The Investment Effect of Fiscal Consolidation

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Research question

Study and quantify the effect of tax changes on:

- *firms' planned investments (revision of future investment plans)*
- *firms' realized investments*

Motivation

- **Alesina, Favero and Giavazzi (AFG 2012)**. Macro analysis: tax-based fiscal adjustments lead to a more prolonged and deeper recessions compared to spending-based adjustments.
  Main drivers: private investment and business confidence and not monetary policies, nor consumption or labor accompanying policies.

- **Current economic situation**: fiscal consolidation is one of the main challenges for most of OECD. Crucial to *understand the impact on investment for growth purposes*.

Literature

Difficult to pin down the link between fiscal consolidation, business confidence, and investments due to:

- scarcity of firm-level data that capture business confidence and investment
- endogeneity of tax policy.

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Realized investment: negative dynamic effect

- Macro-level: Alesina at al. (1999), Cloyne (2013), Mertens and Ravn (2009,2013), and Hayo and Uhl (2013), AFG (2012)
- Micro-level: Schwellnus and Arnold (2008), Johansson (2008)

Literature II

Exogeneity of shocks

- **VAR**: macro data. See Ramey (2011) - literature review
- **Case Studies** Giavazzi and Pagano (1990), Alesina and Ardagna (2010, 2012)
- **Narrative Approach**: Identification of *observable* exogenous shocks. Official documents: only fiscal adjustment motivated by deficit reducing purposes. Romer and Romer (2010), DeVries et al. (2011), Cloyne (2013), and Uhl (2013).

Our contribution

Firm level analysis combined with narrative approach:

- **Planned investment**: IFO firm-level dataset for Germany, look at revision of future planned investment as it reflects business confidence
- **Realized investment and heterogeneous effect**: micro data allows to identify channels - firm size and sector.
- **Type of shocks**: Reclassification of narrative by Uhl (2013). Heterogeneous effects depending on the type of tax - personal, corporate and consumption-related tax changes

IFO Investment Survey

- German manufacturing sector: including 34 sub-sectors
- Realized investment (1970-2010) and planned investment (1993-2010)
- Main questions:
  - How much do you plan to invest this year?
  - How much did you invest last year?
- From 1993: semi-annual data frequency: spring & autumn updates

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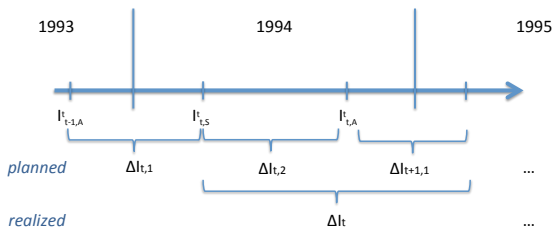
Planned investment $ln((I_{t,S}^t)/(I_{t-1,A}^t)); ln((I_{t,A}^t)/(I_{t,S}^t))$

Realized investment change $ln(I_{j,t}/I_{j,t-1})$
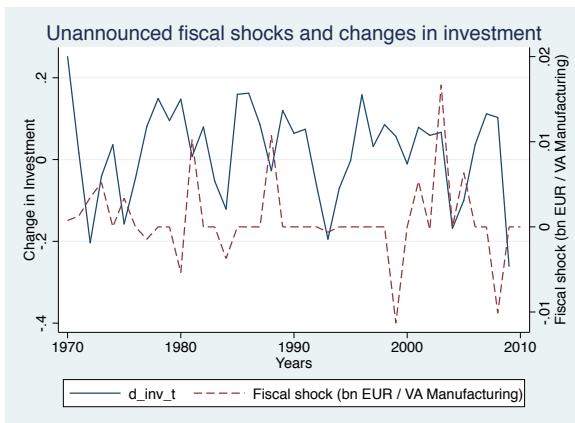
Shocks

Narrative based on Uhl (2013):

- Identify relevant tax laws: total expected revenue impact exceeding 0.1 percent of GDP, resulting in 95 important tax laws (with 845 individual tax measures) for Germany in the period 1964-2010
- Follow the exact timing of these laws (publication & implementation) and budgetary impacts
- Analysis of the main motivation behind each tax law and divide them in "exogenous" (consolidation and some structural shocks) and "endogenous" measures (spending driven, counter cyclical, ..).

▶ Exogenous shock

Fiscal tax shock and investment

In line with the previous literature, we consider only shocks where publication and implementation happens within the same period (Mertens and Raven (2011))

▸ Summary Statistics

Unannounced fiscal shocks and changes in investment

Exogeneity tests

In line with the previous literature we test for the exogeneity of our shock series using a VAR to test for granger causality of lagged output and investment on tax shocks.

- We aggregate investment at annual level
- Include GDP growth, 3-month interbank rate and the shock series
- And find no evidence that the unannounced tax shock series can be predicted by the macroeconomic conditions or by investment in the last period.

▶ Granger causality

Main specification

For both planned and realized investment:

$$\Delta I_{i,j,t} = \alpha + \beta_m(L_m)\tau_t + \psi m_{t-1} + \rho g_t + \nu \Delta z_{i,t} + D_{90} + D_{07} + \theta_j + \epsilon_{i,j,t}$$

- $\Delta I_{i,j,t}$ growth rate of realized investment for firm i, in sector j, in period t
- τ_t exogenous tax adjustment published at time t
- m_{t-1} previous period three-month interbank rate
- g_t cyclical component of HP detrended GDP
- $\Delta z_{i,t}$ sales growth at firm level
- D_{07} crisis period 2007-2010, D_{90} German reunification

Outline

1. Motivation

2. Literature

3. Our Contribution

4. Data

5. Methodology

6. Results
   - Planned Investment
   - Realized Investment - heterogeneity

7. Robustness

8. Conclusion

Planned Investment I - 1993-2010, half-yearly

Dependent variable: Change in investment	(1) (β / SE)	(2) (β / SE)	(3) (β / SE)
Fiscal shock	6.987***	1.087	0.680
	(1.511)	(1.685)	(1.986)
L.Fiscal shock	2.243	-3.335*	-5.251***
	(1.594)	(1.720)	(1.988)
L2.Fiscal shock	-0.164	-2.711*	1.818
	(1.324)	(1.436)	(2.093)
Dummy_crisis		-0.056***	-0.032**
		(0.012)	(0.016)
GDP cycle (HP)		0.000***	0.000***
		(0.000)	(0.000)
L. 3-month interbank rate		-0.034***	-0.038***
		(0.005)	(0.008)
Sales growth			0.155***
			(0.023)
Observations	31163	31163	21045
R^2	0.002	0.004	0.008
Industry FE	Y	Y	Y

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustered standard errors in parentheses.

Planned Investment

Planned Investment II: forward looking behavior

Firms base their future plans not only on the legislations currently published but also on the laws currently under discussion:

Dependent variable: Change in investment	(1) (β / SE)	(2) (β / SE)	(3) (β / SE)
F2.Fiscal shock	-2.665 (1.630)	-4.544** (1.957)	-4.159** (2.017)
F.Fiscal shock	0.959 (1.457)	-1.020 (1.687)	-1.330 (1.724)
Fiscal shock	6.854*** (1.660)	-0.024 (1.913)	-0.141 (2.061)
L.Fiscal shock	0.685 (1.780)	-5.504*** (1.961)	-6.351*** (2.072)
L2.Fiscal shock	6.932*** (1.891)	3.138 (2.040)	1.544 (2.156)
Observations	23153	23153	19268
R^2	0.004	0.006	0.009
Aggregate Controls	N	Y	Y
Firm level Controls	N	N	Y
Industry FE	Y	Y	Y

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustered standard errors in parentheses.

# Outline

Realized Investment - 1970-2010, annual

Dependent variable: Change in investment	(Lag) (β / SE)	(Lead+Lag) (β / SE)	(1991-2010) (β / SE)	(1970-1991) (β / SE)
F.Fiscal shock		-7.487***	-6.825***	-2.328
		(0.976)	(1.262)	(1.856)
Fiscal shock	-3.984***	-4.621***	1.444	-8.246***
	(1.046)	(1.027)	(1.369)	(1.666)
L.Fiscal shock	-0.752	0.172	2.614**	-6.267***
	(0.993)	(1.003)	(1.300)	(1.650)
Dummy_90	-0.072***	-0.073***		
	(0.007)	(0.007)		
Dummy_crisis	-0.168***	-0.170***	-0.070***	.
	(0.021)	(0.021)	(0.023)	.
GDP cycle (HP)	0.000	0.000	0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
L. 3-month interbank rate	-0.026***	-0.019***	-0.073***	-0.031***
	(0.002)	(0.002)	(0.007)	(0.004)
Sales growth	0.537***	0.534***	0.484***	0.571***
	(0.031)	(0.031)	(0.040)	(0.043)
Observations	52828	52828	29093	23735
R^2	0.02	0.021	0.025	0.021
Industry FE	Y	Y	Y	Y

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustered standard errors in parentheses.

Effect by different type of taxes

Divide tax changes in three main categories:

- personal income tax, pension & savings tax
- corporate & business tax, energy tax, property tax
- consumption tax

Exogenous tax shocks by type
Announcement and implementation in same period
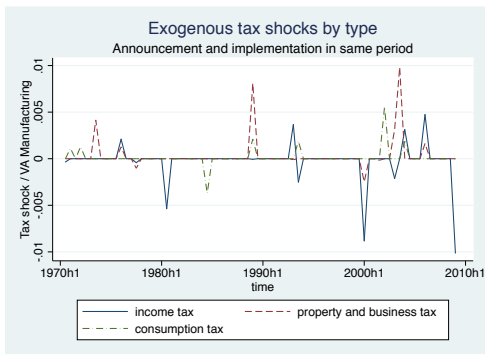
Effect by tax type - full sample

Dependent variable: Change in investment	(1) (β / SE)	(2) (β / SE)	(3) (β / SE)	(4) (β / SE)
F.Income tax	-11.963***	-15.796***		
	(2.119)	(1.859)		
Income tax	-6.286***	-5.687***		
	(2.374)	(2.123)		
L.Income tax	16.545***	13.296***		
	(2.858)	(1.967)		
F.Property & Corp tax	-7.045**		-10.269***	
	(3.168)		(2.114)	
Property & Corp tax	7.095***		-3.033	
	(2.747)		(2.142)	
L.Property & Corp tax	2.142		-3.511	
	(3.067)		(2.152)	
F.Consumption tax	10.686***			-5.727**
	(4.025)			(2.739)
Consumption tax	-11.627***			-13.983***
	(3.461)			(2.657)
L.Consumption tax	-21.199***			-22.681***
	(3.616)			(2.783)
Observations	52828	52828	52828	52828
R^2	0.023	0.022	0.020	0.021
Controls	Y	Y	Y	Y

Effect by size class

size classes: 1-49, 50-199, 200-999 and >1000

■ CONF_MIN ⬚ CONF_MAX ◆ Beta
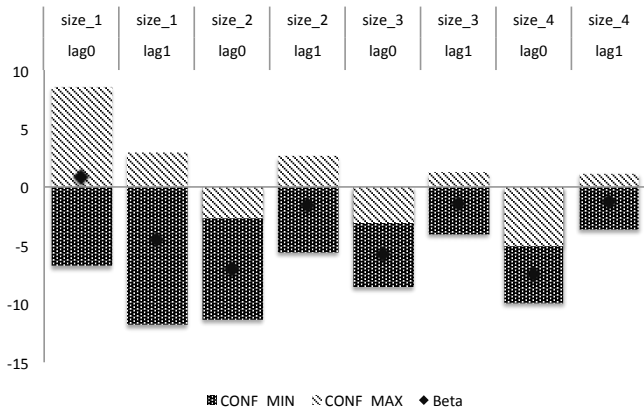
Sector

Significant (& negative) effect only in the year of announcement. ISISC 3 classifications: textiles & footwear; pulp, paper and printing; machinery and equipment (I & II).
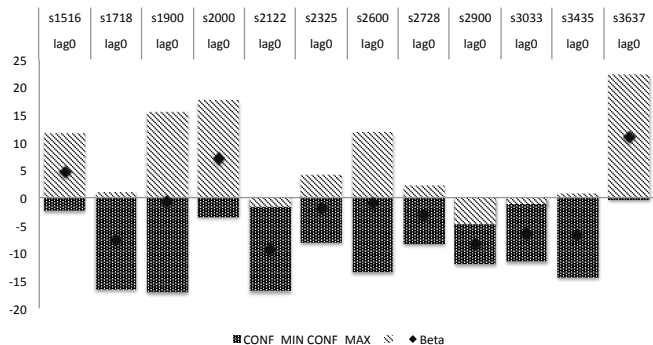
Robustness checks

Sensitivity analysis:

- Excluding crisis years
- Excluding biggest sector - manufacture of machinery and equipment (16,251 obs.)
- Use only subset of "consolidation" shocks
- Use draft and implementation date

Exogeneity of shocks:

- Exploiting different industry exposure to energy related tax (energy dependence, IO-tables (OECD)).
- Use "Diff-in-Diff" approach, define as "treatment group": pulp and paper and "control group": food and tobacco industry and non classified manufacturing.

Diff-in-Diff approach based on energy tax changes

Dependent variable: Change in investment	(1) (β / SE)	(2) (β / SE)
Energy tax*treat	-19.573 (12.317)	-16.464 (12.584)
L.Energy tax*treat	-23.304* (12.516)	-20.219 (12.863)
Energy tax	8.168 (7.683)	5.200 (7.877))
L.Energy tax	-1.096 (8.346)	-4.416 (8.574)
Observations	14387	14387
R^2	0.008	0.008
Dummy treat	Y	Y
Controls	Y	Y
Firm level FE	N	Y

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustered standard errors in parentheses.

Conclusion

Private investment has been shown to be one of the main drivers of aggregate output during periods of fiscal consolidation. This paper provides evidence that tax adjustment affects business confidence and therefore planned investment.

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We combine the **narrative approach** - reclassification of exogenous tax changes in Germany (Uhl (2013)) - **with micro data** - firms' realized and planned investment -IFO investment survey.

We find that an **increase in tax equal to 1% of the value added** of the total manufacturing industry leads to a lagged **decrease in planned investment of about 5.5%** and to an **anticipation effect of about 4.5%**,

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Finally, the effect is higher for medium/big firms, for consumption tax changes and heterogeneous across sectors.

Thanks for your attention!

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Realized Investment - 1970-2010, annual

Dependent variable: Change in investment	(1) (β / SE)	(2) (β / SE)	(3) (β / SE)	(4) (β / SE)	(5) (β / SE)
Fiscal shock	-2.590***	-3.543***	-4.384***	1.543	-7.561***
	(0.983)	(1.075)	(1.086)	(1.455)	(1.818)
L.Fiscal shock	4.731***	2.002**	-0.502	1.071	-5.284***
	(0.962)	(1.010)	(1.007)	(1.272)	(1.612)
L2.Fiscal shock	3.828***	1.016	3.775***	2.746*	1.967
	(1.046)	(1.074)	(1.169)	(1.644)	(1.709)
Dummy_90		-0.079***	-0.061***		
		(0.007)	(0.007)		
Dummy_crisis		-0.114***	-0.161***	-0.060**	.
		(0.018)	(0.022)	(0.024)	
GDP cycle (HP)		0.000***	0.000*	0.000***	-0.000***
		(0.000)	(0.000)	(0.000)	(0.000)
L. 3-month interbank rate		-0.032***	-0.022***	-0.084***	-0.039***
		(0.003)	(0.002)	(0.007)	(0.005)
Sales growth			0.572***	0.534***	0.568***
			(0.033)	(0.043)	(0.046)
Observations	50653	50653	46850	26350	20500
R^2	0.001	0.005	0.021	0.027	0.021
Industry FE	Y	Y	Y	Y	Y

Aggregate investment
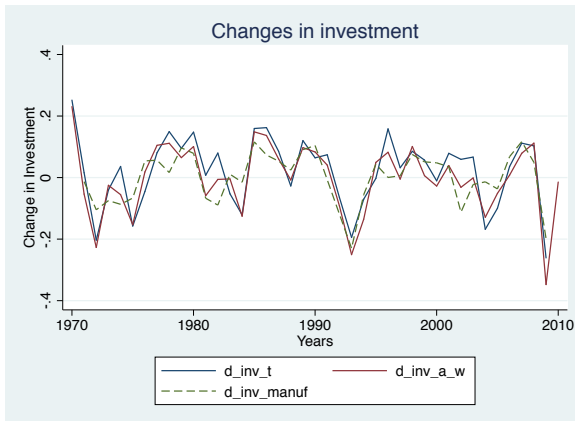
Investment & Tax

Aggregate investment

Equation	Excluded	chi2	df	Prob > chi2	Equation	Excluded	chi2	df	Prob > chi2
shock_0	month3_rate_r	0.013	1	0.911	shock_0	month3_rate_r	0.044	1	0.833
shock_0	gdp_growth	2.538	1	0.111	shock_0	gdp_growth	2.081	1	0.149
shock_0	d_inv_t	0.057	1	0.811	shock_0	d_inv_a_w	0.714	1	0.398
shock_0	ALL	2.693	3	0.442	shock_0	ALL	4.690	3	0.196
d_inv_t	shock_0	0.169	1	0.681	d_inv_a_w	shock_0	0.333	1	0.564
d_inv_t	month3_rate_r	0.469	1	0.493	d_inv_a_w	month3_rate_r	1.534	1	0.215
d_inv_t	gdp_growth	5.865	1	0.015	d_inv_a_w	gdp_growth	1.298	1	0.255
d_inv_t	ALL	5.968	3	0.113	d_inv_a_w	ALL	2.819	3	0.42

▶ Exogeneity

Summary statistics

	Total sample: 1970-2010		Subsample: 1991-2010		Subsample: 1970-1990	
	Mean	se	Mean	se	Mean	se
Realized investment change	-0.0123	(1.0739)	-0.0423	(1.1355)	0.0274	(0.9853)
Exogenous fiscal shock	0.0006	(0.0049)	0.0002	(0.0055)	0.0012	(0.0038)
GDP cyclical component	10.6317	(701.3793)	203.4853	(761.2159)	-260.6210	(492.9087)
3 month interbank rate	2.4687	(1.6143)	2.0205	(1.1856)	3.0990	(1.9012)
sales growth	0.0230	(0.2613)	0.0164	(0.288)	0.0310	(0.2244)
total employment last year	837	(5195)	753	(5154)	948	(5247)
Observations	64436		36666		27770	

▶ Aggregate Investment

Shocks: Example of "exogenous" measure in Uhl (2013)

Tax change law 2007

"The law combined a diversity of tax measures, most of them associated with minor revenue effects. Of most interest is the reduction of the lump-sum tax break for commuters[...]"

"The measure changed tax revenues by 2.53 bn EUR on an annual basis, effective 01. Jan 2007[...] also important was the increased income tax rate of 45 % on incomes above 250.000 EUR effective 2007, which was expected to raise 1.3 bn EUR [...]".

"The statement of the introduction of the bill reported consolidation motives as justification for the changes. Further stated motives were related to simplification of the tax code or ideology, for example, the increased tax rate for the top income brackets[...] In the parliamentary debates, there was a clear emphasis on budget consolidation."

▸ Exogenous shock