



EUROPEAN CENTRAL BANK

EUROSYSTEM

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Factor reallocation in Europe

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Disclaimer: the opinions expressed in this presentation are those of the authors and do not necessarily reflect the views of the ECB or of the European System of Central Banks.

- Reallocation of resources is very large even in non-crisis periods
 - Resulting from the entry and exit of firms, and also from the expansion and contraction of incumbents
 - Within-sector input reallocation matters more than between sector
- Reallocation is productivity enhancing when resources are shifted from low productive to high productive firms
 - Impact on aggregate productivity growth varies with the sector, period and stage of development. But it might be very important
 - The strength of productivity-enhancing reallocation (PER) depends on the benefits/costs of moving towards the optimal size

- **Costs/benefits of reallocation**

- Costs/benefits of reallocation are subject to **trends**, e.g. changes in technology
- They can differ across countries due to **economic structure and framework conditions**
 - Large literature on impact of market distortions: Hsieh and Klenow (2009), Restuccia and Rogerson (2008), Bertola and Rogerson (1997), Bernanke et al. (1996)
- And may vary over the **cycle**
 - Reallocation is less costly in downturns, although some distortions may make it more costly
 - Costs/benefits dynamics over the cycle might depend on the underlying causes and magnitude of shocks
 - Might differ for reallocation of labour and of capital

This paper addresses the following questions:

- **Is input reallocation productivity-enhancing in Europe? Are there country differences? Why?**
 - Yes, in average reallocation is productivity-enhancing
 - Differences across countries are found to be correlated with size distribution of firms and market regulation
- **Does productivity-enhancing reallocation vary over the cycle? Was the GR any different? Why?**
 - The process of productivity-enhancing reallocation (PER) is enhanced over the cycle
 - However, the great recession (GR) was different from other cycles: PER was significantly lower
 - Related to trade collapse and credit crunch

- 1 Factor reallocation: Issues to consider
- 2 Data and measurement**
- 3 Productivity enhancing reallocation: structural issues
- 4 Productivity enhancing reallocation over the cycle
- 5 Conclusions and future work

Data: Transition matrices

Employment or real capital growth and initial characteristics of firms are derived from CompNet's labour module

- CompNet's labour module constructs employment transition matrices for each country, macro-sector and 3-year window—firm growth between $t-3$ and t
- Firms have to be in the dataset at $t-3$ and t , they are incumbents (no entry and exit)

Share of firms in each cell

- 6 euro area countries:
BE, FI, SP, IT, SI, EE;
- 8 macro-sectors ;
- 12 years (2001-2012).

Initial quintile/quintile 3 years later	Share of firms in each cell				
	Q1	Q2	Q3	Q4	Q5
Q1	65%	22%	9%	3%	1%
Q2	22%	43%	26%	7%	1%
Q3	7%	16%	47%	26%	3%
Q4	3%	4%	14%	60%	20%
Q5	1%	1%	1%	9%	88%

Data: Firm growth measurement

- We know the median size, median real stock of capital, median productivity and financial position of firms in each of the cells at t-3
 - With that info we approximate employment and capital growth of firms in each cell of the transition matrix

Employment growth
in each cell

[here for capital
growth](#)

[Comparison with
“real” growth rates
\(selected countries
and years\)](#)

Initial quintile/quintile 3 years later	Q1	Q2	Q3	Q4	Q5
Q1	6%	24%	49%	86%	170%
Q2	-19%	0%	16%	45%	113%
Q3	-32%	-14%	-1%	17%	81%
Q4	-45%	-31%	-16%	-2%	40%
Q5	-58%	-47%	-36%	-20%	0%

- We consider from now on each cell to be a “representative firm” with a given 3-year growth and initial characteristics

Data: Descriptives

Average characteristics of firms growing and shrinking

Variable	Firms with negative employment growth	Firms with positive employment growth
Average employment growth rate	-0.25	0.54
Ratio TFP to sector average	0.91	1.02
Productivity of labor	31.84	40.10
Productivity of capital	4.25	3.51
Real value added (in ,000s)	37595	36494
Employment	9	5
Real capital stock (in ,000s)	92.34	67.66
Investment ratio (Change of capital over capital)	0.16	0.26
Wages (in ,000s)	21.52	21.27
Implicit interest rate	0.05	0.05
Capital intensity (,000s of euros per employee)	9.86	19.12
Profit margin (Operating surplus over turnover)	0.03	0.05
Prob. of being credit constrained	0.11	0.09
Cash holdings (Cash over total assets)	0.09	0.11
Collateral (share of fixed tangible assets)	0.27	0.28
Debt burden (interests over profits)	0.13	0.08
Equity debt ratio	0.76	0.79

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Baseline specification

$$\Delta x_{i,c,s,t} = \beta_1 \Delta cycle_{c,s,t} + \beta_2 relTFP_{i,c,s,t-3} + FE + \varepsilon_{i,c,s,t}$$

VARIABLES	(1) dL	(2) drK
sector demand shifter	0.203*** (0.0564)	0.321*** (0.0917)
Relative initial productivity, ln	0.752*** (0.0706)	0.507*** (0.0454)
Constant	0.365*** (0.0313)	0.246*** (0.0311)
Observations	7,924	7,924
Adjusted R-squared	0.399	0.342
FE	YES	YES

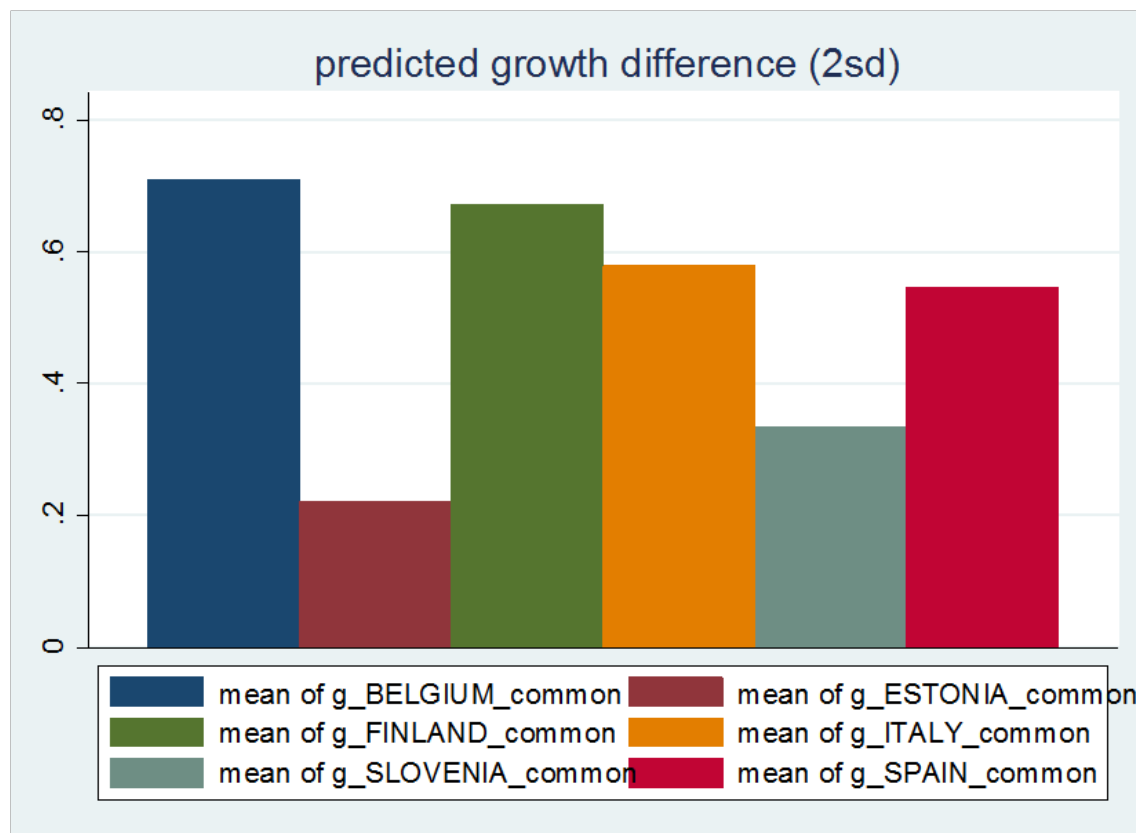
Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

FE=country, sector, size, year, country*sector, sector*size

Is input reallocation different across countries?

Use estimated betas for each country to predict employment growth difference between high and low productive firms



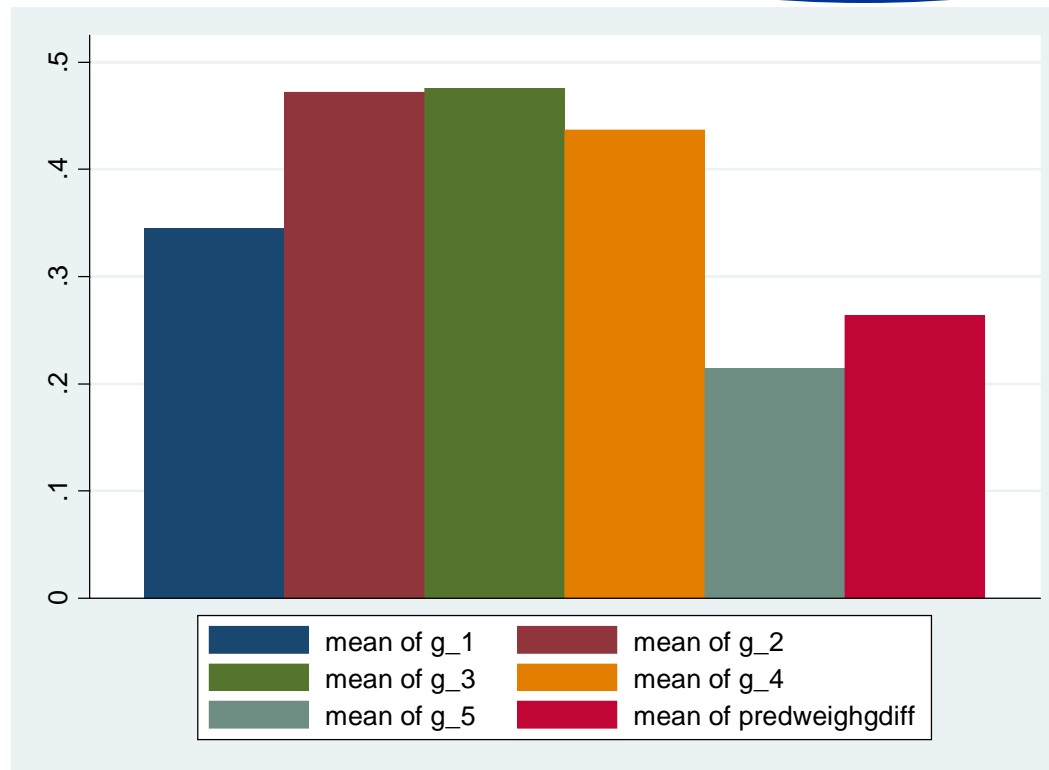
In average, 1 sd above the mean refers to a firm 20% more productive than the average in the sector. Idem with 1 sd below the mean.

With country-specific productivity distribution?

Why are there country-differences? Size distribution of firms

According to the literature, two possible drivers of country differences: 1) economic structure (size distribution) ...

$$\Delta x_{i,c,s,t} = \beta_1 \Delta cycle_{c,s,t} + \beta_2 relTFP_{i,c,s,t-3} + \beta_3 relTFP_{i,c,s,t-3} \times Size_{i,c,s,t-3} + FE + \varepsilon_{i,c,s,t}$$



Country by country
For capital growth

Micro-firms₁₂

Average= 66 employees

Why are there country-differences? Regulations

...and regulations shaping costs and benefits of PER

$$\beta_3 \text{relTFP}_{i,c,s,t-3} \times \text{Regulatory indicator(dummy)}_{c,s,t}$$

		dL	drK
PMR	PMR (OECD)	-0.184***	-0.177***
	Legal barrier to entry (OECD)	-0.162***	-0.143***
	State control (OECD)	-0.166***	-0.149***
	Barriers trade-investment (OECD)	-0.136***	-0.119***
	Regulatory impact of services (OECD)	-0.238***	-0.111*
	Days needed to start a business (WB)	-0.0712***	-0.104***
	Costs to start a business (WB)	-0.0396*	-0.0204
	Cost of starting a business (WEF)	-0.0570*	-0.0802**
LMR	EPL (OECD)	-0.124***	-0.110***
	Hiring and firing regulation (WEF)	-0.0160	-0.0445
	Centralized bargaining (WEF)	-0.0777***	-0.0809***
	Union density (OECD)	0.000931	-0.0508
PMR and EPL	PMR=1 and EPL=0*	-0.145**	-0.151**
	PMR=0 and EPL=1*	0.0470	0.0565
	PMR=1 and EPL=1*	-0.175***	-0.165***
OTHER	Bureaucracy cost (WEF)	-0.0574***	-0.0623***
	PC: Insolvency costs	-0.0346**	-0.0428**

*Reference category is PMR=0 and EPL=0

- 1 Factor reallocation: Issues to consider
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- 3 Productivity enhancing reallocation: structural issues
- 4 **Productivity enhancing reallocation over the cycle**
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Does input reallocation change over the cycle? Is it different over the GR?

Augmented specification

$$\Delta x_{i,c,s,t} = \beta_1 \Delta \text{cycle}_{c,s,t} + \beta_2 \text{relTFP}_{i,c,s,t-3} + \beta_3 \text{relTFP}_{i,c,s,t-3} \times \text{cycle}_{c,s,t} + FE + \varepsilon_{i,c,s,t}$$

VARIABLES	(1) dL cycle	(2) drK cycle	(3) dL cycle_GR	(4) drK cycle_GR
cycle	0.260***	0.337***	0.119	0.452***
cycle_GR			0.263**	-0.216
Relative initial productivity, ln	0.781***	0.535***	0.832***	0.576***
prod_GR			-0.0302	-0.0212
prod_cycle	-0.886***	-0.836***	-1.767***	-1.579***
prod_cycle_GR			2.086***	1.732**
crisis	-0.0174***	-0.0287***	-0.0231***	-0.0259***
Constant	0.383***	0.264***	-0.0320***	0.262***
Observations	7,924	7,924	7,924	7,924
Adjusted R-squared	0.402	0.343	0.406	0.346
FE	YES	YES	YES	YES

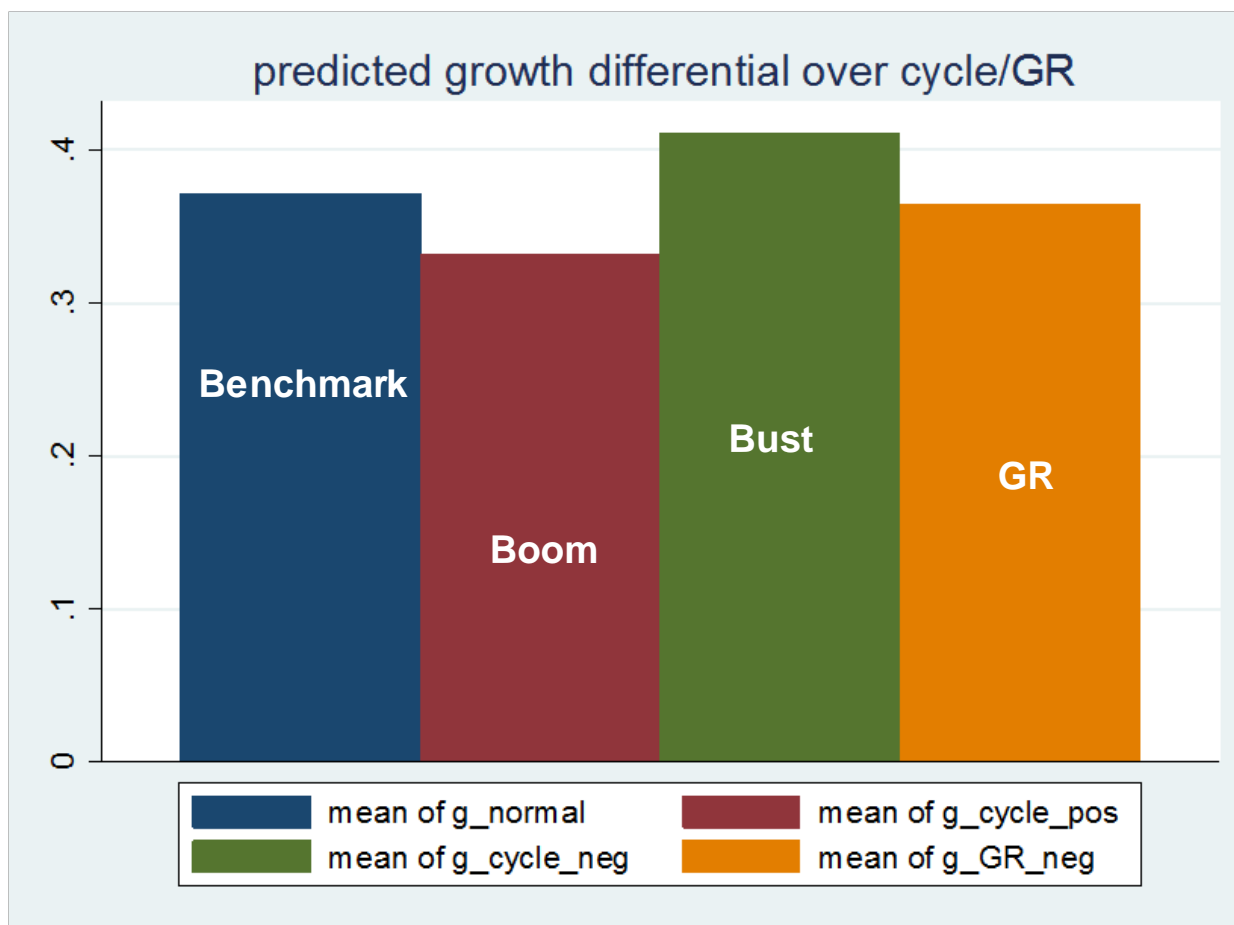
Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

FE=country, sector, crisis, country*sector, sector*size

Augmented specification

$$\Delta x_{i,c,s,t} = \beta_1 \Delta cycle_{c,s,t} + \beta_2 \Delta cycle_{c,s,t} \times GR + \beta_3 relTFP_{i,c,s,t-3} + \beta_4 relTFP_{i,c,s,t-3} \times cycle + \beta_5 relTFP_{i,c,s,t-3} \times cycle \times GR + GR + FE + \varepsilon_{i,c,s,t}$$



The process of productivity-enhancing reallocation slowed down over the GR. Why?

Clues:

- Same finding for the US and the UK (Haltiwanger et al. (2014), Barnett et al (2014))
- Only happened during the first phase of the crisis (2008-2011). Thereafter, cleansing over the cycle returned to “normal” parameters – [regression with two crisis dummies](#)
- It happened only amongst the smallest and the largest size classes – [regression by size class](#)

Suspects:

- Trade collapse: it affected large productive firms who saw their demand collapse – had to downsize?
- Credit crunch: Decreases cleansing when affects not only low but also high productive firms – small/young productive firms?

Why was the GR different? Trade collapse

Trade collapse

$$\Delta x_{i,c,s,t} = \beta_1 \Delta cycle_{c,s,t} + \beta_2 \Delta cycle_{c,s,t} x GR + \beta_3 relTFP_{i,c,s,t-3} + \beta_4 relTFP_{i,c,s,t-3} x cycle + \beta_5 relTFP_{i,c,s,t-3} x cycle x GR + \beta_5 relTFP_{i,c,s,t-3} x cycle x GR x \Delta Exp(dummy) + GR + FE + \varepsilon_{i,c,s,t}$$

VARIABLES	(1)	(2)	(3)	(4)
	dL		drK	
	cycle_GR	chexports	cycle_GR	chexports
sector demand shifter	0.119	0.119	0.452***	0.452***
cycle_GR	0.263**	0.270**	-0.216	-0.218
Relative initial productivity, ln	0.832***	0.832***	0.576***	0.602***
prod_cycle	-1.767***	-1.761***	-1.579***	-1.579***
prod_GR	-0.0302	-0.0217	-0.0212	-0.0224
prod_cycle_GR	2.086***	1.573**	1.732**	1.808**
prod_cy_GR_dexp		1.467*		-0.217
crisis	-0.0231***	-0.0231***	-0.0259***	-0.0259***
Constant	0.390***	0.388***	0.262***	0.263***
Observations	7,924	7,924	7,924	7,924
Adjusted R-squared	0.406	0.407	0.346	0.346
FE	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

FE=country, sector, crisis, country*sector, sector*size

Why was the GR different? Credit crunch

Credit crunch, first for employment growth

$$\Delta x_{i,c,s,t} = \beta_1 \Delta cycle_{c,s,t} + \beta_2 \Delta cycle_{c,s,t} x GR + \beta_3 relTFP_{i,c,s,t-3} + \beta_4 relTFP_{i,c,s,t-3} x cycle + \beta_5 relTFP_{i,c,s,t-3} x cycle x GR + \beta_5 relTFP_{i,c,s,t-3} x cycle x GR x \Delta CC(dummy) + GR + FE + \varepsilon_{i,c,s,t}$$

VARIABLES	cycle_GR	sector little collateral	Change in sector CC1 larger than in country	Change in sector CC2 larger than in country
cycle	0.119	0.109	0.172*	0.135
cycle_GR	0.263**	0.281**	0.202*	0.223**
Relative initial productivity, ln	0.832***	0.831***	0.814***	0.809***
prod_GR	-0.0302	-0.0304	-0.0339	-0.0307
prod_cycle	-1.767***	-1.763***	-1.991***	-1.887***
prod_cycle_GR	2.086***	1.442**	1.082	0.364
prod_cy_GR*(d=1 if sector collateral < med country)		1.172		
prod_cy_GR*(d=1 if ch. sector SAFE > med country)			2.326**	
prod_cy_GR*(d=1 if ch. sector abscons > med country)				3.083***
Constant	0.390***	0.391***	0.378***	0.377***
Observations	7,924	7,804	5,945	6,077
Adjusted R-squared	0.406	0.406	0.374	0.390
FE	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

fe: country, sector, size, crisis, country*sector*sector*s

Measurement?

Full specification

Why was the GR different? Credit crunch

And then for capital growth

$$\Delta x_{i,c,s,t} = \beta_1 \Delta cycle_{c,s,t} + \beta_2 \Delta cycle_{c,s,t} x GR + \beta_3 relTFP_{i,c,s,t-3} + \beta_4 relTFP_{i,c,s,t-3} x cycle + \beta_5 relTFP_{i,c,s,t-3} x cycle x GR + \beta_5 relTFP_{i,c,s,t-3} x cycle x GR x \Delta CC(\text{dummy}) + GR + FE + \varepsilon_{i,c,s,t}$$

VARIABLES	cycle_GR	sector little collateral	Change in sector CC1 larger than in country	Change in sector CC2 larger than in country
cycle	0.452***	0.442***	0.472***	0.436***
cycle_GR	-0.216	-0.189	-0.201	-0.183
Relative initial productivity, ln	0.576***	0.578***	0.574***	0.565***
prod_GR	-0.0212	-0.0229	-0.0336	-0.0111
prod_cycle	-1.579***	-1.587***	-1.486**	-1.545**
prod_cycle GR	1.732**	0.820	1.474	0.193
prod_cy_GR*(d=1 if sector collateral<med country)		1.710***		
prod_cy_GR*(d=1 if ch. sector SAFE >med country)			0.318	
prod_cy_GR*(d=1 if ch. sector abscons > med country)				2.374***
Constant	0.262***	0.265***	0.260***	0.259***
Observations	7,924	7,804	5,945	6,077
Adjusted R-squared	0.346	0.346	0.335	0.352
FE	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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fe: country, sector, size, crisis, country*sector sector*size

Why was the GR different? Credit crunch

Same results with the relative level of *firm-level* equity-debt and collateral to sector averages

	dL			drK		
	cycle_GR	Less equity than median	Less collateral than median	cycle_GR	Less equity than median	Less collateral than median
Cycle	0.119	0.0380	0.0422	0.452***	0.386***	0.344**
Relative initial productivity, ln	0.832***	0.746***	0.857***	0.576***	0.542***	0.563***
prod_GR	-0.0302	-0.0131	-0.0273	-0.0212	0.0172	-0.0308
prod_cycle	-1.767***	-1.231**	-2.006***	-1.579***	-1.118*	-1.008
prod_cycle_GR	2.086***	1.361**	2.732***	1.732**	0.944	1.054
prod_cycle_GR_dummy less equity		2.490**			2.391**	
prod_cycle_GR_dummy less collateral			-1.232			1.068*

Also tried, with cash-holdings, but not significant

- 1 Factor reallocation: Issues to consider
- 2 Data and measurement
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- 4 Productivity enhancing reallocation over the cycle
- 5 **Conclusions and future work**

- Factor reallocation is an important source of aggregate productivity growth
- And yet, not much known, above all in Europe
 - On drivers of country differences
 - On the impact of the GR
- This paper uses CompNet to explore the factor reallocation process in a set of selected European countries
 - Following Haltiwanger et al. (2014) uses the elasticity of firm growth to relative initial TFP, at the firm-level, to “measure” PER
- We find that factor reallocation is productivity-enhancing although there are differences across countries
 - Partly due to the different size distribution of firms
 - Partly to the different institutional and regulatory framework

- Most importantly, we find that although PER is enhanced over the cycle, the GR was different
- During the GR, factor reallocation was not so productivity-enhancing as during other cycles
 - Partly due to the trade collapse, which affected most productive firms
 - Partly to the credit crunch, given that it affected the small/young productive firms
- Some interesting differences between labour and capital reallocation
 - The trade collapse affected only employment growth – temporary shock?
 - The link between capital growth and TFP was significantly reduced in sectors with relatively less collateral – credit market inefficiencies?
- Future work...lots!!
 - Use the wedge between the marginal productivity of the input and the marginal cost as an alternative for TFP
 - Extend the analysis to a larger set of countries (20E sample)
 - Substitute sector cyclical position indicator by one based on input/output tables
 - Grasp aggregate impact of estimated PER

THANK YOU FOR YOUR ATTENTION

RESERVE SLIDES

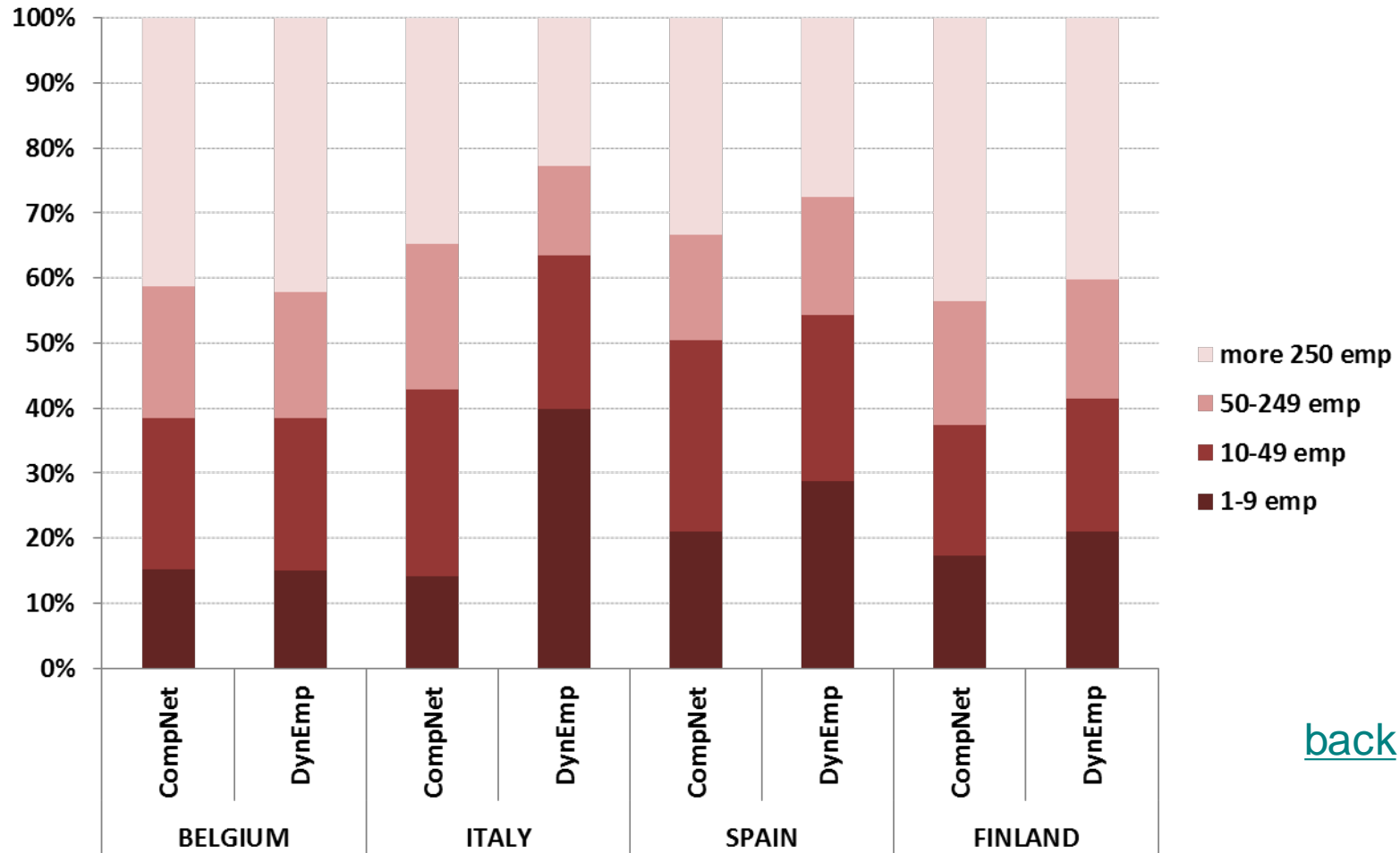
Contributions to manufacturing TFP growth, selected studies (contribution expressed in percentage shares)

	Baily, Hulten and Campbell (1992)	Aw, Chen and Roberts (1997)*	Foster, Haltiwanger and Krizan (2006)	De Loeker and Konings (2006)	Petrin, White and Reiter (2011)
Reference					
Country	US	Taiwan	US	Slovenia	US
Years	1972-1987	1981-1991	1977-1987	1995-2000	1977-1996
Within-firm productivity growth	37	63	57	62	45
Reallocation	63	37	44	38	55

*Contributions to median growth rates

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Size distribution of firms, COmpNet vs. Dynemp (OECD)



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Sample coverage

	Coverage vs. similar population of firms (OECD) ¹		Coverage vs. National Accounts (Eurostat) ²		Time and sector coverage of CompNet samples	
Country	Average No. of firms per year	Total employment	Value added	Total employment	Time coverage	Sectors excluded
Belgium	31%	76%	49%	39%	1996-2010	-
Estonia	73%	95%	25%	56%	1995-2012	12
Finland	48%	96%	NA	45%	1999-2012	12, 68
Italy	10%	53%	27%	30%	2001-2012	-
Slovenia	31%	85%	NA	46%	1995-2012	12
Spain	19%	47%	25%	32%	1995-2012	-

¹ Coverage is computed over the period 2004-2007.

Data of the population of firms with at least 1 employee come from the OECD Structural Business Statistics repository.

² Coverage of the whole economy (not only private firm sector) is computed for 2005.

Eurostat data comes from National accounts: series nama_gdp_c and nama_aux_pem, respectively

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Data Sources, some more details

Country	Name of the source of the microdata used to produce the CompNet indicators (both in English and in original language):
Belgium	Annual account : Centrale des bilans / Balanscentral / Central Balance Sheet Office database (Version commercial : Belfirst, Bureau Van Dijck International trade date : Intra-Stat and Extra-Stat database
Estonia	Source 1: Foreign trade statistics data (Väliskaubanduse andmed)
Finland	Structural Business Statistics (Yritysten rakenne- ja tilinpäätöstilastoaineistot)
Italy	Financial statements from Chamber of Commerce (Bilanci delle società presentati alle CCIA)
Slovenia	Letna porocila slovenskih podjetij (Slovenian companies' annual reports). [For detailed information please refer to: http://www.ajpes.si/Registers/Annual_Reports/Information
Spain	Source 1: Annual Central Balance Sheet Data Office (CBA), Central de Balances Anual (CBA)
	Source 2: Annual Accounts Deposited in Mercantile Registries Data Base (CBB-RM), Base de Datos de Cuentas Anuales Depositadas en los Registros Mercantiles (CBB-RM)

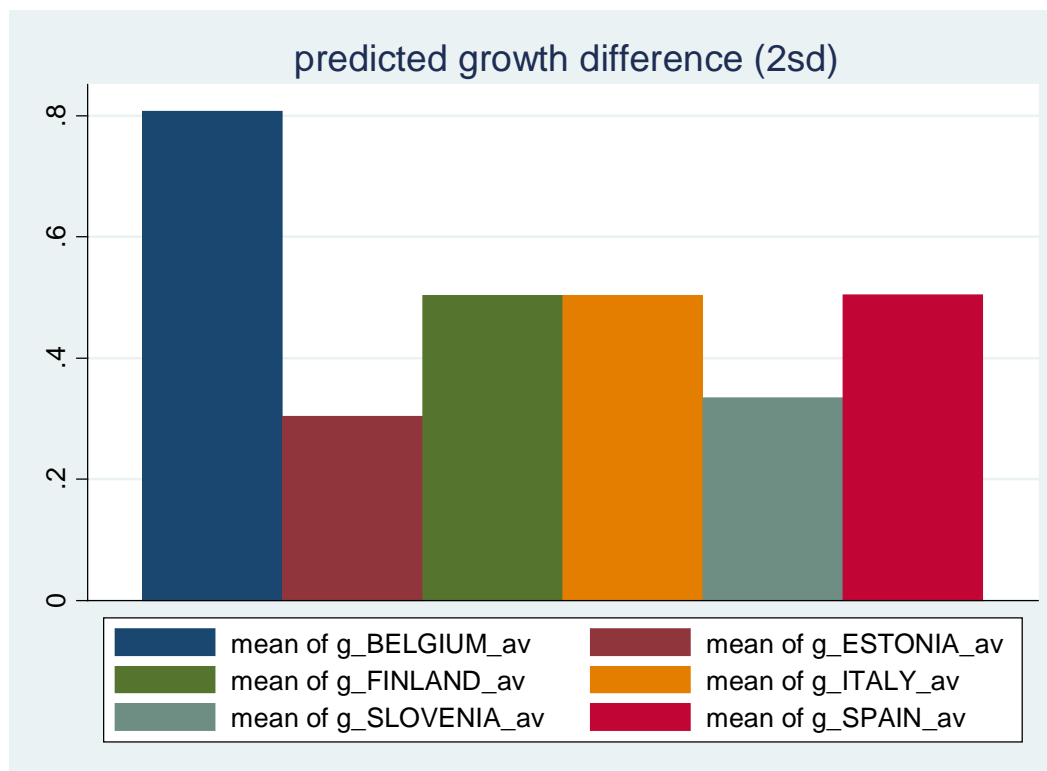
Growth in real stock of capital, by cell

Initial quintile/quintile 3 years later	Q1	Q2	Q3	Q4	Q5
Q1	2%	12%	24%	47%	116%
Q2	-9%	3%	11%	28%	91%
Q3	-21%	-8%	1%	13%	76%
Q4	-34%	-24%	-11%	-3%	39%
Q5	-50%	-42%	-32%	-19%	-3%

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Is input reallocation different across countries?

Use estimated betas for each country to predict employment growth difference between high and low productive firms, taking country-specific productivity distributions



In average, 1 sd above the mean refers to a firm 25% more productive than the average in the sector. Idem with 1 sd below the mean.

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Size distribution very skewed towards very small firms

Average employment by quintile by country. Average of sectors and windows

	1 quintile (0-20%)	2 quintile (21-40%)	3 quintile (41-60%)	4 quintile (61-80%)	5 quintile (81-100%)
Belgium	1	2	3	6	66
Estonia	1	3	5	9	60
Finland	0.4	1	2	5	51
Italy	2	4	7	12	82
Slovenia	1	2	3	6	78
Spain	1	3	4	8	61
Average	1	2	4	8	66

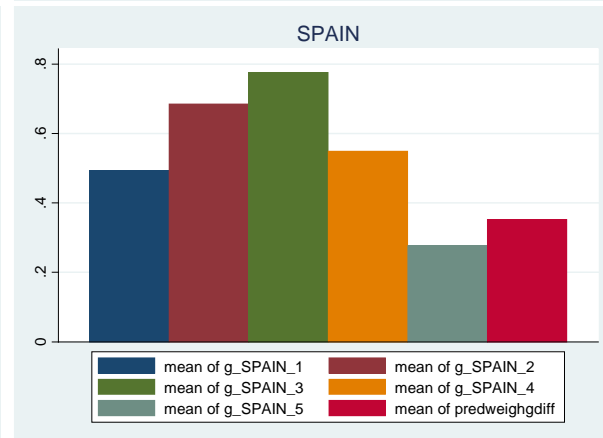
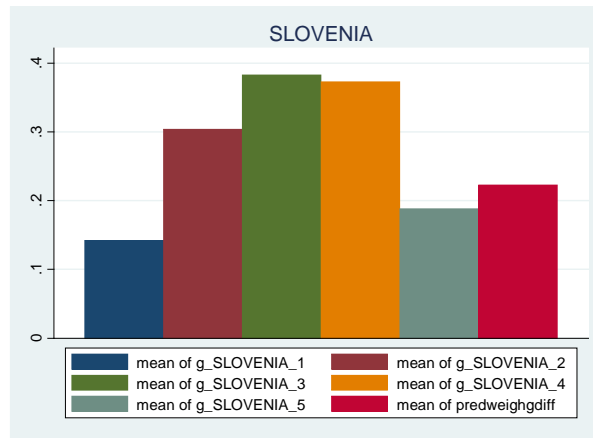
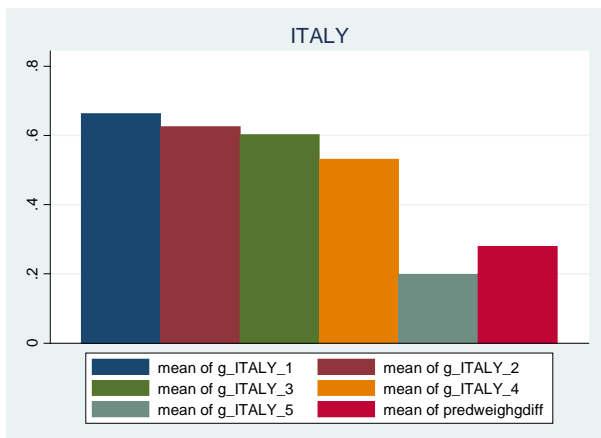
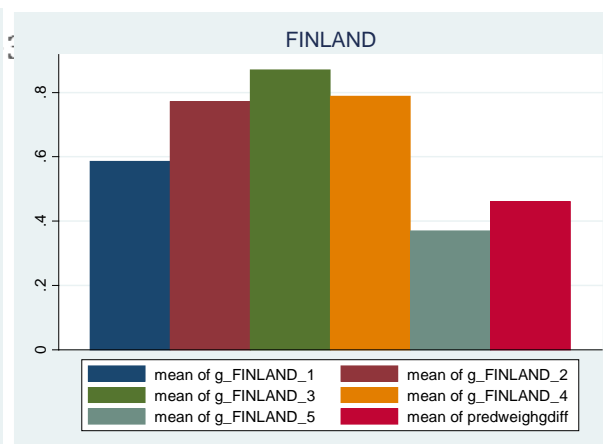
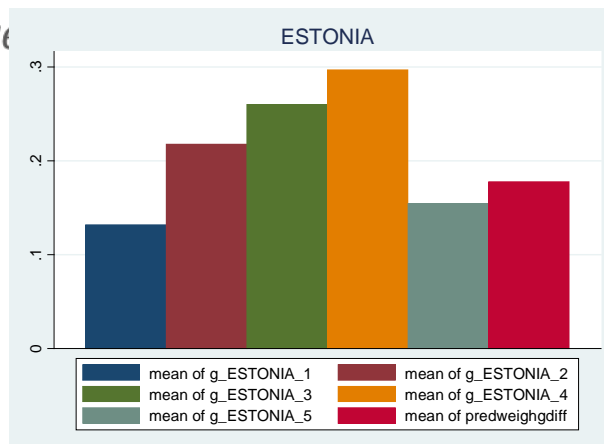
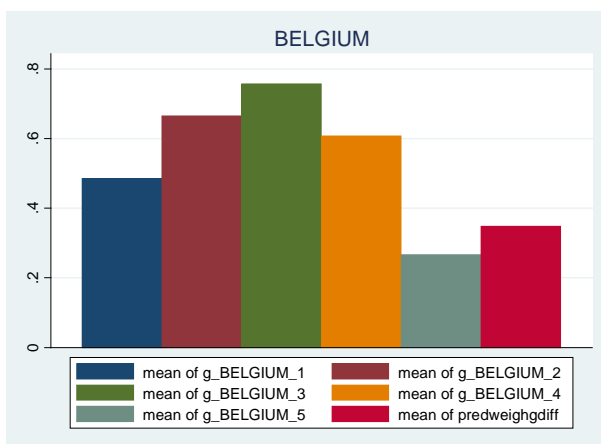
Average real stock of capital by quintile by country. Average of sectors and windows. In thousands of euros

	1 quintile (0-20%)	2 quintile (21-40%)	3 quintile (41-60%)	4 quintile (61-80%)	5 quintile (81-100%)
Belgium	41	63	94	160	413
Estonia	3	4	8	15	46
Finland	15	21	32	62	161
Italy	29	42	61	109	298
Slovenia	9	16	25	56	227
Spain	29	37	48	79	176
Average	21	31	45	80	220

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Why are there country-differences? Cleansing by size and country

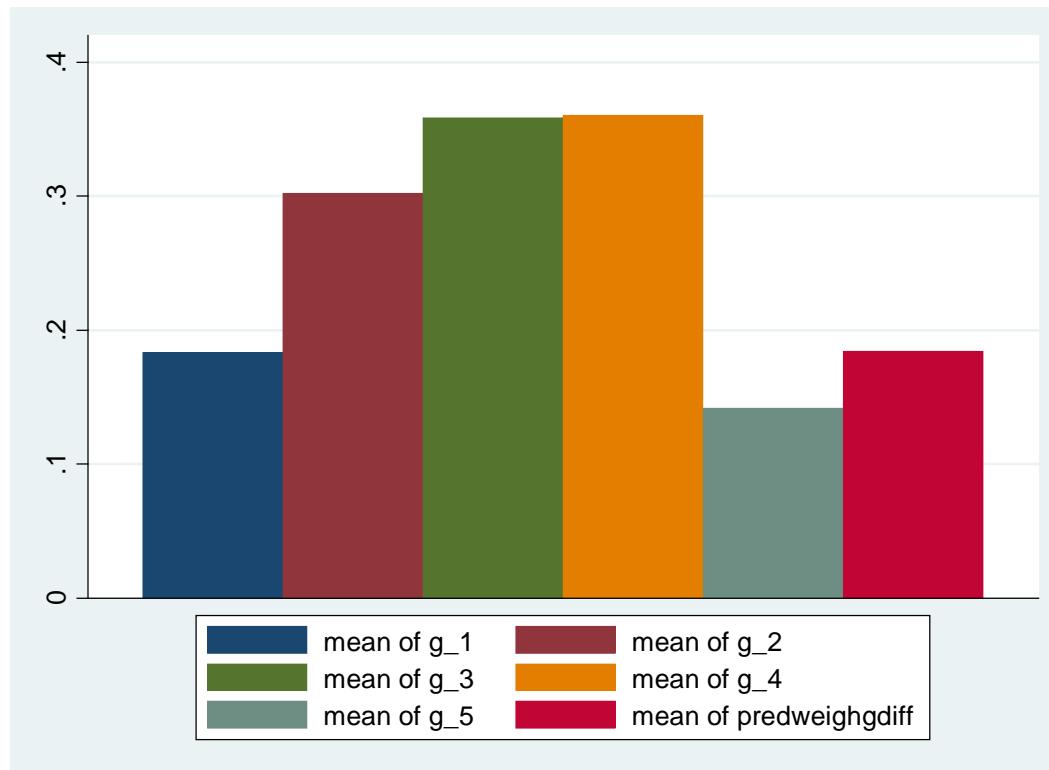
According to the literature, two possible drivers of country differences: 1) economic structure (size distribution) ...



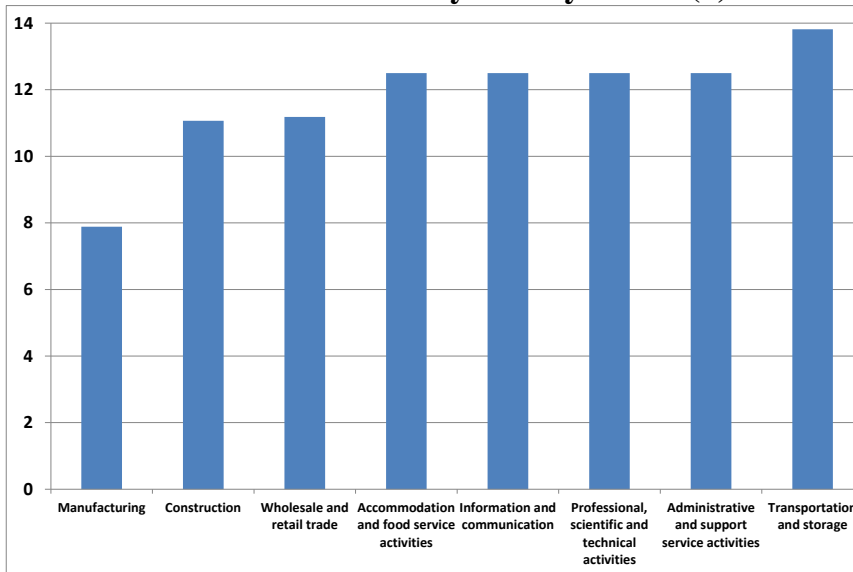
Why are there country-differences in capital-TFP link?

According to the literature, two possible drivers of country differences: 1) economic structure (size distribution) ...

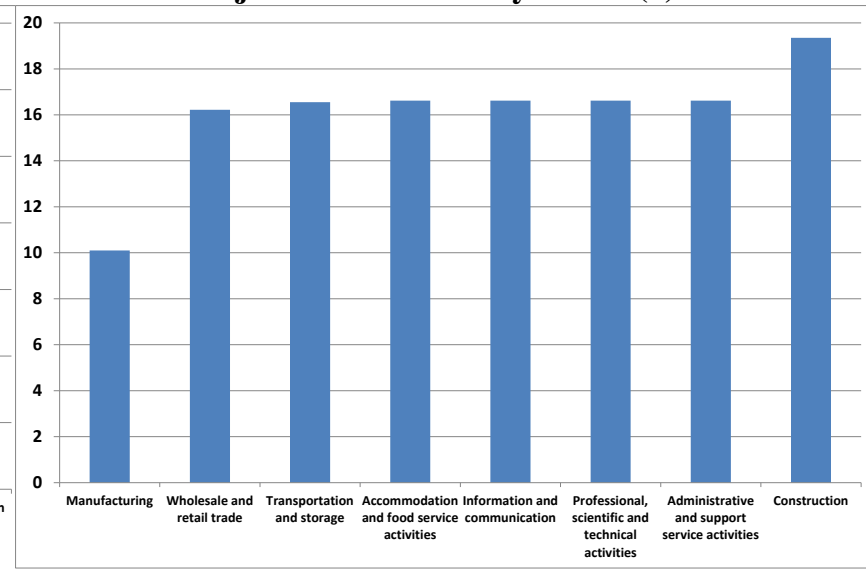
$$\Delta x_{i,c,s,t} = \beta_1 \Delta cycle_{c,s,t} + \beta_2 relTFP_{i,c,s,t-3} + \beta_3 relTFP_{i,c,s,t-3} \times Size_{i,c,s,t-3} + FE + \varepsilon_{i,c,s,t}$$



U.S. establishment entry rate by sector (2)



U.S. job creation rate by sector (2)



Source: OECD and authors' calculations on Census Bureau's Longitudinal Business Database.

- (1) A higher value of the indicators signals tighter regulation.
- (2) 2002-2007 averages.

Alternative sector-specific PMR indicators

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	dL					
Sector demand shifter	0.384***	0.381***	0.372***	0.355***	0.367***	0.350***
Relative initial productivity, ln	0.799***	0.792***	0.804***	0.742***	0.916***	0.677***
dummy_herfindahl_index	-0.0166					
prod_dhh	-0.0586					
dummy_concentration_top10		-0.0127*				
prod_dconc		-0.0405				
dummy_pcm_w_w			-0.00633			
prod_dpcm			-0.0828			
(mean) herfindahl_index				-0.161***		
prod_hh				-0.298		
(mean) concentration_top10					-0.109*	
prod_conc					-0.431*	
(mean) pcm_w_w						-0.00950
prod_pcm						-0.136
Constant	0.388***	0.387***	0.386***	0.368***	0.403***	0.355***
Observations	8,469	8,469	8,469	6,735	6,735	5,181
Adjusted R-squared	0.388	0.388	0.389	0.353	0.358	0.367

YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

All the action took place in the first part of the crisis

Create one dummy (GR1) from window 2006-2009 to 2007-2010 and another dummy for the period 2009-2012 (GR2)

VARIABLES	(1)	(2)	(3)	(4)
	dL		drK	
	cycle	cycle1 and cycle2	cycle	cycle1 and cycle2
cycle	0.119	0.335***	0.452***	0.583***
cycle_GR	0.263**		-0.216	
Relative initial productivity, ln	0.832***	0.820***	0.576***	0.551***
prod_GR	-0.0302		-0.0212	
prod_cycle	-1.767***	-1.540***	-1.579***	-1.165***
prod_cycle_GR	2.086***		1.732**	
cycle_GR1		-0.0199		-0.135
cycle_GR2		0.189*		-0.240
prod_GR1		0.0361		0.0149
prod_GR2		-0.0150		-0.00929
prod_cycle_GR1		3.822***		1.437*
prod_cycle_GR2		0.0322		0.719
crisis	-0.0231***		-0.0259***	
crisis1		-0.00558		-0.00206
crisis2		-0.0156***		-0.0301***
Constant	0.390***	0.377***	0.262***	0.252***
Observations	7,924	7,924	7,924	7,924
Adjusted R-squared	0.406	0.408	0.346	0.343
FE	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

FE=country, sector, crisis, country*sector, sector*size

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Cleansing reduced only among the smallest and largest firms

VARIABLES	(1)	(2)	(3)	(4)
	dL		drK	
	cycle	cycle*size class	cycle	cycle*size class
cycle	0.119	0.125	0.452***	0.461***
cycle_GR	0.263**	0.320**	-0.216	-0.0464
Relative initial productivity, ln	0.832***	0.831***	0.576***	0.576***
prod_GR	-0.0302	-0.0284	-0.0212	-0.0183
prod_cycle	-1.767***	-1.766***	-1.579***	-1.581***
prod_cycle_GR	2.086***	3.304***	1.732**	3.766***
prod_cycle_GR*(lclass==2)		-1.114		-0.826
prod_cycle_GR*(lclass==3)		-2.069**		-3.157***
prod_cycle_GR*(lclass==4)		-2.273**		-4.311***
prod_cycle_GR*(lclass==5)		-1.331		-2.519*
crisis	-0.0231***	-0.0230***	-0.0259***	-0.0258***
Constant	0.390***	0.387***	0.273***	0.258***
Observations	7,924	7,924	8,240	7,924
Adjusted R-squared	0.406	0.406	0.340	0.347
FE	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

FE=country, sector, crisis, country*sector, sector*size

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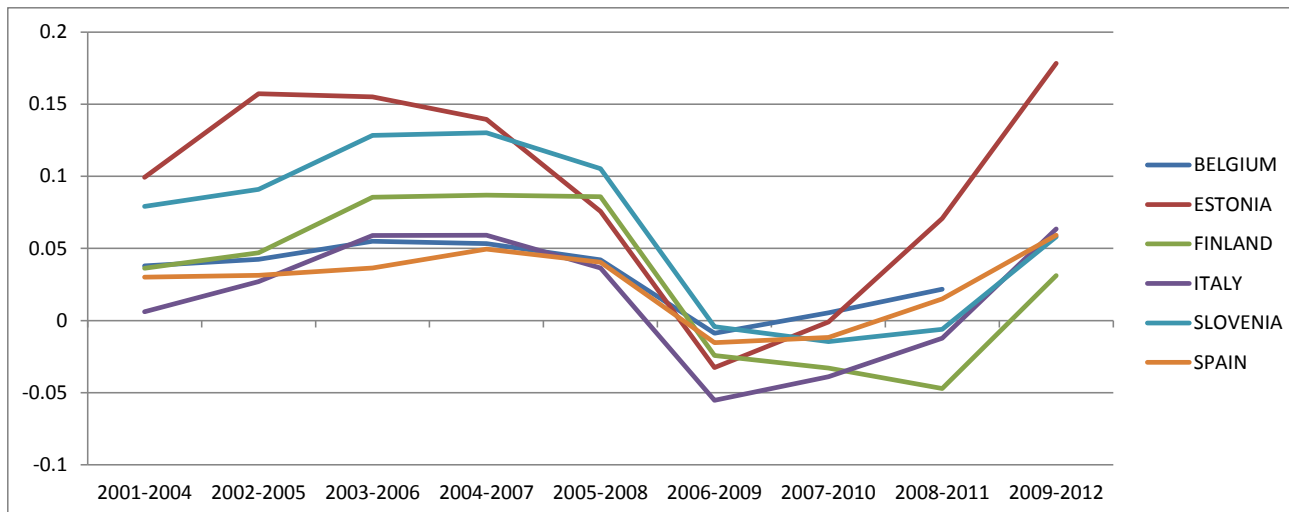
- We derive from TIVA (OECD) the share of sector value added exported
 - Compute average over years: 2005, 2008 and 2009
 - This provides us with the “sector exposure” to change in aggregate exports
- We retrieve from Eurostat aggregate exports for the set of countries and years needed
 - And compute average annual growth in each of the windows
- Sector-exposure to exports x Change in aggregate exports = effect of aggregate trade collapse on each sector
- Compute a dummy = 1 if sector exposure > median in the country during the GR

Measuring sector- impact of trade collapse (II)

Sector share of value added exported (TIVA, OECD), average 2005, 2008, 2009

country	Manufacturing	Construction	Wholesale and retail trade	Transportation and storage	Accommodation and restaurants	ICT	Professional services	Administrative services
BELGIUM	54.06	6.97	23.07	39.95	23.07	39.95	19.91	19.91
ESTONIA	53.24	8.01	21.23	59.10	21.23	59.10	22.93	22.93
FINLAND	37.21	2.04	11.50	39.80	11.50	39.80	17.28	17.28
ITALY	29.23	2.69	10.33	19.05	10.33	19.05	10.50	10.50
SLOVENIA	51.94	7.26	17.16	59.19	17.16	59.19	15.05	15.05
SPAIN	26.36	1.32	6.32	34.61	6.32	34.61	11.97	11.97

Average annual change in aggregate exports by country



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The impact of exports: full specification

VARIABLES	dL	drK
	full spec	full spec
sector demand shifter	0.0984 (0.0742)	0.421*** (0.108)
cycle_dexp	-0.190 (0.136)	-0.213 (0.148)
d_exports	0.00750 (0.00497)	0.0248*** (0.00572)
cycle_GR	0.376*** (0.118)	-0.0590 (0.175)
Relative initial productivity, ln	0.834*** (0.0669)	0.577*** (0.0504)
prod_dexp	0.137*** (0.0367)	0.0809** (0.0304)
prod_GR	-0.0722** (0.0331)	-0.0517 (0.0380)
prod_cycle	-1.764*** (0.455)	-1.582*** (0.544)
prod_cycle_GR	1.496** (0.626)	1.753** (0.772)
prod_cy_GR_dexp	2.698*** (0.926)	0.525 (0.838)
crisis	-0.0276*** (0.00557)	-0.0391*** (0.00680)
Constant	0.389*** (0.0281)	0.265*** (0.0272)
Observations	7,924	7,924
Adjusted R-squared	0.410	0.349
FE	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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ECB's SAFE survey

- Covers micro, small, medium-sized and large firms and it provides evidence on the financing conditions. Starting in 2009.
- Finds that 12% of all firms in the EA are financially constrained
- We estimate probability of firms self-reporting as financially constrained
 - Rejected loan applications;
 - Loan applications for which only a limited amount was granted or with too high borrowing costs
 - Discouraged firms
- Explanatory variables: various financial positions of the firm (profitability, leverage, interest rate burden...)

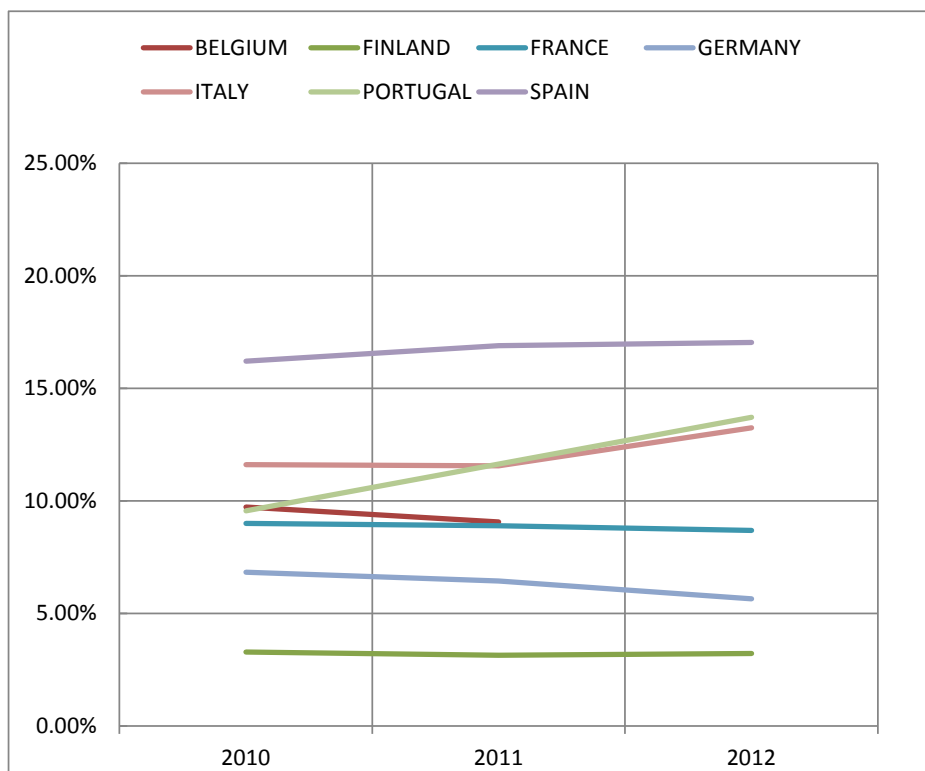
SAFE indicator

- Use coefficients from SAFE survey to generate a SAFE score (i.e. probability of being financially constrained) for each firm based on observable financial variables in the CompNet data
- A country-specific threshold is set on this score, such that the share of constrained firms match the actual share from the SAFE survey over the overlapping years
- For the rest of the years, firms are classified as constrained if their SAFE score is higher than the threshold.

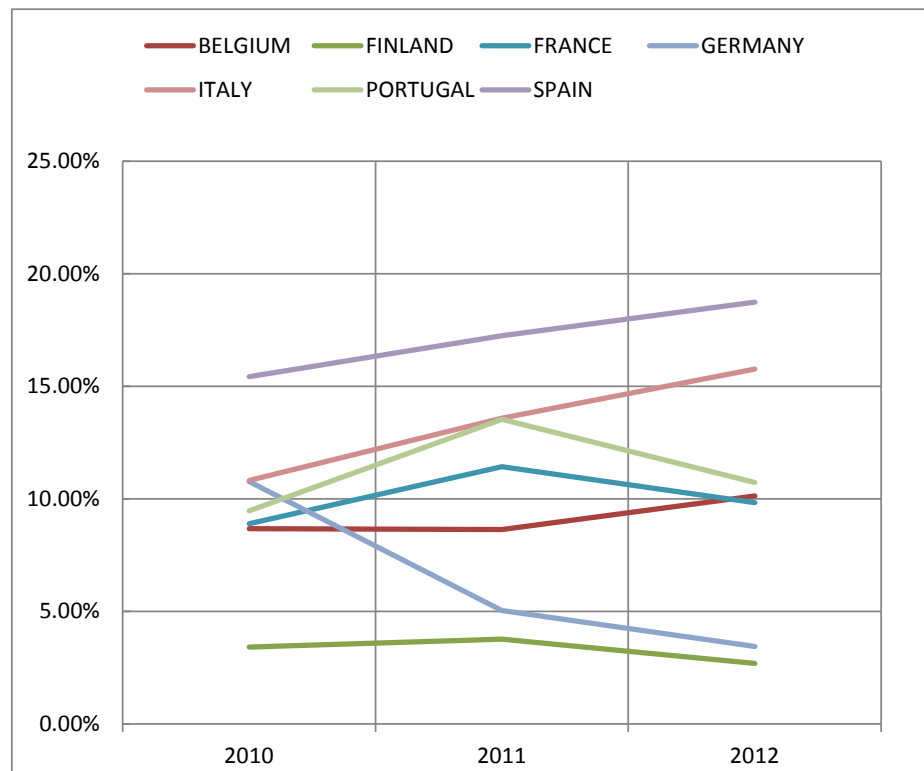
SAFE index: Comparison with benchmark

We compare the share of CC firms according to SAFE published data and the index. Same years; firms with more than 1 employee

CompNet

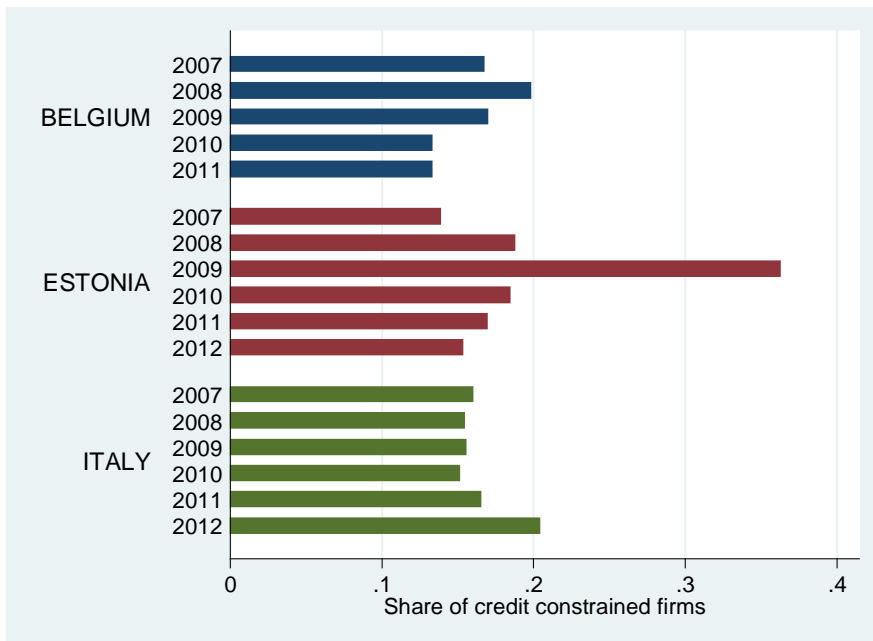


SAFE survey

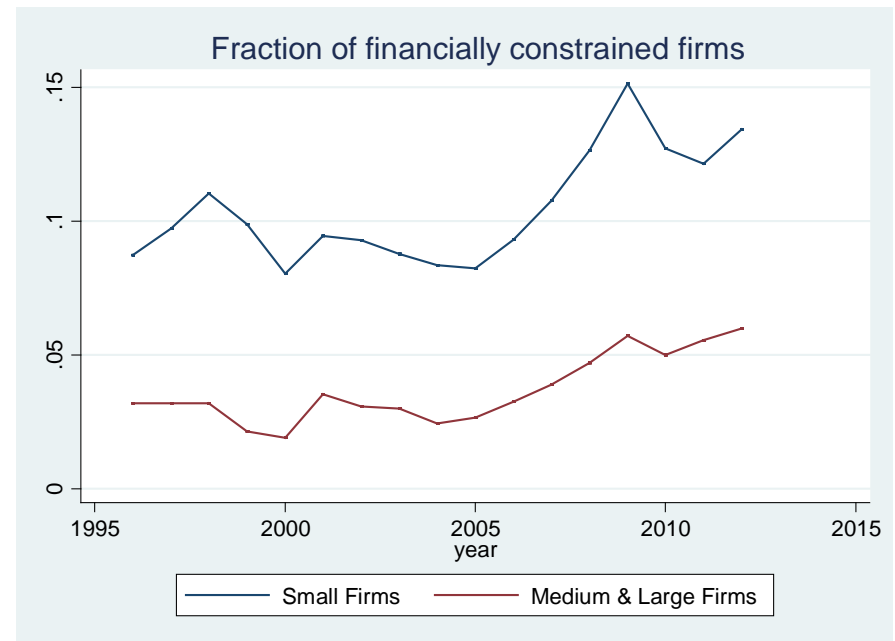


SAFE index: Results

Share of credit constrained firms throughout the crisis: Belgium, Estonia and Italy



Small firms (<50) vs. medium & large (>50); 4 EU countries: BE, IT, EE, SL



The Ferrando-Ruggieri index of credit constraints

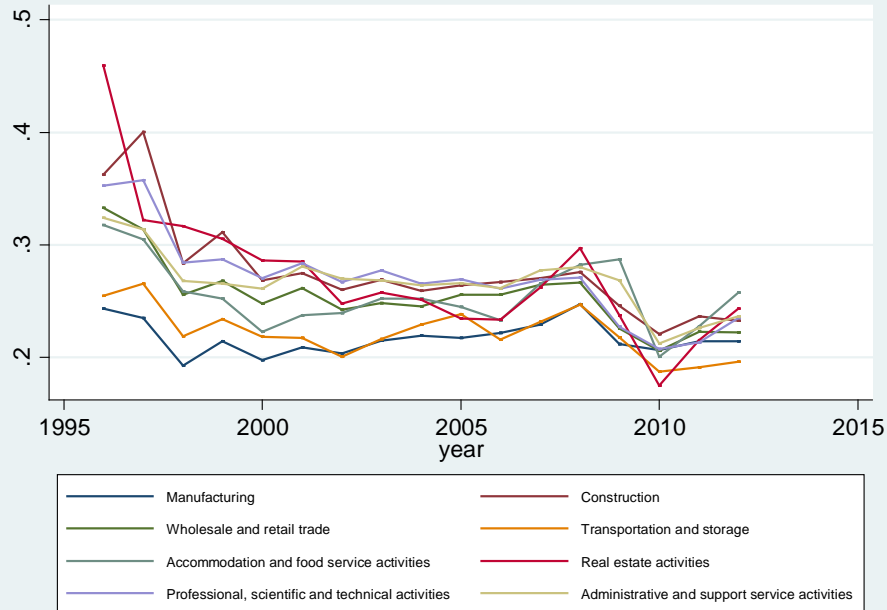
A priori classification (Ferrando-Ruggieri, 2014, Pal-Ferrando, EJM 2010):

- based on a classification scheme of firms' financing conditions, taking into account information derived from balance sheet and profit and loss accounts
- In the regressions we use the share of absolutely constrained firms

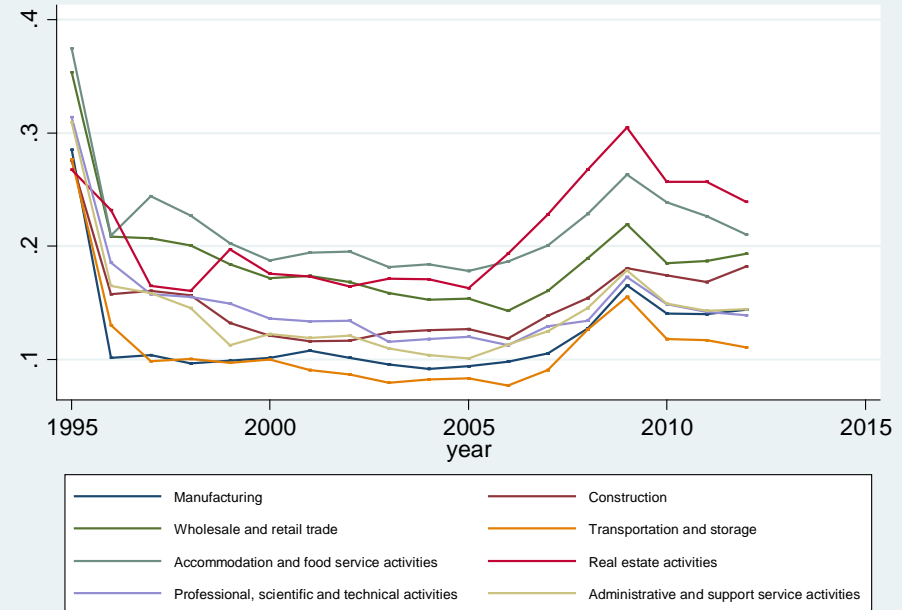
Financing conditions		Total Investment	Financing gap	Changes in total debt	Issuance of new shares	Interest payments
	Absolutely constrained					
10		<0	≥0			
9		≥0	≥0	≤0	≤0	–
	Relatively constrained					
8		<0	<0	>0	≤0	
7		≥0	≥0	≤0	>0	
6		≥0	<0	≤0	–	
5		≥0	≥0	>0	–	≥ MIR c,t
	Unconstrained					
4		≥0	≥0	>0	–	≤MIR c,t
3		≥0	<0	>0	–	
2		<0	<0	≤0	–	
1		<0	<0	>0	>0	

Comparison of both indicators of credit constraints: sector detail

FR index



SAFE index



- Similar results for lowest constrained sectors
 - transportation and storage; manufacturing
- Highest constrained sectors
 - SAFE: real estate; accommodation and food services activities; wholesale and retail trade
 - FR index: construction; administrative and support service activities; accommodation and food services activities & wholesale and retail trade

The impact of credit crunch: full specification

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	dL				drk			
	cycle_GR	sector little collateral	Change in sector CC larger than in country	Change in sector CC larger than in country (second indicator)	cycle_GR	sector little collateral	Change in sector CC larger than in country	Change in sector CC larger than in country (second indicator)
sector demand shifter	0.119 (0.0772)	0.0793 (0.0969)	0.207** (0.0919)	0.168** (0.0734)	0.452*** (0.109)	0.244** (0.100)	0.400** (0.152)	0.481*** (0.140)
dsecc		-0.0177** (0.00872)				-0.0175 (0.0131)		
dSAFE			0.0144** (0.00662)				-0.00261 (0.00961)	
dabsc				0.0102** (0.00504)				0.0110 (0.00871)
cycle_dsecc		0.0432 (0.114)				0.512*** (0.150)		
cycle_dSAFE			-0.0747 (0.0809)				0.107 (0.126)	
cycle_dabsc				-0.0286 (0.125)				-0.0478 (0.171)
cycle_GR	0.263** (0.121)	0.281** (0.107)	0.223* (0.113)	0.172 (0.112)	-0.216 (0.147)	-0.307** (0.147)	-0.118 (0.180)	-0.214 (0.179)
dsecc_GR		-0.0103 (0.0102)				0.0327*** (0.0109)		
dSAFE_GR			-0.00806 (0.00849)				0.0225* (0.0119)	
dabsc_GR				-0.0196*** (0.00648)				-0.0137 (0.0116)
Relative initial productivity, ln	0.832*** (0.0677)	0.839*** (0.0612)	0.825*** (0.0808)	0.805*** (0.0761)	0.576*** (0.0504)	0.573*** (0.0563)	0.569*** (0.0597)	0.559*** (0.0702)
prod_dsecc		0.0126 (0.0829)				0.0386 (0.0542)		
prod_dSAFE			-0.0263 (0.0333)				0.000234 (0.0259)	
prod_dabsc				0.0142 (0.0245)				0.00696 (0.0267)
prod_GR	-0.0302 (0.0318)	-0.0394 (0.0348)	-0.0333 (0.0459)	-0.0318 (0.0385)	-0.0212 (0.0354)	-0.0326 (0.0351)	-0.0289 (0.0541)	-0.00995 (0.0437)
prod_cycle	-1.767*** (0.459)	-1.237** (0.647)	-1.976** (0.744)	-1.738*** (0.451)	-1.579*** (0.544)	-0.803 (0.729)	-1.083 (0.930)	-1.793*** (0.583)
prod_cycle_dsecc		-1.433* (0.835)				-1.943** (0.883)		
prod_cycle_dSAFE			0.0390 (0.518)				-0.595 (0.616)	
prod_cycle_dabsc				-0.457 (0.404)				0.794 (0.552)
prod_cycle_GR	2.086*** (0.640)	0.804 (0.842)	1.044 (1.064)	0.222 (0.562)	1.732** (0.705)	-0.0665 (0.765)	1.111 (1.205)	0.441 (0.542)
prod_cy_GR*(d=1 if sector collateral < median)		2.780** (1.261)				3.799*** (1.367)		
prod_cy_GR*(d=1 if change in sector SAFE > median)			2.143* (1.216)				0.872 (1.485)	
prod_cy_GR*(d=1 if change in sector abscons > median)				3.619*** (0.898)				1.635* (0.898)
crisis	-0.0231*** (0.00529)	-0.0161** (0.00626)	-0.0138* (0.00741)	-0.0102 (0.00618)	-0.0259*** (0.00611)	-0.0403*** (0.00701)	-0.0349*** (0.00845)	-0.0251*** (0.00824)
Constant	0.390*** (0.0290)	0.394*** (0.0275)	0.374*** (0.0304)	0.376*** (0.0296)	0.262*** (0.0275)	0.275*** (0.0310)	0.259*** (0.0303)	0.255*** (0.0314)
Observations	7,924	7,804	5,945	6,077	7,924	7,804	5,945	6,077
Adjusted R-squared	0.406	0.408	0.374	0.390	0.346	0.351	0.336	0.353

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Average employment growth rates computed in new labour code (overlapping countries and years)

Approximation, selected countries and years

Initial quintile/quintile 3 years later	Q1	Q2	Q3	Q4	Q5
Q1	5%	25%	54%	82%	113%
Q2	-20%	0%	18%	49%	97%
Q3	-34%	-14%	0%	19%	78%
Q4	-45%	-31%	-16%	-1%	41%
Q5	-49%	-46%	-36%	-19%	1%

Data 5th wave, selected countries and years

Initial quintile/quintile 3 years later	Q1	Q2	Q3	Q4	Q5
Q1	0%	28%	78%	119%	196%
Q2	-13%	0%	17%	62%	155%
Q3	-21%	-11%	0%	16%	81%
Q4	-24%	-20%	-11%	0%	17%
Q5	-27%	-26%	-23%	-12%	2%

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