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Business Cycle Dynamics and Firm Heterogeneity *Evidence for Austria*

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- Business cycle analysis usually focuses on the **macro level**.
 - Microdata at the firm level can contribute to a better understanding of the behaviour of aggregates (Higson et al., 2002; Basile et al., 2014) or even help to produce better forecasts (Strasser and Wohlrabe 2016)
 - > **role of firm heterogeneity**
 - Shocks specific to **industries/regions** may also influence aggregate outcomes and impact the business cycle (Granularity hypothesis of Gabaix 2011)
 - > **role of industry/regional heterogeneity**

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- BTS data is usually studied with regard to the aggregate **consistency** of the business tendency survey responses over time (business cycle dimension)
 - Our research objectives
 - We are interested in **micro-consistency** i.e. whether lagged variables contain useful information at the firm level
 - Take (observable) heterogeneity into account in modelling business cycle dynamics; i.e. adding firm-level, industry-/regional-specifics -> **is there a role for structural/regional dimensions?**
 - **NEW!** Is there a relationship between the size of the “explained” component and uncertainty or the state of the business cycle?

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- **Business tendency survey (WIFO Konjunkturtest) data -> firm-level**
 - Manufacturing industry, 2772 firms
 - Time period 1996 to 2012
 - Around 55.000 quarterly observations

 - **Employment data (Austrian social security database) -> industry-
/regional-level**
 - (break of time series prevents use of industrial statistics)
 - Sectoral (NACE-3-digit) break-down
 - Regional (NUTS-3-level) break-down
 - Monthly observations

■ Firm-level (business cycle dimension)

Question	Economic Process ¹⁾	Timing ²⁾	exp. Effect / Correl. ³⁾
Production (change), next 3 months	Expectations	lead	+
Selling prices (change), next 3 months	Expectations	lead	+
Firm's employment (change), next months	Expectations	lead	+
Firm's business sentiment (level), next 6 months	Sentiment	lead	+
Total order books (level), current	Demand	lead	+
Factors limiting productions ⁴⁾	Demand/Supply/Finance	lead/co	-
Stocks of finished products (level), current	Demand/Production	co	-
Selling prices (change), past 3 months	Demand/Production	co	+
Capacity utilisation (level)	Production	co	+

Notes: 1) Classification according to Oppenländer (1996, p. 27). 2) The timing notation indicates the expected temporal pattern with respect to the current production activity of a firm: lead=leading; co=contemporaneously. 3) The "+" and "-" sign indicates the expected change of current production output based on an increase of the respective survey indicator. Its also an indication of the pro-/countercyclicality of the indicator. 4) We test for two (out of six) categories: insufficient demand and financial constraints.

■ Structural dimension

■ Firm-level

- Firm size and industry affiliation

■ Industry-specific indicators (time averages)

- Excess labour turnover as proxy for mobility barriers/sunk costs
- Avg. Employment growth and No. of employees

■ Regional-specific indicators

- Sector concentration (related variety; Frenken et al., 2012)
- Employment concentration (Herfindahl type index)
- Local externalities (aggregate output in region x employment density; Basile et al., 2014)

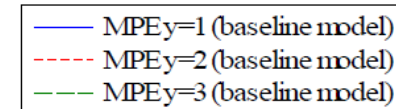
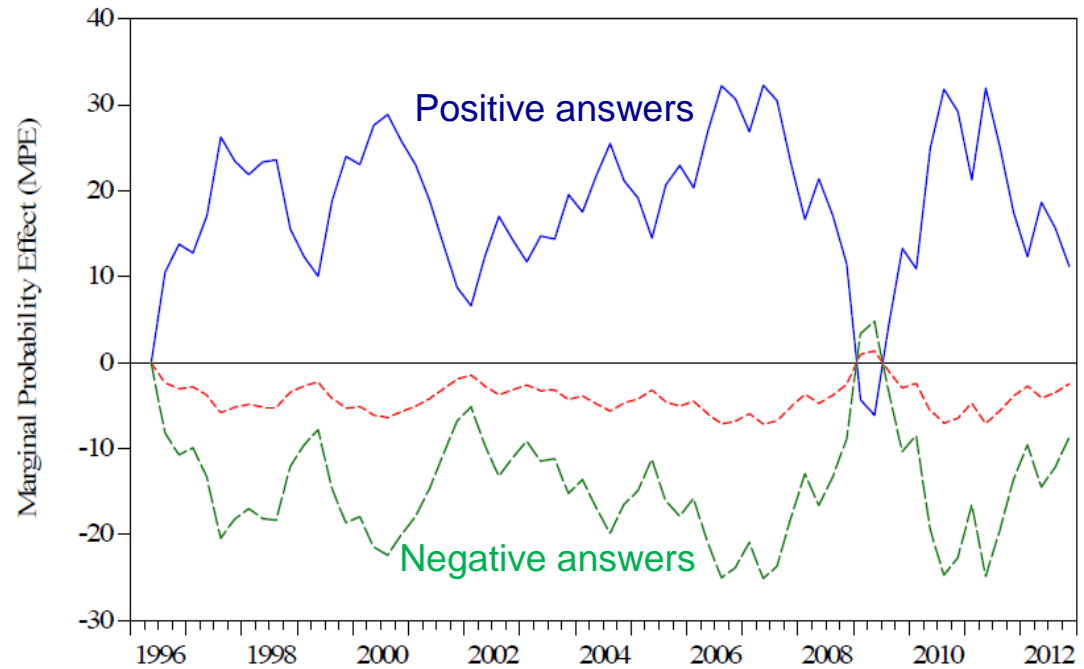
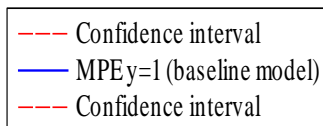
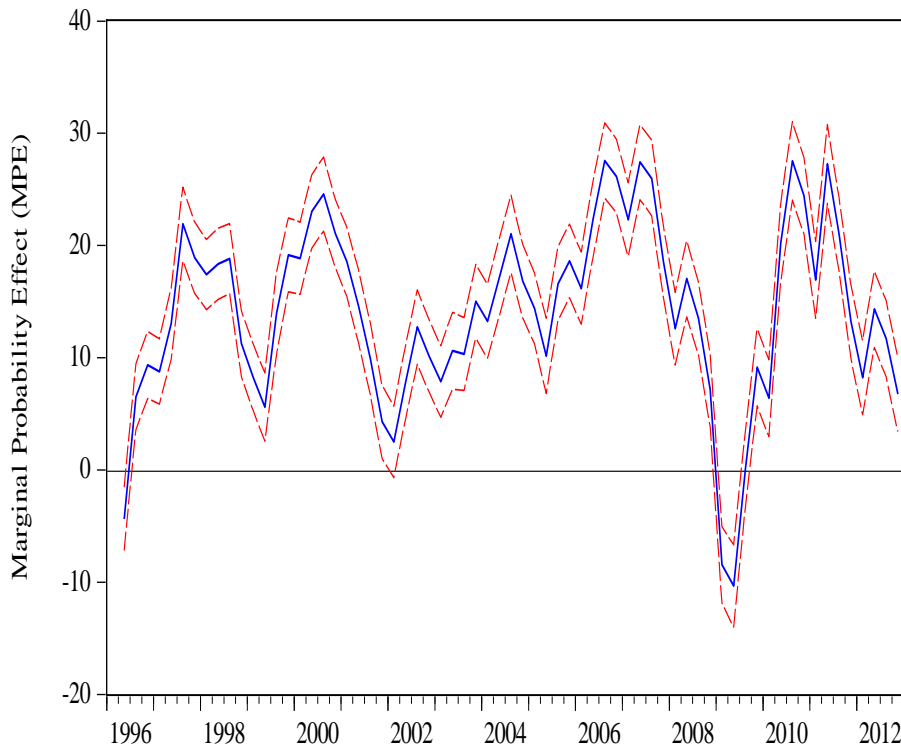
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- **Proxy for the ‘aggregated’ business cycle**
 - **Question on** “*Our production has been ... in the last 3 months? (a) increased, (b) remained the same, or (c) decreased*”

 - **ordered probit model**
 - **Correlated random effects (Wooldridge, 2002)**
 - **Maximum likelihood estimation**
 - **Assuming same thresholds across individuals (strong assumption)**
 - **Interested in marginal effects**

■ **Step 1: Proxy for the ‘aggregated’ business cycle**

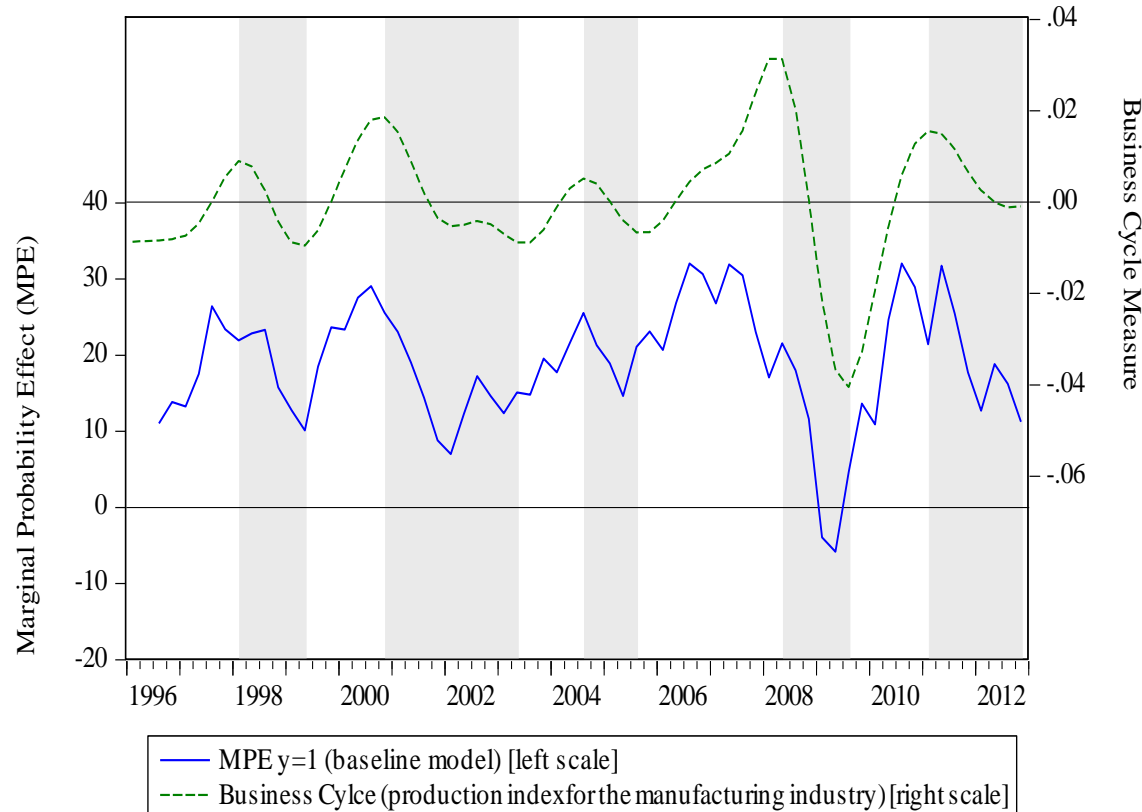
■ **Model** $y_{it}^* = \eta_t + c_i + u_{it},$ with $i = 1, \dots, N; t = 1, \dots, T$

Figure B1: Marginal probability effects of time-dummies ($y_{it} \in \{1,2,3\}$)



- Correlation of the marginal effects (positive answers) with the business cycle component of IP: 0.72

- Model $y_{it}^* = \eta_t + c_i + u_{it}$, with $i = 1, \dots, N$; $t = 1, \dots, T$



Short-run response

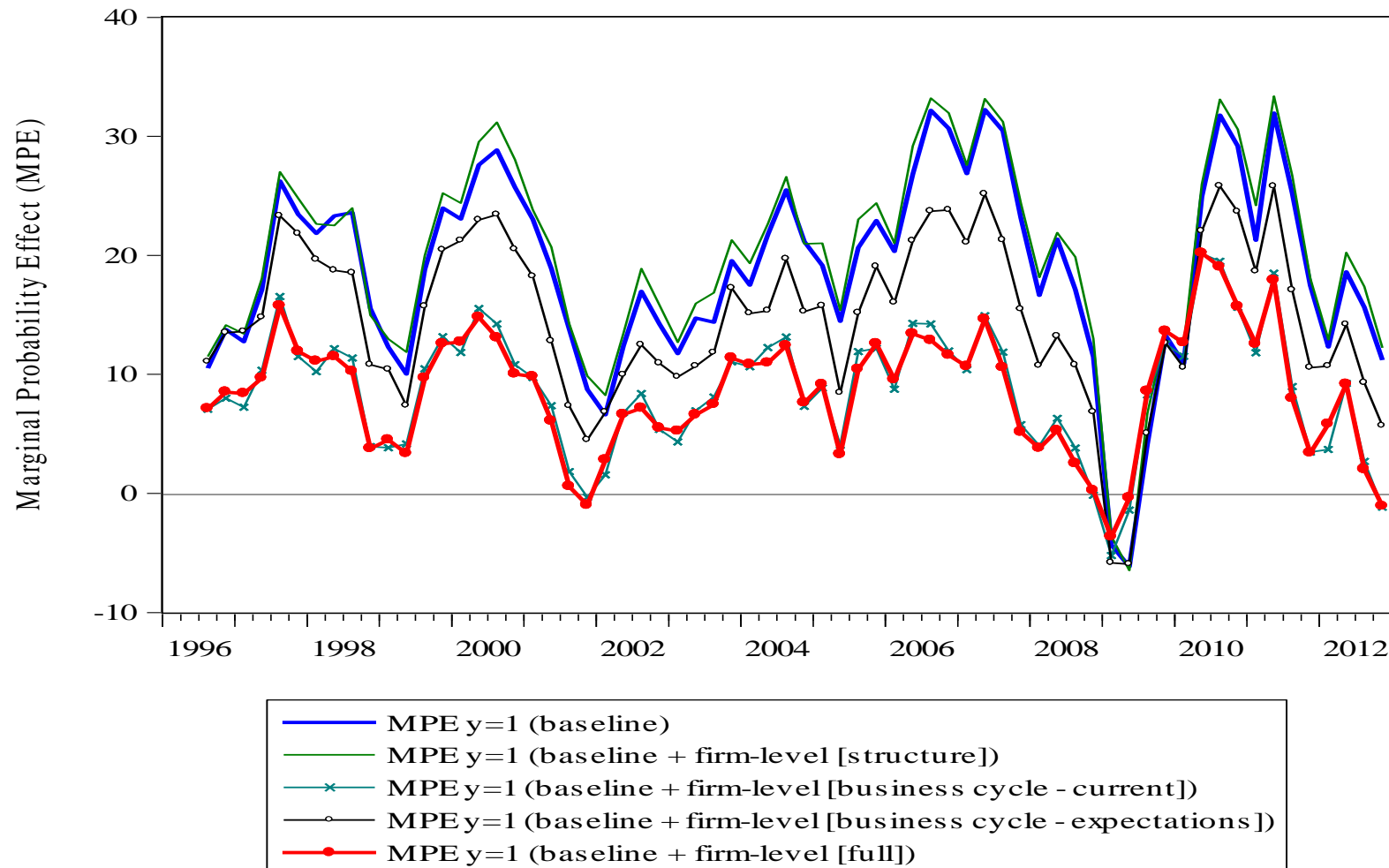
shock level

Firm-specific averages – long run level effect

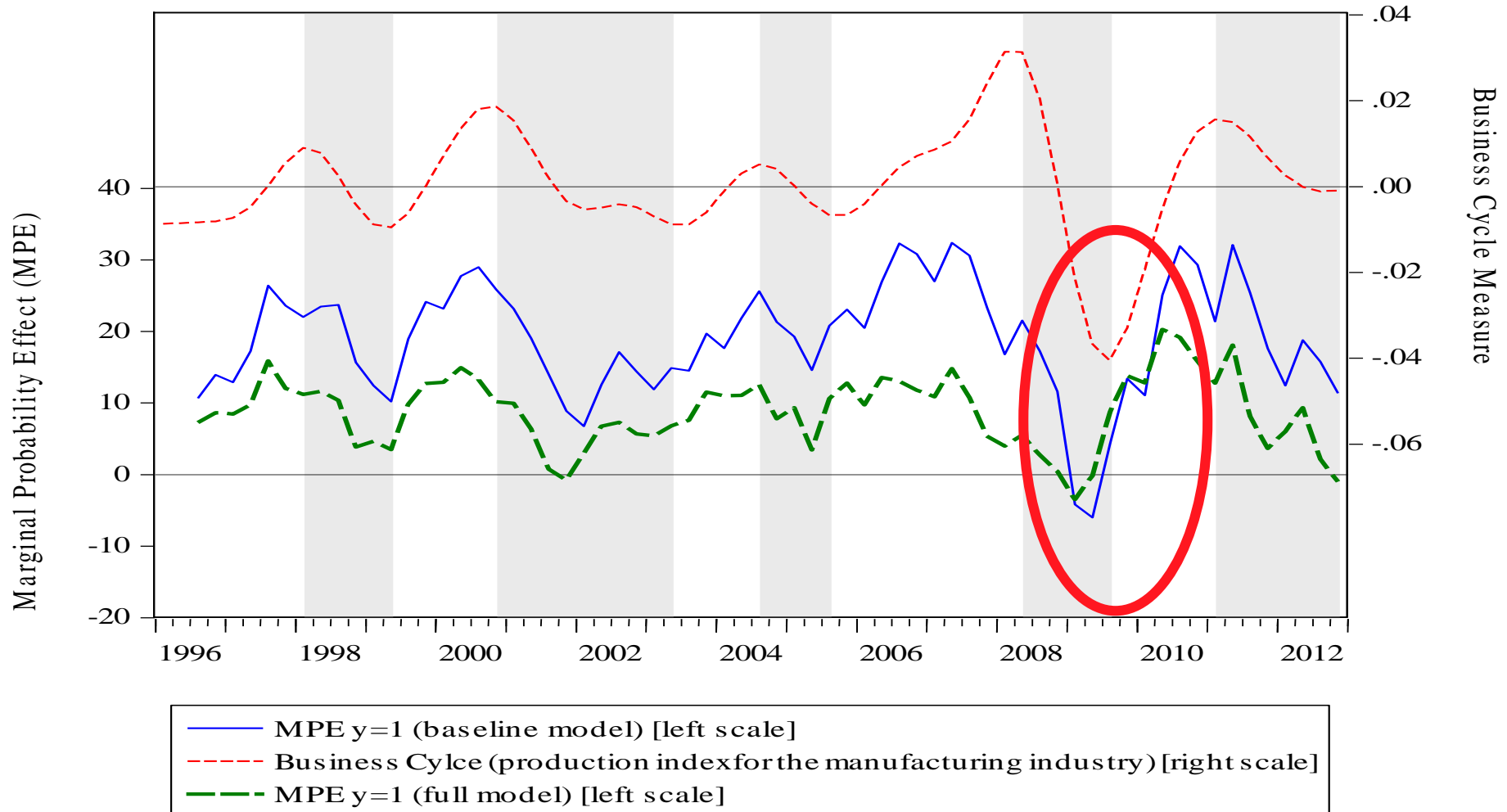
Findings (mpe of $y=1$)

	shock	level		
current	■ Order books _{t-1}	+0.12	+0.49	firm-level
	■ Insufficient demand	-0.15	n.sig.	
	■ Stock of finished products	-0.10	+0.13	
	■ Selling prices	+0.10	n.sig.	
	■ Capacity utilisation	+0.01	-0.01	
expectations	■ Production _{t-1}	+0.22	+0.05	
	■ Selling prices _{t-1}	-0.03	n.sig.	
	■ Employment _{t-1}	+0.06	n.sig.	
	■ Business sentiment _{t-1}	+0.05	n.sig.	
structure	■ Firm size	-0.05	+0.05	
	■ Industry	[n.]sig.	[n.]sig.	
	■ Regional	n.sig.	n.sig.	

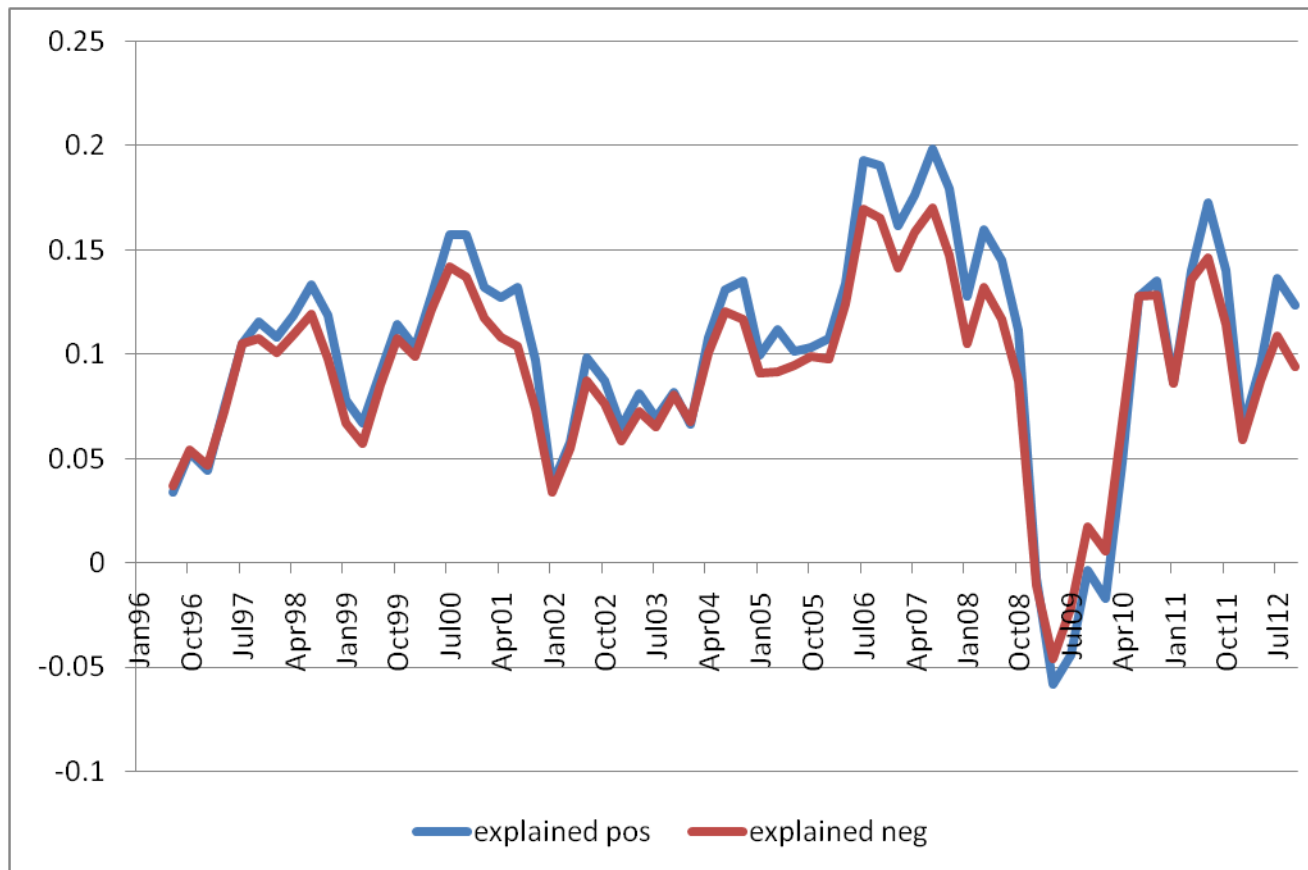
■ Explanatory power of the firm-level covariates



■ Full model specification vs. (manufacturing) business cycle



- Difference between fixed effects of the baseline and the full model



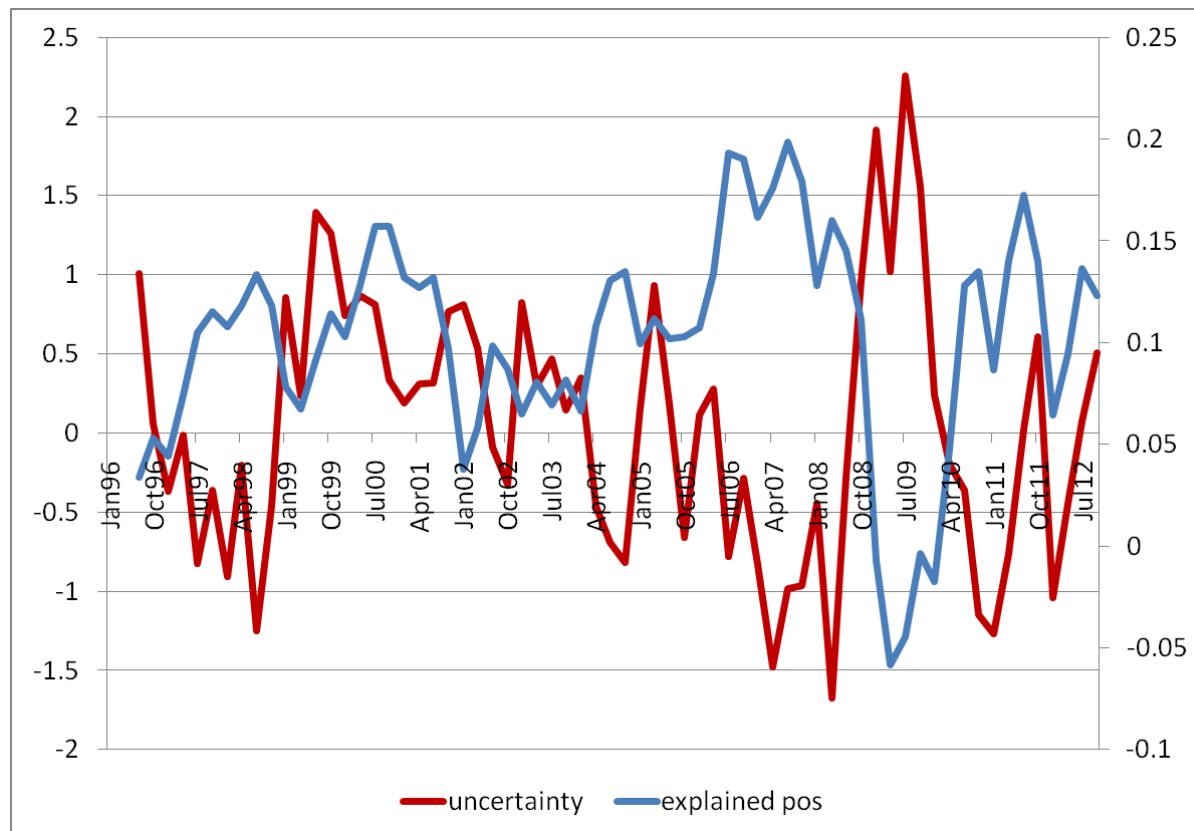
WIFO ■ Role of uncertainty and business cycle

- We measure uncertainty I using production expectations (Bachmann)

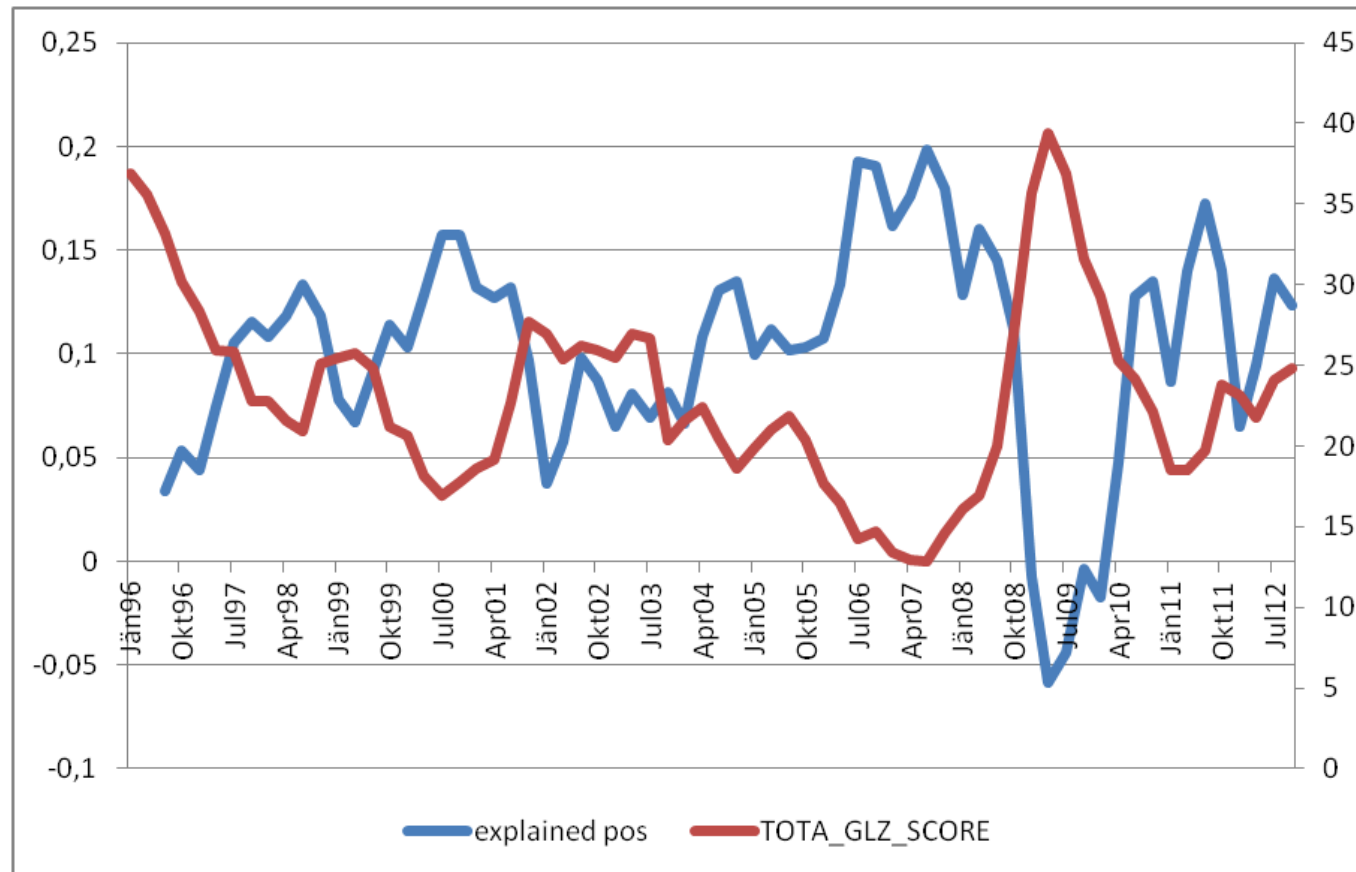
$$\sqrt{\%age POS_t + \%age NEG_t - (\%age POS_t - \%age NEG_t)^2}$$

- Cross-sectional Standard deviation – uncertainty as disagreement
- Uncertainty II – score from WIFO question: on „how certain/uncertain“ respondents assess their own expectations
- Business cycle: business cycle component of industrial production

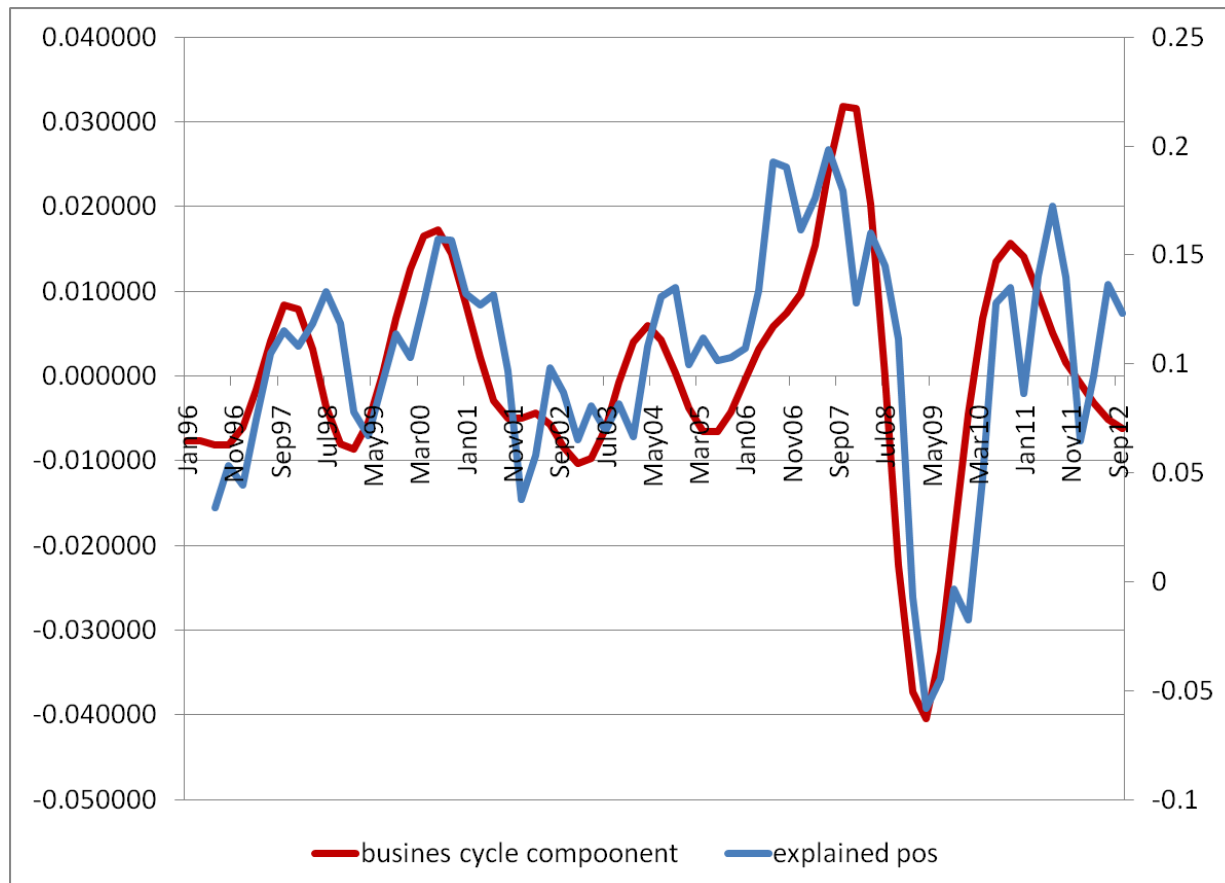
- Correlation: -0.53
- Higher uncertainty – covariates explains less
- Unexpected changes in sentiment?



- Correlation: -0.87
- Higher uncertainty – covariates explains less



- Correlation: +0.83
- Downturns – covariates explains less.
- Good weather model? Are downturns unexpected/uncertain?



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- We find consistency of current assessments and expectations over time within the BTS:
 - The behaviour of the marginal effects follows closely the business cycle component of industrial production in Austria.
 - **Current covariates** are informative. From the covariates related to the assessment of the current situation, order books (t-1), demand conditions and capacity utilisation show the highest explanatory power.
 - **Expectations** are informative. From the covariates related to expectations (the coming months) production expectations (t-1) exhibits the greatest effect.
 - With respect to structural characteristics
 - we find a (weak) negative ('left over') effect for firm-size,
 - no effect for industry affiliation but some evidence for industry-characteristics (e.g. excess labour turnover);
 - regional aspects do not play a role in Austria

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- **Is there a relationship between the size of the “explained” component and uncertainty or the state of the business cycle?**
 - **Yes, the covariates have more explanatory power during upturns than during downturns and when uncertainty is low.**
 - **Further research: disentangling uncertainty and the state of the business cycle.**

Thank you for your attention.

Contact details

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