

A faded, grayscale background image of a multi-story building with many windows and a modern architectural style. A teal horizontal bar is overlaid on the image, containing the title text.

# MODELLING CONSUMPTION OF PRIVATE HOUSEHOLDS IN INFORGE

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

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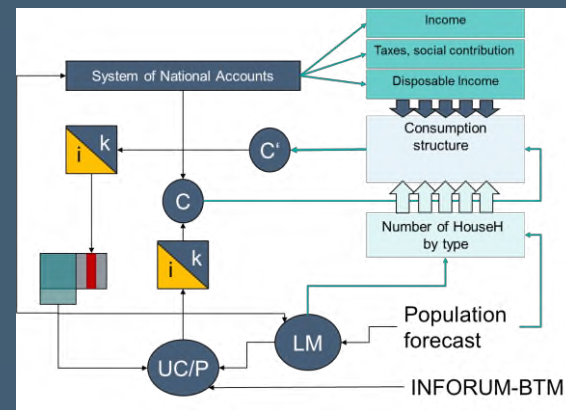
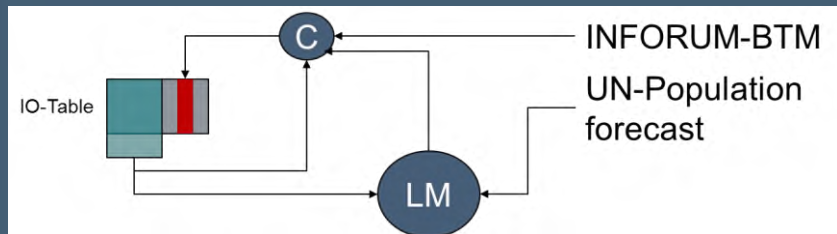
# Motivation

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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**

# Modelling Approaches



# Modelling Approaches: Simple and fast (1/2)

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Total private consumption (**C**) and constant structure of goods:

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

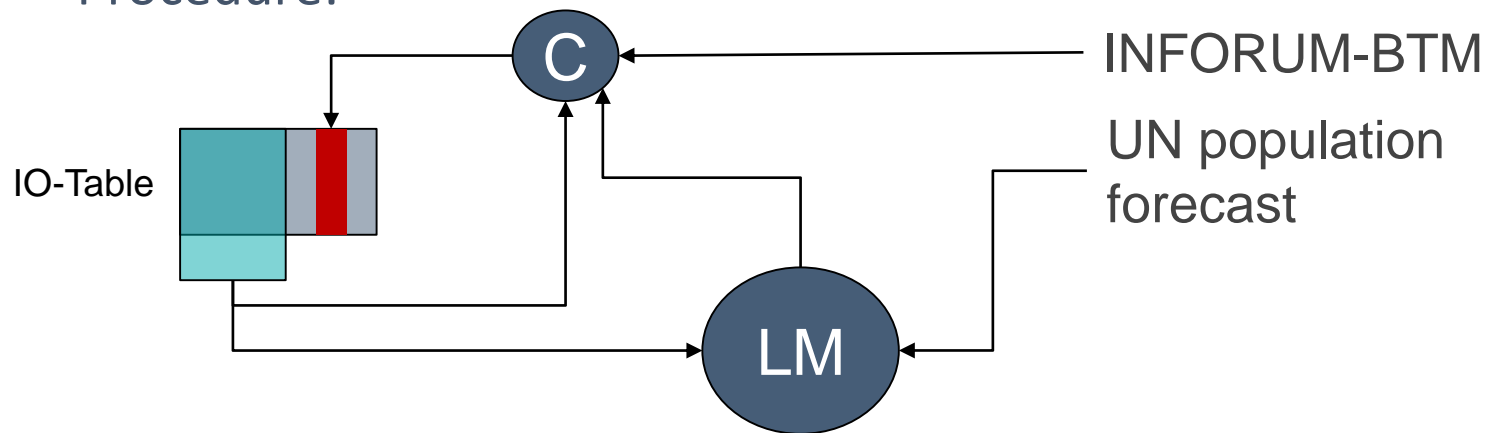
$$PC[t] = f(\text{wages}, PI, \dots)$$

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

- ⇒ 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 accommodation and food services with aging population)
- ▶ Usage: small countries in global trade model
- ▶ Procedure:



# Next steps (1/3)

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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, ..):

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

- ▶ **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**)

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

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

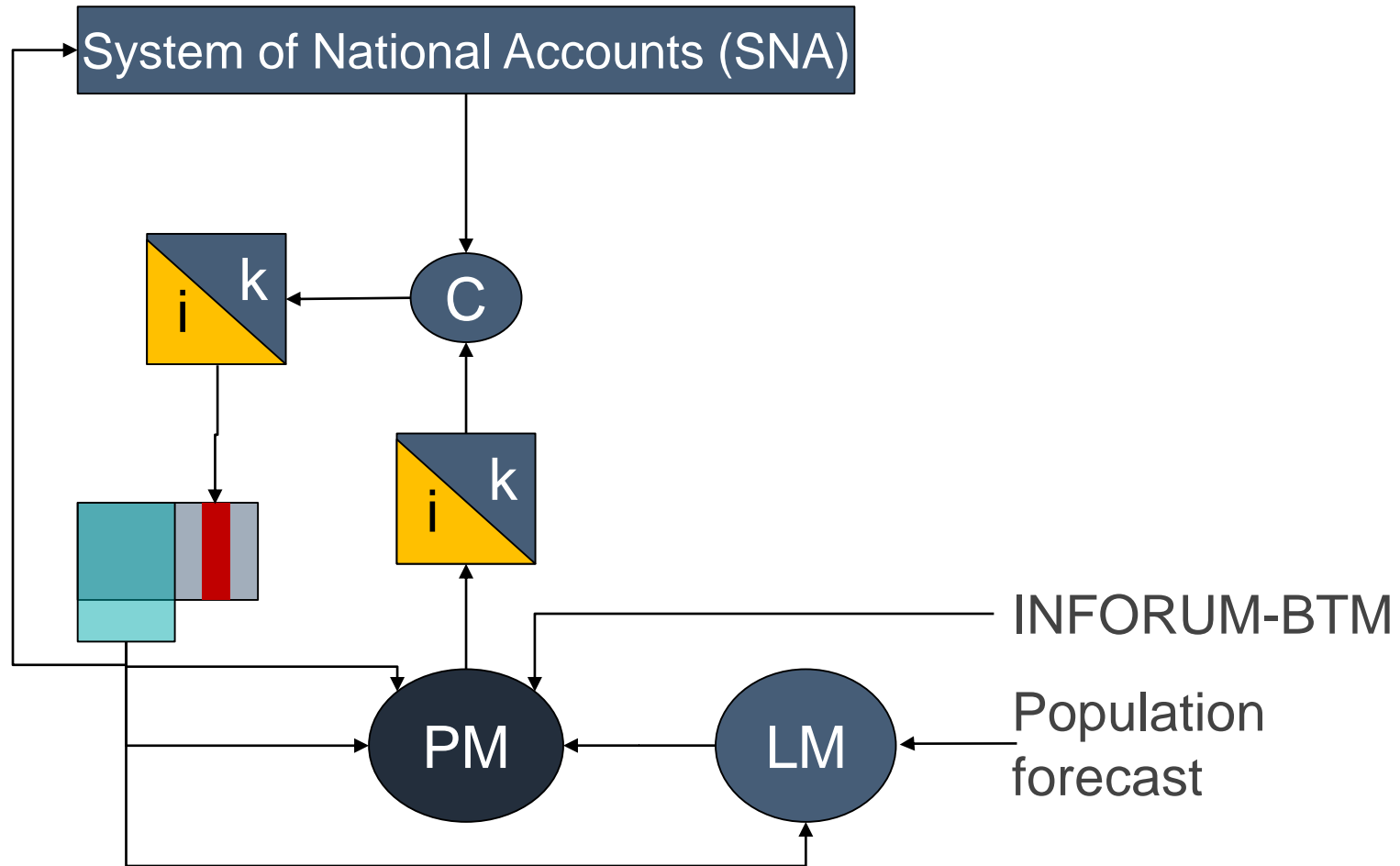
$$pc_k[t] = \sum_i CPXQ_{ik} * p_i[t] \quad \leftarrow \text{weighting}$$

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- ⇒ Other price models can be used, as well
- ▶ Appropriate for
  - ⇒ Medium term projections
  - ⇒ Calculation of more sophisticated scenarios: changes in (1) taxation, (2) prices ..

# Next steps (3/3)

## ► Procedure:





# Final steps (1/3)

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The approaches 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:

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

$$cpn_k[t] = cp_k[t] * pc_k[t] \rightarrow CN[t] = \sum_k cpn_k[t] \text{ (current prices)}$$

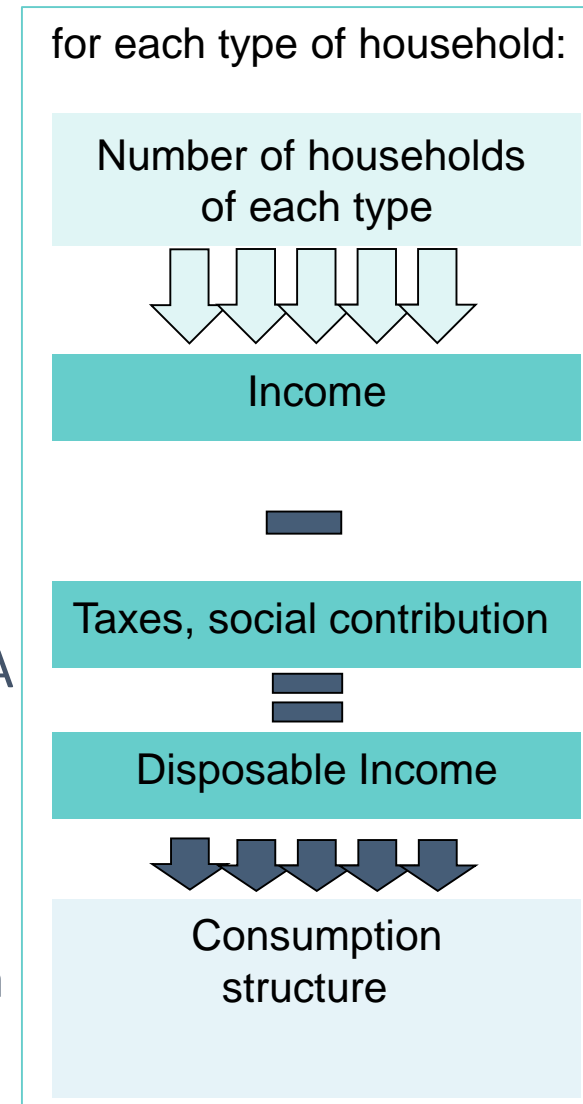
$$\rightarrow PC[t] = CN[t]/C[t] \text{ \& } shn_k[t] = \frac{cpn_k[t]}{CN[t]}$$

- ▶ 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

# Final steps (2/3)

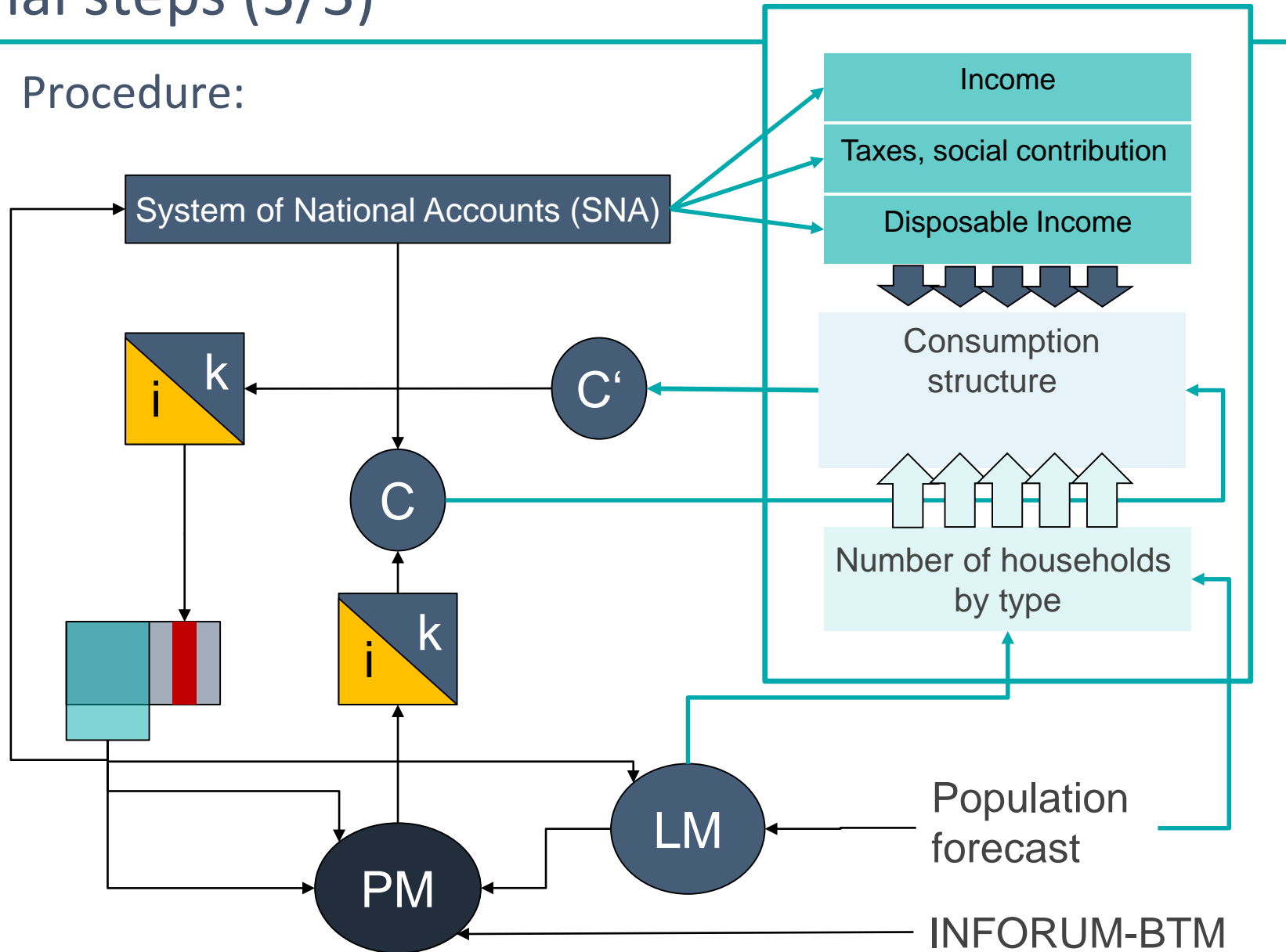
Components of EVS-household-module:

- ⇒ **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  **$\Delta shn$**

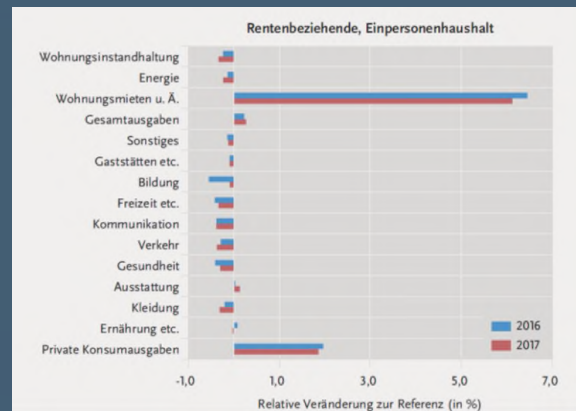
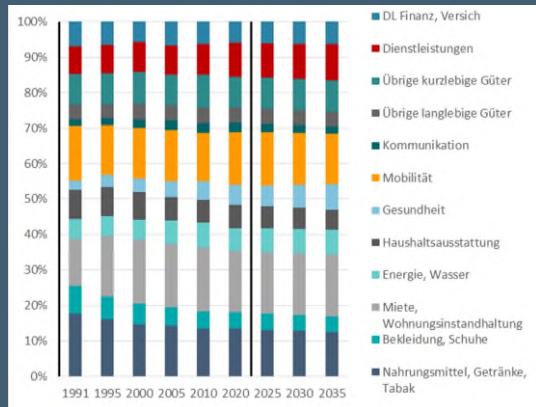


# Final steps (3/3)

## ► Procedure:



# Some results



# Some results

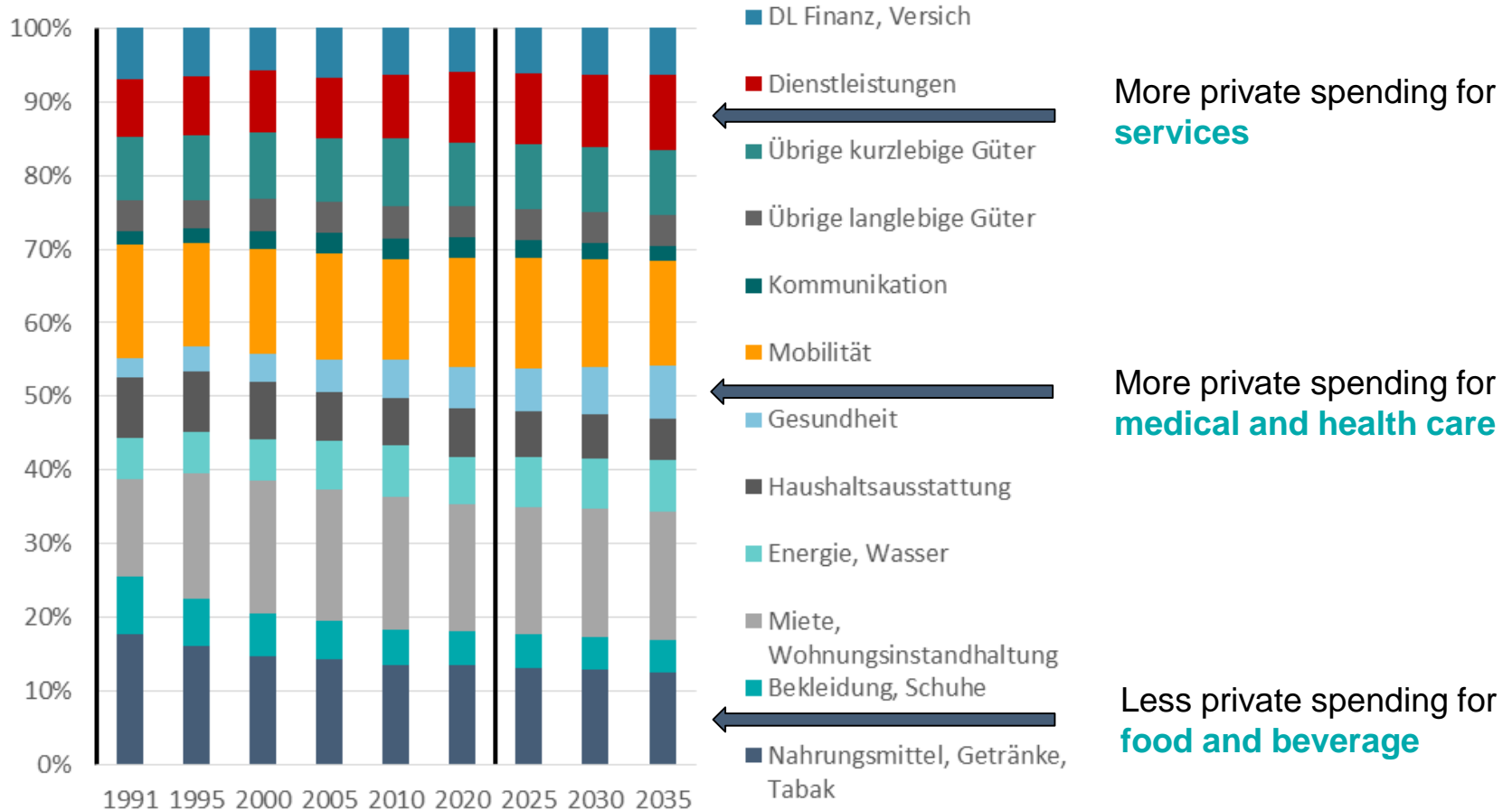
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- ▶ Results taken from INFORGE 17\_1 (August 2017) and
- ▶ A publication of the project “Sozioökonomische Berichterstattung III” (Reporting on socioeconomic development in Germany, third report) → [www.soeb.de](http://www.soeb.de) (also available in English)

Bieritz, L., Drosdowski, T., Stöver, B., Thobe, I. & Wolter, M. I. (2017): Konsumententwicklung 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):



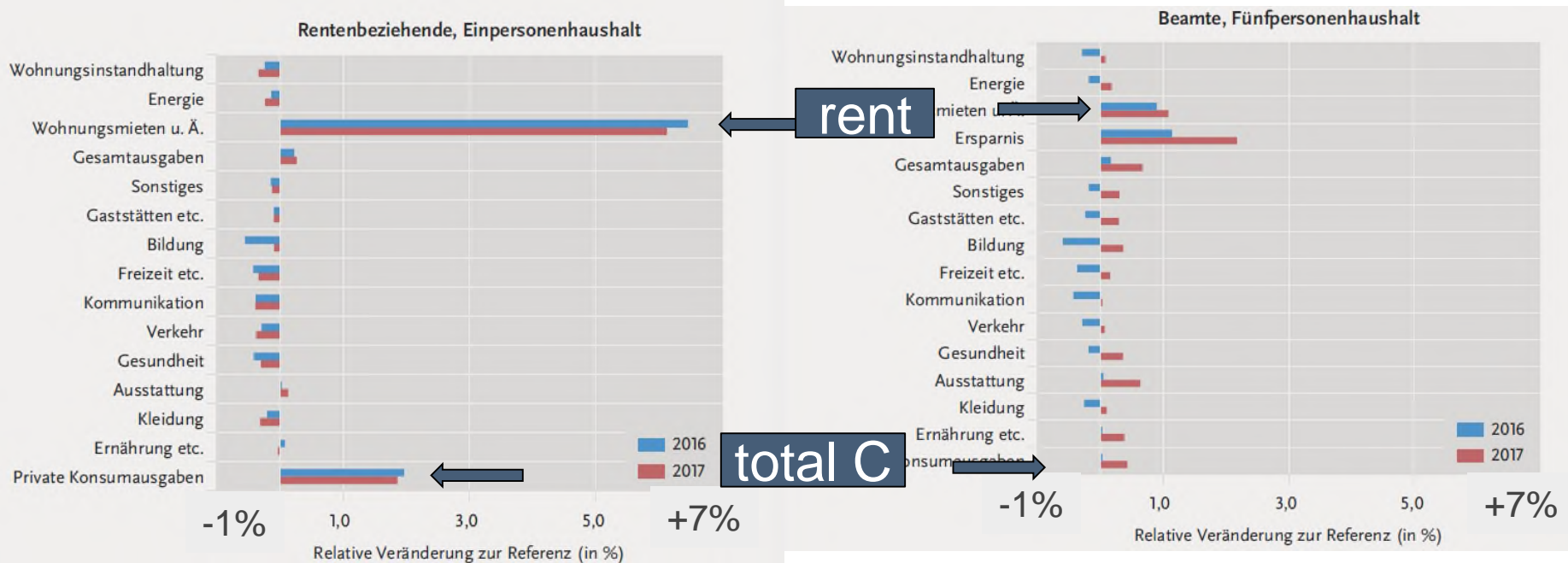
## ► Changes in consumption structure are slower than shifts of labour demand

# 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

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# Next steps & Conclusion



# Next steps & Conclusion

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- ▶ At present, detailed (EVS) household data is only available for 2008 and 2013; in 2021 we will receive data for 2018 → offers two options:
  - ⇒ (1) **Building a complete dataset** (2008 to 2018) and estimate consumption 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)
  - ⇒ (2) **Using shift-share** approach (Dunn 1960)
    - Easy & fast to execute
    - Remains top-down, scenarios are hard to calculate
- ▶ INFORUM – BTM: is helpful → saves a lot of time!
  - ⇒ focus of modelling could be on consumption (private and public) and on investment
- ▶ Consumption module: keep it simple for forecasts



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