -1.1659 T-STAT -36.70
B2 0. 7702 T-STAT 19. 50 | B2 0. 6664 T-STAT 29. 95 | B2 0. 6516 T-STAT 22. 00
B3 0. 8169 T-STAT 20. 27 | B3 0. 6607 T-STAT 28. 99 | B3 0. 6544 T-STAT 21. 18
B4 -0. 0119 T-STAT -2. 19 | B4 -0. 0309 T-STAT -9. 72 | B4 -0. 0294 T-STAT -7. 43
 YEAR 1980 HH SIZE 4 ! YEAR 1980 HH SIZE 5 ; YEAR 1980 HH SIZE 6
RSQ 0.9998 RBARSQ 0.9997 ! RSQ 0.9999 RBARSQ 0.9999 ; RSQ 0.9998 RBARSQ 0.9998
 RHO 0.6011 AAPE 0.6293 | RHO 0.1003 AAPE 0.3651 | RHO 0.4103 AAPE 0.4599
 BI -1.3283 T-STAT -54.79 ; B1 -1.2543 T-STAT -78.54 ; B1 -1.1433 T-STAT -54.66
B2 0.5905 T-STAT 28.44 ! B2 0.6034 T-STAT 41.60 ! B2 0.6871 T-STAT 36.14
B3 0.5881 T-STAT 27.67 ! B3 0.5998 T-STAT 40.00 ! B3 0.6751 T-STAT 35.18
B4 -0.0346 T-STAT -13.24 ! B4 -0.0347 T-STAT -18.01 ! B4 -0.0256 T-STAT -10.34
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YEAR 1981 HH SIZE 1 ! YEAR 1981 HH SIZE 2 ! YEAR 1981 HH SIZE 3 RSQ 0.9995 RBARSQ 0.9994 ! RSQ 0.9995 RBARSQ 0.9994 ! RSQ 0.9998 RBARSQ 0.9995 RBARSQ 0.9994 RHO 0.6496 AAPE 1.2166 ! RHO 0.5296 AAPE 0.5339 ! RHO 0.7063 AAPE 0.9334 B1 -0.8582 T-STAT -23.68 ! B1 -1.0478 T-STAT -46.14 ! B1 -1.1519 T-STAT -30.67 B2 0.7845 T-STAT 20.43 ! B2 0.6786 T-STAT 29.29 ! B2 0.6563 T-STAT 18.35 B3 0.8257 T-STAT 20.68 ! B3 0.6751 T-STAT 28.55 ! B3 0.6563 T-STAT 17.65 B4 -0.0110 T-STAT -2.03 ! B4 -0.0292 T-STAT -8.84 ! B4 -0.0286 T-STAT 17.65 RSQ 0.9997 RBARSQ 0.9996 ! RSQ 0.9998 RBARSQ ```

TABLE C. 2 FIT OF THE CES INCOME DISTRIBUTION MODEL.

| YEAR 1981 H                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | DUSEHOLD                                                                                                                                                                                     | SIZE 1                                                                                                                                                                                                 | t                                                                                      | YE                                                                                                                                                  | AR 1981                                                                                                                                                       | HOUSE                                                                   | HOLD                                                                                | SIZE 2                    |                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ACTUAL   ACTUAL ESTIM.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                              | _                                                                                                                                                                                                      |                                                                                        |                                                                                                                                                     |                                                                                                                                                               |                                                                         |                                                                                     |                           | RESID.                                                                                                                                                                                        |
| % POP. 1 % AGI 1 % AGI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                              |                                                                                                                                                                                                        |                                                                                        | POP. 1 %                                                                                                                                            |                                                                                                                                                               |                                                                         |                                                                                     |                           |                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                              |                                                                                                                                                                                                        |                                                                                        |                                                                                                                                                     |                                                                                                                                                               |                                                                         |                                                                                     |                           |                                                                                                                                                                                               |
| 0. 0500010, 0028710, 00082                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1155. 1                                                                                                                                                                                      | 328.                                                                                                                                                                                                   | 71.610.                                                                                | 0500010.0                                                                                                                                           | 042410.0                                                                                                                                                      | 04081                                                                   | 2211.                                                                               | 1 2128                    | 1 3.7                                                                                                                                                                                         |
| 0 1000010, 0095310, 00783                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                              | 2819                                                                                                                                                                                                   | -5.410.                                                                                | 1000010.0                                                                                                                                           | 137710.0                                                                                                                                                      | 1359:                                                                   | 4970.                                                                               | 1 4759                    | 0 2                                                                                                                                                                                           |
| 0 1500010, 0177010, 01869                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                              |                                                                                                                                                                                                        | 1 -32.810.                                                                             |                                                                                                                                                     |                                                                                                                                                               |                                                                         | 6887.                                                                               |                           |                                                                                                                                                                                               |
| 0 2000010 0299410 03284                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                              |                                                                                                                                                                                                        | 1 -15.710.                                                                             |                                                                                                                                                     |                                                                                                                                                               |                                                                         | 8660.                                                                               |                           | -2.5                                                                                                                                                                                          |
| 0 2500010 0449210 05008                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                              |                                                                                                                                                                                                        | 1 -15.110.                                                                             |                                                                                                                                                     |                                                                                                                                                               |                                                                         |                                                                                     |                           | -3.6                                                                                                                                                                                          |
| 0 3000010, 0626210, 07021                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                              |                                                                                                                                                                                                        | 1 -13.710.                                                                             |                                                                                                                                                     |                                                                                                                                                               |                                                                         |                                                                                     | 12126                     |                                                                                                                                                                                               |
| 0 3500010.0846610.09332                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 8859. 1                                                                                                                                                                                      | 9290.                                                                                                                                                                                                  | 1 -4.910.                                                                              | 3500010.1                                                                                                                                           | 117410.1                                                                                                                                                      | 14031 1                                                                 | 3581.                                                                               | 1 13651.                  | 1 -0.5                                                                                                                                                                                        |
| 0. 4000010, 1106310, 11957                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                              | 10552.                                                                                                                                                                                                 |                                                                                        | 4000010.1                                                                                                                                           |                                                                                                                                                               |                                                                         |                                                                                     |                           |                                                                                                                                                                                               |
| 0 4500010, 1405910, 14915                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                              |                                                                                                                                                                                                        |                                                                                        | 4500010.1                                                                                                                                           |                                                                                                                                                               |                                                                         |                                                                                     |                           |                                                                                                                                                                                               |
| 0 5000010 1749310 18229                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 13802                                                                                                                                                                                        | 13319.                                                                                                                                                                                                 | 3.510.                                                                                 | 5000010.2                                                                                                                                           | 108410. 2                                                                                                                                                     | 10741 1                                                                 | 9262.                                                                               | 18512                     | 3.9                                                                                                                                                                                           |
| 0 5500010 2137010, 21935                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                              |                                                                                                                                                                                                        |                                                                                        | 5500010. 2                                                                                                                                          | 518210. 2                                                                                                                                                     | 47891 8                                                                 | 1374                                                                                | 1 50315                   | 5.0                                                                                                                                                                                           |
| 0 6000010, 2579510, 26070                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 17788 1                                                                                                                                                                                      | 16623                                                                                                                                                                                                  | 6.610.                                                                                 | 6000010.3                                                                                                                                           | 000810. 2                                                                                                                                                     | 9280: 2                                                                 | 5167.                                                                               | 22077                     | 11.1                                                                                                                                                                                          |
| 0 6500010 3077010 30684                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                              | 18547                                                                                                                                                                                                  | 7.210.                                                                                 | 6500010.3                                                                                                                                           | 488510. 3                                                                                                                                                     | 3788: 2                                                                 | 5431.                                                                               | 1 24547                   | 3 5                                                                                                                                                                                           |
| 0. 7000010. 3634710. 35883                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                              |                                                                                                                                                                                                        |                                                                                        | 7000010.4                                                                                                                                           |                                                                                                                                                               |                                                                         | 9546.                                                                               | 1 27092                   | 8.3                                                                                                                                                                                           |
| 0 7500010 4266910 41746                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                              |                                                                                                                                                                                                        |                                                                                        | 7500010.4                                                                                                                                           |                                                                                                                                                               |                                                                         | 1093.                                                                               | 30024                     | 3.4                                                                                                                                                                                           |
| 0.8000010 4979710.48450                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                              |                                                                                                                                                                                                        |                                                                                        | 8000010.5                                                                                                                                           |                                                                                                                                                               |                                                                         | _                                                                                   |                           |                                                                                                                                                                                               |
| 0 8500010 5800210 56259                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                              |                                                                                                                                                                                                        |                                                                                        | 8500010.6                                                                                                                                           |                                                                                                                                                               |                                                                         |                                                                                     |                           |                                                                                                                                                                                               |
| 0 9000010 6791810.65606                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                              |                                                                                                                                                                                                        |                                                                                        | 9000010.6                                                                                                                                           |                                                                                                                                                               |                                                                         |                                                                                     |                           |                                                                                                                                                                                               |
| 0 9500010 7946010 77583                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                              |                                                                                                                                                                                                        |                                                                                        | 9500010. B                                                                                                                                          |                                                                                                                                                               |                                                                         |                                                                                     |                           |                                                                                                                                                                                               |
| 1 0000011 0000011 00000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                              | _                                                                                                                                                                                                      |                                                                                        | 0000011.0                                                                                                                                           |                                                                                                                                                               |                                                                         |                                                                                     |                           |                                                                                                                                                                                               |
| . 0.00011 0000011 00000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                              | , 5 2 6 6.                                                                                                                                                                                             |                                                                                        |                                                                                                                                                     |                                                                                                                                                               |                                                                         |                                                                                     |                           |                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                              |                                                                                                                                                                                                        |                                                                                        |                                                                                                                                                     |                                                                                                                                                               |                                                                         |                                                                                     |                           |                                                                                                                                                                                               |
| YEAR 1981 H                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | OUSEHOLD !                                                                                                                                                                                   | SIZE 3                                                                                                                                                                                                 |                                                                                        | YE                                                                                                                                                  | AR 1981                                                                                                                                                       | HOUSE                                                                   | HOLD !                                                                              | SIZE 4                    |                                                                                                                                                                                               |
| YEAR 1981 HO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                              |                                                                                                                                                                                                        |                                                                                        |                                                                                                                                                     |                                                                                                                                                               |                                                                         |                                                                                     | SIZE 4<br>I ESTIM I       | RESID                                                                                                                                                                                         |
| ACTUAL   ACTUALIESTIM.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ACTUAL!                                                                                                                                                                                      | ESTIM.                                                                                                                                                                                                 | RESID IAC                                                                              | TUAL : AC                                                                                                                                           | TUAL LEST                                                                                                                                                     | IM. IAC                                                                 | TUAL.<br>AGI                                                                        | ESTIM                     | 7.                                                                                                                                                                                            |
| ACTUAL   ACTUAL (ESTIM.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ACTUAL!                                                                                                                                                                                      | ESTIM.<br>\$ AGI                                                                                                                                                                                       | RESID AC                                                                               | TUAL : AC                                                                                                                                           | TUAL LEST                                                                                                                                                     | IM. IAC                                                                 | TUAL.<br>AGI                                                                        | ESTIM                     | %<br>                                                                                                                                                                                         |
| ACTUAL   ACTUAL   ESTIM.   POP     % AGI   % AGI   % AGI   % OSTICLE   1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ACTUAL!<br>\$ AGI !<br>!                                                                                                                                                                     | ESTIM.<br>\$ AGI<br>1470.                                                                                                                                                                              | RESID   AC<br>  %   %<br>  -0.610.                                                     | TUAL   AC<br>POP.   %                                                                                                                               | TUAL : EST<br>A01 : %<br>                                                                                                                                     | IM. :AC<br>AGI : \$                                                     | TUAL.<br>AGI<br>1766.                                                               | ESTIM  <br>  \$ AGI  <br> | 2 4                                                                                                                                                                                           |
| ACTUAL : ACTUAL :ESTIM. % POP : % AGI : % AGI 0 0500010.0048110.00484 0 1000010.0154410.01605                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ACTUAL!<br>\$ AGI !<br>1461 !<br>3227 !                                                                                                                                                      | ESTIM.<br>\$ AGI<br>1470.<br>3404.                                                                                                                                                                     | RESID   AC<br>  %   %<br>  -0.610.<br>  -5.510.                                        | TUAL : AC<br>POP. : %<br>                                                                                                                           | TUAL :EST<br>AQ1 : %<br>                                                                                                                                      | TM. IAC<br>AGI   \$<br>                                                 | TUAL.<br>AGI<br>1966.<br>3988.                                                      | ESTIM                     | 2 4<br>-5.3                                                                                                                                                                                   |
| ACTUAL   ACTUAL   ESTIM.   POP     % AGI   % AGI   % AGI   % OSTICLE   1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ACTUAL!<br>\$ AGI !<br>1461 !<br>3227 !<br>4426 !                                                                                                                                            | ESTIM.<br>\$ AGI<br>1470.                                                                                                                                                                              | RESID   AC<br>  %   %<br>  -0.6 0.<br>  -5.5 0.<br>  -7.2 0.                           | TUAL : AC<br>POP. : X<br>0500010. 0<br>1000010. 0<br>1500010. 0                                                                                     | TUAL :EST<br>AGI : %<br>                                                                                                                                      | IM. !AC<br>AGI : \$<br>                                                 | TUAL.<br>AGI<br>1966.<br>3988.<br>5353.                                             | ESTIM                     | 2 4<br>-5, 3<br>-9, 4                                                                                                                                                                         |
| 0 0500010.0048110.00484<br>0 1000010.0154410.01605<br>0 1500010.0300210.03197<br>0 2000010.0482610.05136                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ACTUAL!<br>\$ AGI !<br>1461 !<br>3227 !<br>4426 !<br>5538 !                                                                                                                                  | ESTIM.<br>\$ AGI<br>1470.<br>3404.<br>4834.<br>5887.                                                                                                                                                   | RESID IAC<br>  %  %<br>  <br>  -0.6 0.<br>  -5.5 0.<br>  -7.2 0.<br>  -6.3 0.          | TUAL : AC<br>POP. : %<br>                                                                                                                           | TUAL :EST<br>A01 : %<br>                                                                                                                                      | IM. :AC<br>AGI : \$<br>                                                 | TUAL.<br>AGI<br>1966.<br>3988.<br>5353.<br>6713.                                    | ESTIM                     | %<br>2 4<br>-5. 3<br>-9. 4<br>-4. 6                                                                                                                                                           |
| 0.0500010.0048110.0048410.1500010.0300210.0319710.2500010.0701610.073971                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ACTUAL I<br>\$ AGI I<br>1461. I<br>3227. I<br>4426. I<br>5538. I<br>6648. I                                                                                                                  | ESTIM.<br>\$ AGI<br>1470.<br>3404.<br>4834.<br>5887.<br>6862.                                                                                                                                          | RESID   AC<br>  %   %<br>  -0.610.<br>  -5.510.<br>  -9.210.<br>  -6.310.<br>  -3.210. | TUAL : AC<br>POP. : X<br>0500010. 0<br>1000010. 0<br>1500010. 0                                                                                     | TUAL :EST<br>A01 : %<br>                                                                                                                                      | IM. :AC<br>AGI : \$<br>                                                 | TUAL.<br>AGI<br>1966.<br>3988.<br>5353.                                             | ESTIM                     | 2 4<br>-5, 3<br>-9, 4<br>-4, 6                                                                                                                                                                |
| #CTUAL : ACTUAL :ESTIM.  # POP : % A01 : % A01  0 0500010.0048110.00484  0 1000010.0154410.01605  0 1500010.0300210.03197  0 2000010.0482810.05136  0 2500010.0701610.07397  0 3000010.0958710.09963                                                                                                                                                                                                                                                                                                                                                            | ACTUAL I<br>\$ AGI I<br>1461. I<br>3227. I<br>4426. I<br>5538. I<br>6648. I<br>7805. I                                                                                                       | 1470.<br>3404.<br>4834.<br>5887.<br>6862.<br>7792.                                                                                                                                                     | RESID   AC<br>                                                                         | TUAL   AC<br>POP.   %<br>0500010.0<br>1000010.0<br>1500010.0<br>2500010.0<br>3000010.1                                                              | TUAL :EST<br>A01 : %<br>                                                                                                                                      | IM !AC<br>AGI : \$<br>!<br>0601!<br>1916!<br>23751!<br>25949!<br>18475! | TUAL.<br>AGI<br>1966.<br>3988.<br>5353.<br>6713.<br>8105<br>9257.                   | ESTIM                     | 2 4<br>-5, 3<br>-9, 4<br>-4, 6<br>0, 5<br>2, 3                                                                                                                                                |
| ACTUAL : ACTUAL :ESTIM. % POP : % A01 : % A01 0 0500010.0048110.00484 0 1000010.0154410.01605 0 1500010.0300210.03197 0 2500010.0482610.05136 0 2500010.0701610.07397 0 3000010.0958710.09963 0 3500010.1253310.12831                                                                                                                                                                                                                                                                                                                                           | ACTUAL I                                                                                                                                                                                     | ESTIM.<br>\$ AGI<br>1470.<br>3404.<br>4834.<br>5887.<br>6862.<br>7792.<br>8706.                                                                                                                        | RESID   AC<br>                                                                         | TUAL : AC<br>POP. : 2<br>                                                                                                                           | TUAL :EST<br>A01 : %<br>                                                                                                                                      | IM.   AC<br>AGI   \$<br>                                                | TUAL.<br>AGI<br>1966.<br>3988.<br>5353.<br>6713.<br>8105<br>9257.<br>0434.          | ESTIM                     | 2 4<br>-5, 3<br>-9, 4<br>-4, 6<br>0, 5<br>2, 3<br>4 4                                                                                                                                         |
| ACTUAL : ACTUAL :ESTIM.  % POP : % A01 : % A01  0 0500010.0048110.00484  0 1000010.0154410.01605  0 1500010.0300210.03197  0 2000010.0482610.051361  0 2500010.0701610.07397  0 3000010.0958710.09963  0 3500010.1253310.128310  0 4000010.1583610.15992                                                                                                                                                                                                                                                                                                        | ACTUAL I<br># AGI I<br>1461. I<br>3227. I<br>4426. I<br>5538. I<br>6648. I<br>7805. I<br>8943. I<br>10027. I                                                                                 | ESTIM.<br>\$ AGI<br>1470.<br>3404.<br>4834.<br>5887.<br>6862.<br>7792.<br>8706.<br>9598.                                                                                                               | RESID   AC<br>                                                                         | TUAL : AC<br>POP. : 2<br>                                                                                                                           | TUAL : EST<br>A01 : %<br> <br>061610. 0<br>186410. 0<br>354010. 0<br>818010. 0<br>107910. 1<br>434610. 1<br>814910. 1                                         | IM :AC<br>AGI : \$<br>                                                  | TUAL.<br>AGI<br>1966.<br>3988.<br>5353.<br>6713.<br>8105<br>9257.<br>0434.<br>2145. | ESTIM                     | 2 4<br>1 -5.3<br>1 -9.4<br>1 -4.6<br>0.5<br>1 2.3<br>1 4 4                                                                                                                                    |
| ACTUAL : ACTUAL :ESTIM.  POP : % A91 : % A91  0 0500010 0048110 00484  0 1000010 0154410 01605  0 1500010 0300210 03197  0 2000010 0482610 05136  0 2500010 0701610 07397  0 3000010 0958710 09963  0 3500010 1253310 12831                                                                                                                                                                                                                                                                                                                                     | ACTUAL I<br># AGI I<br>1461 I<br>3227 I<br>4426 I<br>5538 I<br>6648 I<br>7805 I<br>8943 I<br>10027 I<br>11227 I                                                                              | ESTIM.<br>\$ AGI<br>1470.<br>3404.<br>4834.<br>5887.<br>6862.<br>7792.<br>8706.<br>9598.<br>10532.                                                                                                     | RESID   AC<br>                                                                         | TUAL : AC<br>POP. : 2<br>0500010.0<br>1000010.0<br>1500010.0<br>2500010.0<br>3000010.1<br>3500010.1<br>4000010.1                                    | TUAL : EST<br>AG1 : %<br>                                                                                                                                     | IM                                                                      | TUAL.<br>AGI<br>1966.<br>3988.<br>5353.<br>6713.<br>8105<br>9257.<br>0434.<br>2145. | ESTIM                     | 2 4<br>  -5.3<br>  -9.4<br>  -4.6<br>  0.5<br>  2.3<br>  4.4<br>  10.4<br>  7.1                                                                                                               |
| ACTUAL : ACTUAL :ESTIM.  POP : % A91 : % A91  0 0500010 0048110 00484  0 1000010 0154410 01605  0 1500010 0300210 03197  0 2000010 0482610 05136  0 2500010 0701610 07397  0 3000010 0958710 09963  0 3500010 1253310 12831                                                                                                                                                                                                                                                                                                                                     | ACTUAL I<br># AGI I<br>1461 I<br>3227 I<br>4426 I<br>5538 I<br>6648 I<br>7805 I<br>8943 I<br>10027 I<br>11227 I<br>12863 I                                                                   | ESTIM.<br>\$ AGI<br>1470.<br>3404.<br>4834.<br>5887.<br>6862.<br>7792.<br>8706.<br>9598.<br>10532.<br>11492.                                                                                           | RESID   AC<br>                                                                         | TUAL : AC<br>POP. : 2<br>0500010.0<br>1000010.0<br>200010.0<br>2500010.0<br>3500010.1<br>3500010.1<br>4500010.2<br>5000010.2                        | TUAL : EST<br>AG1 : %<br>                                                                                                                                     | IM                                                                      | TUAL AGI                                                                            | ESTIM                     | 2 4<br>-5.3<br>-9.4<br>-4.6<br>0.5<br>2.3<br>4.4<br>10.4<br>7.1                                                                                                                               |
| ACTUAL : ACTUAL :ESTIM.  POP : % A91 : % A91  0 0500010 0048110 00484  0 1000010 0300210 03197  0 2000010 0482610 05136  0 2500010 0701610 07397  0 3000010 0958710 09963  0 3500010 1253310 12831  0 4000010 1583610 15992  0 4500010 1953410 15992  0 5500010 2377110 23247  0 5500010 2839910 273641                                                                                                                                                                                                                                                         | ACTUAL!<br>\$ AGI !<br>1461.!<br>3227.1<br>4426.!<br>5538.!<br>6648.!<br>7805.!<br>8943.!<br>10027.!<br>11227.!<br>12863.!<br>14050.!                                                        | ESTIM.<br>\$ AGI<br>1470.<br>3404.<br>4834.<br>5887.<br>6862.<br>7792.<br>8706.<br>9598.<br>10532.<br>11492.<br>12500.                                                                                 | RESID   AC<br>                                                                         | TUAL : AC<br>POP. : %<br>                                                                                                                           | TUAL : EST<br>AG1 : %<br>                                                                                                                                     | IM                                                                      | TUAL AGI                                                                            | ESTIM                     | 2 4<br>-5.3<br>-9.4<br>-4.6<br>0.5<br>2.3<br>4.4<br>10.4<br>7.1<br>-0.2                                                                                                                       |
| ACTUAL : ACTUAL :ESTIM.  POP : % A91 : % A91  0 0500010 0048110 00484  0 1000010 0154410 01605  0 1500010 0300210 03197  0 2000010 0482610 05136  0 2500010 0701610 07397  0 3000010 0958710 09963  0 3500010 1253310 12831                                                                                                                                                                                                                                                                                                                                     | ACTUAL!<br>\$ AGI !<br>1461.!<br>3227.1<br>4426.!<br>5538.!<br>6648.!<br>7805.!<br>8943.!<br>10027.!<br>11227.!<br>12863.!<br>14050.!                                                        | ESTIM.<br>\$ AGI<br>1470.<br>3404.<br>4834.<br>5887.<br>6862.<br>7792.<br>8706.<br>9598.<br>10532.<br>11492.<br>12500.                                                                                 | RESID   AC<br>                                                                         | TUAL : AC<br>POP. : 2<br>0500010.0<br>1000010.0<br>200010.0<br>2500010.0<br>3500010.1<br>3500010.1<br>4500010.2<br>5000010.2                        | TUAL : EST<br>AG1 : %<br>                                                                                                                                     | IM                                                                      | TUAL AGI                                                                            | ESTIM                     | 2 4<br>-5.3<br>-9.4<br>-4.6<br>0.5<br>2.3<br>4.4<br>10.4<br>7.1<br>-0.2                                                                                                                       |
| ACTUAL : ACTUAL : ESTIM.  7 POP : 7 A91 : 7 A91  0 0500010 0048110 00484  0 1000010 0154410 01605  0 1500010 0300210 03197  0 2500010 0701610 07397  0 3000010 0758710 09763  0 3500010 1253310 128311  0 4000010 1583610 15992  0 4500010 1593410 194611  0 5000010 2839910 273641  0 6500010 3302710 318361  0 6500010 3834910 367221                                                                                                                                                                                                                         | ACTUAL I                                                                                                                                                                                     | ESTIM.<br>\$ AGI<br>1470.<br>3404.<br>4834.<br>5887.<br>6862.<br>7792.<br>8706.<br>9598.<br>10532.<br>11493.<br>12500.<br>13977.<br>14833.                                                             | RESID   AC<br>                                                                         | TUAL   AC<br>POP.   %<br>0500010. 0<br>1500010. 0<br>2500010. 0<br>2500010. 0<br>3500010. 1<br>4000010. 1<br>4500010. 2<br>5500010. 3<br>6500010. 3 | TUAL LEST A91   %                                                                                                                                             | IM                                                                      | TUAL AGI                                                                            | ESTIM                     | 2 4<br>-5.3<br>-4.6<br>0.5<br>2.3<br>4 4<br>10 4<br>7 1<br>-0.1<br>1 -0.2                                                                                                                     |
| ACTUAL : ACTUAL : ESTIM.  POP : % A91 : % A91  0 0500010 0048110 00484  0 1000010 0154410 01605  0 1500010 0300210 03197  0 2000010 0701610 07397  0 3000010 0958710 09963  0 3500010 1253310 128311  0 4000010 1253310 128311  0 4500010 1393410 194611  0 5000010 2377110 23247  0 5500010 2302710 318361                                                                                                                                                                                                                                                     | ACTUAL I                                                                                                                                                                                     | ESTIM.<br>\$ AGI<br>1470.<br>3404.<br>4834.<br>5887.<br>6862.<br>7792.<br>8706.<br>9598.<br>10532.<br>11493.<br>12500.<br>13977.<br>14833.                                                             | RESID   AC                                                                             | TUAL   AC POP.   2   2   2   2   2   2   2   2   2                                                                                                  | TUAL LEST<br>A01   %<br> <br>061610.0<br>186410.0<br>564210.0<br>818010.0<br>107910.1<br>434610.1<br>814910.1<br>212210.2<br>609610.2<br>579310.3<br>706710.4 | IM                                                                      | TUAL AGI                                                                            | ESTIM                     | 2 4<br>-5 3<br>-9 4 6<br>0 5<br>2 3<br>4 4<br>10 4<br>7 1<br>-0 2<br>11 1<br>4 9<br>3 6                                                                                                       |
| ACTUAL : ACTUAL : ESTIM.  7 POP : 7 A91 : 7 A91  0 0500010 0048110 00484  0 1000010 0154410 01605  0 1500010 0300210 03197  0 2500010 0701610 07397  0 3000010 0758710 09763  0 3500010 1253310 128311  0 4000010 1583610 15992  0 4500010 1593410 194611  0 5000010 2839910 273641  0 6500010 3302710 318361  0 6500010 3834910 367221                                                                                                                                                                                                                         | ACTUAL I # AGI   1461   1327   1466   5538   6648   7805   10027   11227   12863   14050   16158   17150   I                                                                                 | ESTIM.<br>\$ AGI<br>1470.<br>3404.<br>4834.<br>5887.<br>6862.<br>7792.<br>8706.<br>9598.<br>10532.<br>11492.<br>12500.<br>13577.<br>14833.<br>16159.                                                   | RESID   AC                                                                             | TUAL   AC<br>POP.   %<br>0500010. 0<br>1500010. 0<br>2500010. 0<br>2500010. 0<br>3500010. 1<br>4000010. 1<br>4500010. 2<br>5500010. 3<br>6500010. 3 | TUAL LEST<br>A01   %<br> <br>061610.0<br>186410.0<br>564210.0<br>818010.0<br>107910.1<br>434610.1<br>814910.1<br>212210.2<br>609610.2<br>579310.3<br>706710.4 | IM                                                                      | TUAL AGI                                                                            | ESTIM                     | 2 4<br>-5 3<br>-9 4 6<br>0 5<br>2 3<br>4 4<br>10 4<br>7 1<br>-0 2<br>11 1<br>4 9<br>3 6                                                                                                       |
| ACTUAL : ACTUAL :ESTIM.  7 POP : 7 A01 : 7 A01  0 0500010 0048110 00484  0 1000010 0154410 01605  0 1500010 0300210 03197  0 2500010 0701610 07397  0 3000010 0958710 09963  0 3500010 1253310 128311  0 4000010 1583610 15992  0 4500010 1953410 194611  0 5000010 2377110 23247  0 5500010 3302710 31836  0 6500010 3834910 36722  0 7000010 4399810 42045                                                                                                                                                                                                    | ACTUAL I<br># AGI I<br>1461 I<br>3227 I<br>4426 I<br>5538 I<br>6648 I<br>7805 I<br>8943 I<br>10027 I<br>11227 I<br>12863 I<br>14050 I<br>14050 I<br>14050 I<br>16158 I<br>17150 I<br>19630 I | ESTIM.<br>\$ AGI<br>1470.<br>3404.<br>4834.<br>5887.<br>6862.<br>7792.<br>8706.<br>9598.<br>10532.<br>11492.<br>12500.<br>13577.<br>14833.<br>16159.<br>17808.                                         | RESID   AC                                                                             | TUAL   AC POP   2   2   2   2   2   2   2   2   2                                                                                                   | TUAL LEST A01   %                                                                                                                                             | IM   AC AGI   \$   \$   \$   \$   \$   \$   \$   \$   \$                | TUAL AGI                                                                            | ESTIM                     | 2 4<br>-5.3<br>-9.4<br>-4.6<br>0.5<br>2.3<br>4.4<br>10.4<br>7.1<br>-0.2<br>11.1<br>4.9<br>3.6<br>11.9<br>4.4<br>-4.7                                                                          |
| ACTUAL : ACTUAL : ESTIM.  POP : % AGI : % AGI  0 0500010 0048110 00484  0 1000010 0154410 01605  0 1500010 0300210 03197  0 2000010 0701610 07397  0 3000010 0758710 0765  0 3500010 0758710 07765  0 3500010 1253310 128310  0 4000010 1253310 128310  0 4500010 1393610 139921  0 5500010 2377110 232471  0 5500010 2377110 232471  0 5500010 3302710 318361  0 6500010 3834910 367221  0 7000010 3934910 42045  0 7500010 5046410 479111  0 8000010 5758510 544111  0 8500010 6470610 617291                                                                 | ACTUAL I # AGI   1461   1426   1538   6648   7805   10027   11227   112863   14050   14050   16158   17150   19630   121617   121617   1                                                     | ESTIM. \$ AGI  1470. 3404. 4834. 5887. 6862. 7792. 8706. 9598. 10532. 11492. 12500. 13577. 14833. 16159. 17808. 19733. 22218.                                                                          | RESID   AC                                                                             | TUAL   AC<br>POP.   %<br>                                                                                                                           | TUAL LEST A91   %                                                                                                                                             | IM                                                                      | TUAL AGI                                                                            | ESTIM                     | 2 4<br>-5 3<br>-9 4<br>-4 6<br>0 5<br>2 3<br>4 4<br>10 4<br>7 1<br>-0 2<br>11 1<br>4 9<br>3 6<br>3 6<br>1 7<br>4 4<br>4 7<br>1 |
| ACTUAL : ACTUAL : ESTIM.  POP : % A01 : % A01  0 0500010 0048110 00484  0 1000010 0154410 01605  0 1500010 0300210 03197  0 2000010 0701610 07397  0 3000010 0701610 07397  0 3000010 0758710 07963  0 3500010 1253310 128311  0 4000010 1253310 128311  0 5000010 2377110 23247  0 5500010 2377110 23247  0 5500010 3834910 36722  0 7000010 3834910 36722  0 7000010 3902710 318361  0 6500010 3834910 36722  0 7000010 5758510 54411  0 8500010 5758510 54411  0 8500010 6470610 617291  0 9000010 7293910 701941                                            | ACTUAL I # AGI   1461   13227   12863   14050   14050   16158   17150   171630   121617   124997   1                                                                                         | ESTIM.<br>\$ AGI<br>1470.<br>3404.<br>4834.<br>5887.<br>6862.<br>7792.<br>8706.<br>9598.<br>10532.<br>11492.<br>12500.<br>13577.<br>14833.<br>16159.<br>17808.<br>19733.<br>22218.<br>25697.           | RESID   AC                                                                             | TUAL   AC<br>POP.   %<br>                                                                                                                           | TUAL LEST AG1   %                                                                                                                                             | IM                                                                      | TUAL A01                                                                            | ESTIM                     | 2 4<br>1 -5 3<br>-9 4<br>-4 6<br>0 5<br>2 3<br>4 4<br>10 7<br>1 -0 2<br>11 1<br>4 9<br>3 6<br>11 9<br>4 4<br>7 -4 7<br>-2 1<br>-3 7                                                           |
| ACTUAL : ACTUAL : ESTIM.  POP : % A01 : % A01  0 0500010 .0048110 .00484  0 1000010 .0154410 .01605  0 1500010 .0300210 .03197  0 2000010 .0482610 .05136  0 2500010 .0701610 .07397  0 3000010 .0958710 .09963  0 3500010 .1253310 .128311  0 4000010 .1253310 .128311  0 4000010 .1253310 .128311  0 5000010 .2839910 .273641  0 5000010 .2839910 .273641  0 6000010 .3302710 .318361  0 6500010 .3834910 .367223  0 7000010 .4399810 .420451  0 7500010 .5046410 .479111  0 8000010 .5758510 .544111  0 8000010 .7293910 .701941  0 9500010 .8267910 .806281 | ACTUAL I # AGI   1461   13227   14426   5538   6648   7805   18943   10027   11227   12863   14050   16158   17150   19630   121617   121617   121617   129568   1                           | ESTIM.<br>\$ AGI<br>1470.<br>3404.<br>4834.<br>5887.<br>6862.<br>7792.<br>8706.<br>9598.<br>10532.<br>11492.<br>11500.<br>13577.<br>14833.<br>16159.<br>17808.<br>17808.<br>22218.<br>25697.<br>31678. | RESID   AC                                                                             | TUAL   AC POP   2   2   2   2   2   2   2   2   2                                                                                                   | TUAL LEST AG1   %                                                                                                                                             | IM                                                                      | TUAL AGI                                                                            | ESTIM                     | 2 4<br>-5 3<br>-4 6<br>0 5<br>2 3<br>4 4<br>10 4<br>7 1<br>-0 2<br>11 1<br>4 9<br>3 6<br>11 9<br>4 4<br>-4 7<br>1 -2 7<br>-2 7                                                                |
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| ACTUAL   ACTUAL   ESTIM   ROPE   ROPE | ACTUAL!<br>  \$ AGI  <br>  876  <br>  896  <br>  1443  <br>  2329  <br>  2329  <br>  3207  <br>  3886  <br>  4226  <br>  5460  <br>  6091  <br>  7067                                                                          | ESTIM.<br>\$ AGI<br>-378<br>1012.<br>1785.<br>2499.<br>3086.<br>3658.<br>4250.<br>4857.<br>5477.<br>6139.<br>6878.                                                            | RESID. IACTUAL                                              | ACTUAL     % AGI     % AGI        010.004801   010.014951   010.02883   010.04607   010.066351   010.107311   010.148141   010.182441   010.221291   010.263901                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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IACTUAL                                              | ACTUAL     % AGI     1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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IACTUAL                                              | ACTUAL     % AGI     -       010 00480     010 01495     010 04607     010 06635     010 07004     010 11731     010 14814     010 12129     010 22129     010 31073     010 36179                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ESTIM.  2. 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IACTUAL                                              | ACTUAL     % AGI     -       010 00480     010 01495     010 04607     010 04635     010 07004     010 11731     010 14814     010 18264     010 28129     010 36179     010 42212                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ESTIM.  2. 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IACTUAL                                              | ACTUAL     % AQI     1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ESTIM.  2. AGI  0. 00446  0. 01476  0. 02974  0. 04980  0. 07445  0. 12201  0. 15253  0. 18611  0. 22290  0. 30715  0. 35521  0. 40804  0. 46635                                        | 1263.<br>1269.<br>1269.<br>13653.<br>14535.<br>14535.<br>15335.<br>16232.<br>7175.<br>18109.<br>9075.<br>10167.<br>11209.<br>12320.<br>13433.<br>15870.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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| ACTUAL : ACTUAL:ESTIM  % PUP : % AGI : % AGI 0 0500010 00495:- 00209 0 1000010 0099010 00350 0 1500010 0178610 01335 0 2000010 0307210 02714 0 3000010 04357:0 04418 0 3000010 04357:0 06437 0 3500010 0427310 08793 0 4000010 10605:0 11464 0 4500010 1362010 14468 0 5000010 16983:0 17877 0 5500010 20884:0 21674 0 4000010 30302:0 30637 0 7000010 3591010 35949 0 7500010 42327:0 41928 0 8000010 4961010 48742                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ACTUAL    \$ AGI     876     896     1443     2327     3207     3886     4226     5460     6091     7067     8204     8855     10160     11623     13194                                                                       | -378<br>1012.<br>1785.<br>2499.<br>3058.<br>4250.<br>4857.<br>5477.<br>6139.<br>6878.<br>7678.<br>8557.<br>9622.<br>10831.<br>12344.                                          | RESID. IACTUAL                                              | ACTUAL     % AQI     % AQI    -     010.00480    010.02893    010.04697    010.04697    010.1731    010.14814    010.18264    010.22129    010.31073    010.36179    010.48522    010.54831                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ESTIM.  2 AGI  0. 00446  0. 01476  0. 02974  0. 04829  0. 07445  0. 12201  0. 15253  0. 18611  0. 22290  0. 263191  0. 35521  0. 40804  0. 46635  0. 53132                              | 1263.<br>1269.<br>1269.<br>13653.<br>4535.<br>5335.<br>6232.<br>7175.<br>8109.<br>9075.<br>11209.<br>12320.<br>13433.<br>15870.<br>16599.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ESTIM.<br>  \$ AGI<br>  1174.<br>  2760<br>  3742.<br>  4828.<br>  5658.<br>  6483<br>  7251.<br>  8030.<br>  8831.<br>  9681.<br>  10598.<br>  11564.<br>  12642.<br>  13898.<br>  15339.<br>  17093         | 1 8 1 7 0 1 -3 4 1 -7 9 1 -6 5 1 1 -1 1 1 0 1 2 7 1 4 8 1 5 4 1 5 4 1 7 6 1 7 6 1 -3 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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| ACTUAL : ACTUAL:ESTIM  % PUP : % AGI : % AGI  0 0500010 004951- 00209  0 1500010 0178610 01335  0 2000010 0307210 02714  0 3500010 0435710 04418  0 3000010 0435710 06437  0 3500010 0827310 08783  0 4000010 1060510 11464  0 4500010 1362010 14488  0 5000010 1698310 17877  0 5500010 2088410 21674  0 600010 3030210 30637  0 7000010 3591010 35949  0 7500010 4961010 48742  0 8500010 5803710 56644                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ACTUAL    \$ AGI     876     876     1443     2327     3207     3207     3886     4226     5460     6071     7067     8855     10160     11623     13194     15263                                                             | -378<br>1012.<br>1785.<br>2499.<br>3086.<br>3658.<br>4250.<br>4857.<br>5477.<br>6139.<br>6878.<br>7678.<br>8557.<br>9622.<br>10831.<br>12344.                                 | RESID. IACTUAL                                              | ACTUAL     % AQI     1 A | ESTIM.  2 AGI  0. 00446  0. 01476  0. 02974  0. 04829  0. 07445  0. 12201  0. 15253  0. 186111  0. 22290  0. 263191  0. 35521  0. 40804  0. 46635  0. 531321  0. 60497                  | ACTUAL<br>\$ A01<br>1263<br>2669<br>3653<br>4535<br>6232<br>7175<br>8109<br>9075<br>10167<br>11209<br>12320<br>13433<br>15870<br>16599<br>16599<br>19710                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| ACTUAL   ACTUAL   ESTIM   ROPE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ACTUAL    \$ AGI     876     896     1443     2329     3207     3886     4226     5460     6071     7067     8855     10160     11623     13194     15263     17568                                                            | ESTIM.<br>* AGI<br>-378<br>1012<br>1785<br>2499<br>3086<br>3658<br>4250<br>4857<br>5477<br>6139<br>6878<br>7678<br>8557<br>9622<br>10831<br>12344<br>14313<br>17031           | RESID. IACTUAL                                              | ACTUAL     % AGI     % AGI     -       010 004801   010 014931   010 046071   010 046071   010 046071   010 182441   010 182441   010 263901   010 310731   010 421291   010 42121   010 42121   010 548311   010 623241   010 704171                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ESTIM.  2 AGI  0. 00446  0. 01476  0. 02974  0. 04829  0. 04980  0. 12201  0. 12201  0. 12201  0. 1221  0. 22290  0. 26319  0. 30715  0. 35521  0. 46635  0. 53132  0. 60497  0. 69077  | ACTUAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| ACTUAL : ACTUAL:ESTIM  % PUP : % AGI : % AGI  0 0500010 004951- 00209  0 1500010 0178610 01335  0 2000010 0307210 02714  0 3500010 0435710 04418  0 3000010 0435710 06437  0 3500010 0827310 08783  0 4000010 1060510 11464  0 4500010 1362010 14488  0 5000010 1698310 17877  0 5500010 2088410 21674  0 600010 3030210 30637  0 7000010 3591010 35949  0 7500010 4961010 48742  0 8500010 5803710 56644                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ACTUAL    \$ AGI     876     876     876     1443     2329     3207     3886     4226     5460     6071     7067     8204     8855     10160     11623     13194     15263     17568     21379                                 | ESTIM.<br>\$ AG1<br>-378<br>1012<br>1785<br>2499<br>3086<br>3658<br>4250<br>4857<br>5477<br>6139<br>6878<br>7678<br>8557<br>9622<br>10831<br>12344<br>14313<br>17031<br>21698 | RESID. IACTUAL                                              | ACTUAL     % AGI     % AGI         010 004801   010 02893   010 04607   010 066351   010 070041   010 148141   010 182491   010 263901   010 361791   010 422121   010 485221   010 548311   010 623141   010 806221                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ESTIM.  2 AGI  0. 00446  0. 01476  0. 02794  0. 04829  0. 04829  0. 05231  0. 12201  0. 15253  0. 18611  0. 22290  0. 26319  0. 30511  0. 40804  0. 46351  0. 53132  0. 69077  0. 79740 | ACTUAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ESTIM.   \$ AGI     1174.   2760   3742.   4828.   5658.   6483   7251.   8030.   8931.   10598.   11564.   12642.   13898.   17093   17093   17093   17093   19374.   22571.   28051.                        | 1 8 1 7 0 1 -3 4 1 -7 9 1 -6.5 1 -6.1 1 1 0 1 2 7 1 4 8 1 6 1 5 9 1 12 4 7 1 7 6 0 1 1 1 7 6 0 1 1 1 7 6 0 1 1 7 6 0 1 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 5 0 1 7 6 0 1 7 6 0 1 7 6 5 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 5 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 5 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 7 6 0 1 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|                                                                                                         | ACTUALIE                                                                      |                                                      |                                                                                                                                                                                                              |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                                                                           |                                                                                                                                                                                                    |                                                                                                                                |                                                                                                                                                                                                         |                        |
| % POP :                                                                                                 | % AGI :                                                                       | % AG1 (                                              | \$ AGI                                                                                                                                                                                                       | S AGI                                                                                                                                       | : %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | % POP.                                                                                                                                               | / % AGI                                                                                                                                                                   | / % AGI                                                                                                                                                                                            | 1 \$ AG1                                                                                                                       | : \$ AGI                                                                                                                                                                                                | ! %                    |
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|                                                                                                         | 0 00534:0                                                                     |                                                      |                                                                                                                                                                                                              |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                                                                           | 10.00704                                                                                                                                                                                           |                                                                                                                                |                                                                                                                                                                                                         |                        |
| 0 100001                                                                                                | 0. 0175910                                                                    | 018261                                               | 1966                                                                                                                                                                                                         | 2047.                                                                                                                                       | : -4 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.10000                                                                                                                                              | 10. 02116                                                                                                                                                                 | 10. 02162                                                                                                                                                                                          | 2504.                                                                                                                          | 1 2553.                                                                                                                                                                                                 |                        |
| 0 150001                                                                                                | 0 0342710                                                                     | 036051                                               | 2677                                                                                                                                                                                                         | 2956                                                                                                                                        | 1 ~6.7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0. 15000                                                                                                                                             | 10.03953                                                                                                                                                                  | 10.04136                                                                                                                                                                                           | 1 3217.                                                                                                                        | 1 3455.                                                                                                                                                                                                 | 1 -7 5                 |
| 0.200001                                                                                                | 0. 0545310                                                                    | 057421                                               | 3252.                                                                                                                                                                                                        | 3428.                                                                                                                                       | 1 -5.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0. 20000                                                                                                                                             | 10.06230                                                                                                                                                                  | 10.06476                                                                                                                                                                                           | 1 3987                                                                                                                         | 1 4098.                                                                                                                                                                                                 | 1 -2.8                 |
|                                                                                                         | 0. 0786310                                                                    |                                                      |                                                                                                                                                                                                              |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                                                                           | 10.09138                                                                                                                                                                                           |                                                                                                                                |                                                                                                                                                                                                         |                        |
|                                                                                                         |                                                                               |                                                      |                                                                                                                                                                                                              |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                                                                           |                                                                                                                                                                                                    |                                                                                                                                |                                                                                                                                                                                                         |                        |
|                                                                                                         | 0. 1061810                                                                    |                                                      |                                                                                                                                                                                                              |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                                                                           | 10. 12096                                                                                                                                                                                          |                                                                                                                                |                                                                                                                                                                                                         |                        |
|                                                                                                         | 0. 1373710                                                                    |                                                      |                                                                                                                                                                                                              |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                                                                           | 10. 15337                                                                                                                                                                                          |                                                                                                                                |                                                                                                                                                                                                         |                        |
| ·0 400001                                                                                               | 0 1717210                                                                     | ). 173741                                            | 5513.                                                                                                                                                                                                        | 5376.                                                                                                                                       | 1 2.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 10. 40000                                                                                                                                            | 10. 18878                                                                                                                                                                 | 10. 18854                                                                                                                                                                                          | 1 640ଟ.                                                                                                                        | 1 6158                                                                                                                                                                                                  |                        |
| 0 450001                                                                                                | 0. 2095310                                                                    | 210181                                               | 6067.                                                                                                                                                                                                        | 5848.                                                                                                                                       | 1 3.6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.45000                                                                                                                                              | 10. 22838                                                                                                                                                                 | 10. 22647                                                                                                                                                                                          | 1 6935.                                                                                                                        | 6641                                                                                                                                                                                                    | 1 4 2                  |
| 0 500001                                                                                                | 0. 2509310                                                                    | . 247641                                             | 6644.                                                                                                                                                                                                        | 6333                                                                                                                                        | 1 4.7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0. 50000                                                                                                                                             | 10 27066                                                                                                                                                                  | 10. 26729                                                                                                                                                                                          | 7402.                                                                                                                          | 7148.                                                                                                                                                                                                   | 1 3 4                  |
|                                                                                                         | 0. 2958810                                                                    |                                                      |                                                                                                                                                                                                              |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                                                                           | 10.31110                                                                                                                                                                                           |                                                                                                                                | 1 7670                                                                                                                                                                                                  | : 11 4                 |
|                                                                                                         | 0. 3441810                                                                    |                                                      |                                                                                                                                                                                                              |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                                                                           | 10. 35798                                                                                                                                                                                          |                                                                                                                                |                                                                                                                                                                                                         |                        |
|                                                                                                         |                                                                               |                                                      |                                                                                                                                                                                                              |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                                                                           |                                                                                                                                                                                                    |                                                                                                                                |                                                                                                                                                                                                         |                        |
|                                                                                                         | 0. 4018410                                                                    |                                                      |                                                                                                                                                                                                              |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                                                                           | 10. 40841                                                                                                                                                                                          |                                                                                                                                |                                                                                                                                                                                                         |                        |
|                                                                                                         | 0. 4600510                                                                    |                                                      |                                                                                                                                                                                                              |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                                                                           | 10.46258                                                                                                                                                                                           |                                                                                                                                |                                                                                                                                                                                                         |                        |
| 0 750001                                                                                                | 0 5182610                                                                     | . 501701                                             | 9342.                                                                                                                                                                                                        | 7463                                                                                                                                        | I -1.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0 75000                                                                                                                                              | 10. 53193                                                                                                                                                                 | 10.52126                                                                                                                                                                                           | 1 10128                                                                                                                        | 1 10275.                                                                                                                                                                                                | 1 -1.5                 |
| O 800001                                                                                                | 0. 5801310                                                                    | 566671                                               | 7931                                                                                                                                                                                                         | 10430                                                                                                                                       | -5 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0. 80000                                                                                                                                             | 10 59762                                                                                                                                                                  | 10. 58524                                                                                                                                                                                          | 1 11502.                                                                                                                       | 1 11203.                                                                                                                                                                                                | 1 26                   |
| 0.850001                                                                                                | 0 6550610                                                                     | 639261                                               | 12025                                                                                                                                                                                                        | 11646                                                                                                                                       | 1 32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0. 85000                                                                                                                                             | 10 66331                                                                                                                                                                  | 10. 65595                                                                                                                                                                                          | 1 11502                                                                                                                        | 12380                                                                                                                                                                                                   | 1 -7 6                 |
| 0 900001                                                                                                | 0 7334110                                                                     | . 722351                                             | 12574                                                                                                                                                                                                        | 13335                                                                                                                                       | 6.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0. 90000                                                                                                                                             | 10. 74237                                                                                                                                                                 | 10. 73599                                                                                                                                                                                          | 1 13844                                                                                                                        | 1 14015.                                                                                                                                                                                                | 1 -12                  |
|                                                                                                         | 0 8313810                                                                     |                                                      |                                                                                                                                                                                                              |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                                                                           |                                                                                                                                                                                                    |                                                                                                                                | 1 15027                                                                                                                                                                                                 |                        |
|                                                                                                         | 1.00000:1                                                                     |                                                      |                                                                                                                                                                                                              |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                                                                           |                                                                                                                                                                                                    |                                                                                                                                | 27400                                                                                                                                                                                                   |                        |
| 7 700001                                                                                                | 1. 0000011                                                                    | . 0000001                                            | £7000. I                                                                                                                                                                                                     | 20734                                                                                                                                       | , 0.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1. 00000                                                                                                                                             | 11.00000                                                                                                                                                                  | 11.00000                                                                                                                                                                                           | 1 E./U/4.                                                                                                                      | . 27400                                                                                                                                                                                                 |                        |
|                                                                                                         |                                                                               |                                                      |                                                                                                                                                                                                              |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                                                                           |                                                                                                                                                                                                    |                                                                                                                                |                                                                                                                                                                                                         |                        |
|                                                                                                         |                                                                               |                                                      |                                                                                                                                                                                                              |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                                                                           |                                                                                                                                                                                                    |                                                                                                                                |                                                                                                                                                                                                         |                        |
|                                                                                                         | YEAR 197                                                                      |                                                      | USEHOLD                                                                                                                                                                                                      |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1                                                                                                                                                    | YEAR 1                                                                                                                                                                    |                                                                                                                                                                                                    | USEHOL D                                                                                                                       |                                                                                                                                                                                                         |                        |
| ACTUAL 1                                                                                                | YEAR 197<br>ACTUALIE                                                          |                                                      |                                                                                                                                                                                                              |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      |                                                                                                                                                                           |                                                                                                                                                                                                    |                                                                                                                                | SIZE 6<br>  ESTIM.                                                                                                                                                                                      | (RESID                 |
|                                                                                                         | ACTUAL !E                                                                     | STIM !                                               | ACTUAL                                                                                                                                                                                                       | ESTIM.                                                                                                                                      | RESID.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ACTUAL                                                                                                                                               | ACTUAL                                                                                                                                                                    | ESTIM.                                                                                                                                                                                             | FACTUAL                                                                                                                        | ESTIM.                                                                                                                                                                                                  |                        |
| % POP 1                                                                                                 | ACTUALIE                                                                      | STIM !<br>% AGI !                                    | ACTUAL!                                                                                                                                                                                                      | ESTIM.<br>\$ AGI                                                                                                                            | RESID.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ACTUAL % POP.                                                                                                                                        | ACTUAL                                                                                                                                                                    | ESTIM.                                                                                                                                                                                             | ACTUAL<br># AGI                                                                                                                | ESTIM.                                                                                                                                                                                                  | : %                    |
| % POP                                                                                                   | ACTUALIE<br>% AGI                                                             | STIM  <br>% AG1                                      | ACTUAL                                                                                                                                                                                                       | ESTIM.<br>\$ AGI                                                                                                                            | RESID.   %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ACTUAL<br>% POP.                                                                                                                                     | ACTUAL<br>% AGI                                                                                                                                                           | ESTIM.                                                                                                                                                                                             | IACTUAL<br>  \$ AGI                                                                                                            | ESTIM.<br>  \$ AGI<br>                                                                                                                                                                                  | ; %<br> ;              |
| % POP 1                                                                                                 | ACTUALIE<br>% AGI :<br>                                                       | STIM  <br>% AGI  <br> <br>00674                      | ACTUAL  <br>\$ AGI  <br>                                                                                                                                                                                     | ESTIM.<br>\$ AGI<br>667.                                                                                                                    | RESID.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ACTUAL<br>% POP.<br>0. 05000                                                                                                                         | ACTUAL<br>: % AG1<br>!                                                                                                                                                    | ESTIM.<br>1 % AGI<br>1<br>10.00598                                                                                                                                                                 | ACTUAL<br>  \$ AGI<br>                                                                                                         | ESTIM.<br>  \$ AGI<br>  450.                                                                                                                                                                            | ; X<br>;;<br>; 3 Q     |
| % POP  <br>0 050001<br>0 100001                                                                         | ACTUALIE<br>% AGI  <br>                                                       | STIM !<br>% AGI !<br>!<br>006741<br>020671           | ACTUAL!<br>\$ AGI !<br>665. !                                                                                                                                                                                | ESTIM.<br>\$ AGI<br>667.<br>1380.                                                                                                           | RESID.   %     -0.3     -3.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ACTUAL<br>% POP.<br>0. 05000<br>0. 10000                                                                                                             | 1 ACTUAL<br>1 % AG1<br>1<br>10. 00616<br>10. 01996                                                                                                                        | ESTIM. 1 % AGI 1 10.00598 10.01885                                                                                                                                                                 | IACTUAL<br>  \$ AGI<br>  464<br>  1039.                                                                                        | ESTIM.<br>  \$ AGI<br>  450.<br>  969.                                                                                                                                                                  | 1 %<br>1 3 Q<br>1 6. 7 |
| % POP 1<br>0 050001<br>0 100001<br>0 150001                                                             | ACTUALIE<br>% AGI  <br> -<br>0 0067210<br>0 0201910<br>0 0384510              | 5TJM !<br>% AG1 !<br>!<br>00674!<br>02067!<br>03974! | ACTUAL!<br>\$ AGI !<br>665. !                                                                                                                                                                                | ESTIM.<br>\$ AGI<br>667.<br>1380.                                                                                                           | RESID.   %     -0.3     -3.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ACTUAL<br>% POP.<br>0. 05000<br>0. 10000                                                                                                             | 1 ACTUAL<br>1 % AG1<br>1<br>10. 00616<br>10. 01996                                                                                                                        | ESTIM.<br>1 % AGI<br>1<br>10.00598                                                                                                                                                                 | IACTUAL<br>  \$ AGI<br>                                                                                                        | ESTIM.<br>  \$ AGI<br>  450.<br>  969.<br>  1351                                                                                                                                                        | 1                      |
| % POP 1<br>0 050001<br>0 100001<br>0 150001                                                             | ACTUALIE<br>% AGI  <br>                                                       | 5TJM !<br>% AG1 !<br>!<br>00674!<br>02067!<br>03974! | ACTUAL!<br>\$ AGI !<br>665. !                                                                                                                                                                                | 667.<br>1380.                                                                                                                               | RESID.   %      -0.3   -3.4   -4.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ACTUAL<br>% POP.<br>0. 05000<br>0. 10000<br>0. 15000                                                                                                 | ACTUAL<br>  % AG1<br> <br> 0.00616<br> 0.01996<br> 0.03800                                                                                                                | ESTIM. 1 % AGI 1 10.00598 10.01885                                                                                                                                                                 | IACTUAL<br>  \$ AGI<br>                                                                                                        | ESTIM.<br>  \$ AGI<br>  450.<br>  969.<br>  1351                                                                                                                                                        | 1                      |
| 7 POP 1<br>0 050001<br>0 100001<br>0 150001<br>0 200001                                                 | ACTUALIE<br>% AGI  <br> -<br>0 0067210<br>0 0201910<br>0 0384510<br>0 0612210 | 5TJM   % AG1   00674   02067   03974   06241         | ACTUAL  <br>\$ AGT  <br>665.  <br>1334.  <br>1808.  <br>2255.                                                                                                                                                | 667.<br>1380.<br>1888<br>2245.                                                                                                              | RESID.  % -0.3 -3.4 -4.4 0.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ACTUAL<br>% POP.<br>0. 05000<br>0. 10000<br>0. 15000<br>0. 20000                                                                                     | I ACTUAL<br>I % AGI<br>I<br>IO. 00616<br>IO. 01996<br>IO. 03800<br>IO. 06019                                                                                              | ESTIM. 1 % AGI 1 10. 00598 10. 01885 10. 03680 10. 05833                                                                                                                                           | IACTUAL<br>  \$ AGI<br> <br>  464<br>  1039<br>  1358<br>  1671                                                                | ESTIM.<br>  \$ AGI<br>  450.<br>  769.<br>  1351<br>  1621.                                                                                                                                             | 1                      |
| 7 POP 1<br>                                                                                             | ACTUAL 1E<br>% AGI 1<br>                                                      | STIM   % AGI                                         | ACTUAL (<br>\$ AG1 (<br>665 (<br>1334 (<br>1808 (<br>2255 (<br>2589 (                                                                                                                                        | 667.<br>1380.<br>1888<br>2245.<br>2564.                                                                                                     | RESID.   %   -0.3    -3.4    -4.4    0.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ACTUAL<br>% POP.<br>0. 05000<br>0. 10000<br>0. 15000<br>0. 20000<br>0. 25000                                                                         | I ACTUAL<br>I % AG1<br>I<br>IO. 00616<br>IO. 01996<br>IO. 03800<br>IO. 06019<br>IO. 08543                                                                                 | ESTIM.  % AGI  10. 00598 10. 01885 10. 03680 10. 05833                                                                                                                                             | ACTUAL<br>  \$ AGI<br>                                                                                                         | ESTIM.<br>  \$ AGI<br>  450.<br>  769.<br>  1351<br>  1621.<br>  1865.                                                                                                                                  | X<br>                  |
| 7 POP 1<br>0 050001<br>0 100001<br>0 150001<br>0 200001<br>0 250001<br>0 300001                         | ACTUAL   E                                                                    | STIM   % A01                                         | ACTUAL ( \$ AG1   665   1334   1808   2255   2589   2956                                                                                                                                                     | 667.<br>1380.<br>1888<br>2245.<br>2564.<br>2859.                                                                                            | RESID.  2  -0.3  -3.4  -4.4  0.4  1.0  3.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ACTUAL<br>% POP.<br>0. 05000<br>0. 10000<br>0. 15000<br>0. 20000<br>0. 25000<br>0. 30000                                                             | 1 ACTUAL<br>1 % AG1<br>1<br>10.00616<br>10.01776<br>10.03800<br>10.06017<br>10.08543                                                                                      | ESTIM.  % AGI  10.00598  10.01885  10.03680  10.05833  10.08310  10.11090                                                                                                                          | ACTUAL                                                                                                                         | ESTIM.<br>  \$ AGI<br>  450.<br>  769.<br>  1351<br>  1621.<br>  1865.<br>  2093.                                                                                                                       | X<br>                  |
| 7 POP 1<br>0 050001<br>0 100001<br>0 150001<br>0 200001<br>0 250001<br>0 300001<br>0 350001             | ACTUAL IE % AGI                                                               | STIM : % A01 :                                       | ACTUAL I<br>\$ AGI  <br>665. I<br>1334. I<br>1808  <br>2255. I<br>2589. I<br>2956  <br>3258                                                                                                                  | 667.<br>1380.<br>1888<br>2245.<br>2564.<br>2859.                                                                                            | RESID.   %      -0.3   -3.4   -4.4   0.4   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0         | ACTUAL<br>% POP.<br>0. 05000<br>0. 10000<br>0. 15000<br>0. 20000<br>0. 25000<br>0. 30000<br>0. 35000                                                 | E ACTUAL<br>E % AGI<br>E<br>IO. 00616<br>IO. 01996<br>IO. 03800<br>IO. 06019<br>IO. 08543<br>IO. 11401<br>IO. 14563                                                       | ESTIM.  % AGI   10.00598 10.01885 10.03680 10.05833 10.08310 10.11090 10.14161                                                                                                                     | ACTUAL                                                                                                                         | ESTIM.  \$ AGI  450.  969.  1351  1621.  1665.  2093.  2012.                                                                                                                                            | 1                      |
| % POP 1<br>0 050001<br>0 100001<br>0 150001<br>0 200001<br>0 250001<br>0 300001<br>0 350001<br>0 400001 | ACTUAL   E                                                                    | STIM                                                 | 665. 1334. 11908 12255. 12956. 13258. 13556. 1                                                                                                                                                               | 667.<br>1380.<br>1888<br>2245.<br>2564.<br>2859.<br>3141.                                                                                   | RESID.   %     -0.3     -3.4     -4.4     1.0     1.0       1.0         1.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ACTUAL<br>% POP.<br>0. 05000<br>0. 10000<br>0. 15000<br>0. 20000<br>0. 25000<br>0. 35000<br>0. 40000                                                 | ACTUAL  AQ1   0.00616  0.01996  0.03800  10.06019  10.08543  10.14563                                                                                                     | ESTIM. 1 % AGI 1 10.00598 10.01885 10.03680 10.05833 10.08310 10.11090 10.14161                                                                                                                    | ACTUAL                                                                                                                         | ESTIM.   \$ AGI     450.   969.   1351   1621.   1865.   2093.   2312.   2527.                                                                                                                          | 1                      |
| % POP 1<br>                                                                                             | ACTUAL   E                                                                    | STIM                                                 | 665. 1334. 1808 2255. 1259. 2595. 1258. 3556. 13832. 1                                                                                                                                                       | 667.<br>1380.<br>1888.<br>2245.<br>2564.<br>2859.<br>3141.<br>3418.                                                                         | RESID.   %     -0.3     -3.4     -4.4       0.4         1.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ACTUAL<br>% POP.<br>0. 05000<br>0. 10000<br>0. 15000<br>0. 20000<br>0. 25000<br>0. 35000<br>0. 45000<br>0. 45000                                     | ACTUAL  AQ1   0.00616  0.01996  0.03800  10.06019  10.08543  10.11401  10.18019  10.21778                                                                                 | ESTIM. 1 % AGI 1 10 00598 10 01885 10 03680 10 05833 10 08310 10 11090 10 14161 10 17517                                                                                                           | ACTUAL                                                                                                                         | ESTIM.   \$ AGI     450.   969.   1351   1621.   1665.   2093.   2312.   2527.   2742.                                                                                                                  | 1                      |
| % POP 1<br>                                                                                             | ACTUAL   E                                                                    | STIM : % A01 :                                       | 665. 1334. 11908 12255. 12956. 13258. 13556. 1                                                                                                                                                               | 667.<br>1380.<br>1888.<br>2245.<br>2564.<br>2859.<br>3141.<br>3418.                                                                         | RESID.   %      -0.3   -3.4     -4.4     0.4     1.0     3.3     3.6     7.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ACTUAL<br>% POP.<br>0. 05000<br>0. 10000<br>0. 15000<br>0. 25000<br>0. 30000<br>0. 35000<br>0. 45000<br>0. 45000<br>0. 50000                         | ACTUAL  AQ1                                                                                                                                                               | ESTIM.  1 % AGI  1  10.00598  10.01885  10.03680  10.05833  10.08310  10.11090  10.11461  10.17517  10.21160  10.25095                                                                             | ACTUAL                                                                                                                         | ESTIM.   \$ AGI     450.   969.   1351   1621.   1665.   2093.   2312.   2527.   2742.                                                                                                                  | 1                      |
| % POP 1<br>                                                                                             | ACTUAL   E                                                                    | STIM : % A01 :                                       | 665. 1334. 1808 2255. 1259. 2595. 1258. 3556. 13832. 1                                                                                                                                                       | 667.<br>1380.<br>1888.<br>2245.<br>2564.<br>2859.<br>3141.<br>3418.<br>3694.                                                                | RESID.   %      -0.3   -3.4     -4.4     0.4     1.0     3.3     3.6     7.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ACTUAL<br>% POP.<br>0. 05000<br>0. 10000<br>0. 15000<br>0. 25000<br>0. 30000<br>0. 35000<br>0. 45000<br>0. 45000<br>0. 50000                         | ACTUAL  AQ1                                                                                                                                                               | ESTIM. 1 % AGI 1 10 00598 10 01885 10 03680 10 05833 10 08310 10 11090 10 14161 10 17517                                                                                                           | ACTUAL                                                                                                                         | ESTIM.   \$ AGI     450.   769.   1351   1665.   2093.   2312.   2527.   2742.   2963.                                                                                                                  | 1                      |
| 7. POP 1<br>                                                                                            | ACTUAL   E                                                                    | STIM                                                 | ACTUAL I<br>\$ AG1  <br>665  <br>1334  <br>1808  <br>2255  <br>2585  <br>2586  <br>3258  <br>3556  <br>3832  <br>4280                                                                                        | 667.<br>1380.<br>1888<br>2245.<br>2564.<br>2859.<br>3141.<br>3694.<br>3976.<br>4285.                                                        | RESID.   %   -0.3    -0.3    -3.4    -4.4    0.4    1.0    3.3    3.6    7.1    10.8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ACTUAL<br>% POP.<br>0. 05000<br>0. 10000<br>0. 15000<br>0. 25000<br>0. 30000<br>0. 35000<br>0. 45000<br>0. 50000<br>0. 55000                         | E ACTUAL E % AG1 G .00616 G .01996 G .03800 G .06019 G .08543 G .11401 G .14963 G .18019 G .25828 G .30478                                                                | ESTIM.  1 % AGI  1  10.00598  10.01885  10.03680  10.05833  10.08310  10.11090  10.11461  10.17517  10.21160  10.25095                                                                             | ACTUAL                                                                                                                         | ESTIM.   \$ AGI     450.   769.   1351   1621.   1965.   2093.   2312.   2527.   2742.   2963.   3195.                                                                                                  | 1                      |
| % POP 1                                                                                                 | ACTUALIE<br>% AGI  <br>                                                       | STIM                                                 | ACTUAL I<br>\$ AGT  <br>665.1<br>1334.1<br>1808.2255.1<br>2589.1<br>2958.1<br>3258.1<br>3556.1<br>3832.1<br>4280.1<br>4805.1                                                                                 | 667<br>1380<br>1888<br>2245<br>2564<br>2859<br>3141<br>3418<br>3694<br>3976<br>4285                                                         | RESID.   %   -0.3   -3.4   -4.4   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1. | ACTUAL % POP                                                                                                                                         | E ACTUAL E % AG1 C 00616 C 00696 C 0496 C 06019 C 06019 C 06019 C 14963 C 11401 C 14963 C 18019 C 25828 C 30478 C 35466                                                   | ESTIM. 1 % AGI 1 10. 00598 10. 01895 10. 05833 10. 09310 10. 11070 10. 14161 10. 17517 10. 21160 10. 29339 10. 33922                                                                               | ACTUAL   \$ AGI     464   1039.   1358.   1671.   1900.   2151   2381.   2602.   2830.   3049   3501.   3755.                  | ESTIM.   \$ AGI     450.     450.     1351     1621.     1665.   2073.     2312.   2527.   2742.   2742.   2743.   3175.     3451.                                                                      | 1                      |
| % POP 1                                                                                                 | ACTUALIE<br>% AGI  <br>                                                       | STIM                                                 | ACTUAL I<br>\$ AGI  <br>665. I<br>1334. I<br>1808  <br>2255. I<br>2589. I<br>2756  <br>3258  <br>3258. I<br>3832. I<br>4805. I<br>4805. I<br>4805. I                                                         | 667.<br>1388<br>2245.<br>2564.<br>2859.<br>3141.<br>3418.<br>3694.<br>3976.<br>4285.<br>4596.                                               | RESID.   %   -0.3     -0.3     -3.4     0.4     0.4     1.0     3.3     3.6     3.6     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0     1.0    | ACTUAL<br>% POP.<br>0. 05000<br>0. 10000<br>0. 20000<br>0. 25000<br>0. 30000<br>0. 45000<br>0. 45000<br>0. 50000<br>0. 60000<br>0. 65000             | E ACTUAL E % AG1 E - 00616 E 0 00976 E 0 01996 E 0 08543 E 0 11401 E 0 14563 E 0 18019 E 0 25828 E 0 30478 E 0 40455                                                      | ESTIM. 1 % AGI 1 10. 00598 10. 01895 10. 05833 10. 08310 10. 11090 10. 14161 10. 17517 10. 21160 10. 25095 10. 29339 10. 33922                                                                     | ACTUAL                                                                                                                         | ESTIM.   \$ AGI     450.   969.   1351   1621.   1865.   2093.   2312.   2527.   2742.   2763.   3195.   3451.   3714.                                                                                  | X                      |
| % POP 1                                                                                                 | ACTUAL IE % AGI                                                               | STIM                                                 | ACTUAL I<br>\$ AGT   1<br>665. I<br>1334. I<br>1908. I<br>2255. I<br>2589. I<br>2756. I<br>3258. I<br>4280. I<br>4805. I<br>4805. I                                                                          | 667.<br>1380.<br>1380.<br>2245.<br>2564.<br>2859.<br>3141.<br>3418.<br>3694.<br>3976.<br>4285.<br>4596.<br>4745.<br>5331.                   | RESID.   %   -0.3   -3.4   -4.4   1.0   4   1.0   3.3   3.6   3.9   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0  | ACTUAL<br>% POP.<br>0. 05000<br>0. 10000<br>0. 20000<br>0. 25000<br>0. 30000<br>0. 45000<br>0. 45000<br>0. 55000<br>0. 55000<br>0. 65000<br>0. 70000 | E ACTUAL E % AG1 E                                                                                                                                                        | ESTIM. 1 % AGI 1 10.00598 10.01895 10.05833 10.08310 10.11090 10.14161 10.17517 10.21160 10.25095 10.33922 10.38857                                                                                | ACTUAL                                                                                                                         | ESTIM.   \$ AGI     430.   969.   1351   1365.   2093.   2312.   2527.   2742.   2963.   3195.   3451.   3714.   4031.                                                                                  | 1                      |
| % POP 1                                                                                                 | ACTUAL   E                                                                    | STIM                                                 | ACTUAL I<br>\$ AGI  <br>665.  <br>1334.  <br>1808  <br>2255.  <br>2589.  <br>2589.  <br>3556.  <br>3832.  <br>4805.  <br>4805.  <br>4805.  <br>4805.  <br>4805.                                              | 667.<br>1380.<br>1380.<br>2245.<br>2564.<br>2859.<br>3141.<br>3416.<br>3694.<br>3976.<br>4285.<br>4596.<br>4596.<br>5331.<br>5785.          | RESID.   %   -0.3   -3.4   -4.4   1.0   4.3   3.6   3.7   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1. | ACTUAL % POP                                                                                                                                         | ACTUAL  AQ1  AQ1  AQ1  AQ1  AQ1  AQ1  AQ1  A                                                                                                                              | ESTIM. 1 % AGI 1 10.00598 10.01885 10.05833 10.08310 10.11090 10.114161 10.17517 10.21160 10.25095 10.39857 10.39857 10.44211                                                                      | ACTUAL   \$ AGI   464   1039.   1358.   1671.   1900.   2151   2301.   2602.   2830.   3049.   3755.   3755.   3755.   4165.   | ESTIM.   \$ AGI     450.   969.   1351   1621.   1665.   2093.   2312.   2527.   2742.   2963.   3195.   3451.   3714.   4031.   4379.                                                                  | 1                      |
| % POP 1                                                                                                 | ACTUAL IE % AGI                                                               | STIM                                                 | ACTUAL I<br>\$ AGI  <br>665.  <br>1334.  <br>1808  <br>2255.  <br>2595.  <br>2596.  <br>3258  <br>3556.  <br>3832.  <br>4280.  <br>4805.  <br>4805.  <br>4805.  <br>4805.  <br>6067.  <br>6140.              | 667.<br>1380.<br>1888<br>2245.<br>2564.<br>2859.<br>3141.<br>3418.<br>3694.<br>3976.<br>4285.<br>4596.<br>4745.<br>5331.<br>5785.<br>6321.  | RESID.   %   -0.3   -3.4   -4.4   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1. | ACTUAL % POP                                                                                                                                         | ACTUAL  AQ1  AQ1  AQ1  AQ1  AQ1  AQ1  AQ1  A                                                                                                                              | ESTIM.  1 % AGI  1  10.00598  10.01685  10.05833  10.05833  10.08310  10.11090  10.117517  10.21160  10.25095  10.29339  10.38857  10.44211  10.50028                                              | ACTUAL   \$ AGI   464   1039   1358   1671   1900   2151   2381   2602   2830   3049   3501   3755   3755   3755   4165   4825 | ESTIM.   \$ AGI     450.   969.   1351   1621.   1665.   2073.   2312.   2527.   2742.   2963.   3195.   3451.   3714.   4031.   4379.   4905.                                                          | 1                      |
| 7. POP 1                                                                                                | ACTUAL IE % AGI                                                               | STIM                                                 | ACTUAL I<br>\$ AGI  <br>665. 1<br>1908  <br>2255. 2<br>2587. 2<br>2756  <br>3258  <br>3556. 1<br>3832. 1<br>4805. 1<br>4805. 1<br>4805. 1<br>4805. 1<br>6067. 1<br>6140. 1<br>6561. 1                        | 667<br>1380<br>1888<br>2245<br>2564<br>2859<br>3141<br>3418<br>3694<br>4285<br>4596<br>4745<br>5785<br>6321<br>7010                         | RESID.   %   -0.3    -3.4    -4.4    0.4    1.0    3.3    3.6    7.6    10.8    4.3    -10.9    -10.9    -10.9    -2.9    -6.8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ACTUAL % POP                                                                                                                                         | ACTUAL  AG1  CO 00616  CO 00976  CO 08543  CO 11401  CO 18019  CO 25728  CO 30478  CO 35466  CO 40455  CO 57385  CO 57385  CO 63794                                       | ESTIM. 1 % AGI 1 10. 00598 10. 01885 10. 05833 10. 08310 10. 11090 10. 11090 10. 125095 10. 25095 10. 33922 10. 38857 10. 44211 10. 50028 10. 56410 10. 63526                                      | ACTUAL                                                                                                                         | ESTIM.   \$ AGI     450.     1351   1621.   1065.   2073.   2312.   2527.   2742.   2763.   3195.   3451.   3714.   4031.   4379.   4905.   5356.                                                       | X                      |
| % POP   1   1   1   1   1   1   1   1   1                                                               | ACTUAL IE X AGI                                                               | STIM                                                 | ACTUAL   \$ AGI   665.   1334.   1808   2255.   2589.   2956   3258   3556.   3832.   4805.   4805.   4805.   4805.   6067.   6160.   6561.   7536.                                                          | 667<br>1380<br>1888<br>2245<br>2564<br>2859<br>3141<br>3418<br>3694<br>3976<br>4285<br>4596<br>4745<br>5331<br>5785<br>6321<br>7010         | RESID.   %   -0.3   -3.4   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0 | ACTUAL % POP                                                                                                                                         | E ACTUAL                                                                                                                                                                  | ESTIM.  1 % AGI  1  10. 00598  10. 01895  10. 05833  10. 08310  10. 11070  10. 114161  10. 17517  10. 21160  10. 29339  10. 38857  10. 44211  10. 50028  10. 63526  10. 63526                      | ACTUAL   \$ AGI   464   1039   1671   1900   2151   2381   2602   23049   3501   3755   3755   3755   4825   4825   5920       | ESTIM.   \$ AGI     450.     769.     1351     1621.     1065.     2073.     2312.     2527.     2742.     2742.     2743.     3195.     3451.     3714.     4031.     4379.     4905.     5356.   6135 | X                      |
| % POP   1   1   1   1   1   1   1   1   1                                                               | ACTUAL IE % AGI                                                               | STIM                                                 | ACTUAL I<br>\$ AGI  <br>665. I<br>1334. I<br>1808  <br>2255. I<br>2589. I<br>2956  <br>3258  <br>3258. I<br>3258. I<br>4805. I<br>4805. I<br>4805. I<br>6067. I<br>6140. I<br>6561. I<br>7536. I<br>10033. I | 667<br>1380<br>1888<br>2245<br>2564<br>2859<br>3141<br>3418<br>3694<br>4285<br>4596<br>4945<br>5331<br>5785<br>6321<br>7010<br>7974<br>9617 | RESID.   %   -0.3   -3.4   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0 | ACTUAL % POP                                                                                                                                         | E ACTUAL E % AG1 C 00616 C 00976 C 08543 C 11401 C 14563 C 121778 C 21778 C 35466 C 40455 C 45443 C 57385 C 57385 C 71657 C 81659                                         | ESTIM.  1 % AGI  1  10. 00598  10. 01895  10. 05833  10. 08310  10. 11090  10. 14161  10. 17517  10. 25095  10. 29339  10. 33922  10. 38857  10. 44211  10. 50028  10. 50410  10. 63526  10. 71675 | ACTUAL   * AGI   464   1039   1671   1900   2151   2381   2602   2830   3551   3755   3755   4165   4825   5920   7529         | ESTIM.   \$ AGI     450.   767.   1351   1621.   1665.   2093.   2312.   2527.   2742.   2763.   3195.   3451.   3714.   4031.   4379.   4905.   4905.   4905.   6135   7438.                           | X                      |
| % POP   1   1   1   1   1   1   1   1   1                                                               | ACTUAL IE X AGI                                                               | STIM                                                 | ACTUAL I<br>\$ AGI  <br>665. I<br>1334. I<br>1808  <br>2255. I<br>2589. I<br>2956  <br>3258  <br>3258. I<br>3258. I<br>4805. I<br>4805. I<br>4805. I<br>6067. I<br>6140. I<br>6561. I<br>7536. I<br>10033. I | 667<br>1380<br>1888<br>2245<br>2564<br>2859<br>3141<br>3418<br>3694<br>4285<br>4596<br>4945<br>5331<br>5785<br>6321<br>7010<br>7974<br>9617 | RESID.   %   -0.3   -3.4   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0   1.0 | ACTUAL % POP                                                                                                                                         | I ACTUAL  X AG1  10. 00616  10. 01996  10. 08543  10. 11401  10. 14563  10. 18019  10. 21778  10. 35466  10. 45443  10. 45443  10. 57385  10. 57385  10. 63794  10. 71657 | ESTIM.  1 % AGI  1  10. 00598  10. 01895  10. 05833  10. 08310  10. 11090  10. 14161  10. 17517  10. 25095  10. 29339  10. 33922  10. 38857  10. 44211  10. 50028  10. 50410  10. 63526  10. 71675 | ACTUAL   * AGI   464   1039   1671   1900   2151   2381   2602   2830   3551   3755   3755   4165   4825   5920   7529         | ESTIM.   \$ AGI     450.     769.     1351     1621.     1065.     2073.     2312.     2527.     2742.     2742.     2743.     3195.     3451.     3714.     4031.     4379.     4905.     5356.   6135 | X                      |

HOUSEHOLD SIZE 4

YEAR 1975

237

| 0. 4500010. 1366210. 143571 | 3264   3365.    | -3. 110. 4500010. 1853    | 310. 187741 <b>5</b> 698         | 1 5565.1 2.3    |
|-----------------------------|-----------------|---------------------------|----------------------------------|-----------------|
| 0 5000010.1668310.178431    | 3264. 1 3766.   | 1 -15, 410, 5000010, 2239 | 210. 224741 6351                 | . 1 6096. 1 4 0 |
| 0 5500010.2060410.217391    | 4235   4210.    | 0. 610. 5500010. 2669     | 010. 265151 7080                 | 1 6659.1 6.0    |
| 0 6000010 2487710. 260741   | 4617. 1 4683.   | -1. 410. 6000010. 3138    | 310. 309181 7742                 | 1 7255.1 6.3    |
| 0 6500010, 3000310, 308821  | 5538. 1 5195.   | 6. 210. 6500010. 3645     | 110. 357281 8342                 | 1 7925.1 5 0    |
| 0 7000010 3550210 362671    | 5941. ( 5817.   | 2, 110, 7000010, 41966    | 510, 410021 9088                 | 1 8691.1 4 4    |
| 0 7500010. 4216310. 422741  | 7196. 1 6511.   |                           | 210. 468181 9978                 | 1 9583.1 4.0    |
| 0. 8000010. 4951610. 491181 | 7943.1 7372.    |                           | 310. 532871 10918                | 10659 2 4       |
| 0 8500010, 5791010, 569721  | 9069. I B4B4.   |                           |                                  |                 |
| 0 9000010.6763310.662511    |                 |                           |                                  |                 |
| 0 9500010 7924110.779741    |                 |                           |                                  |                 |
| 1 0000011,0000011.000001    | 22426. 1 23795. | -6. 111. 0000011. 00000   | 011.000001 32308.                | 1 33473.1 -3.6  |
|                             |                 |                           |                                  |                 |
| YEAR 1970 HOL               | USEHOLD SIZE 3  | 1 YEAR                    | 1970 HOUSEHOLD                   | SIZE 4          |
| ACTUAL ! ACTUAL IESTIM. !   | ACTUAL! ESTIM.  | RESID. LACTUAL L'ACTUAL   | LIESTIM. FACTUAL                 | I ESTIM. IRESID |
| % POP. 1 % AGI 1 % AGI 1    | \$ AGI   \$ AGI | %  % POP.   % AQI         | 1 % AGI 1 \$ AGI                 | # AGI   %       |
|                             | •               | •                         | •                                | •               |
| 0 0500010.0074910.007031    | 785. 1 737.     |                           |                                  | 1 995.1 2.3     |
| 0 1000010 0213310.021241    | 1451. l ·1489.  |                           |                                  |                 |
| 0 1500010.0396410.040521    | 1917   2019.    | -5. 310. 1500010. 04640   | ) 0,04632  2419.                 | 1 2443.1 -1.0   |
| 0 2000010.0612910.063391    | 2269. 1 2396.   | -5. 610. 2000010. 0717:   | 110.071351 2902.                 | 1 2070.1 1.1    |
| 0 2500010 0867510.089441    | 2667.1 2729.    | -2. 310. 2500010. 0998    | 710. 099501 - 3232.              | 1 3227.1 0 1    |
| 0 3000010.1161310.118441    | 3079. 1 3039.   | 1. 310. 3000010. 13100    | 010. 130481 - 3 <del>5</del> 66. | 1 3553.1 0.4    |
| 0 3500010.1487410.150281    | 3417.   3335.   | 2. 410. 3500010. 16619    | 710. 164161 - 4035.              | 1 3851. 1 4. 3  |
| 0 4000010 1837910 184881    | 3672 : 3625.    | 1, 310, 4000010, 2031     | 210. 200441 4235                 | 1 4160.1 1 8    |
| 0 4500010, 2231910, 222251  | 4128.1 3916.    | 5, 110, 4500010, 24241    | 110. 239401 4505                 | 1 4468 1 0 8    |
| 0 5000010 2653110, 262481   | 4413.1 4215.    | 4, 510, 5000010, 28512    | 210 280991 4897                  | 1 4769.1 2.6    |
| 0. 5500010 3096810, 305791  | 4649. 1 4537.   | 2, 410, 5500010, 32952    | 210.325281 5071                  | 1 5079.1 0.3    |
| 6 6000010 3583210, 352221   | 5096. 1 4865    | 4, 510, 6000010, 37706    | 510. 372551 5451.                | 1 5421 1 0 6    |
| 0 6500010 4101210, 402181   | 5427. 1 5235.   | 3. 610. 6500010. 4277     | 710. 422951 5817                 | 1 5779 1 0 7    |
| 0 7000010.4651610.456001    | 5767. 1 5638.   | 2, 210, 7000010, 48176    | 310. 476921 6191.                | 1 6188.1 0.0    |
| 0.7500010.5243210.514411    | 6198   6120.    | 1 310, 7500010, 53930     | 10. 534871 6595.                 | 1 6545 : -0 B   |
| 0 8000010 5885610 578211    | 6730.1 6684     | 0, 710, 8000010, 60458    | 310, 597711 7486.                | 1 7205.4 3.7    |
| O H500010 6620210 648931    | 7697 1 7409.    | 3, 710, 8500010, 67529    | 710. 666761 8108.                | 1 7718 1 2 3    |
| 0 9000010 7412010 729321    | 8276   8422     | -1 510, 9000010, 74600    | 10. 744501 B108                  | 1 8914 1 -9 9   |
| 0 9500010 0304510 026211    | 9351. 1 10152   | -8. 610. 9500010 83437    | 710. 837061 10133                | 1 10614 : -4 7  |
| 1 0000011 0000011 000001    | 17764.   18208. | -2. 511. 0000011. 00000   | 11.000001 18991                  | 1 18683 : 1 6   |
|                             |                 |                           |                                  |                 |

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                                                                                                                                                                                                                                                                                                                                                                                                                                               | 90P.<br>05000<br>10000<br>15000<br>20000<br>25000<br>30000                                                        | 10.<br>10.<br>10.<br>10.                                    | 00527<br>00527<br>01512<br>02832<br>04464<br>06479<br>08761<br>11525                                                                                                     | 10. (10. (10. (10. (10. (10. (10. (10. (        | TIM.  <br>AGI  <br> <br>DO376 <br>D1366 <br>D2824 <br>D4637 <br>D6783 <br>D9248                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 638<br>1194<br>1598<br>1977<br>2464<br>2739<br>3347                                                                                                                      | ESTIM.  \$ AGI  456.  1178.  1765  2195.  2600.  2985.  3345.                                                                                                   | 28.6<br>-0.4<br>-10.5<br>-11.0<br>-5.5<br>-9.0                                                                                                                                                                                                                                             |
| % POP 1<br>0 050001<br>0 100001<br>6 150001<br>0 200001<br>0 250001<br>0 350001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ACTUAL % AGI 0 00834 0 01668 0 02503 0 03337 0 04171 0 05923 0 08245 0 10568                                                                 | 11-<br>11-<br>110.<br>110.<br>110.                                        | 00650:<br>00396:<br>00364:<br>00364:<br>01583:<br>03170:<br>05145:<br>07473:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 651   651   651   651   651   651   651   651   651   651   1366   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   1812   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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 90P.<br>05000<br>10000<br>15000<br>20000<br>25000<br>30000<br>35000                                               | 10.<br>10.<br>10.<br>10.<br>10.<br>10.                      | 00527<br>01512<br>02832<br>04464<br>06499<br>08761<br>11525                                                                                                              | 10. (10. (10. (10. (10. (10. (10. (10. (        | TIM.  <br>AGI  <br> <br>00376 <br>01366 <br>01366 <br>02824 <br>04637 <br>06783 <br>09248 <br>12010                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 638<br>1194.<br>1598<br>1977<br>2464.<br>2739.<br>3347.                                                                                                                  | ESTIM.<br>  \$ AGI<br>  456.<br>  1198.<br>  1765.<br>  2195.<br>  2600.<br>  2985.<br>  3345.<br>  3705.                                                       | 28.6<br>-0.4<br>-10.5<br>-11.0<br>-5.5<br>-9.0                                                                                                                                                                                                                                             |
| % POP 1<br>0 050001<br>0 100001<br>0 150001<br>0 200001<br>0 250001<br>0 350001<br>0 400001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ACTUAL % AGI 0 00834 0 01668 0 02503 0 04171 0 05923 0 08245 0 10568 0 12891                                                                 | 10.<br>10.<br>10.<br>10.<br>10.                                           | 00650:<br>00396:<br>00364:<br>00364:<br>01583:<br>03170:<br>05145:<br>07473:<br>10155:<br>13204:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 651. 651. 651. 651. 1366. 1812. 1812. 1812.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | -507.<br>199.<br>593.<br>1238.<br>1541.<br>1816.<br>2093.<br>2379.                                                                       | % 177. 69. 84690. 1-120. 1-1531.                                                                                    | 710.<br>510.<br>510.<br>510.<br>310.<br>310.<br>210.<br>310.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | POP.<br>05000<br>10000<br>15000<br>20000<br>25000<br>30000<br>40000                                               | 10.                                                         | 00527<br>01512<br>02832<br>04464<br>06499<br>08761<br>11525<br>14490                                                                                                     | 10. (10. (10. (10. (10. (10. (10. (10. (        | TIM.  <br>AGI  <br>DO376  <br>D1366  <br>D2824  <br>D4637  <br>D4783  <br>D9248  <br>12010  <br>15070                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 638<br>1194.<br>1598<br>1977<br>2464.<br>2739.<br>3347.<br>3590.                                                                                                         | ESTIM.  \$ AGI  456.  11765  2175.  2600.  2985.  3345.  3705.  4071.                                                                                           | 26.6<br>-0.4<br>-10.5<br>-11.0<br>-5.5<br>-9.0<br>-5.5<br>-9.0                                                                                                                                                                                                                             |
| # POP   1   0   05000   0   10000   0   20000   0   25000   0   35000   0   40000   0   45000   0   45000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ACTUAL % AGI 0 00834 0 01668 0 02503 0 03337 0 04171 0 05923 0 08245 0 10568 0 12891                                                         | 10.<br>10.<br>10.<br>10.<br>10.                                           | TIM.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 651. 651. 651. 651. 651. 651. 1366. 1812. 1812. 1812. 1812.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | -507.<br>199.<br>593.<br>951.<br>1238.<br>1541.<br>1816.<br>2093.<br>2379.<br>2677.                                                      | % 177.                                                                                                              | 910.<br>510<br>910.<br>510<br>910.<br>310.<br>810.<br>210.<br>510.<br>310.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 90P.<br>05000<br>10000<br>15000<br>20000<br>25000<br>35000<br>40000<br>45000                                      | 10.10.10.10.10.10.                                          | 00527<br>00527<br>01512<br>02832<br>04464<br>06479<br>11525<br>14470<br>18140<br>21990                                                                                   | 10. (10. (10. (10. (10. (10. (10. (10. (        | TIM.  <br>AGI  <br> <br>DO376 <br>D1366 <br>D1366 <br>D1367 <br>D6783 <br>D6783 <br>D6783 <br>D13070 <br>D13070 <br>D13070 <br>D13070                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 638<br>1194.<br>1598<br>1977<br>2464.<br>2739.<br>3347.<br>3590.<br>4420.<br>4662.                                                                                       | ESTIM.  \$ AGI  456.  1198.  1765  2195.  2600.  2985.  3345.  3705.  4071.  4452.                                                                              | 26.6<br>-0.4<br>-10.5<br>-11.0<br>-5.5<br>-9.0<br>-9.0<br>-9.2<br>7.9                                                                                                                                                                                                                      |
| # PDP   1   10000   0   10000   0   15000   0   25000   0   35000   0   45000   0   50000   0   50000   0   50000   0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ACTUAL % AGI                                                                                                                                 | 10.<br>10.<br>10.<br>10.<br>10.                                           | TIM. (CAGE CONTROL CON | 651. 651. 651. 651. 1366. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 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1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812  | -50750759359351523854118162093237924772993.                                                                                              | % 177. 1 69. 1 -46. 1 -90. 1 -12. 1 -0. 1 -15. 1 -21. 2.                                                            | 910.<br>510<br>910.<br>510<br>910.<br>310.<br>810.<br>210.<br>510.<br>610.<br>910.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 90P.<br>05000<br>10000<br>15000<br>20000<br>25000<br>35000<br>40000<br>45000<br>50000                             | 10.10.10.10.10.10.                                          | 00527<br>01512<br>02832<br>04464<br>06499<br>08761<br>11525<br>14490<br>18140<br>21990<br>26206                                                                          | 1ES 10. (10. (10. (10. (10. (10. (10. (10.      | TIM.   A01   | ACTUAL<br>\$ A01<br>638<br>1194<br>1598<br>1977<br>2464<br>2739<br>3347<br>3990<br>4420<br>4662<br>5104                                                                  | ESTIM.  \$ AGI  456.  1178. 1765 2195. 2600. 2985. 3345. 3705. 4071. 4452.                                                                                      | 26.6<br>-0.4<br>-10.5<br>-11.0<br>-5.5<br>-1.0<br>-5.5<br>-0.1<br>-3.2<br>7.7<br>4.5                                                                                                                                                                                                       |
| # POP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ACTUAL % AGI                                                                                                                                 | 115<br>117<br>117<br>110<br>110<br>110<br>110<br>110<br>110<br>110<br>110 | TIM. (CAGE CAGE CAGE CAGE CAGE CAGE CAGE CAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 651. 651. 651. 651. 1366. 1812. 1812. 1812. 1812. 3084. 3084                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | -507. 199. 593. 1238. 1541. 1816. 2093. 2379. 2677. 2993.                                                                                | % 177.   1 69.   1 -46.   1 -90.   1 -12.   1 -0.   1 -15.   1 -21.   2.   -8.                                      | 7 10.<br>7 10.<br>7 10.<br>7 10.<br>7 10.<br>3 10.<br>8 10.<br>2 10.<br>3 10.<br>6 10.<br>7 10.<br>5 10.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | POP.<br>05000<br>10000<br>20000<br>25000<br>35000<br>40000<br>45000<br>55000<br>60000                             | 10.10.10.10.10.10.10.                                       | 00527<br>00527<br>01512<br>02832<br>04464<br>06499<br>08761<br>11525<br>14490<br>181490<br>26206<br>30852                                                                | 10. (10. (10. (10. (10. (10. (10. (10. (        | TIM.   A01   | ACTUAL<br>\$ A01<br>638<br>1194<br>1598<br>1977<br>2464<br>2739<br>3347<br>3590<br>4462<br>5104<br>5626                                                                  | ESTIM.  \$ AGI  456. 1178. 1765. 2195. 2600. 2985. 3345. 3705. 4071. 4452. 4868. 5298                                                                           | 28.6<br>-0.4<br>-10.5<br>-11.0<br>-5.5<br>-9.0<br>0.1<br>-3.2<br>7.7<br>4.5<br>4.6                                                                                                                                                                                                         |
| 7 POP 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ACTUAL % AGI                                                                                                                                 | 115 117 117 117 117 117 117 117 117 117                                   | TIM. (CAGE CONTROL CON | 651. 651. 651. 651. 1366. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 1812. 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | POP.<br>05000<br>10000<br>20000<br>25000<br>25000<br>35000<br>40000<br>45000<br>55000                             | 10.<br>10.<br>10.<br>10.<br>10.<br>10.<br>10.<br>10.<br>10. | 00527<br>00527<br>01512<br>02832<br>04464<br>06499<br>08761<br>11525<br>14490<br>18140<br>21990<br>26206<br>30852<br>35843                                               | 10. (10. (10. (10. (10. (10. (10. (10. (        | TIM. ( AGI   1 | ACTUAL<br>\$ A01<br>638<br>1194<br>1598<br>1977<br>2464<br>2739<br>3347<br>3590<br>4420<br>462<br>5104<br>5626<br>6044                                                   | ESTIM.  \$ AGI  456. 1178. 1765. 2195. 2600. 2985. 3345. 3705. 4071. 4452. 4868. 5298. 5770.                                                                    | 29.6<br>-0.4<br>-1.0<br>-5.5<br>-9.0<br>-3.2<br>7.9<br>4.6<br>5.8                                                                                                                                                                                                                          |
| # POP   1   10000   0   10000   15000   0   25000   0   35000   0   45000   0   55000   0   65000   0   65000   0   70000   0   70000   0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ACTUAL % AGI 0 00834 0 01668 0 02503 0 04171 0 05923 0 08245 0 10568 0 12891 0 15714 0 29513 0 28513                                         | 115<br>117<br>117<br>110<br>110<br>110<br>110<br>110<br>110<br>110<br>110 | TIM. (CART CART CART CART CART CART CART CART                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ACTUAL: \$ AGI   651.  651.  651.  651.  1366.  1812.  1812.  1812.  2202.  3084.  3084.  3818.  4318.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | -507. 199. 199. 199. 199. 1991. 1238. 1541. 1816. 2093. 2379. 2477. 2993. 3345. 3731. 4163.                                              | % 177. 69. 84690. 1-120. 1-15312121213. 3. 3.                                                                       | 7   A<br>  1%<br>  7   0<br>  5   0<br>  7   0<br>  7   0<br>  3   0<br>  5   0<br>  6   0<br>  6 | POP.<br>05000<br>10000<br>15000<br>20000<br>25000<br>35000<br>45000<br>55000<br>60000<br>65000                    | 10.10.10.10.10.10.10.10.10.10.10.10.10.1                    | ACTUAL<br>4 AG1<br>00527<br>01512<br>02832<br>04464<br>06499<br>08761<br>11525<br>14490<br>18140<br>21990<br>30852<br>35843<br>41350                                     | 1ES 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1       | TIM.   A01   | ACTUAL<br>\$ A01<br>638<br>1194<br>1598<br>1977<br>2464<br>2739<br>3347<br>3590<br>4420<br>4662<br>5104<br>5626<br>6044<br>6668                                          | ESTIM.<br>  \$ AGI<br>  456.<br>  1198.<br>  1765<br>  2195.<br>  2600.<br>  2985.<br>  3345.<br>  3705.<br>  4071.<br>  4452.<br>  4868.<br>  5298.<br>  5770. | 28.6<br>-0.4<br>1-10.5<br>1-11.0<br>1-5.5<br>1-9.0<br>1-3.2<br>7.9<br>4.6<br>4.6<br>5.8<br>4.5                                                                                                                                                                                             |
| # POP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ACTUAL % AGI 0 00834 0 01668 0 02503 0 04171 0 05923 0 10568 0 12891 0 15714 0 23619 0 28613 0 34049                                         | 1                                                                         | TIM. (CART CART CART CART CART CART CART CART                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | POP.<br>05000<br>10000<br>15000<br>20000<br>25000<br>35000<br>40000<br>50000<br>55000<br>65000<br>70000           | 10.<br>10.<br>10.<br>10.<br>10.<br>10.<br>10.<br>10.<br>10. | ACTUAL<br>4 AQ1<br>00527<br>01512<br>02832<br>04464<br>06479<br>08761<br>11525<br>14470<br>18140<br>21790<br>26206<br>30852<br>30852<br>41350<br>47370                   | 1ES   2   1   10   (10   10   10   10   10   10 | TIM.   A01   | ACTUAL<br>\$ A01<br>638<br>1194<br>1977<br>2464<br>2739<br>3347<br>3590<br>4420<br>4662<br>5104<br>5626<br>6044<br>6668<br>7289                                          | ESTIM.  \$ AGI  456.  1178.  12600.  2985.  2345.  3345.  4071.  4452.  4868.  5278.  5770.  6328.  6755.                                                       | 28.6<br>-0.4<br>-10.5<br>-10.5<br>-10.5<br>-10.5<br>-9.0<br>-5.7<br>-9.0<br>-3.2<br>-7.9<br>4.6<br>5.8<br>5.8<br>5.1                                                                                                                                                                       |
| # POP   1   10000   0   10000   0   15000   0   25000   0   35000   0   45000   0   55000   0   65000   0   65000   0   65000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000   0   75000 | ACTUAL % AGI 0 00834 0 01668 0 02503 0 04171 0 05923 0 08245 0 10568 0 12891 0 15714 0 19667 0 28513 0 28513 0 34049                         | 1                                                                         | TIM. (CART CART CART CART CART CART CART CART                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 651 651 651 651 651 1366 1812 1812 1812 1812 1812 1812 1812 18                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -507.<br>199.<br>593.<br>951.<br>1238.<br>1541.<br>1816.<br>2093.<br>2379.<br>2677.<br>2993.<br>3345.<br>3731.<br>4163.<br>4672.<br>5303 | % 177. 69. 8901201521212. 28. 3. 4.                                                                                 | 910.<br>910.<br>910.<br>910.<br>910.<br>310.<br>910.<br>310.<br>910.<br>910.<br>910.<br>910.<br>910.<br>910.<br>910.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | POP.<br>05000<br>10000<br>15000<br>25000<br>35000<br>40000<br>45000<br>55000<br>65000<br>70000<br>75000           | 1 2 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0                     | ACTUAL<br>4 AQ1<br>00527<br>01512<br>02832<br>04464<br>06499<br>08761<br>11525<br>14490<br>18140<br>21990<br>26206<br>30852<br>30852<br>35843<br>41330<br>47370<br>54493 | 1ES   2   1   10   (10   10   10   10   10   10 | TIM.   A01   | 638<br>1194.<br>1598<br>1977<br>2464.<br>2739.<br>3347.<br>3590.<br>4420.<br>4662.<br>5104.<br>5626.<br>6044.<br>6648.<br>7289.                                          | ESTIM.  \$ AGI  456.  1178.  1765  24600.  2785.  3345.  3705.  4071.  4452.  4868.  5278.  5770.  6938.  6755.                                                 | 26.6<br>-0.4<br>-10.5<br>-10.5<br>-15.5<br>-9.0<br>-5.1<br>-3.2<br>-7.9<br>4.6<br>5.8<br>4.6<br>5.8<br>4.6<br>10.5                                                                                                                                                                         |
| # POP   1   10000   0   10000   0   20000   0   25000   0   35000   0   45000   0   55000   0   65000   0   75000   0   75000   0   75000   0   80000   0   80000   0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ACTUAL % AGI                                                                                                                                 | 11 7 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1                                   | TIM. (CAGE 1) (CAGE 1 | 651 651 651 651 651 1366 1812 1812 1812 1812 1812 1812 1812 18                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -5075075939511238154118162093237924772993334537314163467253036108.                                                                       | % 77. 69. 69. 69. 69. 69. 69. 69. 69. 69. 69                                                                        | ). [A]<br>1%<br>910.<br>510<br>910.<br>310.<br>210.<br>310.<br>610.<br>910.<br>310.<br>610.<br>910.<br>110.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | POP.<br>05000<br>10000<br>15000<br>25000<br>35000<br>40000<br>45000<br>55000<br>60000<br>75000<br>80000           | 10.10.10.10.10.10.10.10.10.10.10.10.10.1                    | 00527<br>00527<br>01512<br>02832<br>04464<br>06499<br>08761<br>11525<br>14490<br>21990<br>26206<br>30852<br>35843<br>41350<br>54493<br>62258                             | 1ES   2   1   2   1   1   1   1   1   1   1     | TIM. 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| # POP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ACTUAL % AGI 0 008345 0 02503 0 03337 0 04171 0 05923 0 08245 0 10568 0 12871 0 17667 0 23617 0 28513 0 340491 0 47539 0 56151               | 11 7 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1                                   | TIM. 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1ESTIM.<br>1 % AGI<br>1<br>10. 00830<br>10. 02434<br>10. 04546                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ACTUAL<br>  \$ AGI<br> <br>  540.<br>  786.<br>  1254.                                                                                                                                                                  | # AGI<br># AGI<br># 447.<br># 864.                                                                                                                                                                                    | 17.2<br>12.4<br>9.2                             |
| ACTUAL : ACTUAL ESTIM.  % POP : % AGI : % AGI  0 0500010 0095810 00789  0 1000010 0269010 02404  0 1500010 0484510 04550                                                                                                                                                                                                                                   | ACTUAL<br>  \$ AGI<br>  539.<br>  974.<br>  1211.<br>  1426.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ESTIM.<br>\$ AGI<br>443.<br>908.<br>1206.<br>1423.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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447.<br>  864.<br>  1138.<br>  1340.                                                                                                                                                      | 17.2<br>112.4<br>19.2<br>1 6 9                  |
| ACTUAL : ACTUAL ESTIM.  % POP : % AG1 : % AG1  0 0500010 0095810 00789  0 1000010 0269010 02404  0 1500010 0484510 04550  0 2000010 0738210 07080  0 2500010 1026810 09930                                                                                                                                                                                 | ACTUAL:   \$ AGI     539.     974.     1211.     1426.     1623.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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447.<br>  864.<br>  1138.<br>  1340.<br>  1509.                                                                                                                                           | 17.2<br>12.4<br>19.2<br>1 6 9                   |
| ACTUAL : ACTUAL : ESTIM.  % POP : % AGI : % AGI  0 0500010 0095810 00789 0 1000010 0269010 02404 0 1500010 0484510 04550 0 2000010 0738210 07080 0 2500010 1026810 09930 0 3000010 1351710 13066                                                                                                                                                           | ACTUAL<br>\$ AGI<br>539.<br>974.<br>1 1211.<br>1 1426.<br>1 1623.<br>1 1827.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1ACTUAL<br>1% POP.<br>1<br>10. 05000<br>10. 10000<br>10. 15000<br>10. 20000<br>10. 25000                                                                         | 1 ACTUAL<br>1 % AGI<br>1<br>10. 01002<br>10. 02833<br>10. 05160<br>10. 07833<br>10. 10967<br>10. 14100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ESTIM.   % AGI       0.00830    0.02434    0.04546    0.07034    0.09835    0.12920                                                                                                                                                                                                            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                                                                                                                                                                                          | 17.2<br>12.4<br>19.2<br>1 69<br>1 10.6          |
| ACTUAL : ACTUAL : ESTIM.  2 POP : 2 AG1 : 2 AG1  0 0500010 0095810 00789  0 1000010 0269010 02404  0 1500010 0484510 04550  0 2000010 0738210 07080  0 2500010 1026810 09930  0 3000010 1351710 13066  0 3500010 1688210 16469                                                                                                                             | ACTUAL:   \$ AGI     539.   974.   1211.   1426.   1623.   1627.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.   1692.  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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | IACTUAL<br>1% POP.<br>1<br>10. 05000<br>10. 10000<br>10. 15000<br>10. 25000<br>10. 30000<br>10. 35000                                                            | 1 ACTUAL<br>1 % AQI<br>10. 01002<br>10. 02833<br>10. 05160<br>10. 07833<br>10. 10967<br>10. 14100<br>10. 17492                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ESTIM.   % AGI       0.00830   0.04546   0.07034   0.07034   0.12920   0.16271                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 540. 986. 1254. 1440. 1689. 1689. 1827.                                                                                                                                                                                 | ESTIM                                                                                                                                                                                                                 | 17.2<br>12.4<br>19.2<br>1 69<br>1 10.6<br>1 1 6 |
| ACTUAL: ACTUAL:ESTIM.  2 POP: 1 % AG1 1 % AG1  0 0500010 0095810 00789  0 1000010 0269010 02404  0 1500010 0484510 04550  0 2000010 0738210 07080  0 2500010 1026810 09930  0 3000010 1351710 13066  0 3500010 1688210 16469  0 4000010 2068610 20128                                                                                                      | ACTUAL.  \$ AGI  539.  974.  1211.  1426.  1623.  1827.  1892.  2139.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | # AG1<br># AG1<br># 443.<br># 908.<br># 1206.<br># 1423.<br># 1602.<br># 1763.<br># 1913<br># 2057.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | # AGTUAL<br>  \$ AGI<br>  540.<br>  786.<br>  1254.<br>  1440.<br>  1689.<br>  1689.<br>  1895.                                                                                                                         | ESTIM                                                                                                                                                                                                                 | 1                                               |
| ACTUAL: ACTUAL:ESTIM.  2 POP: 1 % AG1 1 % AG1  0 0500010.0095810.00789  0 1000010.0269010.02404  0 1500010.0484510.04550  0 2000010.0738210.07080  0 2500010.1026810.09930  0 3000010.1351710.13066  0 3500010.1688210.16469  0 4000010.2068610.20128  0 4500010.2449010.24044                                                                             | ACTUAL.  \$ AGI  539.  974.  1211.  1426.  1623.  1627.  1692.  2139.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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                                                                                                                                                                                          | 1                                               |
| ACTUAL: ACTUAL:ESTIM.  2 POP: 1 % AG1 1 % AG1  0 0500010.0095810.00789  0 1000010.0269010.02404  0 1500010.0484510.04550  0 2000010.0738210.07080  0 2500010.1026810.09930  0 3500010.1351710.13066  0 3500010.1351710.13066  0 3500010.2068610.20128  0 4500010.2449010.24044  0 5000010.2872010.28210                                                    | ACTUAL.  \$ AGI  539.  974.  1211.  1426.  1623.  1627.  1897.  2139.  2378.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 540.<br>986.<br>1254.<br>1440.<br>1689.<br>1895.<br>2114.                                                                                                                                                               | ESTIM<br>  \$ AGI<br>  447.<br>  964.<br>  1138.<br>  1340.<br>  1509.<br>  1662.<br>  1805.<br>  1943.<br>  2083.<br>  2221.                                                                                         | 1                                               |
| ACTUAL : ACTUAL : ESTIM.  2 POP : 2 AG1 : 2 AG1  0 0500010 0095810 00789  0 1000010 0269010 02404  0 1500010 0484510 04550  0 2000010 0738210 07080  0 2500010 1026810 09930  0 3000010 1351710 13066  0 3500010 1688210 16469  0 4000010 2068610 20128  0 4500010 2447010 24044  0 5000010 2872010 28210  0 5500010 3301510 32630                         | ACTUAL.  \$ AGI  539.  974.  1211.  1426.  1623.  1827.  1892.  2139.  2139.  2378.  2415                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | # AGI<br># AGI | RESID.    %      17.7   6.7   0.4   0.2   1.3   3.5   -1.1   3.8   -3.0   1.5   -2.9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | IACTUAL 1% POP. 1 10. 05000 10. 10000 10. 15000 10. 25000 10. 25000 10. 35000 10. 40000 10. 45000 10. 55000                                                      | 1 ACTUAL<br>1 % AQI<br>10.01002<br>10.02833<br>10.05160<br>10.07833<br>10.10967<br>10.14100<br>10.17492<br>10.20991<br>10.24915<br>10.28852<br>10.33279                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ESTIM.  1 % AGI  10.00830  10.02434  10.04546  10.07034  10.12920  10.12920  10.12921  10.12920  10.23743  10.27864  10.32246                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ACTUAL<br>\$ AGI<br>540.<br>986.<br>1254.<br>1440.<br>1689.<br>1827.<br>1895.<br>2114.<br>2121.<br>2385.                                                                                                                | ESTIM<br>  \$ AGI<br>  447.<br>  964.<br>  1138.<br>  1340.<br>  1509.<br>  1662.<br>  1805.<br>  1943.<br>  2083.<br>  2221.<br>  2361.                                                                              | 1                                               |
| ACTUAL : ACTUAL : ESTIM.  % POP : % AGI : % AGI  0 0500010 0095810 00789  1 1000010 0269010 02404  1 1500010 0484510 04550  2 2000010 0738210 07080  2 500010 1026810 09930  3 3000010 1351710 13066  3 3500010 1688210 16469  4 4000010 2068610 20128  4 4500010 2449010 24044  0 5000010 2872010 28210  0 5500010 3301510 32630  0 6000010 3773210 37332 | ACTUAL.  \$ AGI  539.  974.  1211.  1426.  1623.  1827.  1892.  2139.  2139.  2378.  2415.  2652.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ESTIM.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | RESID.    %      17.7   6.7   0.4   0.2   1.3   3.5   -1.1   3.8   -3.0   1.2   9   0.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | IACTUAL 1% PDP. 1 10. 05000 10. 15000 10. 25000 10. 35000 10. 45000 10. 45000 10. 55000 10. 55000                                                                | I ACTUAL I % AGI   1 % AGI | ESTIM.  1 % AGI  10.00830  10.02434  10.07034  10.07034  10.12920  10.12927  10.12927  10.23743  10.27864  10.32246  10.36911                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ACTUAL<br>\$ AGI<br>540<br>986<br>1254<br>1440<br>1689<br>1689<br>1887<br>1885<br>2114<br>2121<br>2385                                                                                                                  | ESTIM<br>  \$ AGI<br>  447,<br>  864,<br>  1138,<br>  1340,<br>  1509,<br>  1662,<br>  1905,<br>  1943,<br>  2083,<br>  2083,<br>  221,<br>  2361,                                                                    | 1                                               |
| ACTUAL : ACTUAL   ESTIM.  % POP : % AGI : % AGI  0 0500010 0095810 00789  0 1000010 0269010 02404  0 1500010 0484510 04550  0 2000010 1026810 07930  0 3000010 126810 07930  0 3500010 1688210 16469  0 4000010 2068610 20128  0 4500010 2469010 24044  0 5000010 2872010 28210  0 5500010 3301510 32630  0 6000010 4252910 42324                          | ACTUAL.  \$ AGI  539.  1211.  1426.  1623.  1827.  1892.  2139.  2139.  2378.  2415.  2652.  2697.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | # AG1<br># AG1<br># AG1<br># AG1<br># AG3<br># 1206<br># 1423<br># 1602<br># 1763<br># 1913<br># 2057<br># 2202<br># 2485<br># 2485<br># 2643<br># 2806                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | RESID.    %      17.7   6.7   0.4   1.3   3.5   -1.1   3.8   -3.0   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5 | IACTUAL 1% PDP. 1 10. 05000 10. 15000 10. 25000 10. 25000 10. 35000 10. 45000 10. 55000 10. 55000 10. 60000                                                      | 1 ACTUAL<br>1 % AQI<br>10. 01002<br>10. 05160<br>10. 05160<br>10. 10767<br>10. 14100<br>10. 17492<br>10. 20991<br>10. 24915<br>10. 28952<br>10. 33279<br>10. 32797<br>10. 42631                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ESTIM.    % AGI        0. 00830     0. 02434     0. 07534     0. 07835     0. 12920     0. 16271     0. 27844     0. 32246     0. 32246     0. 41878                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | # ACTUAL<br>  \$ AGI<br>  540<br>  1254<br>  1254<br>  1440<br>  1689<br>  1689<br>  1827<br>  1885<br>  2114<br>  2121<br>  2385<br>  2385<br>  2385                                                                   | ESTIM<br>  \$ AGI<br>  447,<br>  864,<br>  1138,<br>  1340,<br>  1509,<br>  1662,<br>  1805,<br>  1905,<br>  2081,<br>  2081,<br>  2221,<br>  2361,<br>  2513,<br>  2677,                                             | 1                                               |
| ACTUAL : ACTUAL : ESTIM.  2 POP : 2 AG1 : 2 AG1                                                                                                                                                                                                                                                                                                            | ACTUAL.  \$ AGI  539.  974.  1211.  1426.  1623.  1827.  1892.  2139.  2139.  2378.  2415.  2657.  3333.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 443.<br>908.<br>1206.<br>1423.<br>1602.<br>1763.<br>1913.<br>2057.<br>2202.<br>2342.<br>2445.<br>2643.<br>2806.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | RESID.    %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | IACTUAL 1% POP. 1 10 05000 10 10000 10 15000 10 25000 10 35000 10 40000 10 55000 10 55000 10 60000 10 65000                                                      | 1 ACTUAL<br>1 % AQI<br>10. 01002<br>10. 05160<br>10. 07833<br>10. 10967<br>10. 14100<br>10. 17492<br>10. 20991<br>10. 24915<br>10. 28852<br>10. 33279<br>10. 33279<br>10. 42631<br>10. 47756                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ESTIM.    % AGI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 540.<br>986.<br>1254.<br>1440.<br>1689.<br>1689.<br>1885.<br>2114.<br>2121.<br>2385.<br>2385.<br>2453.                                                                                                                  | ESTIM<br>  \$ AGI<br>  447.<br>  964.<br>  1138.<br>  1340.<br>  1509.<br>  1662.<br>  1805.<br>  1905.<br>  1943.<br>  2083.<br>  2221.<br>  2361.<br>  2513.<br>  2677.                                             | 1                                               |
| ACTUAL : ACTUAL   ESTIM.  2 POP : 2 AGI : 2 AGI                                                                                                                                                                                                                                                                                                            | ACTUAL.  \$ AGI  539.  974.  1211.  1426.  1623.  1827.  1892.  2139.  2139.  2139.  2415.  2652.  2697.  3333.  3401.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 443. 908. 1206. 1402. 1763. 1913 2057. 2202. 2342. 2485. 2643 2806. 2994                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | RESID.    %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | IACTUAL 1% POP. 1 10 05000 10 10000 10 15000 10 25000 10 30000 10 35000 10 45000 10 55000 10 55000 10 60000 10 65000 10 70000                                    | 1 ACTUAL<br>1 % AQI<br>1 — — — — — — — — — — — — — — — — — — —                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ESTIM.    % AGI        0. 00830     0. 02434     0. 07034     0. 07034     0. 12920     0. 16271     0. 23743     0. 27864     0. 32246     0. 36911     0. 41878     0. 52872                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 540.<br>986.<br>1254.<br>1440.<br>1689.<br>1895.<br>1895.<br>2114.<br>2121.<br>2385.<br>2385.<br>2453.<br>2761.                                                                                                         | ESTIM<br>  \$ AGI<br>  447.<br>  964.<br>  1138.<br>  1340.<br>  1509.<br>  1662.<br>  1805.<br>  1905.<br>  2083.<br>  2083.<br>  2221.<br>  2361.<br>  2513.<br>  2677.<br>  2656.                                  | 1                                               |
| ACTUAL : ACTUAL   ESTIM.  2 POP : 2 AGI : 2 AGI                                                                                                                                                                                                                                                                                                            | ACTUAL.  \$ AGI  539.  974.  1211.  1426.  1692.  2139.  2139.  2378.  2415.  2652.  2697.  3333.  3401.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | # AGI<br># AGI<br>443.<br>908.<br>1206.<br>1423.<br>1602.<br>1713.<br>2057.<br>2202.<br>2342.<br>2485.<br>2485.<br>2643.<br>2806.<br>2794.<br>3202.<br>3461.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | RESID.    %      17.7   6.7   0.4   1.3   5.5   -1.1   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5   1.5  | IACTUAL 1% POP. 1 10. 05000 10. 10000 10. 15000 10. 25000 10. 30000 10. 45000 10. 45000 10. 55000 10. 60000 10. 65000 10. 75000 10. 75000                        | 1 ACTUAL<br>1 % AQI<br>10 01002<br>10 02833<br>10 05160<br>10 07833<br>10 10967<br>10 14100<br>10 2991<br>10 24915<br>10 28852<br>10 3727<br>10 3727<br>10 42631<br>10 47756<br>10 53967<br>10 60178                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ESTIM.    % AGI        0. 00830     0. 02434     0. 07034     0. 07034     0. 16271     0. 19877     0. 23743     0. 27864     0. 32246     0. 41878     0. 41878     0. 52872     0. 59041     0. 59041     0. 59041     0. 60830     0. 60830     0. 60830     0. 60830     0. 60830     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447.<br>  964.<br>  1138.<br>  1340.<br>  1509.<br>  1662.<br>  1905.<br>  1943.<br>  2083.<br>  2221.<br>  2361.<br>  2513.<br>  2677.<br>  2858.<br>  3065.<br>  3024.                       | 1                                               |
| ACTUAL : ACTUAL   ESTIM.  2 POP : 2 AGI : 2 AGI                                                                                                                                                                                                                                                                                                            | ACTUAL.  \$ AGI  539.  974.  1211.  1426.  1623.  1627.  1692.  2139.  2139.  2378.  2415.  2652.  2697.  3333.  3401.  3401.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | # AGI<br>#                                                                                                                                                                                                                                                                                                                                                                                                                                                     | RESID.    %                                                                                                                                              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60000  10. 75000  10. 75000  10. 75000  10. 75000 | I ACTUAL I % AQI I ————— 10. 01002 10. 05160 10. 07833 10. 10967 10. 14100 10. 17492 10. 20791 10. 24915 10. 28852 10. 33279 10. 42631 10. 47756 10. 43967 10. 66389                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ESTIM.    % AGI        0. 00830     0. 02434     0. 07034     0. 19835     0. 12920     0. 16271     0. 23743     0. 27864     0. 32246     0. 36911     0. 47183     0. 52872     0. 59041     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 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65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. 65811     0. | 540.<br>986.<br>1254.<br>1440.<br>1689.<br>1895.<br>2114.<br>2121.<br>2385.<br>2385.<br>2553.<br>2761.<br>3346.<br>3346.                                                                                                | ESTIM<br>  \$ AGI<br>  447,<br>  864,<br>  1138,<br>  1340,<br>  1509,<br>  1662,<br>  1805,<br>  1943,<br>  2083,<br>  2083,<br>  2361,<br>  2513,<br>  2677,<br>  3677,<br>  3065,<br>  3324,                       | 1                                               |
| ACTUAL : ACTUAL   ESTIM.  % POP : % AGI : % AGI                                                                                                                                                                                                                                                                                                            | ACTUAL.  \$ AGI  539.  974.  1211.  1426.  1623.  1827.  1892.  2139.  2139.  2378.  2415.  2652.  2697.  3333.  3401.  3401.  3462.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ESTIM.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | RESID.    %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | IACTUAL 1% PDP. 1 10. 05000 10. 15000 10. 25000 10. 35000 10. 35000 10. 45000 10. 55000 10. 60000 10. 65000 10. 75000 10. 75000 10. 85000 10. 85000              | I ACTUAL I % AGI I———— 10. 01002 10. 05160 10. 05160 10. 10967 10. 14100 10. 17492 10. 20991 10. 24915 10. 28852 10. 33279 10. 42631 10. 47756 10. 53967 10. 66389 10. 66389                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ESTIM.    % AGI        0. 00830     0. 02434     0. 07034     0. 07835     0. 12920     0. 16271     0. 19877     0. 23743     0. 32246     0. 32246     0. 32246     0. 32878     0. 58878     0. 59878     0. 59818     0. 65818     0. 73434     0. 73434     0. 73434     0. 73434     0. 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447<br>  864<br>  1138<br>  1340<br>  1509<br>  1662<br>  1805<br>  1943<br>  2021<br>  2361<br>  2513<br>  2677<br>  2656<br>  3065<br>  3324<br>  3647<br>  4107                             | 1                                               |
| ACTUAL : ACTUAL   ESTIM.  2 POP : 2 AGI : 2 AGI                                                                                                                                                                                                                                                                                                            | ACTUAL.  \$ AGI  539.  1211.  1426.  1623.  1827.  1892.  2139.  2139.  2378.  2415.  2652.  2697.  3333.  3401.  3401.  3462.  4892.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ESTIM.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | RESID.    %      17.7   6.7     0.4   1.3     3.5   -1.1     3.8   -3.0     1.5   9     -1.7   -1.7     -1.7   -1.7     -1.7   -1.8     -3.8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | IACTUAL 1% PDP. 1 10 05000 10 10000 10 15000 10 25000 10 35000 10 45000 10 55000 10 55000 10 70000 10 75000 10 85000 10 75000 10 85000 10 95000                  | I ACTUAL I % AQI I ————— 10. 01002 10. 05160 10. 07833 10. 10967 10. 14100 10. 17492 10. 20791 10. 24915 10. 28852 10. 33279 10. 42631 10. 47756 10. 43967 10. 66389                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ESTIM.    % AGI        0. 00830     0. 02434     0. 07935     0. 12920     0. 16271     0. 27864     0. 32246     0. 32246     0. 41878     0. 47183     0. 52872     0. 52872     0. 67811     0. 73434     0. 73434     0. 82563                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | # ACTUAL<br># ACT<br># ACT<br># 986<br># 1254<br># 1440<br># 1689<br># 1885<br># 2114<br># 2385<br># 2385<br># 2385<br># 2461<br># 3346<br># 3346<br># 3346<br># 3346<br># 3346<br># 3346<br># 3346<br># 3346<br># 3346 | ESTIM<br>  \$ AGI<br>  447,<br>  864,<br>  1138,<br>  1340,<br>  1509,<br>  1662,<br>  1805,<br>  1905,<br>  2221,<br>  2361,<br>  2513,<br>  2677,<br>  2858,<br>  3065,<br>  3324,<br>  3324,<br>  4107,<br>  4919, | 7                                               |

. 070

# B1 18 THE INTERCEPT 82 18 THE UNEMPLOYMENT RATE B3 18 THE PERCENT OF INCOME IN DIVIDENDS AND INTEREST

```
HH SIZE 1 ! PARAM S
 HH BIZE 1 | PARAM V
 HH 817E 1
RBQ 0.5151 RBARGQ 0.4405 | RBQ 0.6877 RBARBQ 0.6396 | RSQ 0.6643 RBARBQ 0.6127
81 0.3723 T-STAT 23.28 | 81 0.4354 T-STAT 45.08 | 81 1.1771 T-STAT 10.66
 1.65 | B2 0.0017 T-STAT
 1.46 | B2 0,0340 T-BTAT
B2 0.0031 T-STAT
 2.35 | 83 0.0115 T-STAT
 0.99 | B3 0.0025 T-STAT
83 0.0018 T-STAT
PARAM P
 HH BIZE 1 | PARAM A
 HH SIZE 2 | PARAM S
RSQ 0 6743 RBARSQ 0 6242 ! RSQ 0 5975 RBARSQ 0.5355 ! RSQ 0.4446 RBARSQ 0.3591
RHO 0 5139 AAPE 22 0978 I RHO 0 0715 AAPE 1.2434 I RHO -. 0244 AAPE 0.2454
B1 0 1715 T-STAT 5 06 | B1 0 2835 T-STAT 25.86 | B1 0 4958 T-STAT 156 03
B2 -0.0124 T-STAT -3.13 | B2 -0.0001 T-STAT -0.10 | B2 -0.0012 T-STAT -3 13
B3 -0.0016 T-STAT -0.42 | B3 0.0037 T-STAT 3.01 | B3 0.0010 T-STAT 2.85
 HH SIZE 2 I PARAM A
PARAM V
 HH SIZE 2 I PARAM P
 HH SIZE 3
RSQ 0. 2988 RBARSQ 0. 1909 | RSQ 0. 3047 RBARSQ 0. 1977 | RSQ 0. 7566 RBARSQ 0. 7192
B1 1. 2515 T-STAT 15. 15 ! B1 0. 1909 T-STAT. 3. 69 ! B1 0. 1956 T-STAT 11. 08
B2 0.0193 T-STAT 1.99 | B2 -0.0139 T-STAT -2.29 | B2 0.0041 T-STAT
83 -0.0059 T-STAT -0 65 I 83 0.0072 T-STAT
 1. 25 | B3 0. 0050 T-STAT
 2.54
 HH SIZE 3 I PARAM V
 HH SIZE 3 I PARAM P
PARAM 8
RSQ 0.6666 RBARSQ 0.6153 | RSQ 0.3648 RBARSQ 0.2671 | RSQ 0.3232 RBARSQ 0.2171
RHO 0.2664 AAPE 0.3887 | RHO 0.3589 AAPE 4.4886 | RHO 0.3261 AAPE 15 6700
B1 0.5099 T-STAT 107 B7 | B1 1.1705 T-BTAT | 8.41 | B1 0.1985 T-STAT | 2.17
B2 -0.0021 T-STAT -3.81 | B2 0 0386 T-STAT | 2.37 | B2 -0.0256 T-STAT -2.38
83 0.0003 T-STAT 0.58 I 83 -0.0132 T-STAT -0.65 I 83 0.0131 T-STAT 1.29
 HH SIZE 4 ! PARAM S
 HH SIZE 4 I PARAM V
RSQ 0.8875 RBARSQ 0.8702 ! RSQ 0.6473 RBARSQ 0.5930 ! RSQ 0.4654 RBARSQ 0.3832
 1 3726 | RHO 0.2414 AAPE | 0.4553 | RHO 0.3075 AAPE | 3.3176
 0 1892 T-STAT 21.47 | B1 0.5158 T-STAT 88.47 | B1 1.1192 T-STAT 11.82
 4 42 | B2 -0.0024 T-STAT -3.52 | B2 -0.0336 T-STAT -3.03
 0.0046 T-STAT
 2.78 | B3 | O.0002 T-STAT | O.36 | B3 -O.015 T-STAT | -1.29
 HH SIZE 4 I PARAM A
 HH SIZE 5 I PARAM S
PARAM P
RSG 0.3995 RUARSG 0.3071 | RSG 0.6762 RBARSG 0.6264 | RSG 0.2014 RBARSG 0.0785
RHD 0 3211 AAPE 11 1109 (RHD 0 2447 AAPE 3 1613 (RHD 0 1760 AAPE 0 9780
91 0 2343 T-8T4T 3 26 : 81 0.1621 T-8T4T 9.32 : 81 0.5273 T-8T4T 36.30
B2 -0.0238 T-STAT -2 82 ! B2 0.0044 T-STAT
 1. 94 1 B2 -0 0013 T-STAT -0. 76
 1. 55 | B3 0. 0039 T-STAT
 1.78 / 83 -0.0009 T-STAT -0.53
B3 0 0124 T-STAT
```

REGRESSION RESULTS OF THE TIME—SERIES

TABLE

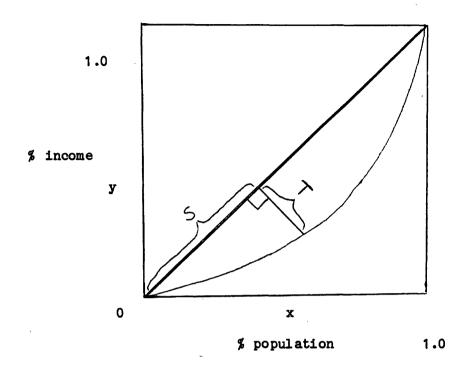
PARAMETERS

THE

FOR

EQUATIONS

### Mathematical Appendix.



The Lorenz curve is defined by a function T = f(S).

Basic geometry and algebra reveal that:

$$S = (x + y)/\sqrt{2}$$

$$T = (x - y)/\sqrt{2}$$

$$M.3) x = (S + T)/\sqrt{2}$$

M.4) 
$$y = (S + T)/\sqrt{2}$$

Equations M.1 - 4 are derived at the end of this appendix.

The Lorenz curve function for year t and household size h is

M.5) 
$$T_{thi} = A_{th} *T81_{hi} + B_{th} *\{(S_{thi}^{1.5}(\sqrt{2}-S_{thi})^{.5})\}$$

 ${
m A}_{
m th}$  and  ${
m B}_{
m th}$  are parameters which are estimated from historical observations on the income distribution. The third subscript on S and T, i, refers to the position along the x axis at which the function is evaluated. T81 hi is the value of T in the 1981 Lorenz curve for

household size h evaluated at position i.

The parameters  $A_{\rm th}$  and  $B_{\rm th}$  are obtained by regression estimation of equation M.5. The data for the estimation is obtained through the following process. First, the variable T81<sub>hi</sub> must be created, that is to say, the 1981 distribution must be defined. But to do this the observations of  $x_{\rm thi}$  and  $y_{\rm thi}$  must first be constructed. The raw data from Statistics of Income (SOI) are grouped. Each distribution has from 15 to 31 published observations (the j subscript) on the number of returns,  $r_{\rm thi}$ , and on the amount of income,  $q_{\rm thi}$ .

M.6) 
$$x_{thj} = \sum_{n=1}^{3} r_{thn}/R_{th}$$
  
M.7)  $y_{thj} = \sum_{n=1}^{3} q_{thn}/Q_{th}$ 

 $R_{th}$  and  $Q_{th}$  are the total number of returns and income for year t, household size h. Linear interpolation is applied to get 40 values of  $yy_{thk}$  which correspond to 40 (k=1,40) values of  $xx_k$  chosen to be .025, .05, .075, ... 1.0. For example, if the value of  $xx_k$  chosen fell between  $x_{thj}$  and  $x_{thj+1}$ , then the value of  $yy_{thk}$  which corresponds to the value of  $xx_k$  would be

M.8) 
$$yy_{thk} = \{(xx_k - x_{thj})/(x_{thj+1} - x_{thj})\} *(y_{thj+1} - y_{thj}) + y_{thj}$$

These 40 values of of xx and yy for each year and household size are then used in equations M.1 and M.2 to obtain 40 corresponding values of  $S_{\rm thk}$  and  $T_{\rm thk}$ . The values of T which correspond to the 40 constructed points of  $xx_{\rm k}$  for the year 1981 are called  $T81_{\rm hk}$ . This constructing of xx and yy are necessary to get a whole time series of consistent data points used in estimating and forecasting the two parameters of the income distribution from equation M.5. This procedure is followed for all the years in the data sample (1966 through 1982, excluding 1967 because of lack of data) and values of  $S_{\rm thk}$  and  $T_{\rm thk}$  are

similarly obtained. The values of  $T_{\rm thk}$  are then used on the left-hand side of equation M.5, and the values of  $S_{\rm thk}$  and  $T81_{\rm hk}$  are used on the right.

Equation M.5 is then estimated with ordinary least squares for each year and household size with the 40 observations to obtain the estimates of  $A_{th}$  and  $B_{th}$ . The results of these estimations are shown in table 2.1 of the text. Each parameter A, and B are cross-section estimates. Table 2.2 shows how well the estimated equations fit the interpolated grouped data from SOI. In order to save space, only the years 1966, 1970, 1975, and 1980 are shown. The fit for 1981 is perfect, by definition, since  $A_{1981} = 1.0$  and  $B_{1981} = 0.0$  for all six household sizes.

The cross-section estimates of the A and B parameters are then arranged in time-series. To forecast the income distribution in some future year, we need to forecast the value of this time-series. Equations are estimated in the form:

M.9) 
$$A_h = c + d^*UN + e^*PCTINC + f^*INFL + g^*TIME$$

M.10) 
$$B_h = c + d^*UN + e^*PCTINC + f^*INFL + g^*TIME$$

where UN is the unemployment rate, PCTINC is the share of personal income that is made up of interest and dividends, INFL is the percentage change in the GNP deflator, and TIME is a linear time trend. The parameters estimated (c,d,e,f&g) are used with the forecasts of the economic variables to get forecasts of the parameters A and B. Equation M.5 indicates that if parameter A is greater than 1, the income distribution will be more unequal than it was in 1981. Also as parameter B increases, the more skewed the income distribution will be toward the right or upper end. The results of the estimations of

equations M.9 and M.10 are shown in table 2.5 of the text and explained fully there.

What we have at this point is a means of forecasting  $A_{th}$  and  $B_{th}$ . We must next transform those into forecasts of ythe which correspond to 50 grid values of x. The grids are necessary to combine the income distributions of the six household sizes into aggregate income distributions. The grids are created from the  $A_{th}$ 's and  $B_{th}$ 's numerically. Values of  $S_{hg}$ ,  $T_{hg}$  and  $y_{hg}$  from the 1981 distribution are used. They are contained in a grid of 50 corresponding quadruplets which correspond to 50 equally spaced values of  $x_g$ . The 50 values of  $S_{
m hg}$  and T81  $_{
m hg}$  are put in equation M.5 with the new forecast values of Ath and Bth. The result is 50 new values of T for each year and These new T's and the S's ( $S_{81}$ ) used to generate them household size. are put into equations M.3 and M.4 to get new grids of values for x and y. These values of x are not equally spaced, however, so another linear interpolation is done, just as in equation M.8, to get the grid of quadruplets which correspond to the 50 equally spaced values of  $x_{\sigma}$  for each household size in the forecast years.

Since the forecast values of x and y are in percentage terms, it is a simple matter to convert them to the number of people,  $X_{\rm thg}$ , and dollar amount of income  $Y_{\rm thg}$ , for year t, size h and grid cell g. The required pieces of data are the total population and income for each household size per year. The model determines both numbers in the aggregate, and the equations in tables 2.7 and 2.8 show how the aggregate is divided among the six household sizes. Let  $R_{\rm th}$  be the number of people in household size h, year t, and  $Q_{\rm th}$  be that group's AGI.  $X_{\rm thg}$  and  $Y_{\rm thg}$  are defined:

M.11) 
$$x_{thg} = (x_{thg} - x_{thg-1}) *R_{th} *H$$

$$Y_{thg} = (y_{thg} - y_{thg-1}) *Q_{th}$$

H = h, except when h = 6; Then H is the overall average household size of the six and over household size group.

## Combining the Household Sizes.

The 6 household sizes are combined into a single overall 20 ventile distribution for each year. (Each ventile contains people from all 6 household sizes.) The grid values of x and y are converted into unit values by equations M.11 and M.12, and per capita incomes (PCI's) are calculated for each cell in each grid:

The cutoff PCI, (PCC) which defines the border between grid cell g and g+1 is obtained by:

The different household sizes are combined into a single distribution per year by an alogorithm where first, a guess is made at ventile i's cutoff PCI,  $\widetilde{PCC}_{ti}$  (i = 1...20). If that guess falls between the grid's  $PCC_{thg}$  and  $PCC_{thg+1}$ , then the guess at ventile i's population from that household size and that year is arrived at by linear interpolation:

M.15) 
$$X_{\text{thi}} = (PCC_{\text{ti}} - PCC_{\text{thg}})/(PCC_{\text{thg+1}} - PCC_{\text{thg}}) * X_{\text{thg}} * X_{\text{thg-1}}$$
The same interpolation is used to get the guess at the dollar income for ventile i, from household size h and year t, that is,  $Y_{\text{thi}}$ . The same guess at  $PCC_{\text{ti}}$  is used for all six household sizes. Now the  $X_{\text{thi}}$ 's are summed over h. If that sum is more than one-twentieth of that year's total population, the process is repeated with a lower inital guess at

the per capita income cutoff,  $PCC_{ti}$ . If the sum is less than one-twentieth, a higher  $\widetilde{PCC}_{ti}$  is tried. The process is repeated until the sum is within a specified range (100 persons) of the true ventile population. The resulting  $X_{thi}$ 's and  $Y_{thi}$ 's are shown in table 2.10 along with their sums over household sizes,  $X_{ti}$  and  $Y_{ti}$ . Note that the sums of  $X_{thi}$  over h,  $X_{ti}$ , are the same for all 20 ventiles in any given year. The final cutoff income,  $PCC_{ti}$  is saved for later use in constructing an index for the consumption model.

# Estimating Federal Income Tax Liability.

Taxes are levied against household income, so an estimate of each household size's income in each ventile must be obtained. Average household incomes,  $AHI_{thi}$  are calculated:

M. 16) 
$$AHI_{thi} = (Y_{thi}/X_{thi}) *H$$

Next, "standard" tax liability is calculated as a function, TX<sub>thi</sub>, of AGI<sub>thi</sub>. The function is not estimated, but depends on parameters in the tax law. The standard tax rates are the rates which would apply to the average taxpayer in the {thi} group if that taxpayer took the standard deduction, and no other special tax credits or tax preferences.

These are calculated for both the history and the forecast. The historical values of standard tax rates are compared to the effective historical rates and a relation is established by regression analysis and used for the forecast. To establish this relationship, the historical actual taxes must be determined.

First, the actual income distribution for the history must be derived from the grouped SOI data. Interpolation is necessary to get

the data to conform to the detailed ventile configuration as illustrated in table 2.10. Since we already have cross-section parameter estimates for each distribution in the history, it would be possible to derive the necessary detail in the same method as described above for the forecast, but that would result in distributions that correspond to the fitted, not the actual distribution. Since the purpose of analyzing the historical data is to establish the true relation between standard and actual taxes by ventile and household size, it is only appropriate to use the actual income distributions and not the fitted ones. These actual distributions in ventile and household size detail are obtained in the following manner.

The IRS reports AGI<sub>thj</sub>, the number of exemptions other than age or blindness (EX<sub>thj</sub>), and the taxes paid, (TAX<sub>thj</sub>), for year t, household size h, and income group j. The cutoff, or upper income boundaries for each group are also reported, and here are converted to per capita incomes and denoted by SOI<sub>thj</sub>. Cumulative percentage distributions are calculated as in equations M.6 & M.7, above, for exemptions, (ex<sub>thj</sub>), and taxes (tax<sub>thj</sub>). Next, a grid of size G (G=200) was constructed so that each cell contains AGI and taxes for 1/G of the population. This was accomplished by first, obtaining the cutoff per capita incomes GPCC<sub>thg</sub> and effective tax rates, GTR<sub>thg</sub> at the upper border of each grid cell. This was done by linear interpolation: If the cumulative percent population for the g<sup>th</sup> cell, g/G, falls between ex<sub>thj-1</sub> and ex<sub>thj</sub>, then

M.18) 
$$\frac{\text{GPCC}_{\text{thg}} = \{ (g/G - ex_{\text{thj}-1})/(ex_{\text{thj}} - ex_{\text{thj}-1}) \} *}{(SOI_{\text{thj}} - SOI_{\text{thj}-1}) + SOI_{\text{thj}-1}}$$

and

M.19) 
$$GTR_{thg} = \{(g/G - ex_{th,i-1})/(ex_{th,i} - ex_{th,i-1})^*\}$$

The upper border of the highest cell is, of course, not obtainable from the data. Fortunately, we are still able to to accurately assess the lower border and the dollar amounts of income and taxes in the highest cell, even when G=200. This is because the IRS reports its top income group as the one with households recieving over a million dollars in AGI. The number of returns in that group is less than .5% of the total returns for all the distributions in the sample. So even with the linear interpolation described above, it is possible to determine the average income and tax rates for the highest .005 of each distribution.

The next step is to fill out the rest of the grid cells, that is, to convert the upper limits of each cell's AGI and taxes to dollars of AGI and taxes in each grid cell. The dollars of income, GAGI and taxes GTAX are calculated as follows:

M.20) 
$$\frac{J}{\text{GAGI}_{\text{thg}} = \{ (GPCC_{\text{thg}-1} + GPCC_{\text{thg}})/2.0 \} *1/G* \stackrel{J}{=} ex_{\text{thj}}} ex_{\text{thj}}}$$

M.21) 
$$GTAX_{thg} = \{(GTR_{thg-1} + GTR_{thg})/2.0\} + GAGI_{thg}$$

Now the data are ready to be used to determine the historical ventile cutoff incomes. The household combining algorithm described above (equation M.15) for the forecast is applied to the history, using the historical grids just constructed. The result is not only income and exemptions for each of the 120 groups, but historical effective tax rates, (ETR<sub>thi</sub>s) as well. Each group's average household income is calculated as in equation M.16, and the historical tax laws are applied to get the standard tax rates for each group as in equation M.17.

The reason 200 grid cells per distribution were necessary in the history was that the cell cutoff, or top per capita income border is used to determine the ventile per capita cutoff income. Because the top

grid cell has no upper bound, linear interpolation is only possible if the ventile cutoff incomes are below the penultimate grid cell's upper bound. This was not the case in some of the historical distributions for grids of size 50 or 100, but a grid of size 200 was always sufficient. (Note that the top ventile's dollar income and taxes are calculated as residuals by subtracting the first 19 ventile amounts from the total dollar amount reported.

The AHI's are calculated as above, and applied to their year's tax laws. The tax laws in the past have, of course, varied over time, and every effort has been made to account for those changes which affect the calculation of standard taxes.

The actual or "effective" tax rates, ETR<sub>thi</sub>'s, are obtained from the data by the interpolation method just described. Next, an equation which relates the standard tax rates to the effective tax rates must be estimated. The equations could have been estimated separately for each household size, but that would have required 120 equations. Instead, the six household sizes were aggregated into one, reducing the number of required equations to 20. Because the cutoff incomes, PCC<sub>ti</sub>, are the same for all household sizes, the aggregation was accomplished by a simple income-weighted average:

M.22) 
$$STR_{ti} = \sum_{h=1}^{6} \{STR_{thi} * (Y_{thi} / (\sum_{h=1}^{6} Y_{thi}))\}$$

M.23) 
$$ETR_{ti} = \sum_{h=1}^{5} \{ETR_{thi} * (Y_{thi} / (\sum_{h=1}^{5} Y_{thi}))\}$$

At this point, the STR<sub>ti</sub>'s and ETR<sub>ti</sub>'s both exist for the history. The forecast STR<sub>ti</sub>'s are obtained from the income distribution forecast and the future tax law assumptions. The forecast ETR<sub>ti</sub>'s are obtained from the estimated results of regression equations which relate the historical standard and effective tax rates.

The ratios of effective to standard tax rates are assumed to change over time.

M.24) 
$$ETR_{ti}/STR_{ti} = a1_{ti} + a2_{ti} * TIME_{t}$$

The equations are estimated in nearly the equivalent form:

The estimates of the al<sub>ti</sub>'s and a2<sub>ti</sub>'s are used to forecast the standard-to-effective tax ratios. The estimated ratios (not the actual ratios) from 1982 are used for the base forecast. They are shown in the first column of table 3.2

The forecast income tax revenue for year t, ventile i is:

State and local income tax is calculated as an exogenous percentage of federal income taxes, and other taxes are calculated as percentages of personal income (the percentages are the average percentages over the 1980-1982 period). Disposable AGI is then calculated as:

Next, the per capita cutoff disposable AGI's, the  $PCCD_{ti}$ 's, must be estimated. This is done by estimating the effective tax rates on the cutoff incomes ,  $CETR_{ti}$ 's, by linear interpolation. If the cutoff income,  $PCC_{ti}$ , is two thirds of the way between the its surrounding ventiles' average AGI (denoted by  $PCAGI_{ti} = AGI_{ti}/NEX/20$ , where NEX is the total number of exemptions), then the cutoff tax rate will be two thirds of the way between the effective tax rates of its two surrounding ventiles:

M.28) CETR<sub>ti</sub>={(PCC<sub>ti</sub>-PCAGI<sub>ti</sub>)/(PCAGI<sub>ti+1</sub>-PCAGI<sub>ti</sub>)} \*(ETR<sub>ti+1</sub>-ETR<sub>ti</sub>)+ETR<sub>ti</sub>

Then, PCCD<sub>ti</sub> can be calculated by multiplying the pre-tax cutoff

AGI by one minus the tax rates. State and local income taxes are a

fraction, RSLINC, of federal taxes, and the other taxes are a fraction, ROTH, of personal income.

### Reconciliation to the Personal Income Definition of Income.

The reconciliation items which are part of personal income but not AGI must now be added. The result of this last step is that the pre-tax and post-tax income distributions will be defined in terms of personal income instead of AGI. Let RI<sub>tr</sub> be the 12 aggregate reconciliation items (r=1,12) and P<sub>ir</sub> be the coefficients of the AGI-PI bridge. RF<sub>ti</sub> is the flow of total reconciliation items to ventile i, and is defined as:

$$RF_{ti} = P_{ir} *RI_{tr}$$

That amount is added to disposable AGI to get disposable Personal Income.

The per capita reconciliation and per capita AGI are calculated as:

M.33 
$$PCAGI_{+1} = AGI_{+1}/(NEX/20)$$

Then, the amount of per capita reconciliation at the ventile cutoff is is estimated by linear interpolation as the tax rates were before.

Then  $PCCRF_{ti}$  is added to the per capita cutoffs for pre-tax AGI,  $PCC_{ti}$ , and post-tax AGI,  $PCCD_{ti}$ , to get the cutoffs for both pre-tax and

post-tax personal income, PCCPI, and PCCPID,

Next, the nonfiler adjustment must be made. The adjustment can be expressed as follows where  $v_i^*$  denotes the adjusted cutoff income for ventile i, and  $v_i$  is the unadjusted cutoff income.

$$v_2^* = .65v_2$$

M.36) for i=3,6 
$$v_{i}^{*}=v_{i-1}-(.075(20-i)-1)*(v_{i-1}-v_{i-2})$$

M.37) for i=7,19 
$$v_i^* = v_i - (.075(20-i)) * (v_i - v_{i-1})$$

The top ventile, which is the share of the total is increased by the appropriate factor (about 7%) to account for its having some people in it that were previously in the 19th ventile.

Finally, an index of the disposable personal income distribution must be constructed to be used in in the consumption model. The index  $PCCDX_{ti}$  is defined as the cutoff per capita personal income divided by the average per capita personal income:

M.38) 
$$PCCDX_{ti} = PCCPID_{ti} / (\sum_{i=1}^{20} DISPY_{ti} / POP)$$

and the twentieth index number for year t is defined as:

M.39) 
$$PCCDX_{t20} = DISPY_{t20} / \sum_{i=1}^{20} DISPY_{ti}$$

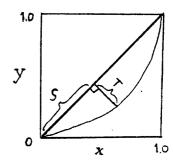
# Derivation of equations M.1 - M.4.

M.1) 
$$S = (x + y)/\sqrt{2}$$

$$T = (x - y)/\sqrt{2}$$

M.3) 
$$x = (S + T)/\sqrt{2}$$

$$M.4) y = (S - T)/\sqrt{2}$$



a) 
$$x^2 + y^2 = S^2 + T^2$$
 (Pythagorean Theorem)

b) 
$$T^2 = x^2 + y^2 - S^2$$
 (rearrangement of a)

c) 
$$T^2 = (1-x)^2 + (1-y)^2 - (\sqrt{2}-s)^2$$
 (Pythagorean Theorem)

d) 
$$x^2+y^2-S^2 = (1-x)^2 + (1-y)^2 - (\sqrt{2}-S)^2$$
 (combination of b & c)

e) 
$$x^2+y^2-s^2 = 1-2x+x^2+1-2y+y^2-2+2\sqrt{2}s-s^2$$
 (expansion of d)

f) 
$$0 = -x - y + \sqrt{2}S$$
 (cancellation of like terms in e)

g) Equation M.1: 
$$S = (x + y)/\sqrt{2}$$
 (rearrangement of f)

h) 
$$T^2 = x^2 + y^2 - x^2/2 - xy - y^2/2$$
 (sub eq. 1 for S<sup>2</sup> in b)

i) 
$$T^2 = x^2/2 - xy + y^2/2$$
 (combine like terms in h)

j) 
$$T^2 = (x^2 - 2xy + y^2)/2$$
 (factor out 2 in i)

k) 
$$T^2 = \{(x-y)/\sqrt{2}\}^2$$
 (factor right side of j)

1) Equation M.2: 
$$T = (x - y) / \sqrt{2}$$
 (square root of both sides of k)

m) 
$$y = \sqrt{2}S - x$$
 (solve eq. 1 for y)

n) 
$$y = x - \sqrt{2}T$$
 (solve eq. 2 for y)

o) 
$$x - \sqrt{2}T = \sqrt{2}S - x$$
 (combine m and n)

p) Equation M.3: 
$$x = (S + T)/\sqrt{2}$$
 (rearrange o and solve for x)

q) 
$$x = \sqrt{2}S - y$$
 (solve eq. 1 for x)

r) 
$$x = \sqrt{2}T + y$$
 (solve eq. 2 for x)

s) 
$$\sqrt{2}T + y = \sqrt{2}S - y$$
 (combine q and r)

t) Equation M.4: 
$$y = (S - T)/\sqrt{2}$$
 (rearrange s and solve for y)

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