

What Drives Aggregate Investment? Evidence from German Survey Data

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ESCoE Conference on Economic Measurement 2018

Introduction

- What drives aggregate fluctuations?
- We propose a survey-based, narrative approach to identification
- Uses unique survey data about determinants of firms' investment decisions

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Q2. Investment Determinants [*This Year*]

Our investment activity in the Old Laender in [*This Year*] was positively/negatively affected by:

Investment Determinant	<i>[This Year]</i>				
	strongly positive influence	weakly positive influence	no influence	weakly negative influence	strongly negative influence
Sales Situation and Expectation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Finance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Return Expectation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Technological Factors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Macro Policy Environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Introduction

Four steps:

1. Construct narrative series of the importance of each investment determinant
2. Validation against broader proxies of aggregate demand, technology, etc.
3. Exploit information in narratives and pricing implications for identification
 - $\text{Corr}(\text{shock, associated narrative}) \gg 0$
 - $\text{Corr}(\text{AD shock, prices}) > 0$ and $\text{Corr}(\text{technology shock, prices}) < 0$
4. Estimate contributions of shocks to aggregate investment and output growth

Introduction

- Advantage of survey-based, narrative approach is putative directness
- Respondents directly report effects of aggregate demand, technology, etc.
- Identification of shocks from narratives less prone to other confounds

Introduction

- Explain 81 percent of total variance of aggregate investment growth
- Technology most important on average, but not for *fluctuations*
- Aggregate demand shocks explain 2/3 of aggregate investment growth
- Technology shocks account for less than 10 percent
- Similar results for industrial production growth

Introduction

- What are aggregate demand shocks?
- Results not driven by spill-over effects between industries
 - technology shocks downstream not perceived as demand shocks upstream
- Evidence for interpretation as sentiment or animal spirit shocks
- Except for one episode, no relation to demand stabilization policy

Literature and Contribution

- Survey-based, narrative approach complements...
 - SVARs (Blanchard and Perotti ('03), ...)
 - dynamic factor models (Stock and Watson ('12), ...)
 - estimated DSGE models (Smets and Wouters ('07), ...)
 - business cycle accounting (Chari et. al ('07), ...)
 - narrative approach (Romer and Romer ('04,'10), ...)
- Asking managers about the motivation for their actions \rightsquigarrow Bewley ('99)
- Growing literature exploiting subjective survey data to study...
 - expectation formation and rationality (Nerlove ('83), Gennaioli et. al ('15), ...)
 - effects of uncertainty (Guiso and Parigi ('99), Bachmann et. al ('13), ...)
 - households (Souleles ('04), Malmendier and Nagel ('16), ...)

Narrative Series: Construction and Validation

ifo Investment Survey

- Semi-annual survey in the West German manufacturing sector since 1955
- Quantitative firm-specific capital expenditure data
- Qualitative investment determinants at annual frequency since 1989
- Sample period: 1989-2013
- 40,905 firm-year observations

Survey Questionnaire

Q1. Gross Fixed Capital Formation in Fiscal Year *[Last Year]*

[Last Year] _____
(in 1000 Euro)

Q2. Investment Determinants *[This Year]*

Our investment activity in the Old Laender in *[This Year]* was positively/negatively affected by:

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<i>[Codification]</i>	<i>[+2]</i>	<i>[+1]</i>	<i>[0]</i>	<i>[-1]</i>	<i>[-2]</i>

Construction of Narrative Series

- Main idea: survey responses contain information about aggregate shocks
- Compute weighted cross-sectional averages for each investment determinant
 - Weights are firm's share in total investment
- Large cross-section ($\sim 1,600$ firms per year) \rightsquigarrow idiosyncratic factors wash out
- Capture aggregate importance of a particular reason to invest
- Henceforth called aggregate investment determinant indices

Aggregate Investment Determinant Indices



Summary Statistics

	Sales	Tech	Finance	Return	Macro	Other	ΔI_t^{FSO}
<i>Panel A:</i>							
Sales	1						
Tech	0.6640***	1					
Finance	0.6059***	0.3183*	1				
Return	0.9539***	0.5802***	0.6165***	1			
Macro	0.6381***	0.3733**	0.4481***	0.6987***	1		
Other	0.2228	0.3416*	-0.0796	0.1426	0.2538	1	
<i>Panel B:</i>							
ΔI_t^{FSO}	0.8645***	0.5539***	0.6191***	0.8895***	0.6148***	0.0346	1
<i>Panel C:</i>							
$\hat{\mu}$	0.6005	0.9193	-0.0245	0.4806	-0.1046	0.3347	0.0123
$\hat{\sigma}$	0.5155	0.1642	0.2243	0.4192	0.2630	0.4021	0.0943

Validation

Validate narratives against broader proxies:

- Sales highly correlated with new manufacturing orders
- Tech correlated with firm-level restructuring and rationalization investment
- Tech correlated with process innovations at the firm level
- Finance related to external finance dependence at the firm level
- Finance correlated with credit spreads and business uncertainty over time

Validation

	LHS Variable is...							
	Frequency of Price Increases				Frequency of Price Decreases			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sales	0.015*** (0.0015)	0.0069*** (0.0015)	0.0073*** (0.0015)	0.0091*** (0.0014)	-0.023*** (0.0020)	-0.016*** (0.0021)	-0.015*** (0.0019)	-0.014*** (0.0016)
Tech	-0.0086*** (0.0030)	-0.0076*** (0.0029)	-0.0088*** (0.0028)	-0.0085*** (0.0025)	0.0054** (0.0027)	0.0069** (0.0027)	0.0036 (0.0026)	0.00041 (0.0023)
Constant	0.096*** (0.0039)	0.14*** (0.0081)	0.13*** (0.021)	0.14*** (0.0074)	0.076*** (0.0042)	0.025*** (0.0042)	0.032 (0.030)	0.025*** (0.0051)
Observations	11539	11539	11520	11539	11539	11539	11520	11539
R^2	0.013	0.061	0.079	0.072	0.028	0.051	0.082	0.073
Year Effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Firm Fixed Effects	No	No	No	Yes	No	No	No	Yes
Industry Effects	No	No	Yes	No	No	No	Yes	No

Identification

Identification

- Focus on effects of aggregate demand and aggregate technology
- Two key ideas:
 1. \widehat{Sales} and \widehat{Tech} main respective drivers of $Sales$ and $Tech$
 - $Corr(\widehat{Sales}, Sales) > 0.5$ and $Corr(\widehat{Tech}, Tech) > 0.5$
 2. \widehat{Sales} and \widehat{Tech} differ in implications for prices
 - $Corr(\widehat{Sales}, PPI) > 0.005$ and $Corr(\widehat{Tech}, PPI) < 0.005$
- In principle, multiple shocks admissible \rightsquigarrow set identification
- Residual variation in other narratives recursively identified

Baseline Specification

- For each admissible shock, run

$$\Delta I_t^{FSO} = \mathbf{c} + \beta_1 \widehat{\text{Sales}}_t + \beta_2 \widehat{\text{Tech}}_t + \beta_3 \widehat{\text{Finance}}_t \\ + \beta_4 \widehat{\text{Return}}_t + \beta_5 \widehat{\text{Macro}}_t + \beta_6 \widehat{\text{Other}}_t + \mathbf{e}_t$$

- Compute contributions to $\text{Var}(\Delta I_t^{FSO})$ using

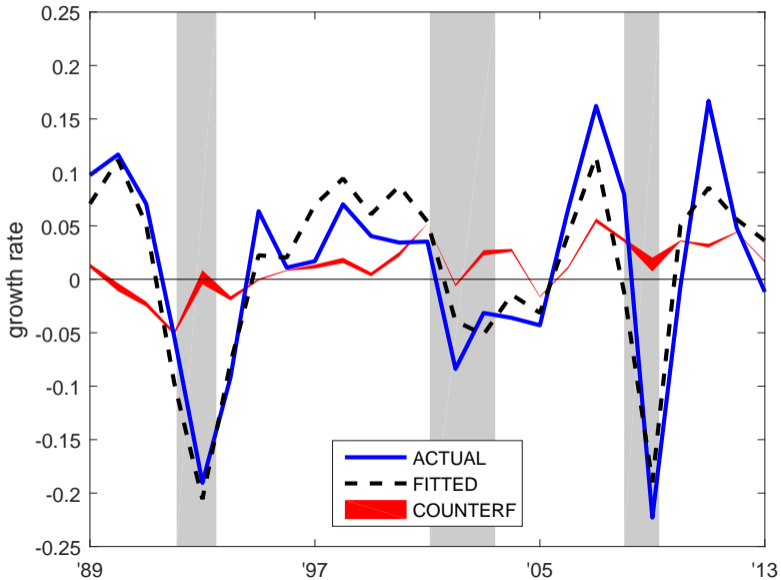
$$\text{Var}(\Delta I_t^{FSO}) = \beta_1^2 + \beta_2^2 + \beta_3^2 + \beta_4^2 + \beta_5^2 + \beta_6^2 + \text{Var}(\mathbf{e}_t)$$

Results

Main Result

	Correlation Restrictions	Recursive: Sales first	Recursive: Tech first
<i>Panel A:</i>			
$\widehat{\text{Sales}}$	[65.92, 74.81]	74.74	44.13
$\widehat{\text{Tech}}$	[0.00, 8.89]	0.07	30.68
$\widehat{\text{Finance}}$	1.37	1.37	1.37
$\widehat{\text{Return}}$	4.08	4.08	4.08
$\widehat{\text{Macro}}$	0.00	0.00	0.00
$\widehat{\text{Other}}$	1.15	1.15	1.15
R^2	0.81	0.81	0.81
<i>Panel B:</i>			
$\text{Corr}(\widehat{\text{Sales}}, \widehat{\text{Sales}})$	[0.95, 1.00]	1.00	0.75
$\text{Corr}(\widehat{\text{Tech}}, \widehat{\text{Tech}})$	[0.50, 0.81]	0.75	1.00
$\text{Corr}(\widehat{\text{Sales}}, \widehat{\text{PPI}})$	[0.47, 0.52]	0.51	0.42
$\text{Corr}(\widehat{\text{Tech}}, \widehat{\text{PPI}})$	[-0.22, -0.01]	-0.06	0.30

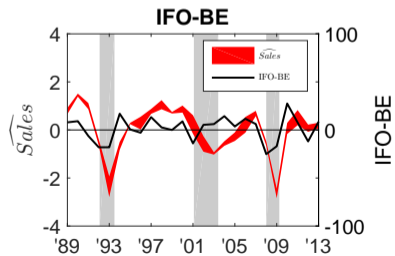
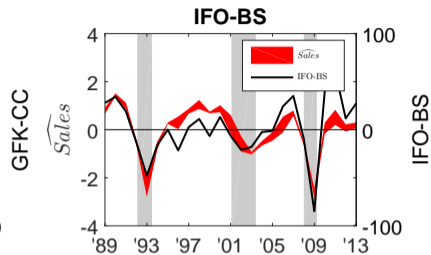
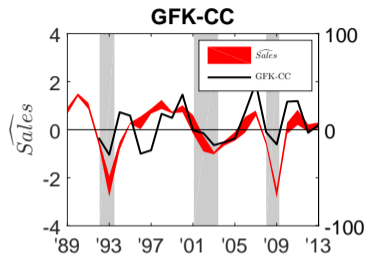
Counterfactual Simulation



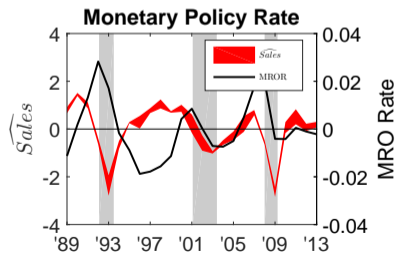
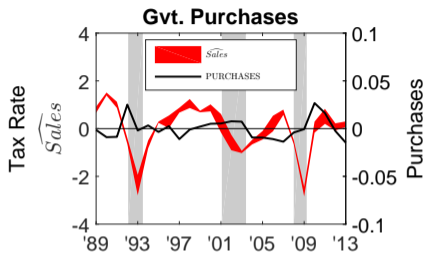
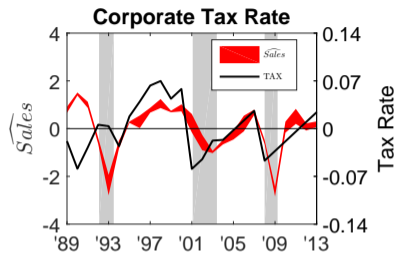
Additional Results and Robustness

- Looser or tighter correlations between identified shocks and narratives
- Deflated specification with real investment growth
- Parsimonious VAR with $Sales$, $Tech$, ΔI_t^{FSO} , and PPI_t
- Technology shocks downstream not perceived as demand shocks upstream
- No evidence for misclassification of technology shocks as demand shocks
- Semi-aggregate specifications at the 2-digit industry level and the state level
- Similar results for industrial production

Nature of Aggregate Demand Shocks



Nature of Aggregate Demand Shocks



Conclusion

- “It’s Aggregate Demand, Stupid”
- Survey-based subjective reasons high in economic content
- Explain a significant portion of aggregate fluctuations
- Calls for more extensive use of and heightened effort to collect this data