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INPUT-OUTPUT ANALYSIS FOR REGIONAL PLANNING IN TURKEY: SAMSUN 2004-2023

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Contents

1. INTRODUCTION

In Turkey, without a formal planning authority three industrial development plans were framed in the 1930s and 1940s. They were a set of industrial projects to take off a backward country. More comprehensive national economic planning started in 1962 by the establishment of State Planning Organization (SPO). Strategies and general guidelines of the planning process were laid down by the constitution. Then the first five-year-national development plan covering 1963-1967 was framed and implemented. A Horrod-Domar type growth modeling technique was employed in this first plan. In the second five-year development plan (1968-1972) a consistency modeling technique based on a 35-sector input-output table was used. Since then the Sate Institute of Statistics (SIS) started to construct large-scale national input-output tables of the Turkish economy. By now seven input-output tables have been complied and published on a comparable basis.

Concerning regional input-output tables in Turkey, again, a limited number of examples can be found in the form of academic thesis. They, however, are not based on a sound theory of the relevant technique. To say the least they are full of conceptual and numerical errors. One careful study is carried out by us for the Eastern Anatolian Region. And the subsequent regional I-O table for Eastern Anatolia is published by the SPO (2000).

Regional planning has not been on the agenda of the national governments. To some extent this reflects the lack of concern with the issue of regional disparities across the country. So far there have been only four regional development initiatives. The first and largest one is the South East Anatolia Project, best known with its initials in Turkish, GAP (Güney-Doğu Anadolu Projesi). This name suits well with the word *gap* in English since it aims to close the gap between the region and the national average in terms of

economic and social indicators. The other three regional development projects are Zonguldak regional development project, which can be abbreviated BAKAP (West Black Sea Project), DOKAP (East Black Sea Project) and DAP (East Anatolia Project). None of them except for the last one mentioned above based on a regional I-O table.

In 1999 the European Council decided that Turkey is a candidate country destined to join the Union. Among many forms of adoption and economic transformation programs, Turkey has now defined 26 regional statistical units (NUTS II regions) for the statistical purposes as required by the EU. We believe that, from now on, along with two other class of regional statistical units, 12 NUTS me (macro or larger regions) and 81 NUTS III (micro regions or provinces), this new form of statistical units at regional level can stimulate rigorous regional studies.

Samsun region, with its code name TR83 on the list (otherwise Samsun), comprises four provinces, Amasya, Çorum, Samsun, Tokat. The region is placed between two long rivers, namely Yeşilırmak (Greenriver) and Kızılırmak (Redriver, the longest one in Anatolia) on the coast of Black Sea north of the country. The Turkish government has initiated a development project for the concerned region (TR83). The SPO delegated the formulation of the program (project) under the name “Yeşil-ırmak Havza Gelişim Projesi (Green-river valley development project)” to DOLSAR, an engineering consultancy firm situated in Ankara.

This paper aims to construct a regional input-output table for Samsun and to formulate a set of growth scenerios to restructure the economy of the region. It is a summary version of large project initiated by the State Planning Organization. It addresses some distributional issues at regional level. To eleviate the imbalances for Samsun region a development plan is

formulated for 14 sectors with a very high growth rate target over the period 2004-2023. The importance of the year 2023 in that it is the centenary of the establishment of the Turkish Republic after the collapse of the Ottoman Empire in 1923.

With this introduction section the paper is organized into eight sections. The second section portrays the regional disparity in Turkey with some basic descriptive statistics. The third section introduces the process followed in the construction of the regional input-output table. The key sectors identified by using the regional input-output table of the region are introduced in section four. Section five is devoted to multiplier anlaysis which covers the income and employment multipliers. Section six defines four alternative growth secnerios hypothesized and formulated for the economic development of the region. The seventh section provides the forecsts over the planning horizon covering 2004-2023. Section eight summaries the basic findings of the paper and set out some policy proposels concerning fot the implementation of the project.

2. REGIONAL DISPARITY IN TURKEY

There are 26 NUTS II (Nomenculator of Territorial Units for Statistics) regions in Turkey defined in 2002. With the data collected for 2000 a sorted list of these regions with respect to their per capita income is given in Table 1 below.

Table 1. Regions and Regional Disparity in Turkey, 2000

	Population	Share of	GDP	Per	Area	Population Per	Cum

NUTS II Regions	million	urban population %	Billions of $	capita income 1000 $	(1000 M2)	density (persons per square kilometer)	capita income index above (below) average %	share of GDP %
1 Kocaeli	2,7	57,2	14,3	5,3	20,2	135	78,3	7,1
2 İstanbul	10,0	90,7	44,1	4,4	5,2	1928	49,3	29,2
3 İzmir	3,4	81,1	14,5	4,3	12,0	281	45,9	36,5
4 Ankara	4,0	88,3	16,8	4,2	24,5	163	42,5	44,9
5 Tekirdağ	1,4	60,2	5,0	3,7	18,7	73	25,6	47,4
6 Bursa	3,0	76,4	10,5	3,5	28,6	106	18,0	52,6
7 Adana	3,5	68,5	11,6	3,3	29,4	119	12,0	58,4
8 Aydın	2,5	46,7	8,2	3,3	32,4	78	10,7	62,5
9 Zonguldak	1,0	44,5	3,1	3,0	9,5	108	2,4	64,1
10 Balıkesir	1,5	51,5	4,6	3,0	24,2	64	2,2	66,4
Turkey	67,8	64,9	199,9	2,9	769,6	88	0,0	
11 Antalya	2,5	55,3	6,8	2,7	35,8	69	-7,9	69,8
12 Manisa	3,1	52,0	7,7	2,5	44,7	68	-14,5	73,6
13 Kırıkkale	1,7	53,0	4,1	2,4	31,2	54	-17,6	75,7
14 Konya	2,4	58,9	5,5	2,3	47,7	51	-23,3	78,5
15 Samsun	3,0	51,5	6,4	2,1	37,5	80	-27,5	81,7
16 Hatay	2,7	52,6	5,8	2,1	23,3	117	-27,9	84,5
17 Kastamonu	0,9	47,8	1,8	2,0	26,4	33	-31,4	85,4
18 Malatya	1,8	58,8	3,4	1,9	35,9	49	-34,9	87,1

19 Kayseri	2,5	58,8	4,7	1,9	59,7	42	-36,4	89,5
20 Gaziantep	2,0	70,3	3,8	1,9	15,3	132	-36,7	91,4
21 Trabzon	3,1	49,4	5,8	1,9	35,2	89	-36,9	94,3
22 Sanlıurfa	2,8	59,1	4,2	1,5	33,8	83	-49,3	96,4
23 Erzurum	1,4	57,3	2,0	1,5	40,7	33	-49,6	97,4
24 Mardin	1,8	59,6	2,2	1,3	26,1	68	-57,5	98,5
25 Van	2,0	49,3	1,9	1,0	41,6	47	-67,2	99,4
26 Ağrı	1,2	44,6	1,1	1,0	30,0	39	-67,2	100,0

Two thirds of total GDP is generated within the territory of the first ten NUTS II regions located to the west of Ankara, except Adana on the east cost of Mediterranean Sea. Samsun region (TR83) is placed on the 15th row on the list which ranks the regions from the highest to the lowest in terms of per capita income. Per capita income in the region (TR83) in 2000 is only $2,100 which is 27.5 percent lower then the national average $2,900.

To measure the overall size of Samsun region we have to look at the share of the regional GDP in total GDP. This comcaprision at sectroral level is provided in Table 2. Table 2 also shows the structure of the region's economy in comparision with the structure of the Turkish economy from 1987 to 2000.

In terms of the oveall size of GDP the regional income was 3,5 percent of the total GDP of the country in 1987. The size of GDP in Samsun has further declined to 3,2 percent over the period 1987 – 2000. This implies that the GDP growth rate was lower than the growth rate of the Turkish economy. To see that this was the cas to 3,2 percent e the growth rates in 14 sectors are calculated and

presented in Table 3. Table 2 also reveals that both Samsun region and Turkey have stiil been maintaining large share of agricultural activities in total GDP.

The SIS started to publish annual data for 14 sectors of GDP at provincial level in 1994 starting from 1987, both constent (1987) and current prices.

Tablo 3. Annual Average Growth Rates, Samsun and Turkey, 1987 – 2000, %
Source: SIS (1994, 2002).

It is seen that the Samsun region grew at around 3 percnet per year from 1987 to 2000 while national egonomy as a whole grew at a hgher rate, 3,6 percent per annum. The first five sectors that grew with relative high rate are Electricity, gas and water supply (5,8 percent), Transportation and communication (5,1 percent), Hotels and restaurants services (4.9 percent), Manufacuring industry (4,1 percent), and Wholesale and retail trade (4 percent). Some sectors has declined from 1987 to 2000. Banking sector (Financial institutions) at regional level unprecedently showed negative growth rate of 0,8 percent, though it grew by 1,8% at national level. Since Samsun region has grown at a lower rate than Turkey the disparity between the region and the nation gets worse.

3. REGIONAL INPUT-OUTPUT MODEL

3.1 Theoretical Framework: Why I-O Analysıs

When Leontief published the first IO table of 19191 and 1929 for the US economy he wrote that on the bases of the available statistical data the tables represented a *Tableau Êconomique* of the United States (Leontief, 1952). Leontief, also adds that “when Quesnay first published his famous schema,

his contemporaries and discples acclaimed it as the greatest discovery since Newton's laws" (Leontief, 1941; p.9).

Regional (interregional) input-output analys's date back to 1950s. The theory and practice of the regional study based on input-output was intiated by Leontief (Leontief, 1953) and Waltwr Isard (1953).
Ronal E. Miller states that determ'nat'on of these indirect demands makes the 'nput-output framework efficient tool of regional science research (Miller, 1998, s.43). The structure of the regional input-output frmawork employed in this study is given in Table 3.1.

Tablo 3.1 Schematic Regional Input-Output Table

		Expenditures		Total
		Activities	Final demand	
Incomes	Activities	T_{11}	T_{12}	Total output
	Primary inputs	T_{21}	T_{22}	Total level of primary inputs
Total		Cost of production	Total final demand	

Definitions of the items in Table 1 are as follows

T_{11}: Regional (intraregional) intermediate transactions between sectors, square matrix

T_{12}: Final demand matrix showing the output of regional producing sectors

T_{21}: Primary inputs for the regional production

T_{22}: Primary inputs for the regional final demand.

Final demand categories comprise the following items: Private final consumption, public consumption, private and public investment, exports and change in stocks. Exports are classified into two groups, one going to the rest of the country the other to out of the country i.e, to the rest of the world.

Primary inputs are the following: Import from the rest of the country, import from the rest of the world, net indirect taxes, employee compensations, and other factor incomes.

3.2 Methods of Regional Input-Output Modelling

There are basically three approaches to the construction of regional input-output tables. The first ia called the direct method which is based on surveys applied to the firms aporeting in the region under consideration. This method is also called the direct method or buttom up method. Although it is potentially credited with the highest reliability it is the most expensive one in terms of the cost of compilation. The second one is called the top down method which starts from a national input-output table and adapts it with available regional data to estimate a regional table. Some sources call the first method as the survey-based approach and the second methed as the non-survey based approach (Statistics New Zealand, 2003). The third one is called the hybrid approach which is the combitaion of the first two methods (Pinge, 2005).

3.3 TR83 Input-Output Table 2003

Since there is no regional input-output tables conpiled officially in Turkey we had to construct one for TR83 Samsun from the stretch. For this purpose an industry survey was designed and applied in about 300 establshements (firms) operating in manufacturing and trade in the region in 2004. However, the data collected from these questionares were so reliable and most of the questions were not replied properly. Therfore we had to make use of the national input-output table of 1998 as a starting point for the regional table. Then by using the available regional and sectoral GDP data (14 sectors in 2001) we obtained an estimate of the regional IO table. Briefly, TR83 2003 input-output table has been constructed by applying the hybrid approach.

TR83 2003 input-output table details 63 sectors (industry groupings) of the regional economic activities. Due to the fact that the share of agriculture is relatively high in the region agricultural activities are dissagregated into 17 sectors. The construction process of the regional table can be sumarised in five steps.

In the first step, in order to enlarge the number of agricultural activities frm 10 to 17, the national input-output table is xtended from 97 to 117. Since we do not know any mathematical method to enlarge a small matrix to larger size we accomplished this only on the basis of expert judgments.

In the second stage, the national IO table was aggregated in to 65 sectors to mach its size with the regional one. However two sectors, pertoroleum minig and petroleum refining are omly national activities we filled the corresponding rows and colums with zeros in the regional table. Thus two comparable input-output tables were obtained.

In the third stage we aggregated the national input-output table into 14 sectors. The rationale for this is that the provincial national income data by type of industries are published only at 14-sector level on annual basis. The national input-output table was also aggregated into 14 sectors. Then the outputs of the 14 regional sectors are derived by multiplying the inverse of national value added coefficients. In this process it is assumed that the regional the value added/output coefficients are the same both for the national and the reginonal.

Finally, we estimated the 63-sector output vector by extending the 14-sector output vector, using some additional data data, mainly the preliminary provincial results of the Industry Survey of 2002 (SIS, 2004). Then, we postmultiplied the national (and) domestic input coefficient matrix A (1998) by the regional diagonal matrix of sectoral outputs (2003) as given in Equation 3.1.

$$T = A\hat{t} \qquad \text{Equation 3.1}$$

Where

T : First estimate of the regional transaction matrix

$\hat{t}$: Diagonal matrix made of regional sectoral outputs

A : Matrix of national domestic input coefficients

Equaton 3.1 was the first estimate of the regional IO table. It was obvious that this was not an accurate table. To improve the quality of tha first estimate, two sectors are delated from the first estimate, namely Petroleum mining and natural gas extraction and Petroleum refining and manufacturing of coke.

Finally, at the last stage we consulted many experts involved in the project on the first estimated version of the regional input flow matrix, input

coefficients and output coefficients derived froma the flow matrix. During this process regional household income and consumption survey data for 2003 are published by the SIS for broad economic categories. We also made use of such supporting secondary data to balance the whole regional IO table with respect to final demand catagories.

4. KEY SECTORS: BACKWARD AND FORWARD LINKAGES

4.1 Input-Output Production Model

The main equation for the regional economic analysis based on input-output table is given by equation 4.1 which is cllaed the input-output production model.

$$t = At + f \qquad \text{Equation} \quad 4.1$$

Where

A: Matrix of input coefficients

f: Vector of final demand

t: Vector of level of total outputs

However before writing Equation 4.1 the input matrix A should be defined first. That is given in Equation 4.2

$$A = T\hat{t}^{-1} \qquad \text{Equation} \quad 4.2$$

The solution of the production model is given in equation 4.3

$$t = (I - A)^{-1} f \qquad \text{Equation} \quad 4.3$$

In eqution 4.3 $(I - A)^{-1}$ is called the Leontief inverse with its usual meaning. The α_{ij} element of the Leontief inverse measures the expnsionary effects of one unit chnge in the final demand of sector j on the production of sector i

Production model gfiven in the first three equations (Eqution 4.1 to 4.3.3) is called the demand side pruction model. A symmetrical version of the production model can also be written from the supply side. The supply-side production moel is given in the following three equations (Eqtion 4.4 to 4.6)

$$t' = t'Q + v' \qquad \text{Equation} \quad 4.4$$

Where

Q: Matrix of output coefficients obtained by dvividing each row entry of the flow matrix into its row toptal

v': Trasnpose of the vector of value added (actually all primary inputs including imports)

t'; Transposed vector of total outputs

Output coefficients Q is defined as follows

$$Q = \hat{t}^{-1} T \qquad \text{Equation} \quad 4.5$$

Soltion of the supply side production model of the input-output system is given by Eqtion 4.4

$$t' = v'(I - Q)^{-1}$$ Equation 4.6

The inverse matrix $(I - Q)^{-1}$ in Equaton 4.6 is called the output inverse as opposed to the input inverse $(I - A)^{-1}$. The β_{ij} element of the output inverse measures the expansionary effects of sector i's value added on the output of sector j. Output inverse can be found, among others, in Bulmer-Thomas (1982) and Augustunovich (1976), Miller and Blair (1985).

4.2 *BL Backward Linkages (BL)*

In the context of regional input-output model backward linkages measures the total output effects of one unit increase in the final demand of sector i on the level of production of all other sectors. An index measuring the relative size of backward linkages of sector *j* is defiend as follows

$$Y_j = \frac{1/n \sum_{i=1}^{n} \alpha_{ij}}{1/n^2 \sum_{i=1}^{n} \sum_{j=1}^{n} \alpha_{ij}}$$ Equation 4.5

Coeffient Y_j the ratio of mean of the column j of the input inverse to the overall average of the all elements of the inverse. It follows that $Y_j > 1$ implies the expansioanry output effects of j th sector is obove the average. Therefore those setors with bakward linkage indices grater than one can be idetifified as the key sectors of the region.

There were 25 sectors among 63 sectors of the region with the Y_j indices greater than one. Table 4.1 shows only the first ten sectors of that list.

Table 4.1 Production Multipliers and Backward Linkages

Rank	IO-sector number	Sector	Total output multiplier	Backward limkages ($Y_j = BL_j$)	Share of output in the region (%)
1	22	Food and beverage products	1,8838	1,3698	8,0
2	27	Wood and wood products (exc furniture)	1,8411	1,3387	0,4
3	31	Rubber and plastic products	1,7496	1,2722	0,9
4	40	Manufacture of motor vehicles, trailers and semi-trailers	1,7045	1,2394	0,7
5	33	Basic metal industry	1,7005	1,2365	2,3
6	34	Manufacture of other fabricated metal products; metal working service activities	1,6903	1,2290	1,4
7	15	Agricultural and	1,6866	1,2263	0,5

		animal husbandry service activities, except veterinary activities			
8	29	Prnting and Publishing	1,6816	1,2227	0,7
9	50	Hotels;camping sites and other provision of short-stay accommodation	1,6793	1,2211	1,9
10	46	Construction	1,6478	1,1981	4,5

4.3 Forward Linkages

These linkage coefficients measure the output effects of any row sector on the other sectors. More specifically an increase in the value added of sector i leads some increase in the available supply for the other sectors thus genarting further increase in the total production of the regional economy. The row sum of the output inverse $(I-Q)^{-1}$ is used to measure the such effects for sector i. Thus the total forward linkage indeks for sector i can be defined as in Equation 4.6

$$Z_i = \frac{1/n \sum_{i=1}^{n} \beta_{ij}}{1/n^2 \sum_{i=1}^{n} \sum_{j=1}^{n} \beta_{ij}} \qquad \text{Equation 4.6}$$

If $Z_i > 1$ the sector i can play a key role in the development process of the region in terms of its forward linkage effects. That is to say an increase in the investment in sector i can generate aove average multiplier effects on the level of production of other local industries

There were 27 industries among 63 local producing sectors with forward linkage indices grater than unity. The first 10 of them are shown in Table 4.2

Table 4.2 Forward Linkage Indexes (First 10 largest indices)

Rank	Input-utput sector number	Sector	Total output multiplier	Forward linkage index $(Z_i = BL_i)$	Share of output in the region(%)
1	19	Iron and other metal mining	2,7596	1,7573	0,0
2	28	Paper and paper products	2,4664	1,5706	0,7
3	18	Mining of coal and lignite	2,3994	1,5279	0,1
4	56	Financial intermediation, except insurance and pension funding	2,3601	1,5029	2,0
5	57	Real estate activities	2,3226	1,4790	0,3

6	21	Mining and quarrying n.e.c.	2,2360	1,4239	0,1
7	29	Prnting and Publishing	2,2195	1,4134	0,7
8	5	Beet root planting	2,1458	1,3664	0,7
9	15	Prnting and Publishing	2,1220	1,3513	0,5
10	20	Quarrying of stone, sand and clay	2,0675	1,3166	0,1

4.4 Grouping Backward and Forward Linkage Indices

Linkage indices can be classified into four categories if one can take their combination as shown in Table 4.3

Table 4.3. Combinations of Linkage Coefficients

		Backward linkages (BL)	
		$BL > 1$	$BL \leq 1$
Forward linkages (FL)	$FL > 1$	$BL > 1$ $FL > 1$	$BL \leq 1$ $FL > 1$
	$FL \leq 1$	$BL > 1$ $FL \leq 1$	$BL \leq 1$ $FL \leq 1$

The first category consists of those sectors with both backward and forward linkage indices are greater than 1 $(BL > 1,\ \ FL > 1)$. Included in the second group are the sectors with backward linkage indices smaller than 1 but with forward linkage coefficient less than or equal to 1 $(BL > 1,\ \ FL \le 1)$. The third group consists of those sectors with backward linkage indices smaller than or equal to 1 and forward linkages greater than 1 $(BL \le 1,\ \ FL > 1)$. Included in the fourth category are thethose sectors with both backward and forward linkge indices are smaller than 1 $(BL \le 1,\ \ FL \le 1)$. Acording to this categorization the most influeentil sectors are thos included in the first roupu whis are shown in Table 4.4.

Table 4.4. Sectors with Both Backward and Forward Linkages Greater than 1

IO Sector Number	Sector	Backward Linkages	Forward Linkages	Output share
9	Plant for feeding animals (maze, alfalfa, cow vetches)	1,0835	1,2001	0,2
15	Agricultural and animal husbandry service activities, except veterinary activities	1,2263	1,3513	0,5
27	Wood and wood prıducts	1,3387	1,2350	0,4
28	Paper and paper products	1,1955	1,5706	0,7
29	Printing and	1,2227	1,4134	0,7

	publishing			
30	Chemical products	1,1631	1,2037	2,0
31	Ruber and rubber products	1,2722	1,1128	0,9
32	Non-metalic products	1,1373	1,0023	2,2
33	Basic metal industry	1,2365	1,2756	2,3

5. MULTIPLIER ANALYSIS

Multiplier analysis plays an important role in addition to the identification of key sectors with high backward or forward linkages. The multipliers in the standard IO system measure the degree of the difference between the initial effects and the final effects on the economy of one unit exogenous change in one sector. In this section three types of multipliers are defined: (i) output multipliers, (ii) income multipliers, and (iii) employment multipliers. The theory and examples on this topic can be found, among others, in Miernyk (1965), Richardson (1972), Miller ve Blair (1985), ABS (1991).

5.1 Output multipliers

Two types of output multipliers can be defined: (i) The first from the input inverse, and (ii) the second from the output inverse. The sum of each column in the Leontief inverse measures the total (direct and indirect) output effects of an exogenous increase in the final demand of one sector on the output of other sectors. On the other hand the row sum of output inverse measures the total direct and indirect effects of an increase in the value added of one sector on the production of the other sectors troughout the economy. Since both multipliers

are reflected in the backward and forward linkage indices respectively they need not to be repeated here.

5.2 Income Multipliers

Income multipliers measure the direct and indirect effects of exogenous changes in the final demand on the total income (labour supply) of households rather than on the total output of the economy as a whole. In an input-output model two types of income multipliers can be defined.

i. Type I Income Multipliers

Prior to the type I income multiplier two new concepts called the open and closed input-output model need to be defined. Open input-output model is the one with all the elements of the final demand vector (vectors), namely, private consumption, government consumtion, investment, export, and change in stocks are all assumed to be determined exogenously. On the other hand closed input-output system is the one with one (particularly household sector) or more elements of the final demand vector are determined endogenously within the system.

Type I income multipliers are calculated in three steps. In the first step, the row of wage (income) coefficients in the primary inputs block of the original open input-output structure are in the way a_{ij}'s are calculated. In the second stage this row vector of wage coeffients is postmultiplied by the Leontief inverse. The resulting product or output (in mathematical sense) vector shows the total income effects of the final demand changes on each sector. In the third stage, the (total) income multiplier is defined by deviding the totoal income coefficients by the corresponding original (initial) income coefficients.

Ten highest type I income mutipliers for Samsun region are given in Table 4.1.

Table 5.1 Type I Income Multipliers

Rank	IO sector number	Sector	Direct income change	Direct and indirect income change	Indirect income change	Type I income multiplier	Output share (%)
1	22	Food and beverage	0,048	0,168	0,119	3,478	8,0
2	15	Agricultural and animal husbandry service activities, except veterinary activities	0,060	0,178	0,118	2,958	0,5
3	27	Wood and wood products (exc furniture)	0,106	0,248	0,142	2,340	0,4
4	33	Basic metal industry	0,084	0,190	0,106	2,266	2,3
5	40	Manufacture of motor vehicles, trailers and semi-trailers	0,088	0,196	0,108	2,223	0,7
6	30	Manufacture of basic chemicals	0,089	0,191	0,101	2,132	2,0
7	31	Plastics &	0,110	0,231	0,121	2,103	0,9

		synthetics rubber					
8	34	Other metal prodcuts	0,106	0,217	0,111	2,053	1,4
9	28	Paper and paper products	0,114	0,232	0,118	2,032	0,7
10	36	Manufacture of computing and bureau machines	0,075	0,150	0,075	2,001	0,2

ii. Type II Income Multiplier

Type II income multiplier is obtained from an open input-output system in which hoseholds are included in the endogenous part of the model. More clearly to obtain the type II income multipliers consumption vector is added as the $(n+1)th$ column, and wage row is added as the $(n+1)th$ row to the system. Then new input inverse is obtained for the extended input-output model with $(n+1)$ sectors. The type two income multiplier takes into account not only direct and indirect income effects of increased spending of the exogenous account but also induced effects of additional household spending effect on wage income. Thus the total income effect now include the direct, indirect and induced change in household income. In practice it is obtained by dividing the hosehold row elements of the extanded input inverse by the original elements in the wage row.

Ten highest type II multipliers obtained this way are given in Table 5.2

Table 5.2 Type II Income Multipliers

Rank	IO sector number	Sector	Direct, indirect and induced income change	Induced income change	indirect and induced income change	Type II income multiplier
1	22	Food and beverages	0,207	0,040	0,159	4,298
2	15	Agricultural and animal husbandry service activities, except	0,220	0,042	0,160	3,655
3	27	Wood and wood products	0,306	0,058	0,200	2,891
4	33	Basic metal industry	0,235	0,045	0,151	2,800
5	40	Manufacture of motor vehicles, trailers and semi-trailers	0,242	0,046	0,154	2,747
6	30	Manufacture of basic chemicals	0,236	0,045	0,146	2,635
7	31	Plastics & synthetics rubber	0,285	0,054	0,176	2,599

8	34	Other metal products	0,268	0,051	0,162	2,537
9	28	Paper and paper products	0,287	0,055	0,172	2,510
10	36	Manufacture of computing and bureau machines	0,185	0,035	0,110	2,472

5.4 Employment Multipliers

In this section we define two types of employment multipliers. They both measure the employment generating effects of final demand change as a result of changes in sectoral output.

i. Type I Employment Multipliers

Before defining the Type I employment multiplier, employment coefficients must be defined in terms of physical employment units (number of labour or man-hours worked). Labour coefficient for one sector is the ratio of total albour to the total output of that sector which measures the total labour requirement for a certain amount of output in monetary terms. It is the inverse of labour productivity. We defined these coefficients as the number of people employed

for 1 million new TL. Defining direct labour requirements this way we obtained a vector of labour coefficients for 63 sectors. Then by post multiplying the vector of direct labour coefficients by the input inverse one can obtain total labour requirements as a result of increase in final demand in each sector. Finally, Type I employment multiplier is obtained by dividing the total employment requirements by the direct labour coefficients.

Direct employment coefficients with the highest 10 Type I employment multipliers for the region are given in Table 5.4.

Table 5.3 Type I Employment Multipliers

Rank	IO sector number	Sector	Employment/ output coefficient L/Q (Person/Million new TL)	Direct and indirect employment change	Indirect employment change	Type I employment change
1	22	Food and beverages	23	205	182	8,989
2	54	Air transportation	3	15	13	6,067
3	53	Sea transportation	5	21	16	4,285
4	27	Wood and wood products	67	257	189	3,816
5	23	Tobacco production	20	76	56	3,806
6	28	Paper and paper products	17	61	45	3,700

7	31	Rubber and plastic products	13	39	27	3,143
8	51	Rail transport	4	13	9	3,108
9	40	Manufacture of motor vehicles, trailers and semi-trailers	10	30	20	3,090
10	30	Manufacture of basic chemicals,	10	31	20	2,950

ii. Type II Employment Multipliers (Truncated)

Type II employment multipliers are calculated for the regional input-outptu model. Truncated multiplires are calculated with household account is endogenous but the column sum of the extended inverse is taken only for *n* rows. The reason for this we could not determine the labour requirement for the hosehold expenditure as 64^{th} processing sector.

Type II employment multipliers for the first 10 sectors for TR83 region are given in Table 4.4.

Table 5.4 Type II Employment Multipliers (Truncated)

Rank	IO sector number	Sector	Direct, indirect and induced employment change	Induced employment change	indirect and induced employment change	Type II employment multiplier
1	54	Air transport	49	34	46	19,394
2	51	Rail transport	69	56	65	16,157
3	53	Water transport	58	37	53	11,922
4	22	Food and beverages	229	23	206	10,012
5	43	Production, collection and distribution of electricity	41	31	36	8,567
6	58	Computer and related servis activities	70	45	61	7,532
7	40	Manufacture of motor vehicles, trailers and semi-trailers	57	27	47	5,927
8	37	Manufacture of electrical	58	32	48	5,810

		machinery and apparatus n.e.c.				
		Manufacture of medical, precision and optical instruments, watches and clocks				
9	39		73	40	60	5,759
		Rubber and plastic				
10	31	products	72	32	59	5,713

6. GROWTH SCENERIOS FOR REGIONAL DEVELOPMENT

6.1 TR83 Historical Economic Performance

The model

$Y_n = Y_0 e^{rn}$ Equation 5.1

Or

$\ln Y = \ln Y_0 + rn$

$Y = \alpha + \beta n$

Where

Y_n : Terminal insome (GDP per capita)

Y_0 : Initial level of income

e : Base for the naturel logarithm $(e = 2{,}718283)$

r : Annual average growth rate (constent to be estimated)

n : Number of years

Estimated forms:

i. National model

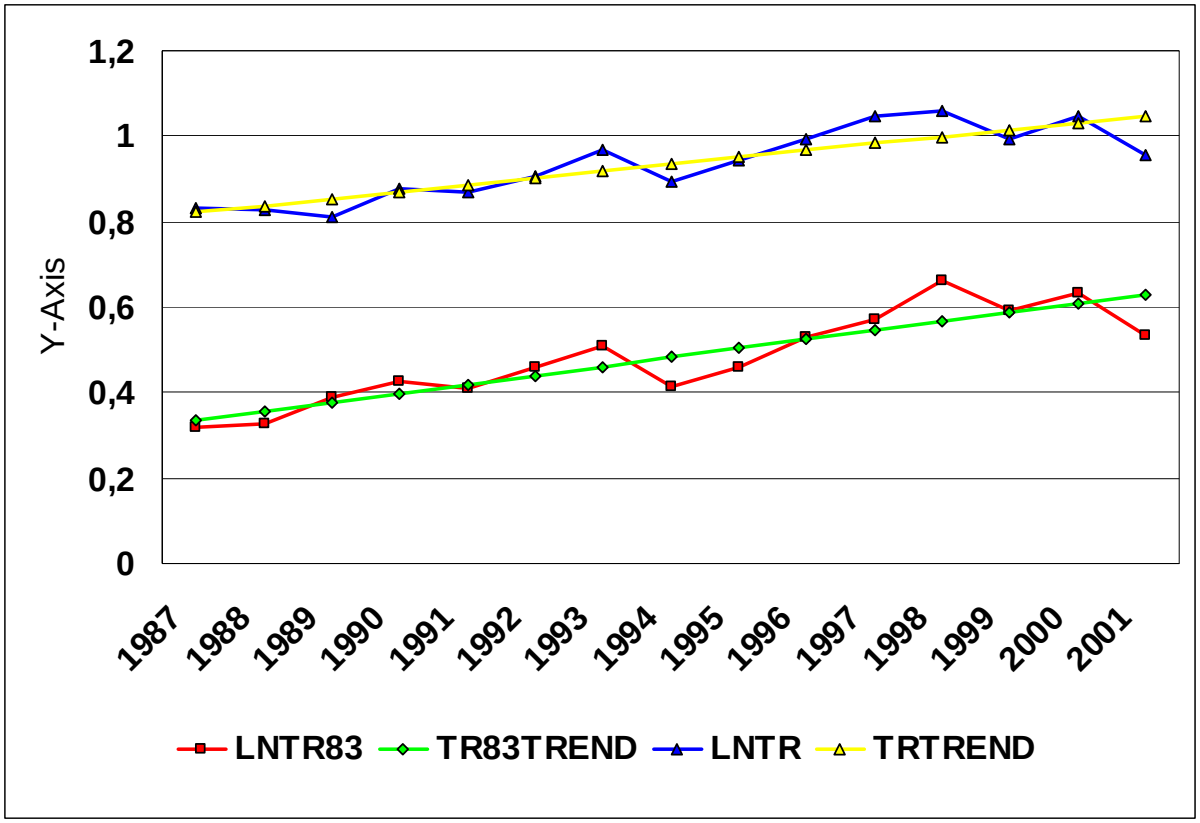
$Y_n = e^{0,8215} e^{0,016131n}$ $\quad (t = 6{,}286 \quad R^2 = 0{,}7524)$ Eşitlik 5.2

ii. Regional model

$Y_n = e^{0,3352} e^{0,021026n}$ $\quad (t = 7{,}178 \quad R^2 = 0{,}7985)$ Eşitlik 5.3

Period: 1987 – 2001.

Figure 6.1. Per Capita Income TR83 and Turkey, 1987-2001(Ln)



Interpretation will be added here.

6. 2 Basic Assumptions and Starategies of Altenative Scenarios

For the regional development from 2004 to 2023 we base our projections on one single target and two broad strategies.

The target of the development plan for the tregion is to increase the per capita income to the national average.

Broad strategies of the plan are threfold. The first strategy of the plan is to convert the structure of the regional economy in 2023 to the structure of the national economy in 2003.

Second strategy which the virtually the result of the first one, is to increase the share of the industry in the regional GDP while reducing the size of the agriculture.

Aditionally, we have two basic assumptions. Firstly the national economic growth rate planned in the eight-five-year plan is exogenous to the regional plan. Secondly population growth is exogenous and wil slow down because of lower fertility rate and net pozitif internal outmigration.

6.3 Alternative Scenarios: A0, A1, A2, A3

To formulate the possible alternative growth paths for the regional income we formulated four scenerios.

i. Base-line growth scenario

A0 Scenerio (g = 3,7%)

Where *g* shows per capita income average annual growth rate over the planning period 2004 – 2023.

Although it is the lowest growth scenario among four this scenario assumes that the region's economy will grow a little faster then its trend line growth over the last ten years.

During the planning period national economy is expected to grow by 6% per annum while the growth rate in the region will be 4,2%. Population growth rate will be smaller at the region (0,8%) then the national average (1,2%) as well. As a result the ratio of regional per capita income to the national average will decline from the present level of 70,1% to 54,7%.

Table 6.1 shows the outcome of this growth scenario for some macro variables resulted from A0 scenario.

Table 6.1 A0 Baseline Growth Scenerio 2004-2023

	TR83			TR			Per capita income growth rate (Percent)	
	Population (Thousands)	GDP (Millions NTL)	Per capita income (Thousand) NTL)	Population(Thousands)	GDP (Millions NTL)	Per capita income (Thousands) NTL)	Per capita income TR83/TR (Percent)	TR83	TR
1990	2.844	7.005	2,5	56 473	205 182	3,6	67,8		
1995	2.914	7.389	2,5	60 611	235 384	3,9	65,3	0,6	1,3
2000	2.999	9.084	3,0	67 804	291 622	4,3	70,4	3,6	2,0
2003	3.055	10.883	3,6	70 847	359 879	5,1	70,1	5,4	5,5
2005	3.093	12.277	4,0	73 333	414 044	5,6	70,3	5,4	5,3
2010	3.204	14.497	4,5	78 454	547 930	7,0	64,8	2,6	4,3
2015	3.345	17.384	5,2	82 890	714 382	8,6	60,3	2,6	4,2
2020	3.492	21.820	6,2	86 966	963 857	11,1	56,4	3,8	5,0
2023	3.580	25.412	7,1	89 339	1 158 946	13,0	54,7	4,2	5,2
Annual average growth rate (2004-2023, percent)									

	0,8	4,2	3,4	1,2	6,0	4,7		3,7	4,8

The per capita income growth rates with the remainig three alternatives are as follows:

ii. A1 Scenerio (g = 4,7%)

Per capita income to national average in 2023 will be %70,2

iii. A2 Scenerio (g = 5,7%)

Per capita income to national average in 2023 will be %85,2

iv. A3 Scenerio (g = 6,5%)

Per capita income to national average in 2023 will be %100

More explanation is needed here

Predictions produced with the other four scenerios are given on Table 6.2

Table 6.2 TR83 Alternative Growth Scenarios A1, A2, A3 (2004-2023)

	A1		A2		A3	
GDP (Millio	Per capit	Per capita income (Milli	GDP (Millions NTL)	Per capit	Per capita income	

	ns NTL)	a inco me (Tho usand s) NTL)	TR83/TR (P ercent)	ons NTL)	a inco me (Tho usan ds) NTL)	TR83/TR (Percent)		a inco me (Tho usan ds) NTL)	income TR83/T R (%)
1990	7.005	2,5	67,8	7.005	2,5	67,8	7.005	2,5	67,8
1995	7.389	2,5	65,3	7.389	2,5	65,3	7.389	2,5	65,3
2000	9.084	3,0	70,4	9.084	3,0	70,4	9.084	3,0	70,4
2003	10.883	3,6	70,1	10.883	3,6	70,1	10.883	3,6	70,1
2005	12.277	4,0	70,3	12.277	4,0	70,3	12.277	4,0	70,3
2010	15.017	4,7	67,1	15.997	5,0	71,5	16.797	5,2	75,1
2015	19.194	5,7	66,6	21.704	6,5	75,3	24.204	7,2	83,9
2020	26.320	7,5	68,0	31.120	8,9	80,4	36.140	10,3	93,4
2023	32.589	9,1	70,2	39.561	11,0	85,2	46.445	13,0	100,00
Annual average growth rate (2004-2023, percent)									
	5,5	4,7		6,5	5,7		7,3	6,5	

Figure 6.1 Per Capita Income Growth Paths in Alternative Scenarios 1990-2023

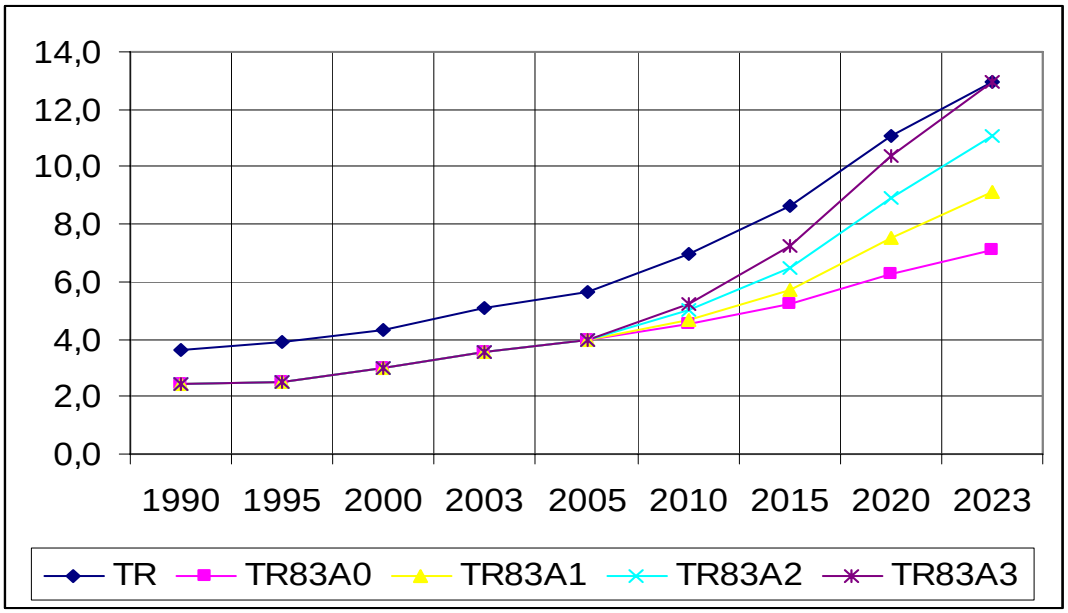
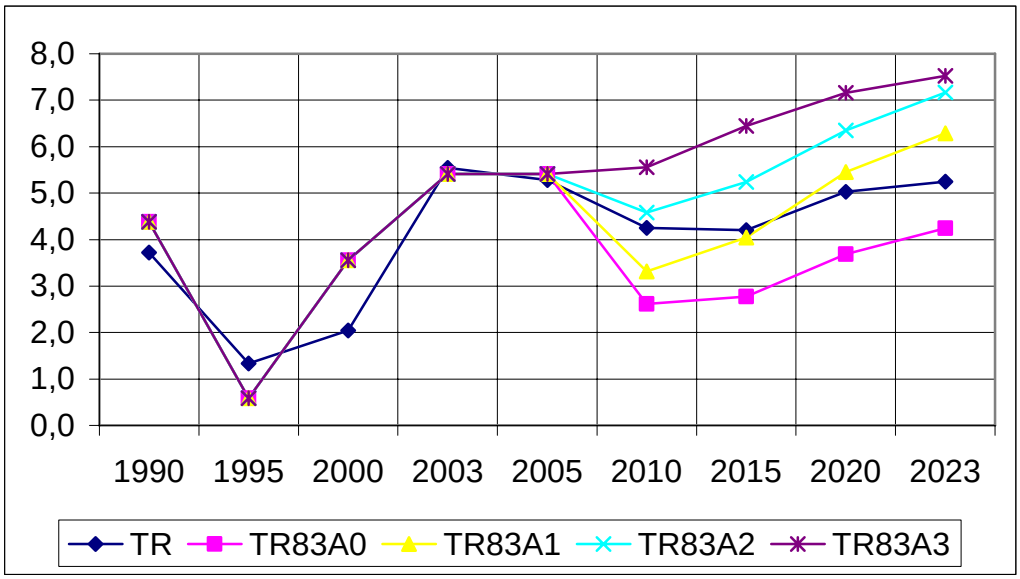


Table 6.3 Per Capita Income Growth Rates (Percent)

	TR83				TR		Population	
	A0	A1	A2	A3	GDP	Per capita income	TR	TR83
1995	0,6	0,6	0,6	0,6	2,7	1,3	1,41	0,48
2000	3,6	3,6	3,6	3,6	4,3	2,0	2,24	0,58
2003	5,4	5,4	5,4	5,4	7,0	5,5	1,46	0,61
2005	5,4	5,4	5,4	5,4	7,0	5,3	1,72	0,61
2010	2,6	3,3	4,6	5,6	5,6	4,3	1,35	0,71
2015	2,8	4,0	5,2	6,4	5,3	4,2	1,10	0,86
2020	3,7	5,5	6,4	7,2	6,0	5,0	0,96	0,86
2023	4,2	6,3	7,2	7,5	6,1	5,2	0,90	0,83

Figure 6.2 Per Capita Income Grwth Rates (Percent)



7. FORECASTS WITH A3 VERY HIGH GROWTH SCENERIO

7.1 GDP Structure and Growth TR83 (A3)

This section explains the general outline and the details of the A3 scenerio.

General settings: Target, assumptions and strategies:

Target: Per capita income will reach to the national average

Assumption: As explained before. Population growth is exogenous. National economic growth is exogenous. Outmigration trend in the region will continue

Strategies. As explained earlier. The structure of the economy will be similar to the structure of the national economy in 2003. Industry should grow much faster than agricultur. Large scale investment by government (public) firms should not increase. Nationalization of existing regional state economic exterprise should

be privitized. Investment in some small size utility services at local level, like electricity and gas, can be provided or supplied by public firms.

Figure 7.1 produces the growth path of per capita income that can be obtained when the scenario A3 is applied in comparison with the planne growth path of the national economy.

Figure 7.1 Growth Path of Per Capita Income With A3 Scnerio

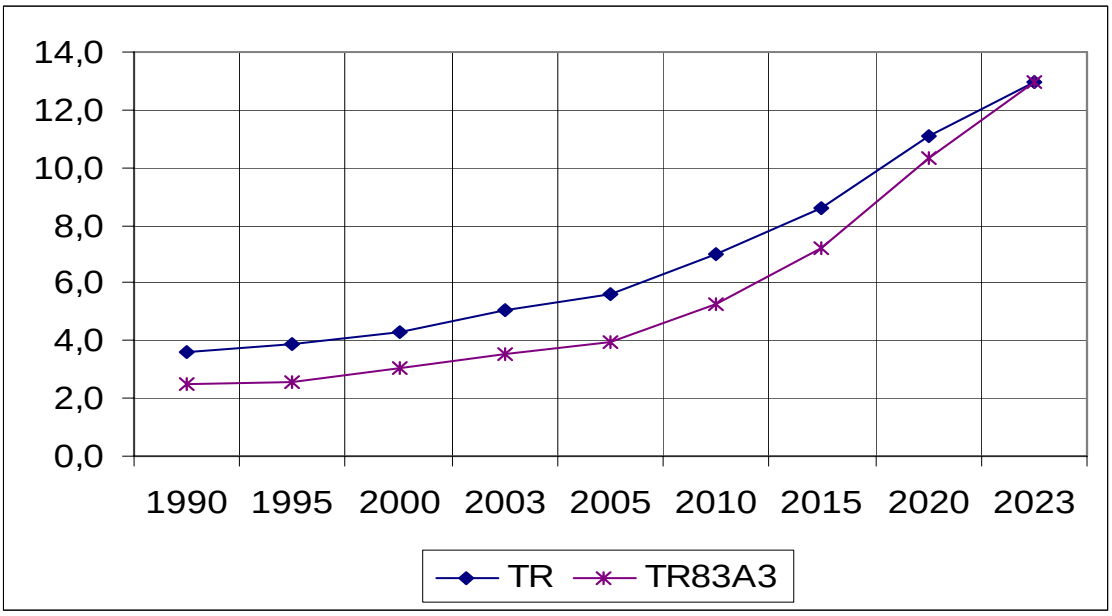
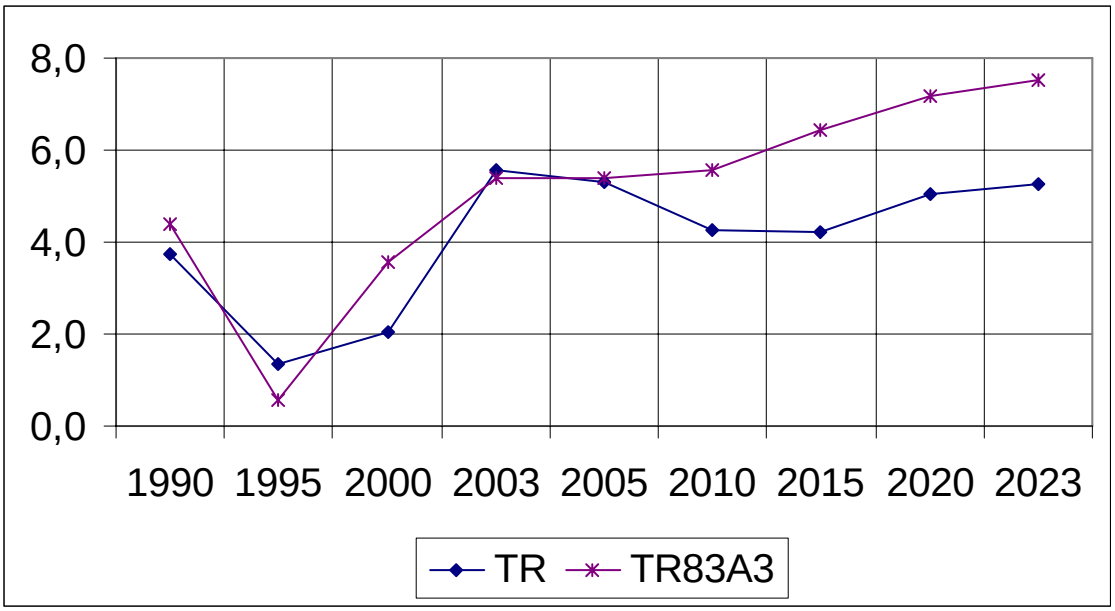


Figure 7.2 shows the growth rate comparision of A3 scenerio with the national average.

Figure 7.2 Per Capita Income Growth Rate with A3 Scenerio (%)



Other results of the regional planning model based on A3 scenerio are given in the following sections and tables therein.

7.2. GDP Structure and Growth with A3 Scenerio

GDP structure which is planned to be attained with A3 scenerio is given in Table 7.2

Table 7.2 GDP Structure and Growth TR83 (A3)

							TR 2003
	2003	%	2010	2015	2023	%	%
Agriculture	**2241**	**20,6**	**3100**	**4089**	**5570**	**12,0**	**11,9**
1 Farming and animal husbandary	2167	19,9	2984	3912	5230	11,3	11,2

2	Forestry	50	0,5	77	113	197	0,4	0,4
3	Fischery	24	0,2	39	64	143	0,3	0,4
	Industry	**2146**	**19,7**	**3580**	**5333**	**11634**	**25,0**	**25,2**
4	Mining	35	0,3	55	88	237	0,5	1,1
5	Manufacturing	1831	16,8	3080	4551	9670	20,8	20,4
6	Electricity, gas, water	280	2,6	445	694	1726	3,7	3,7
	Services	**6497**	**59,7**	**10118**	**14786**	**29241**	**63,0**	**62,9**
7	Construction	349	3,2	545	812	1730	3,7	3,6
8	Wholesale and retail trade	1880	17,3	2952	4348	8252	17,8	16,6
9	Hotels nad restaurants	164	1,5	266	401	901	1,9	3,6
10	Transportation and communication	1661	15,3	2575	3724	7361	15,8	15,2
11	Finacial institutions	215	2,0	341	509	1115	2,4	5,1
12	Selfemployed	262	2,4	411	613	1351	2,9	4,5
13	Public services	1628	15,0	2508	3605	7008	15,1	10,2
14	Dwellings	338	3,1	520	775	1523	3,3	4,1
	GDP	**10883**	**100,0**	**16797**	**24207**	**46445**	**100,0**	**100,0**

Tablo 7.3 Sectoral Growth Rates With A3 Scenerio (Percent)

	1991 - 2000	2004 - 2010	2011 - 2015	2016 - 2023	Cumulative (2016 – 2003)
Agriculture	**-0,8**	**4,6**	**5,5**	**3,9**	**148,6**
1 Farming and animal husbandary	-0,8	4,6	5,4	3,6	141,3
2 Forestry	-2,4	6,1	7,8	6,9	294,5
3 Fischery	-1,0	7,2	9,6	10,2	501,8
Industry	**1,6**	**7,3**	**8,0**	**9,8**	**442,1**
4 Mining	1,3	6,2	9,4	12,5	571,4
5 Manufacturing	3,1	7,4	7,8	9,4	428,2
6 Electricity, gas, water	-4,7	6,6	8,9	11,4	517,4
Services	**2,6**	**6,3**	**7,6**	**8,5**	**350,1**
7 Construction	0,2	6,3	8,0	9,5	395,4
8 Wholesale and retail trade	2,7	6,4	7,7	8,0	339,1
9 Hotels nad restaurants	3,6	6,9	8,2	10,1	449,5
10 Transportation and communication	3,9	6,3	7,4	8,5	343,1
11 Finacial institutions	-2,3	6,6	8,0	9,8	419,7
12 Selfemployed	1,7	6,4	8,0	9,9	414,9
13 Public services	1,8	6,2	7,3	8,3	330,5
13 Dwellings	1,9	6,2	8,0	8,4	350,5
14 **GDP**	**1,5**	**6,2**	**7,3**	**8,1**	**326,8**

7.3 Investment Model for All Alternative Scenarios

The model

$I = \alpha Y^{\beta}$ Equation 7.1

Where

I: Gross investment

Y: GDP

α : Constent term

β : Elasticity of investment with respect to income

The estimated form of national investment model

$I = e^{-3,222} Y^{1,133}$ $\left(t = 24,325 \quad R^2 = 0,95 \quad n = 33\right)$ Equation 7.2

Or

$\ln I = -3.222 + 1.133 \ln Y$

Annual investment plan is given in Table 7.4

Table 7.4 A3 Scenerio Investment Plan (Million NTL)

	2003	Percent	2010	2015	2023	Percent	Annual average growth 2004-2023 (Percent)
Agriculture	**60**	**4,0**	**91**	**139**	**279**	**3,6**	**7,7**

1	Farming and animal husbandary	55	3,7	84	128	259	3,3	7,7
2	Forestry	3	0,2	5	7	13	0,2	7,3
3	Fischery	1	0,1	2	4	7	0,1	7,8
	Industry	**420**	**28,1**	**723**	**1076**	**2363**	**30,5**	**8,6**
4	Mining	27	1,8	43	66	122	1,6	7,6
5	Manufacturing	325	21,7	557	832	1851	23,9	8,7
6	Electricity, gas, water	69	4,6	123	178	390	5,0	8,7
	Services	1015	67,9	1631	2485	5099	65,9	8,1
7	Construction	40	2,7	68	107	220	2,8	8,5
8	Wholesale and retail trade	99	6,6	163	257	532	6,9	8,4
9	Hotels nad restaurants	83	5,6	130	207	433	5,6	8,3
10	Transportation and communication	441	29,5	708	1055	2156	27,8	7,9
11	Finacial institutions	34	2,3	55	92	195	2,5	8,7
12	Selfemployed	45	3,0	72	110	241	3,1	8,4
13	Public services	143	9,6	226	343	699	9,0	7,9
14	Dwellings	130	8,7	209	313	623	8,0	7,8
	Total	**1495**	**100,0**	**2445**	**3700**	**7741**	**100,0**	**8,2**
	I/Y (Percent)	13,7		14,6	15,3	16,7		

Total investment plan is given in Table 7.5

Table 7.5 A3 Scenerio Total Investment Plan (Million NTL)

					Percent			
	1997-2003	2004-2010	2011-2015	2016-2023	1997-2003	2004-2010	2011-2015	2016-2023
Agriculture	**346**	**544**	**623**	**1785**	**4,0**	**3,9**	**3,9**	**3,9**
1 Farming and animal husbandary	332	521	596	1715	3,8	3,7	3,8	3,8
2 Forestry	8	13	15	39	0,1	0,1	0,1	0,1
3 Fischery	6	10	11	31	0,1	0,1	0,1	0,1
Industry	**2804**	**4510**	**5117**	**14830**	**32,1**	**32,3**	**32,4**	**32,5**
4 Mining	163	269	298	855	1,9	1,9	1,9	1,9
5 Manufacturing	2337	3811	4285	12438	26,7	27,3	27,1	27,2
6 Electricity, gas, water	305	430	534	1537	3,5	3,1	3,4	3,4
Services	5597	8922	10042	29065	64,0	63,8	63,6	63,6
7 Construction	247	432	494	1429	2,8	3,1	3,1	3,1
8 Wholesale and retail trade	253	431	483	1400	2,9	3,1	3,1	3,1
9 Hotels nad restaurants	624	1070	1204	3487	7,1	7,7	7,6	7,6
10 Transportation and communication	2529	3995	4461	12901	28,9	28,6	28,3	28,2

	Finacial							
11	institutions	336	557	632	1828	3,8	4,0	4,0	4,0
12	Selfemployed	214	350	386	1115	2,4	2,5	2,4	2,4
13	Public services	628	866	1045	3052	7,2	6,2	6,6	6,7
14	Dwellings	766	1220	1338	3853	8,8	8,7	8,5	8,4
	Total	**8747**	**13976**	**15781**	**45680**	**100,0**	**100,0**	**100,0**	**100,0**
	Total (Million $)	5850	9347	10554	30549				
	Public (Percent)	13,8	11,7	12,6	12,5				
	Private (Percent)	86,2	88,3	87,4	87,5				
	Total	100,0	100,0	100,0	100,0				

Table 7.6 A3 Scenerio Urban and Rural Population (Thousand)

	1990	2000	2010	2015	2023
Total	2844	2999	3204	3345	3580
Urban Population	1251	1545	2074	2374	2865
Rural population	1593	1454	1130	971	716
Annual average growth rate (Percent)					
Total	-	0,5	0,7	0,9	0,8
Urban	-	2,1	2,9	2,7	2,3

Population					
Rural population	-	-0,9	-2,5	-3,0	-3,8
Urban and rural distribution (Percent)					
Total	100,0	100,0	100,0	100,0	100,0
Urban Population	44,0	51,5	64,7	71,0	80,0
Rural population	56,0	48,5	35,3	29,0	20,0

Definition: Urban places: Centers with more than two thousand inhabitants.

Table 7.7 A3 Scenerio Employment Plan (Thousand)

	Level				Share (%)			
	2003	2010	2015	2023	2003	2010	2015	2023
Agriculture	**704,9**	**545,8**	**478,7**	**331,4**	**66,3**	**50,0**	**40,0**	**26,1**
1 Farming and animal husbandary	674,6	514,0	447,0	301,0	63,5	47,1	37,4	23,7
2 Forestry	24,6	23,8	22,9	19,6	2,3	2,2	1,9	1,5
3 Fischery	5,7	8,0	8,8	10,8	0,5	0,7	0,7	0,9
Industry	**78,1**	**152,8**	**217,0**	**318,0**	**7,4**	**14,0**	**18,1**	**25,1**
4 Mining	2,8	4,9	9,0	13,1	0,3	0,4	0,8	1,0
5 Manufacturing	72,1	139,7	196,7	289,7	6,8	12,8	16,4	22,8

6	Electricity, gas and water	3,2	8,3	11,3	15,3	0,3	0,8	0,9	1,2
	Services	**279,6**	**393,2**	**500,2**	**619,2**	**26,3**	**36,0**	**41,8**	**48,8**
7	Construction	29,7	48,2	56,2	72,4	2,8	4,4	4,7	5,7
8	Wholesale and retail trade	73,0	104,5	123,9	133,9	6,9	9,6	10,4	10,6
9	Hotels nad restaurants	15,4	26,2	30,9	46,3	1,5	2,4	2,6	3,7
10	Transportation and communication	19,2	34,1	44,0	73,0	1,8	3,1	3,7	5,8
11	Finacial institutions	5,1	12,3	19,6	23,7	0,5	1,1	1,6	1,9
12	Selfemployed	29,8	46,3	61,7	82,5	2,8	4,2	5,2	6,5
13	Public services	102,6	114,6	151,8	173,0	9,7	10,5	12,7	13,6
14	Dwellings	4,7	6,9	12,2	14,3	0,4	0,6	1,0	1,1
	Total	**1062,5**	**1091,9**	**1195,9**	**1268,6**	**100,0**	**100,0**	**100,0**	**100,0**
	L/N (%)	34,8	34,1	35,8	35,4				

8. SUMMARY AND CONCLUSIONS

i. Regional economy (TR83) should grow much faster than national average during the next 20 years.

ii. The structure of the regional economy should change : The share of industry must increase while the share of agriculture decreases.

iii. The level of investment must increase to accelerate the growth. Some portion of growth will be the result of increase in TFP.

iv. Finance for the proposed regional development plan will depend mainly on local private sources (savings) and initiatives.

v. External resources mainly the EU structural funds are expected. A sizable amount has already been granted.

vi. If the abovementioned conditions are met A3 growth scenario will be feasible and desirable.

vii. To make the planning and forecasting process easier regional development agencies (26) should produce regional IO tables coformable with the national one.

THANK YOU

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