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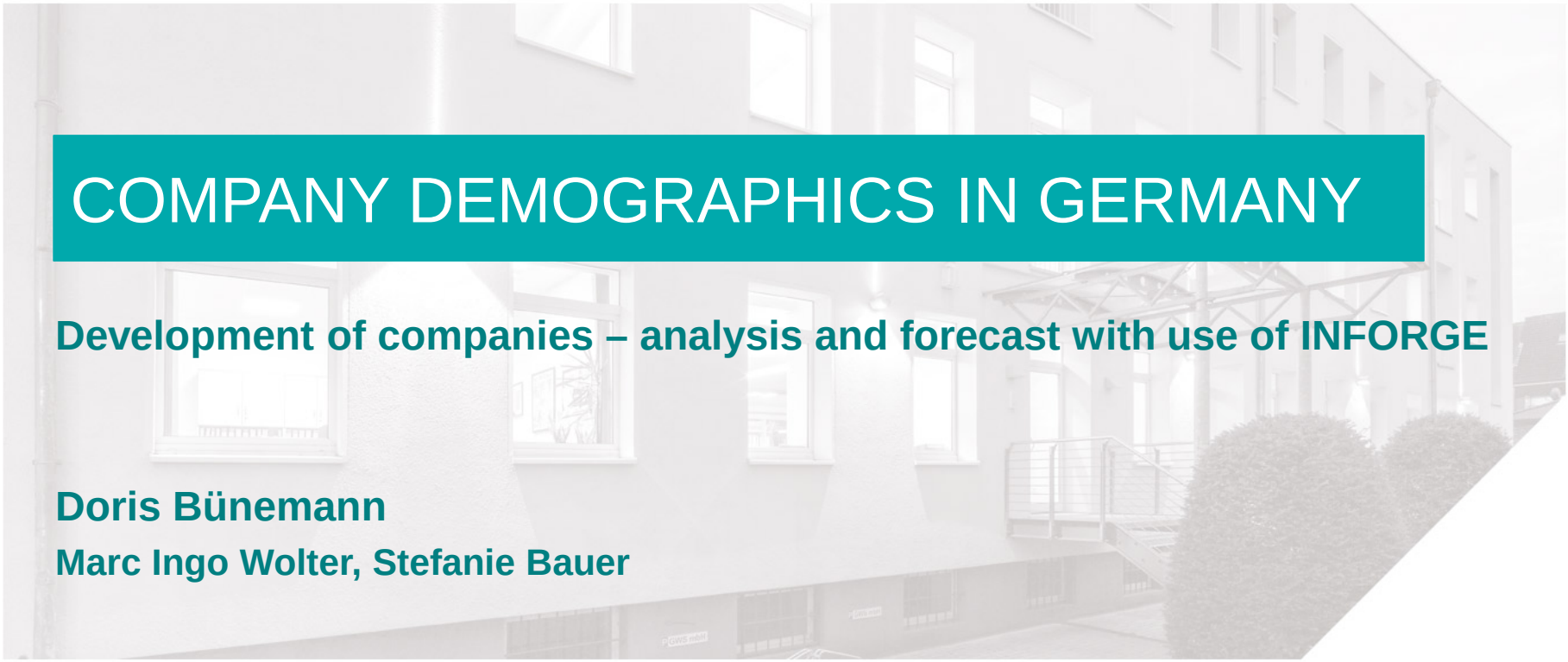

COMPANY DEMOGRAPHICS IN GERMANY

Development of companies – analysis and forecast with use of INFORGE

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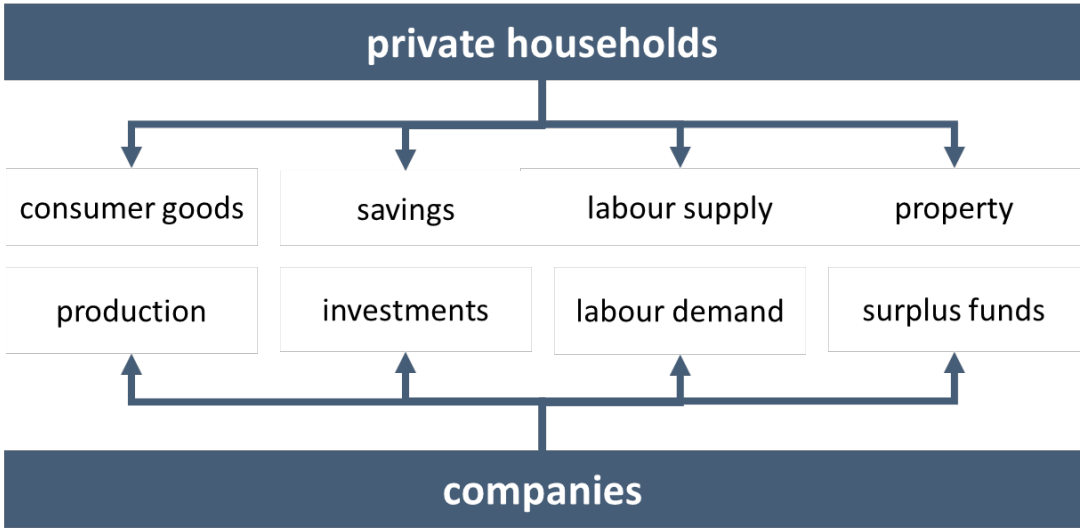
1. Background

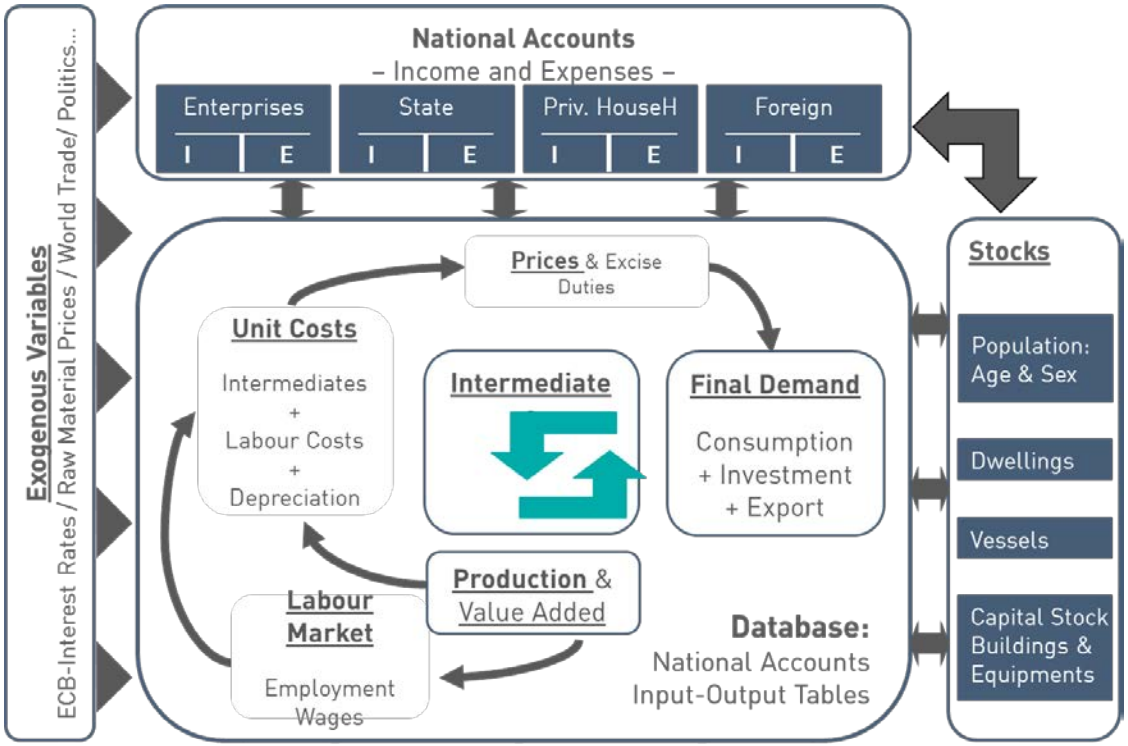
Companies (alike private households) are important economic units, but they are so far not part of GWS I/O modelling



- Data about development of companies in economic sections/divisions available from German Federal Statistical Office (from 2006/2008–2014)
- GWS started UDEMO analysis and forecast in 2015
- Mid-term objective: integration of UDEMO in GWS modelling

1. Background

Components of INFORGE (INterindustry FORecasting GErmany)



- So far, only the total number of enterprises (income & expenses) in INFORGE
- Like DEMOS for private households, UDEMO could deliver detailed information about company perspective
- UDEMO can add important new aspects for modelling & forecasts, i.e. about division/market structures (e.g. monopoly, oligopoly, polipoly)

2. Results of analysis

Data base for analysis: 17 NACE / WZ-2008 sections:

	Sections according to NACE / WZ-2008	divisions
B	Mining & quarrying	05 - 09
C	Manufacturing	10 - 33
D	Electricity, gas, steam and air conditioning supply	35
E	Water supply, sewerage, waste mgmt. & remediation	36 - 39
F	Construction	41 - 43
G	Trade (wholesale, retail & car retail/repair)	45 - 47
H	Transport & storage	49 - 53
I	Accommodation & food service activities	55 - 56
J	Information & communication (ITC)	58 - 63
K	Financial & insurance activities	64 - 66 *)
L	Real estate activities	68
M	Professional, scientific & technical activities	69 - 75
N	Administrative & support service activities	77 - 82
P	Education	85
Q	Human health & social work activities	86 - 88
R	Arts, entertainment & recreation	90 - 93
S	Other service activities	94 - 96

*) 64.2: excluding equitiy holdings

source: Federal Statistical Office Germany, NACE/ WZ-2008, June 2008, own diagram

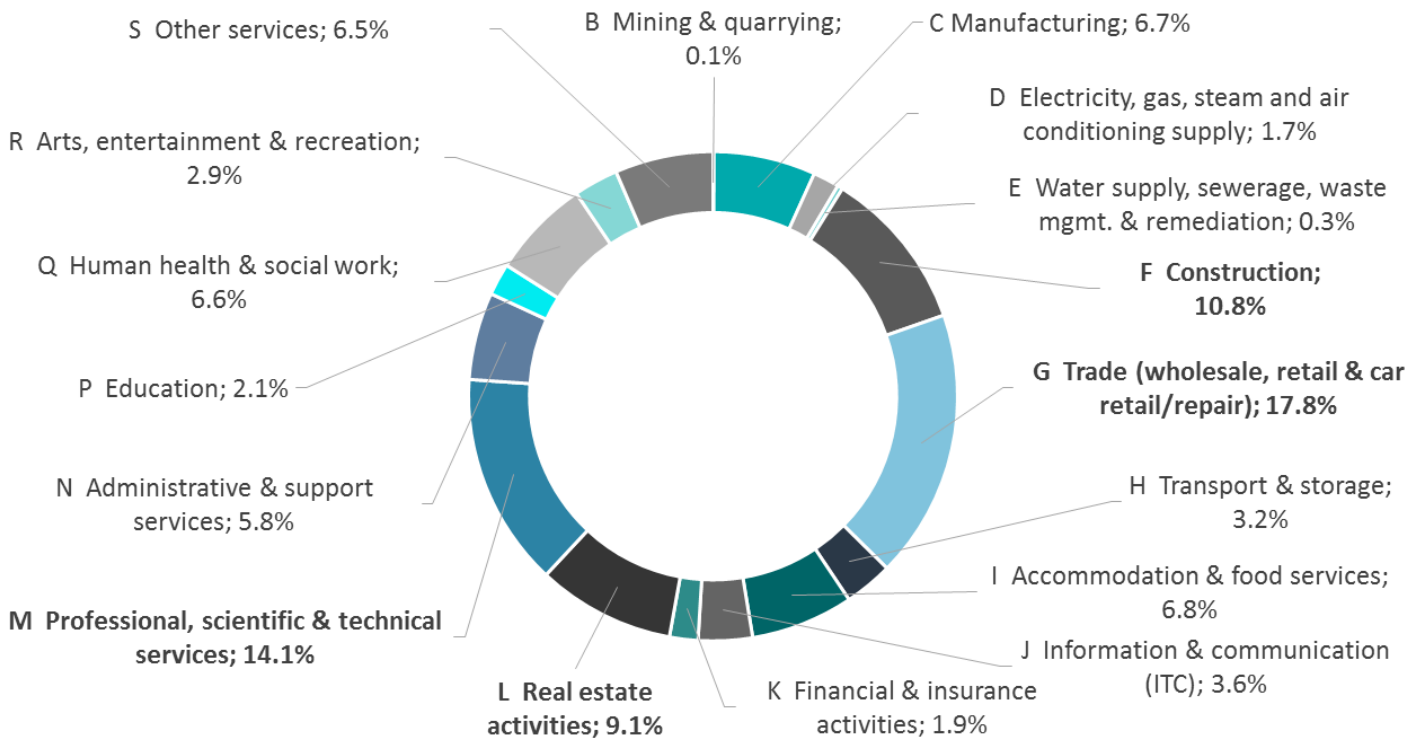
NOT included in business register data from German Federal Statistical Office:

- ⇨ A: Agriculture, forestry & fishing
- ⇨ O: Public administration & defence, compulsory social security

2. Results of analysis

Most companies are in trade section followed by professional, scientific & technical services, construction and real estate activities

Distribution of companies within industry sections (2014)

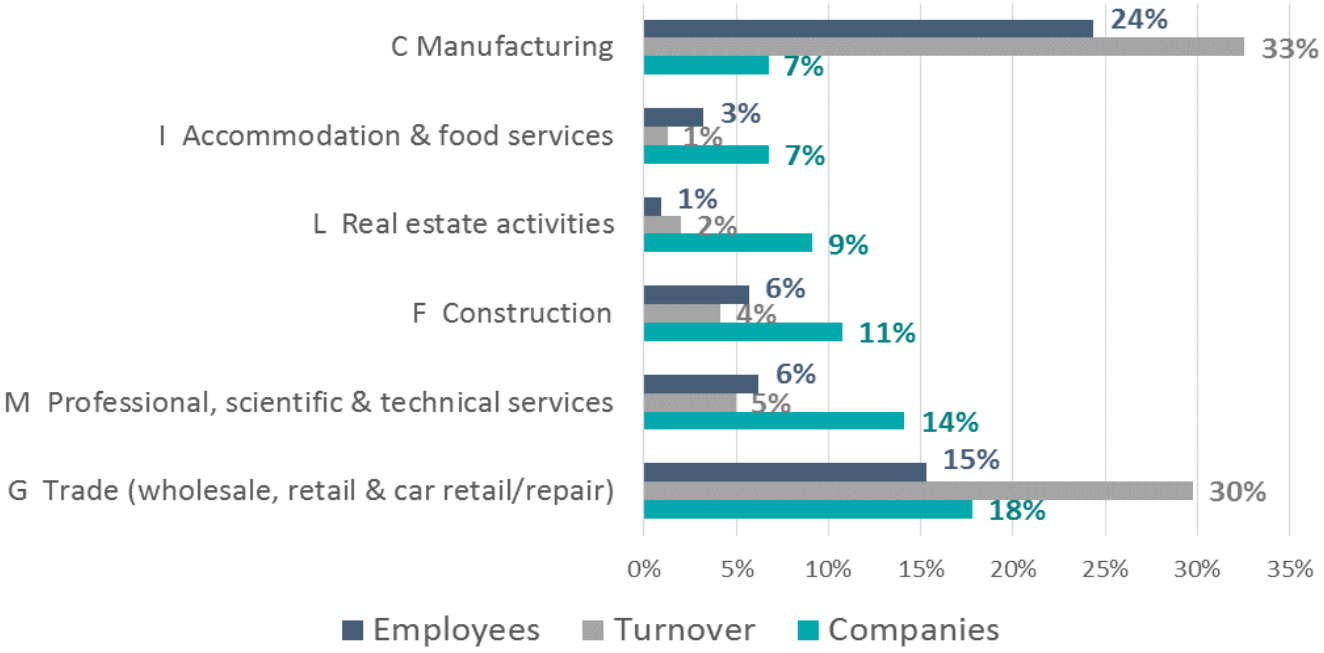


Source: Federal Statistical Office Germany, Business register 2017, own diagram

2. Results of analysis

Turnover share exceeds company share in manufacturing and trade

Shares of companies, turnover and employees
in six sections with highest number of companies (2014)



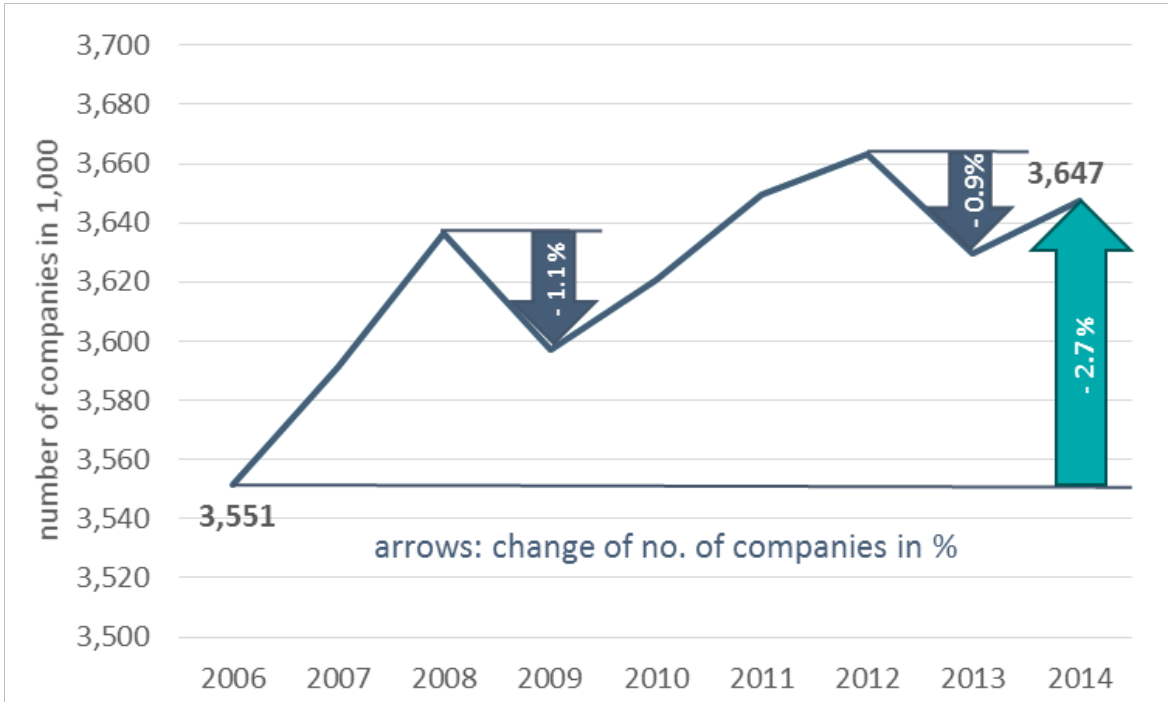
source: Federal Statistical Office Germany, Business register 2017, own diagram

- Far smaller turnover per company in other sections
- Most employees are also found in manufacturing and trade sections

2. Results of analysis

Rising total number of companies except in 2009 and 2013

Development of total number of companies in Germany in 2006–2014



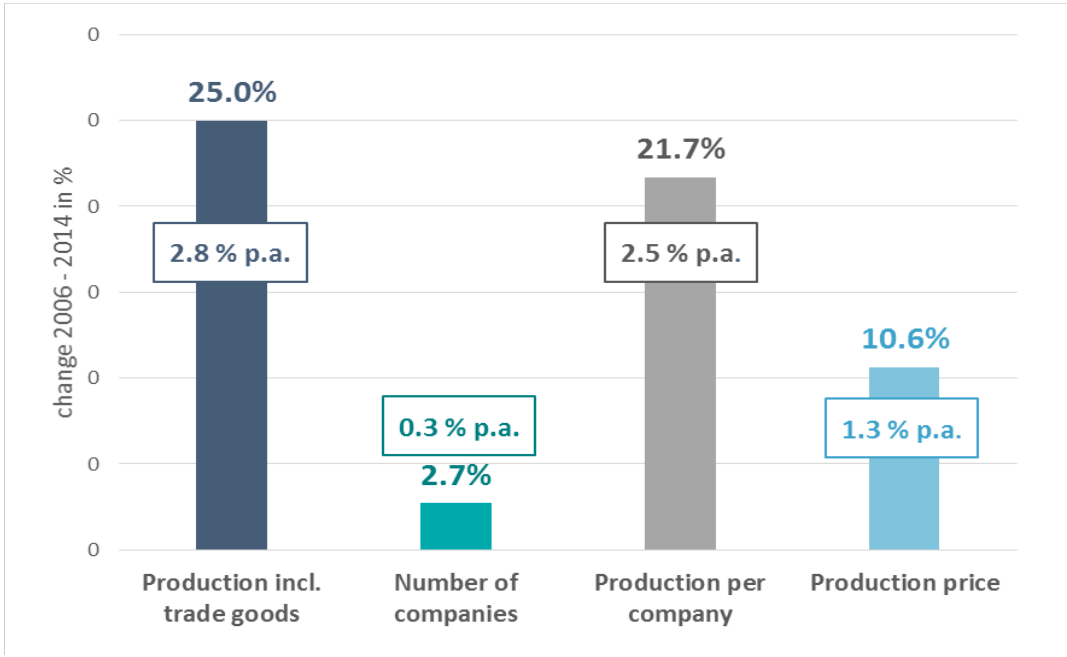
- Relatively small increase of companies with only 95.000 or 2.7% in eight years / 0.3% p.a. compared with turnover/GDP growth

Sources: Federal Statistical Office Germany, Business register and National accounts FS 18 R. 1.4, 2017 , own diagram

2. Results of analysis

Rise of companies is far smaller than production increase

Development of production, companies and prices (2006–2014 in %)



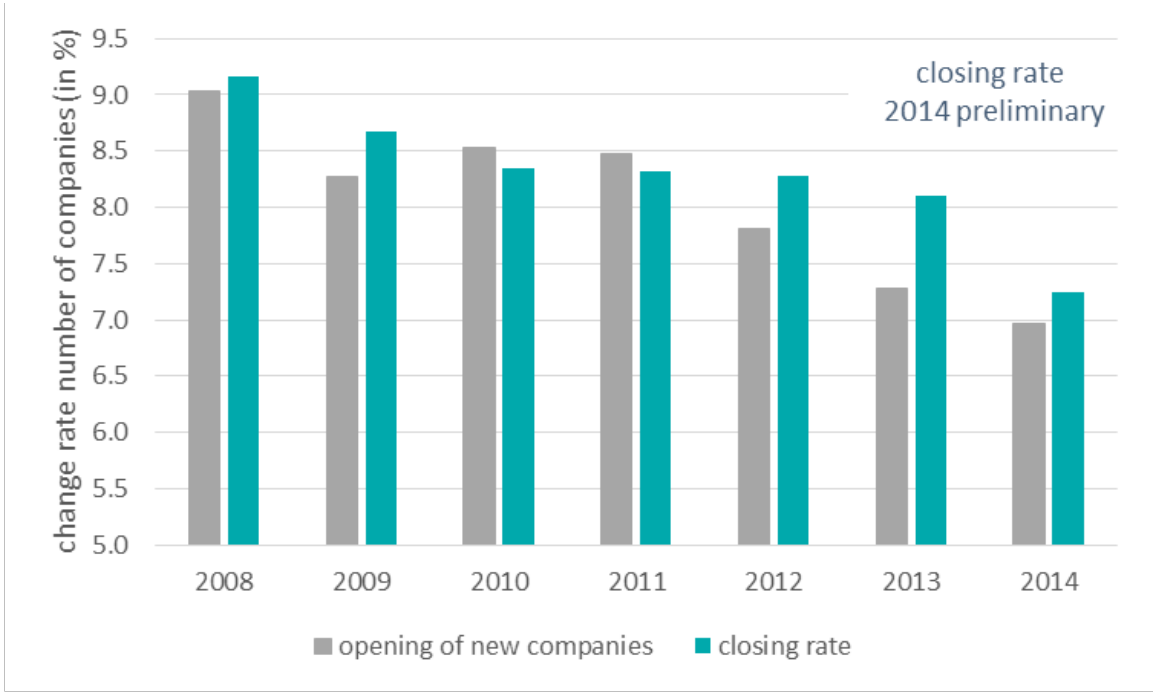
Source: Federal Statistical Office, Business register and National accounts, 2017, own diagram

- Rise in total production and production per company in eight years is over 20%
- Still 13% production growth with adjustment/deduction of price increase
- Number of companies merely increased by 2.7% during the same period
  - ⇨ Indicates overall concentration process/structural change

2. Results of analysis

Company closing rate exceeds opening rate (exception: 2010/2011)

Opening and closing of companies in Germany 2008–2014
(in % vs. previous year)



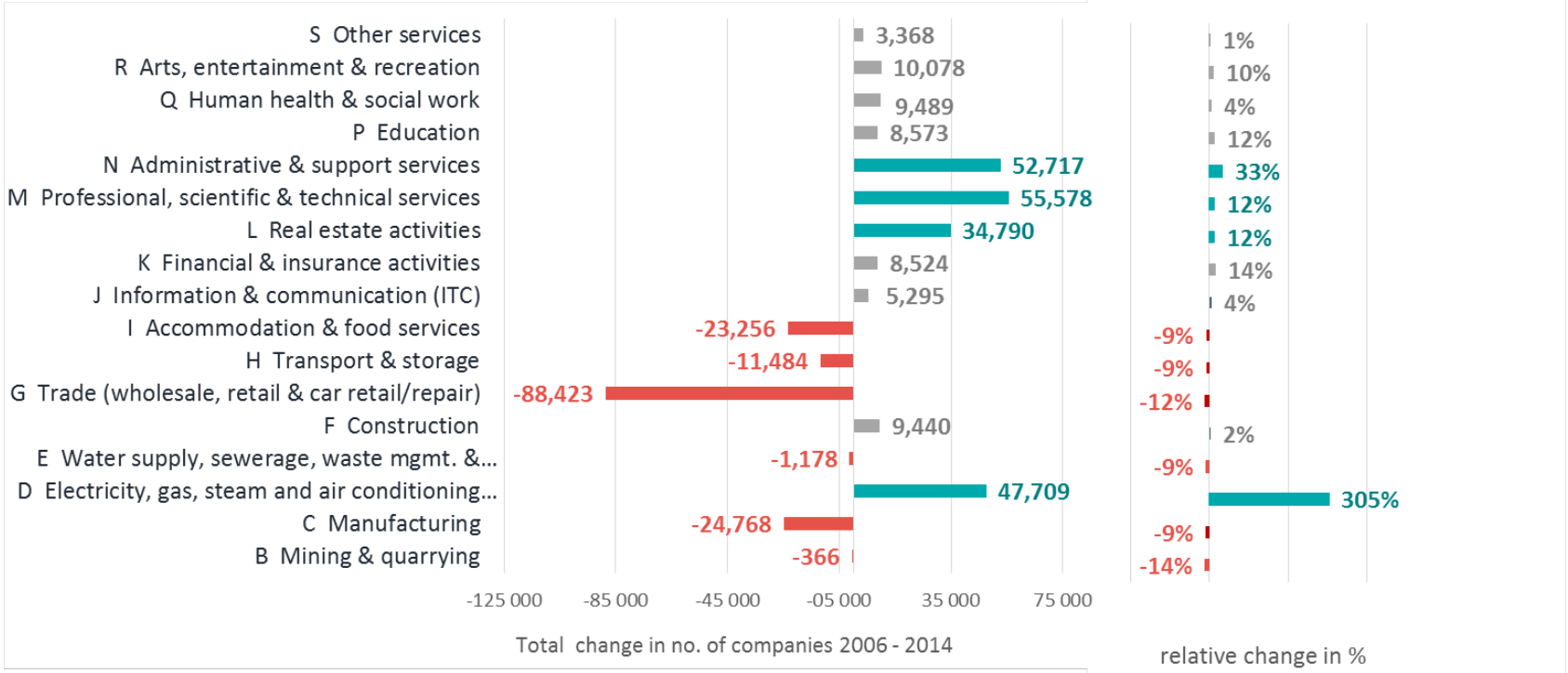
Source: Federal Statistical Office Germany, Business register 2017, own diagram

⇨ Total number of companies is also influenced by other developments (e.g. mergers, acquisitions, founding of new companies within groups…)

2. Results of analysis

Diverging development of number of companies in economic sections

Change of number of companies in NACE/WZ sections (2006–2014)



Source: Federal Statistical Office Germany 2017, own diagram

- Highest reduction in trade, accomodation & food services and manufacturing
- Strong rise in service sections (professional, scientific & technical services, administrative & support services) and real estate activities
- Special effect in energy section due to EEG (German renewable energy act) feed-in-tariff

3. Modelling approach

Basic equation for calculation of number of companies:

$$U_t = U_{t-1} + G_t - S_t + X_t \Leftrightarrow X_t = (U_t - U_{t-1}) - (G_t - S_t)$$

where U = company, G = opening of co., S= clo, X = other processes)*

forecast of number of companies 2015–2020:

$$G_t = \bar{g} * U_t \quad \text{and} \quad S_t = \bar{s} * U_t$$

where $\bar{g}$ / $\bar{s}$ = average number of openings/closings 2008–2014 relative to figure at start

$$\bar{g} = \frac{1}{6}\sum_{i=0}^{5}\left(\frac{G_{t-i}}{U_{t-i}} * 100\right) \qquad \bar{s} = \frac{1}{6}\sum_{i=0}^{5}\left(\frac{S_{t-i}}{U_{t-i}} * 100\right), \; t = 2014$$

Definition of other processes of companies (X) for forecast*):

$$X_t = x_t * U_{t-1}$$

Resulting formula for forecast of number of companies 2015–2020:

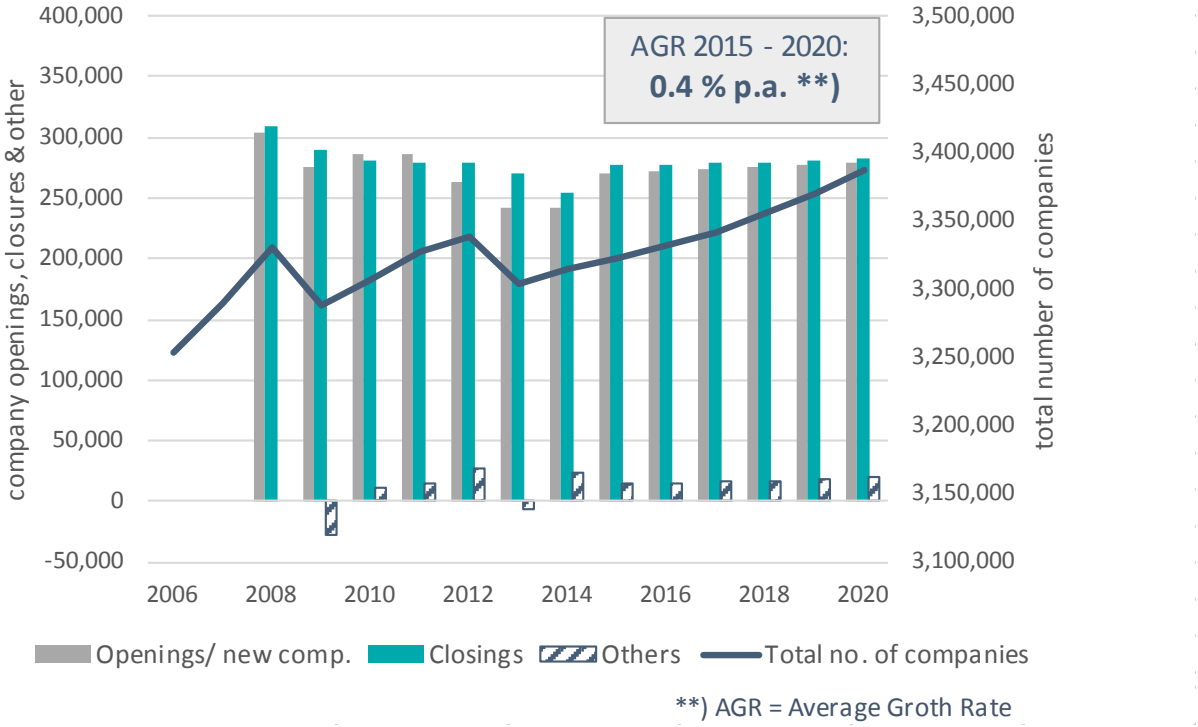
$$U_t = (1 + x_t) * \frac{U_{t-1}}{(1 - \bar{g} + \bar{s})} \Leftrightarrow \frac{U_t}{U_{t-1}} = \frac{(1 + x_t)}{(1 - \bar{g} + \bar{s})}$$

*) examples for other processes: mergers, acquisitions, opening of new companies within groups

4. Results of forecast

Small increase of companies despite higher closing than opening rates

forecast results for all 16 NACE / WZ sections considered*):



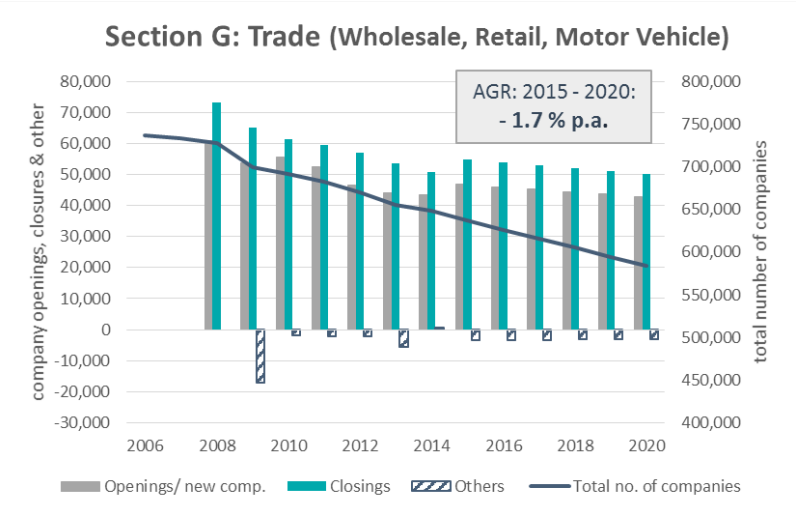
⇨ Other processes lead to total rise of companies of 0.4% p.a.

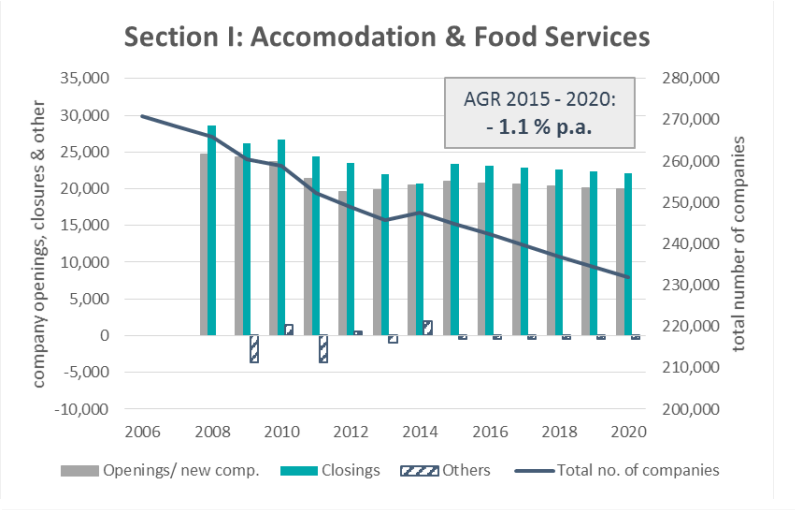
*) Real estate section had to be ommited since base value for openings & closings of companies has been changed by Federal Statistical Office as of 2014 (private lessors etc. now excluded, i.e. reduction of number of companies by almost 50%)

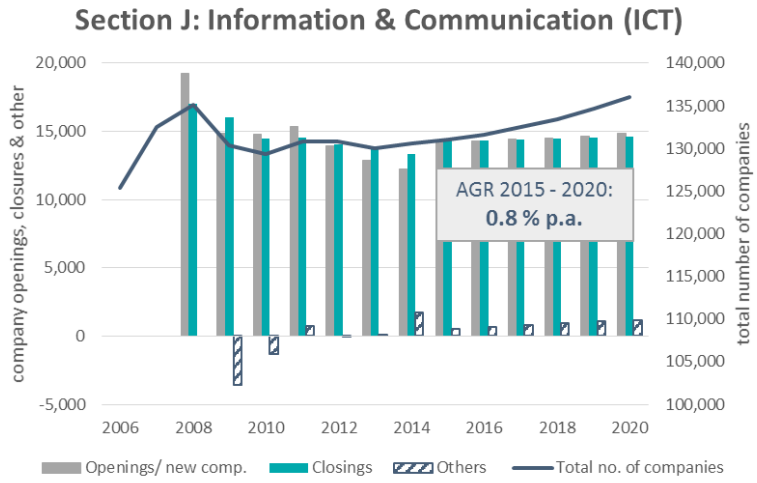
Source: Federal Statistical Office, Business register, Germany 2017, own diagram

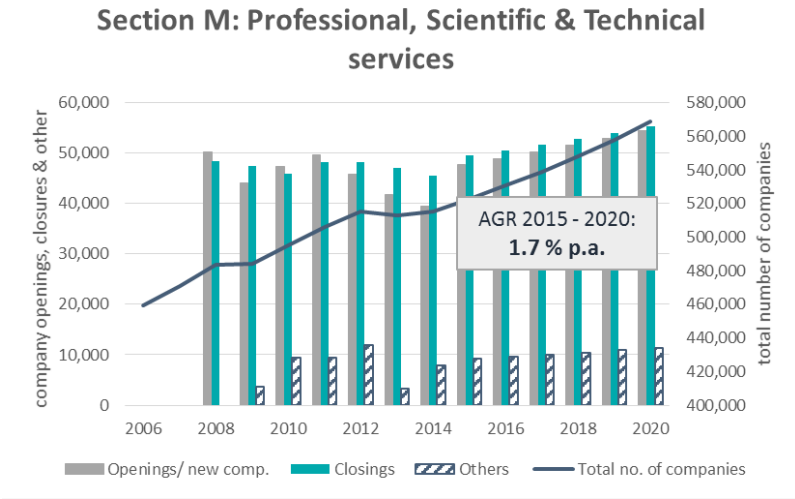
4. Results of forecast

Forecast results in sections with high change rates





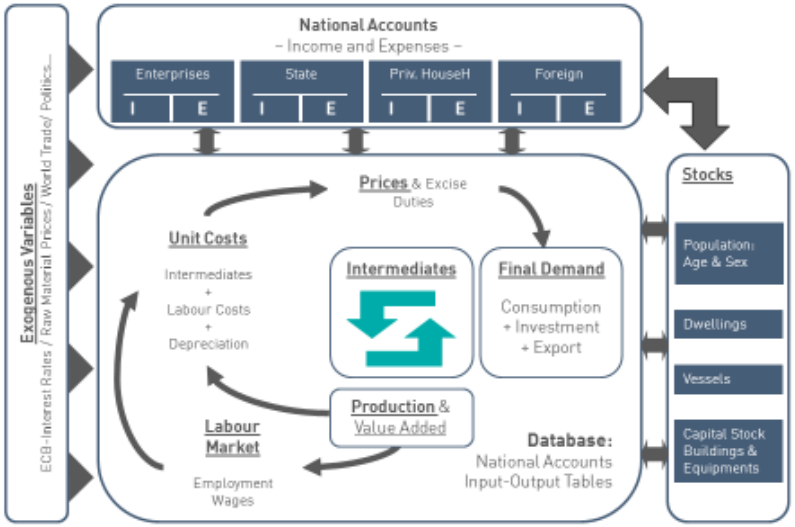




Source: Federal Statistical Office, Business register, Germany 2017, own diagram

5. UDEMO linked with INFORGE

Linking of module UDEMO with INFORGE for forecasts of company demographics and comparison with production & labour force development



UDEMO

UDEMO forecast

5. UDEMO linked with INFORGE

Results of forecast of company and labour productivity

	development 2014–2020 versus 2008–2014		
	production per company	labour force per company	production per worker
B Mining & quarrying	↑	↑	↑
C Manufacturing	↑	→	↑
D Electricity, gas, steam and air conditioning supp	↑	↑	↓
E Water supply, sewerage, waste mgmt. & rem.	↑	→	↑
F Construction	→	→	↑
G Trade (wholesale, retail & car retail/repair)	↑	→	↑
H Transport & storage	↑	→	↑
I Accommodation & food services	↑	→	↑
J Information & communication (ITC)	↑	→	↑
K Financial & insurance activities	↑	→	↑
M Professional, scientific & technical services	↑	→	↑
N Administrative & support services	↓	→	↓
P Education	↓	↓	↑
Q Human health & social work	↑	→	↑
R Arts, entertainment & recreation	↓	→	↓
S Other services	↑	↑	↑
arrows indicate development:	green > + 3%	yellow 0% to < 3%	red < 0%

*) special effect through EEG law (see above)

Source: Federal Statistical Office, Business register, Germany 2017, INFORGE, own diagram

6. Outlook / Next Steps

Longer historic period and further/more detailed analysis & research required before UDEMO module is ready

- Longer historic time span than 6 - 8 years needed for more reliable forecasts
- Deepen analysis and observation of market changes
- Refining of UDEMO modelling approach
- Eventually integration of UDEMO as module in INFORGE

Thank you for your interest & attention!

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