MODELLING CONSUMPTION OF PRIVATE HOUSEHOLDS IN INFORGE

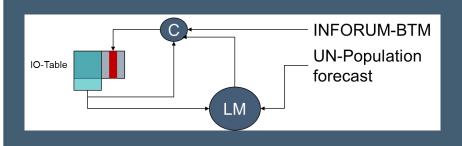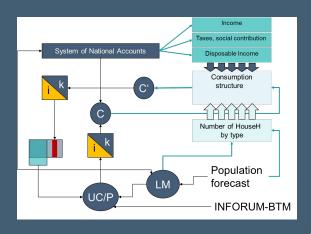**26th Inforum World Conference in Łódź, Poland**

Marc Ingo Wolter

Motivation

1. **Private consumption over 50% of GDP**

2. **Demographic change: declining population, aging and increasing single-person households**

3. **Possible shifts in consumption structure due to**

    a. Digitization → growing services sector

    b. Aging → increasing demand for medical & health care services

    c. Green Economy → from goods to services (e.g. car sharing)

    d. inequality of income

➔ **Over the past 20 years, GWS has used different approaches to calculate private consumption**

INFORUM. *Interindustry Forecasting at the University of Maryland*

Modelling Approaches

Modelling Approaches: Simple and fast (1/2)

▶Total private consumption (C) and constant structure of goods:
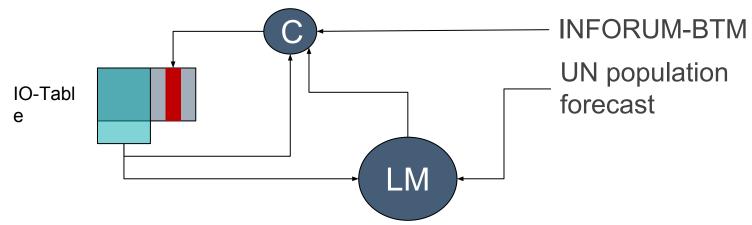
$$C[t] = a + b \left(\frac{VA[t]}{PC[t]} \right)$$

$$PC[t] = f(wages, PI, \dots)$$

$$c_i[t] = sh_i * C[t]$$

⇨ Estimation of Keynesian consumption function (a>0, 0<b<1) using value added (**VA**) (or trend for short term projection)

⇨ Consumption prices (**PC**) estimated by domestic and foreign prices

- Domestic prices: **wages** from a small, aggregated labour market (supply and demand, **LM**), or trend and

- assumption about import prices (**PI**) ← **INFORUM-BTM**

⇨ and constant shares (**sh**) of goods (**i**)

Modelling Approaches: Simple and fast (2/2)

► Appropriate as/ for…

⇨ **Starting point** for model building

⇨ Calculation of scenarios in a **short-term** simulation with I/O-model (example: higher consumption of health care services but less consumption of accomodation and food services with aging population)

► Usage: small countries in global trade model

► Procedure:

IO-Table

C

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UN population forecast

LM

Next steps (1/3)

▶As next steps, we need consumption purposes (**cp**), prices pc_{cp}, disposable income (**DI**) and a bridge-matrix (**CPX**) from purposes (COICOP) to goods (CPA)

- ▶ Aggregated consumption function, **DI** calculated from SNA, prices from a price-model (unit costs (**uc**), see next slide)

$$C[t] = a + b \left(\frac{DI[t]}{PC[t]}, \dots \right)$$

- ▶ Shares of consumption purposes (sh$_k$) driven by relative prices, cross prices or other structural indicators (e.g. share of people over 70, ..):

$$sh_k[t] = f(\frac{pc_k[t]}{PC[t]}, \dots) \rightarrow 1 = \sum_k sh_k[t]$$

- ▶ Consumption purpose calculation:

$$cp_k[t] = sh_k[t] * C[t]$$

(COICOP - Classification of individual consumption by purpose)
CPA - Classification of Products by Activity
SNA - System of National Accounts

Next steps (2/3)

▶▶ Calculation of consumption by goods

$$c_i[t] = \sum_k CPX_{ik} * cp_k[t]$$

▶ Calculation of consumption prices for purposes; in INFORGE via unit costs (**uc**)

$$uc_j[t] = labour\_uc_j[t] + intermediate\ demand\_uc_j[t] + \dots$$

$$p_j[t] = f(uc_j[t]) \quad \leftarrow \text{estimation of mark ups}$$

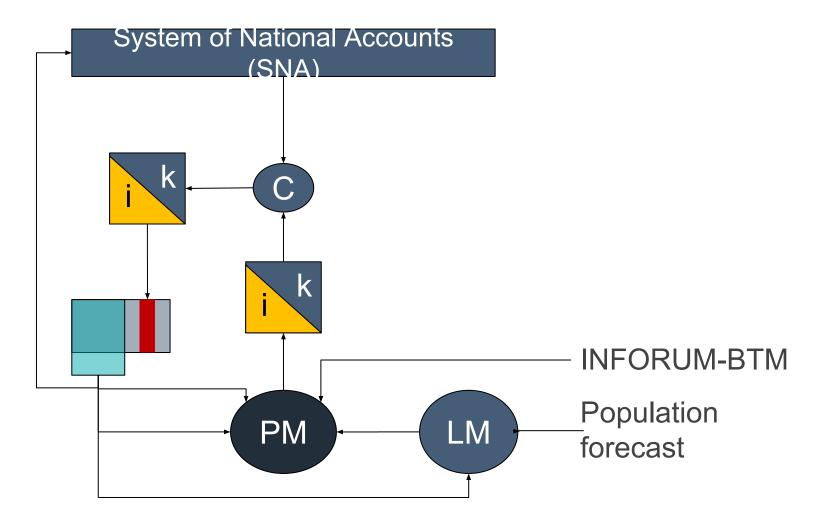$$pc_k[t] = \sum_i CPXQ_{ik} * p_i[t] \leftarrow \text{weighting}$$

⇨ Other price models can be used, as well

▶ Appropriate for

⇨ Medium term projections

⇨ Caculation of more sophisticated scenarios: changes in (1) taxation, (2) prices ..

Next steps (3/3)

► Procedure:

System of National Accounts (SNA)

k / i

C

k / i

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Population forecast

PM

LM

Final steps (1/3)

▶ The approches above are not able to cope with demographic change or inequality of income; but both are contemporary problems
→ INFORUM Italy, USA, … → cross-section analysis

▶ INFORGE: decomposition of two main influencing factors: **price changes** and **demographic change**

⇨ We use the procedure above, but without an aggregated consumption function:

$$cp_k[t] = f\left(\frac{DI}{PC}, \frac{pc_k}{PC}, \dots\right) \rightarrow C[t] = \sum_k cp_k[t] \text{ (constant prices)}$$

$$cpn_k[t] = cp_k[t] * pc_k[t] \rightarrow CN[t] = \sum_k cpn_k[t] \text{ (current prices)}$$
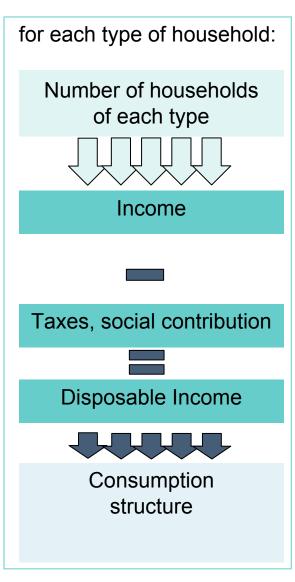
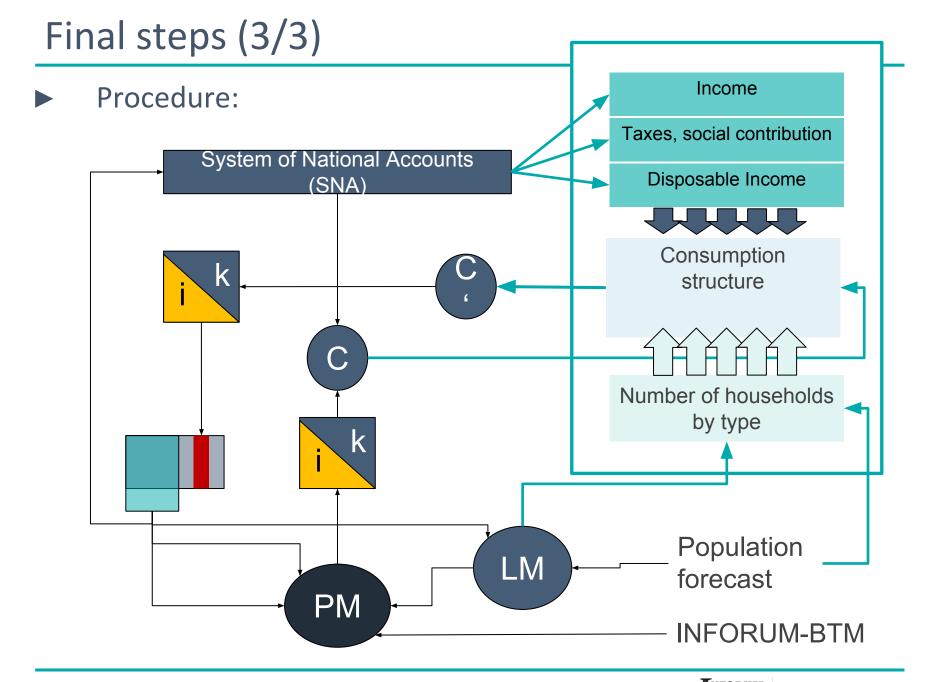$$\rightarrow PC[t] = CN[t]/C[t] \ \& \ shn_k[t] = \frac{cpn_k[t]}{CN[t]}$$

▶ Changes of consumption structures (shn) are applied to consumption patterns of 50 different household types

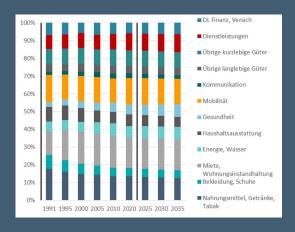▶ Data: Household survey 2008 and 2013 („EVS") conducted by Federal Statistical Office of Germany

Components of EVS-household-module:

⇨ **Number of households** for each type are driven by the population forecast and the INFORGE labour market (blue & white-collar workers, self-employed, public sector)

⇨ **Components of income** of each household type driven by SNA (wages, capital income, transfer payments...)

⇨ **Taxes and social contribution** are calculated for each household type and adjusted to SNA

⇨ **Disposable income** calculated for each household type

⇨ Relativ changes in specific consumption structure of each household type taken from Δ **shn**

for each type of household:

Number of households of each type

Income

Taxes, social contribution

Disposable Income

Consumption structure

► Procedure:

System of National Accounts (SNA)

Income

Taxes, social contribution

Disposable Income

Consumption structure

Number of households by type

C'

C

k / i

k / i

LM

PM

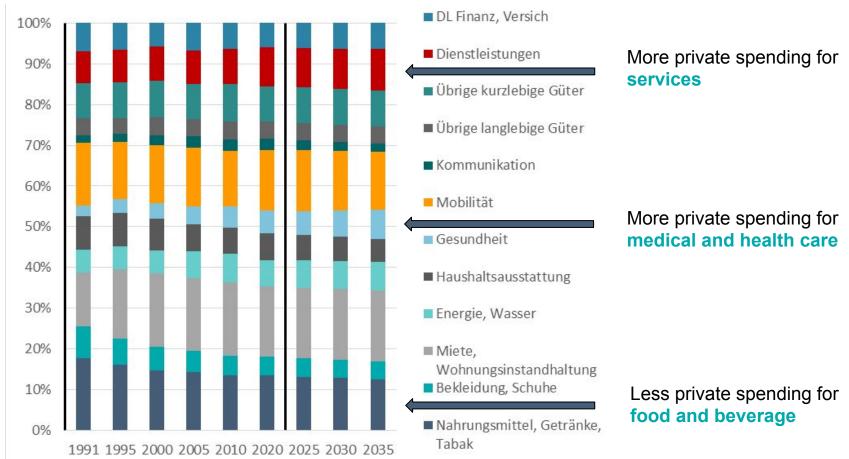Population forecast

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Some results

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► Results taken from INFORGE 17_1 (August 2017) and

► A publication of the project "Sozioökonomische Berichterstattung III" (Reporting on socioeconomic development in Germany, third report) → www.soeb.de (also available in English)

> Bieritz, L., Drosdowski, T., Stöver, B., Thobe, I. & Wolter, M. I. (2017): Konsumentwicklung bis 2030 nach Haushaltstypen und Szenarien. In: Forschungsverbund Sozioökonomische Berichterstattung (Hg.): Berichterstattung zur sozioökonomischen Entwicklung in Deutschland. Download, wbv Open Access. DOI: 10.3278/6004498w017

Some results

► Forecast for Germany (INFORGE17_1):

Legend:
- DL Finanz, Versich
- Dienstleistungen
- Übrige kurzlebige Güter
- Übrige langlebige Güter
- Kommunikation
- Mobilität
- Gesundheit
- Haushaltsausstattung
- Energie, Wasser
- Miete, Wohnungsinstandhaltung
- Bekleidung, Schuhe
- Nahrungsmittel, Getränke, Tabak

More private spending for **services**

More private spending for **medical and health care**

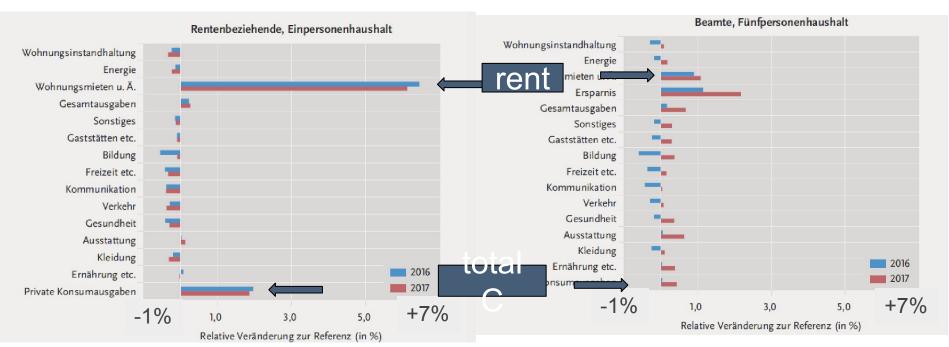Less private spending for **food and beverage**

► Changes in consumption structure are slower than shifts of labour demand

Some results

Scenario analysis: *rising rents for dwellings* and relative changes of different consumption purposes in 2016 & 2017 for

(1) single household, retired

(2) five person household, civil servant

► Results as expected: rising rents for dwellings have a far stronger impact on small households with low income

Next steps & Conclusion

Next steps & Conclusion

▶ At present, detailed (EVS) household data is only available for *2008* and *2013*; in 2021 we will recieve data for 2018 → offers two options:

⇨ (1) ***Building a complete dataset*** (2008 to 2018) and estimate consump-tion function for each type of household and each consumption purpose

   Bottom-up, easily extendable for „new" types

   A lot of work (50 HH-types x 40 CP = 2000 functions)

⇨ ***Using shift-share*** approach (Dunn 1960)

   Easy & fast to execute

   Remains top-down, scenarios are hard zu calculate

▶ INFORUM – BTM: is helpful ➔ saves a lot of time!

⇨ focus of modelling could be on consumption (private and public) and on investment

▶ Consuption module: keep it simple for forecasts

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