Micro Founded Competitiveness Indicators

Chiara Angeloni and Nicola Benatti
CompNet

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Outline

1. Added value of the exercise
2. Set of Indicators and Country-Time Coverage
3. Validation with respect to Eurostat Structural Business Statistics
4. Main findings
5. Conclusion

1.1 Added value of the Dataset

- **Harmonized dataset across country:**
  - Shared methodology for the estimation of the indicators
  - the standardisations in the definition of needed variables

  → all the performance indicators are highly comparable across country and across time

- **Country Coverage:** 1) dataset without threshold: BE, CZ, DE, EE, ES, FR, SI, SK, RO and 2) dataset with threshold 20 employees: BE, CZ, DE, EE, FR, IT, PL, SI, SK, RO

- **Time Coverage:** the time horizon covered by the datasets is country-specific and ranges between 1995 and 2011.This allows to assess the pre and post crisis dimension

- **Sectorial Coverage:** 60 selected sectors based on NACE rev.2 industry classification, disaggregation level at 2 digits

- **Unique set of results** in terms of estimation of productivity indicators and their decompositions

- The aggregation of firm level indicators allow to **overcome confidentiality issues**

- **POLICY USE: improve competitiveness analysis at macro level**

1.2 Added value of the Methodology

- **Firm Balance Sheet** variables
- **Industry and Country specific deflators**: country specific deflators in national currency. For the sectors in the category "Industry": Eurostat Industry producer prices index (NACE Rev. 2) from Eurostat. For the categories "Constructions" and "Services": AMECO aggregated deflators.
- Creation of 5 **size classes** based on number of employees (<10, 10<I<20, 20<I<50, 50<I<250, I>250)
- **Estimation of Total Factor Productivity** → Wooldridge 2009 methodology, GMM with year dummies, using real value added.
- TFP and the productivity decomposition have been estimated with/without size class and with/without the p1 and p99 of the TFP distribution.
- Specific **set of weights** for the calculation of the Olley-Pakes Decomposition of capital productivity, labour productivity and TFP.

2. Set of Performance Indicators and Country-Time Coverage

2.1 Performance Indicators

- **Indicators:**

- Number of Employees
- Real value added (RVA)
- Capital/Labour Ratio
- Labour Productivity
- Capital Productivity
- Wage Share
- Unit Labour Cost (ULC)
- Total Factor Productivity (TFP)
- Covariances between Size (ln L) and TFP, ULC, Wage Share, Labour Productivity

- Olley-Pakes Decomposition of: Labour Productivity (weights: number of employees), Capital Productivity (weights: total asset), TFP (inputs weights and output weights)
- Foster Decomposition of TFP, Labour Productivity, ULC with 2 year lag and 5 year lag

- **Descriptive Statistics:**
  - Number of obs.
  - Mean
  - Standard deviation
  - Percentiles: 1, 10, 25, 50,75, 90 , 99
  - Maximus
  - Minimum
  - Interquartile Range
  - Skewness

  - K-parameter of TFP distribution

2.2 Country-Time Coverage

Country	Total Number of Firms, year average		Time Range	
	Full sample	Of which over 20 employees	Full sample	Of which over 20 employees
BE	66884	7755	1996-2011	1996-2011
CZ	24230	12076	2005-2010	2005-2010
DE	25167	19634	1997-2010	1997-2010
EE	11588	1855	1995-2010	1995-2010
ES	245121	n.a.	1995-2011	n.a.
FR	342738	55042	1995-2009	1995-2007
HU	n.a,	n.a.	n.a.	n.a.
IT	n.a.	3007	n.a.	2002-2011
PL	n.a.	18014	n.a.	2002-2011
PT	115723	n.a.	2006-2009	n.a.
SI	16700	2143	1995-2011	1995-2011
SK	4386	4105	2000-2011	2000-2011
RO	115846	16990	2003-2011	2003-2011
EFIGE	n.a.	14759	n.a.	2001-2008

3. Validation with respect to Eurostat Structural Business Statistics

Means, correlations and correlations of growths with respect to Eurostat variables (2008-2010) for manufacturing for:

1) Number of firms
2) Number of employees
3) Turnover

Sample Representativeness			
Country	**Firms**	**Employees**	**Turnover**
BELGIUM	43%	93%	94%
CZECH REPUBLIC	25%	76%	
ESTONIA	82%	77%	
FRANCE	48%		90%
GERMANY	15%	56%	68%
PORTUGAL	59%	89%	91%
ROMANIA	64%	81%	
SLOVAKIA	31%	96%	98%
SLOVENIA	43%	86%	93%
SPAIN	63%	65%	68%

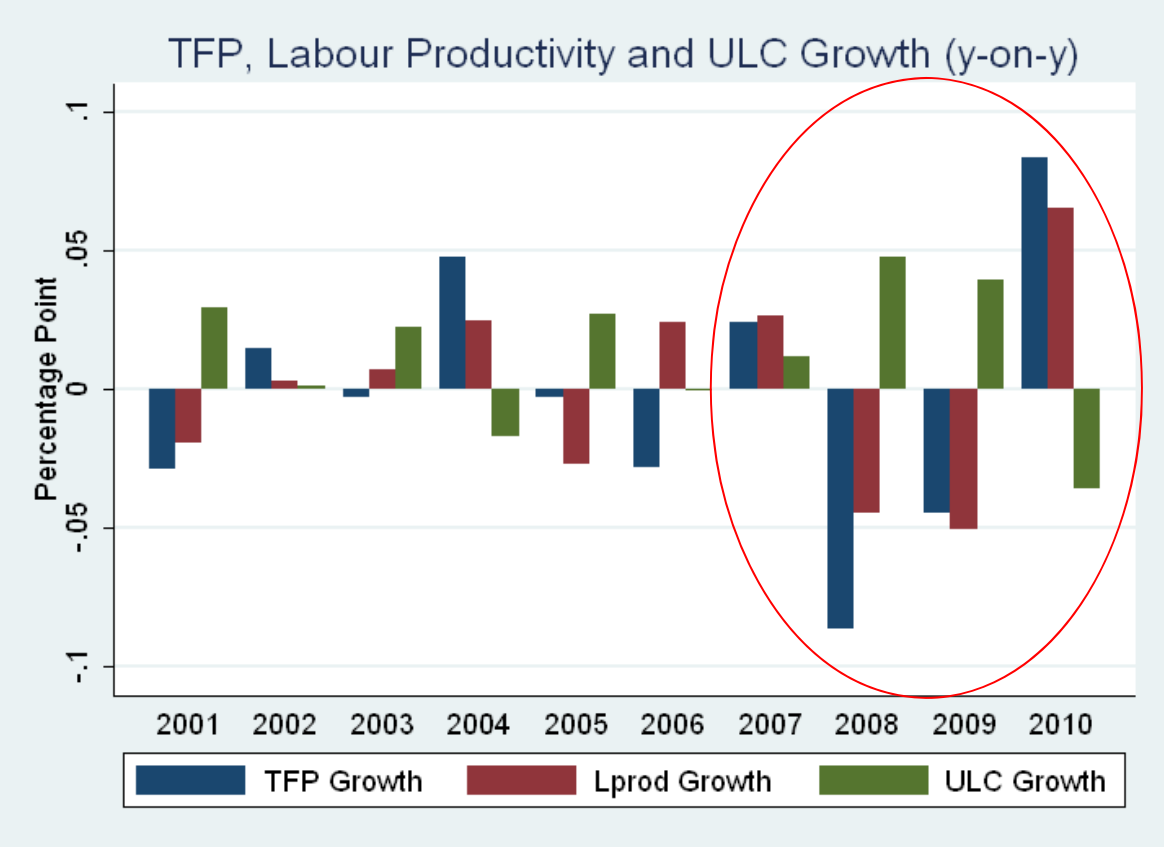
3. Validation with respect to Eurostat Structural Business Statistics (cont)

	CORRELATION			GROWTH CORRELATION		
Country	Firms	Labour	Turnover	Firms	Labour	Turnover
BELGIUM	0.9741*	0.9829*	0.7350*	0.9465*	0.9186*	0.7762*
CZECH REPUBLIC	0.7191*	0.9592*	0.9769*	0.9239*	0.9700*	0.9817*
ESTONIA	0.9074*	0.8159*	0.7101*	0.8347*	0.8944*	0.8347*
FRANCE	0.8463*		0.9404*	0.9666*		0.9889*
GERMANY	0.6185*	0.8424*	0.9713*	0.6645*	0.8238*	0.9472*
PORTUGAL	0.9875*	0.9974*	0.9557*	0.9837*	0.9903*	0.9943*
ROMANIA	0.9954*	0.9915*	0.9503*	0.9811*	0.7007*	0.6710*
SLOVAKIA	0.3360*	0.8536*	0.9948*	0.4922*	0.9203*	0.9599*
SLOVENIA	0.9603*	0.9774*	0.9917*	0.9820*	0.9752*	0.9899*
SPAIN	0.7577*	0.8958*	0.8893*	0.8192*	0.8014*	0.7668*

4. Main findings from preliminary graphical analysis

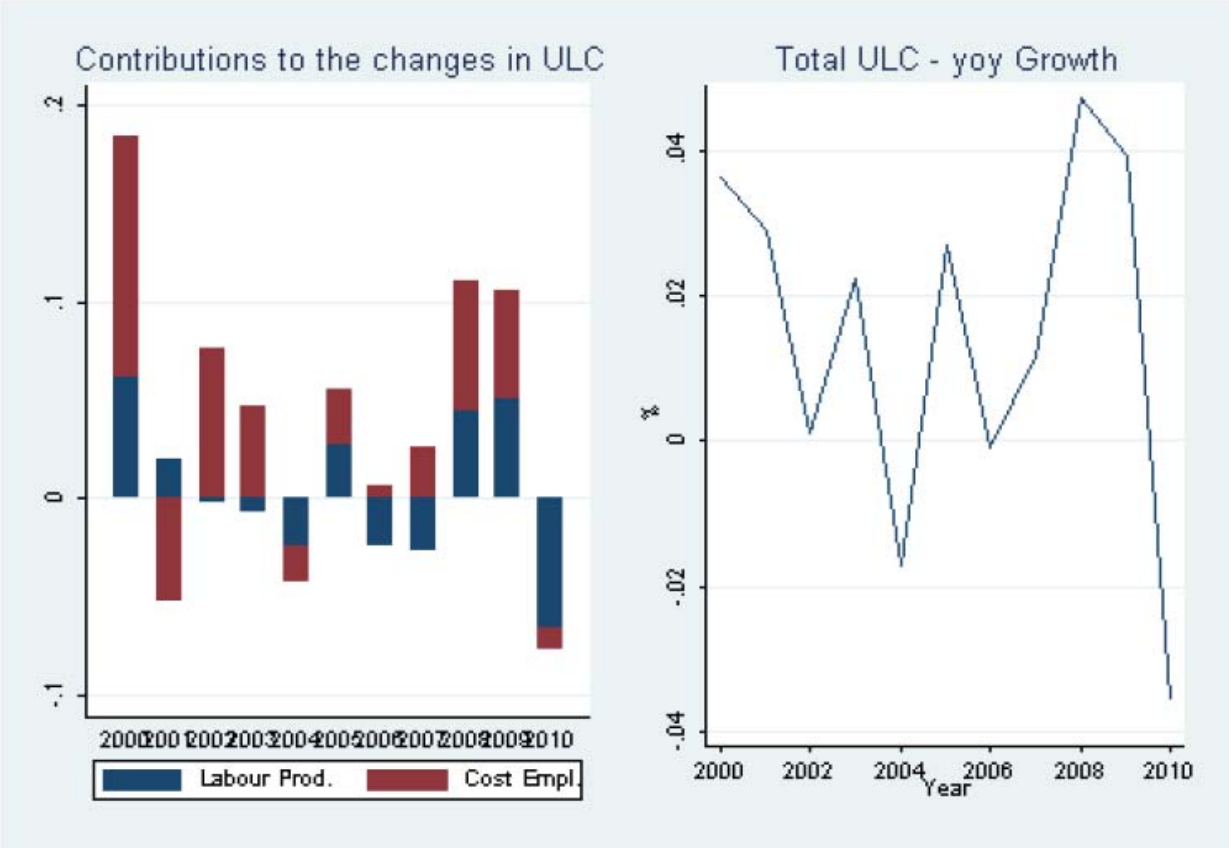
4.1 TFP, Labour Productivity and ULC growth

Productivity measures (TFP and Lab. Prod) and competitiveness indicators (ULC) exhibit diverging pre and post crisis patterns (results for Germany).



4.2 Decomposing ULC

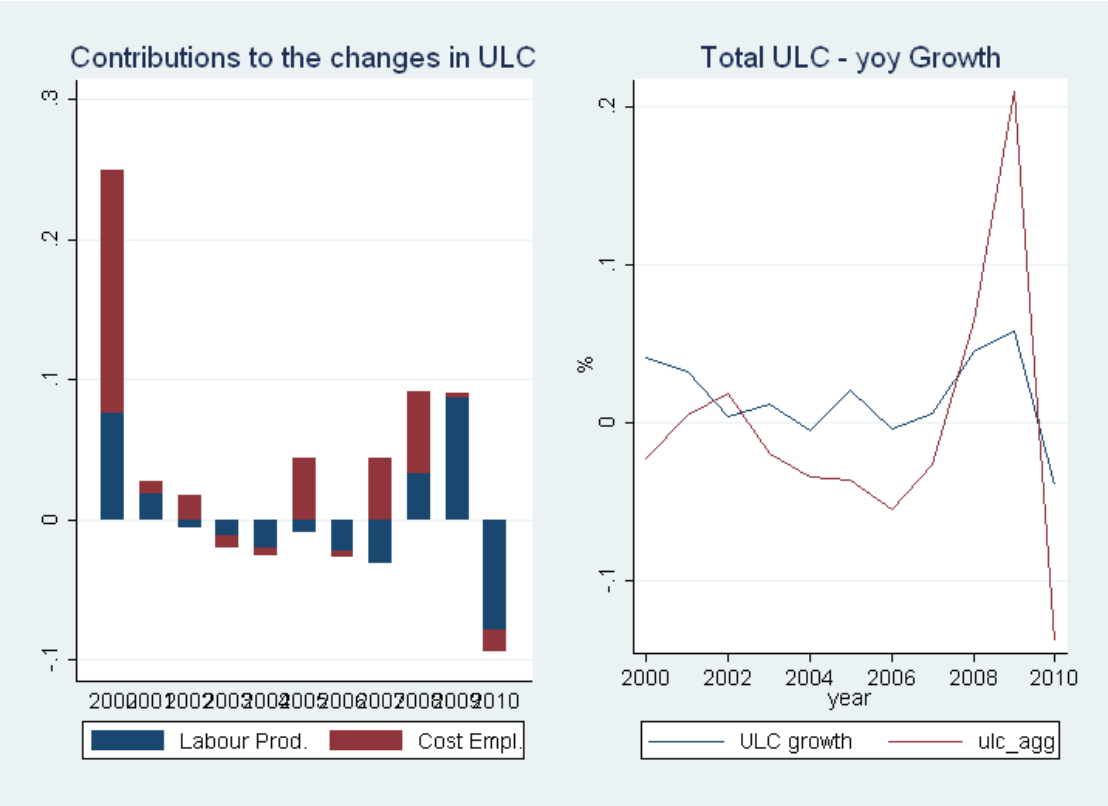
Labour productivity and cost of employee's contributions to ULC growth over time (results for Germany).



Note: labour productivity changes, contributing negatively to ULC growth, enter with opposite sign in the chart.

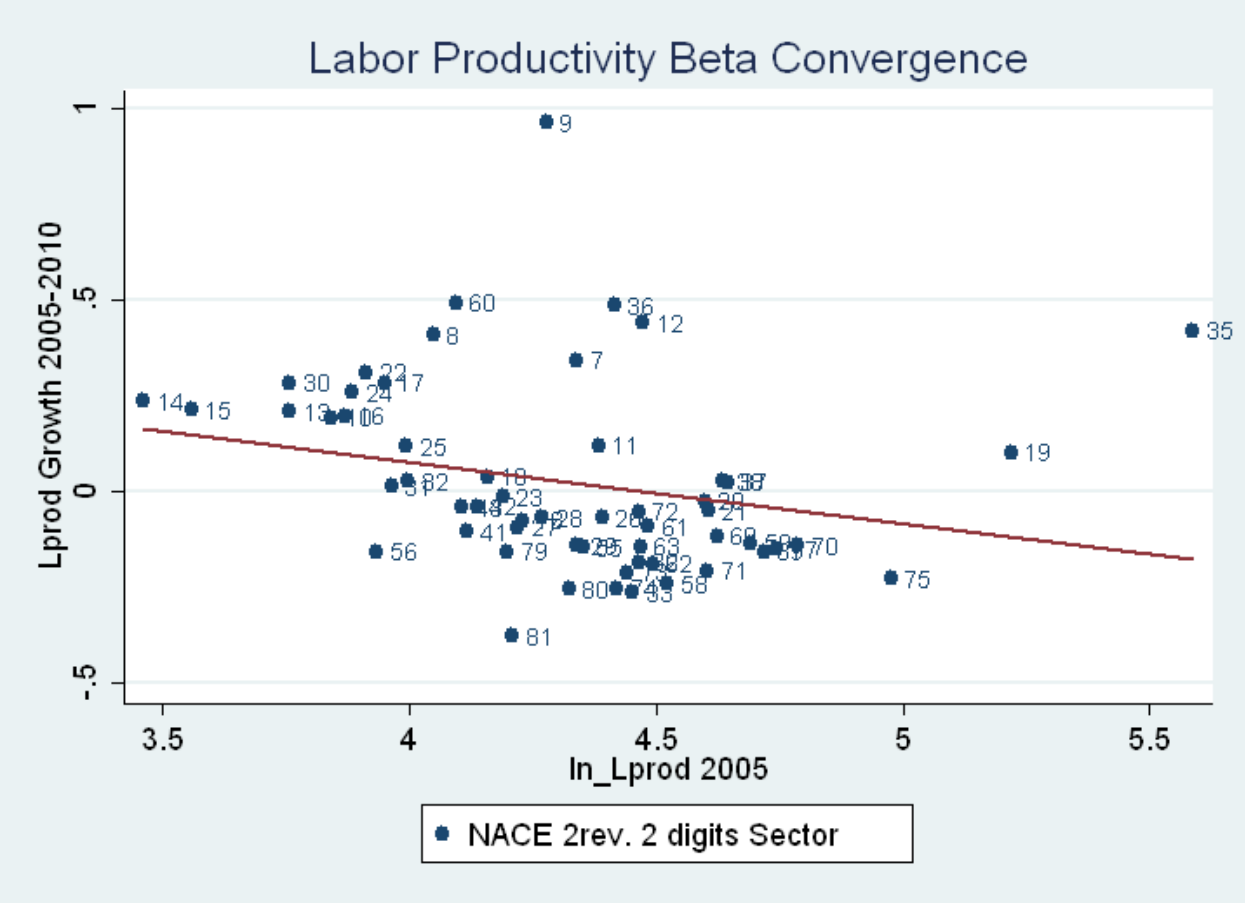
4.3 Micro and Micro

Rather consistent pattern of the aggregate and micro-based measures of ULC, although higher volatility of the former (results for Germany, manufacturing sector).



Note: labour productivity changes, contributing negatively to ULC growth, enter with opposite sign in the chart.

4.4 Sectorial Productivity Catching Up



Sectors with lower productivity tend to catch up over time in Belgium.
(results for Belgium)

4.5 Sectorial Productivity Catching Up (cont)

	Beta Coefficient	T statistic
BE	-0.0525***	0.00610
CZ	-0.0369***	0.0106
DE	0.0837***	0.0210
EE	-0.0295***	0.00504
ES	-0.0369***	0.00631
FR	-0.0274***	0.00735
SI	-0.0426***	0.00626
SK	-0.0476***	0.00586
RO	-0.0359***	0.00839

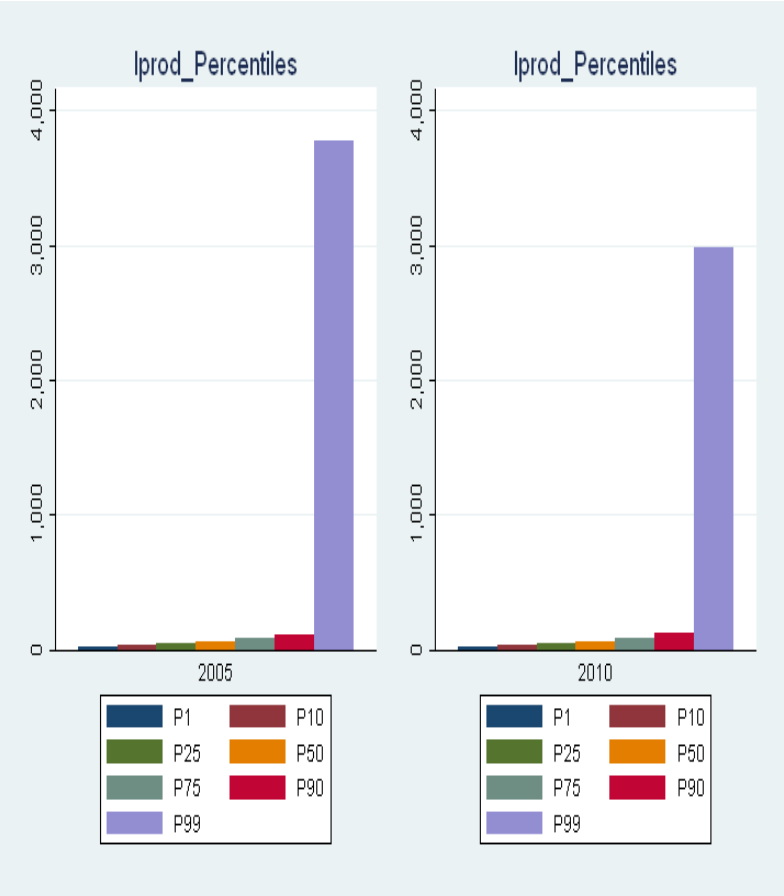
Note: Computation with the unrestricted sample.

Countries can be ranked according to their speed of catching up across sectors. For the period 2005-2010, for instance, Belgium is best performer whereas German sectors do not experience labour productivity catching up.

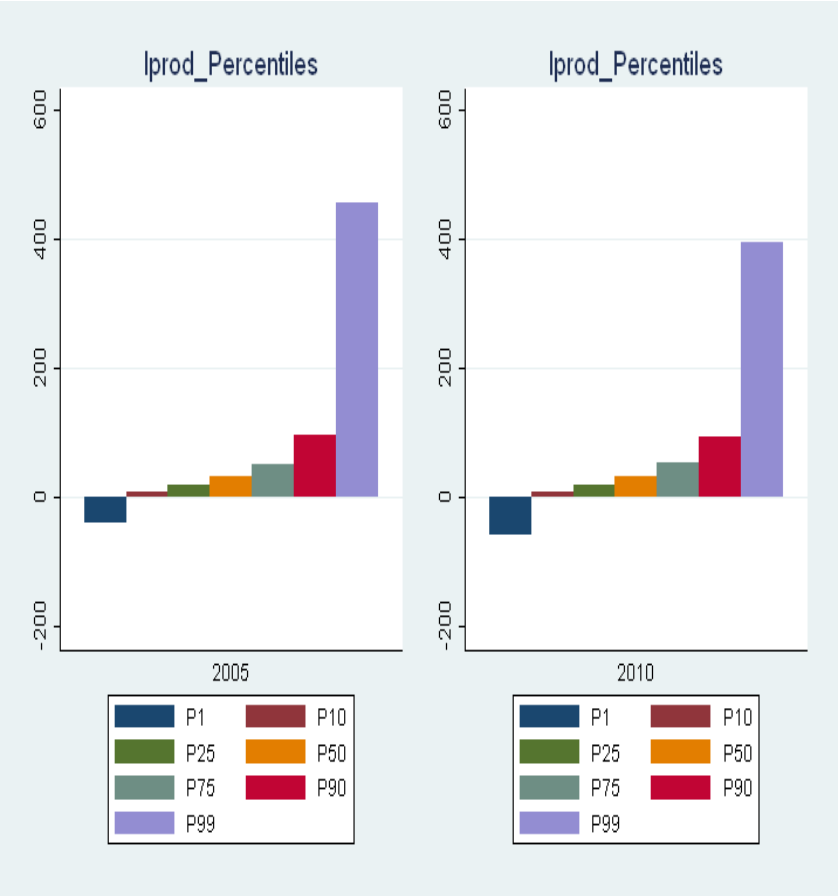
4.6 Labour Productivity Heterogeneity

Labour Productivity distribution is very skewed in Germany , whereas the dispersion is lower across Spanish firms.

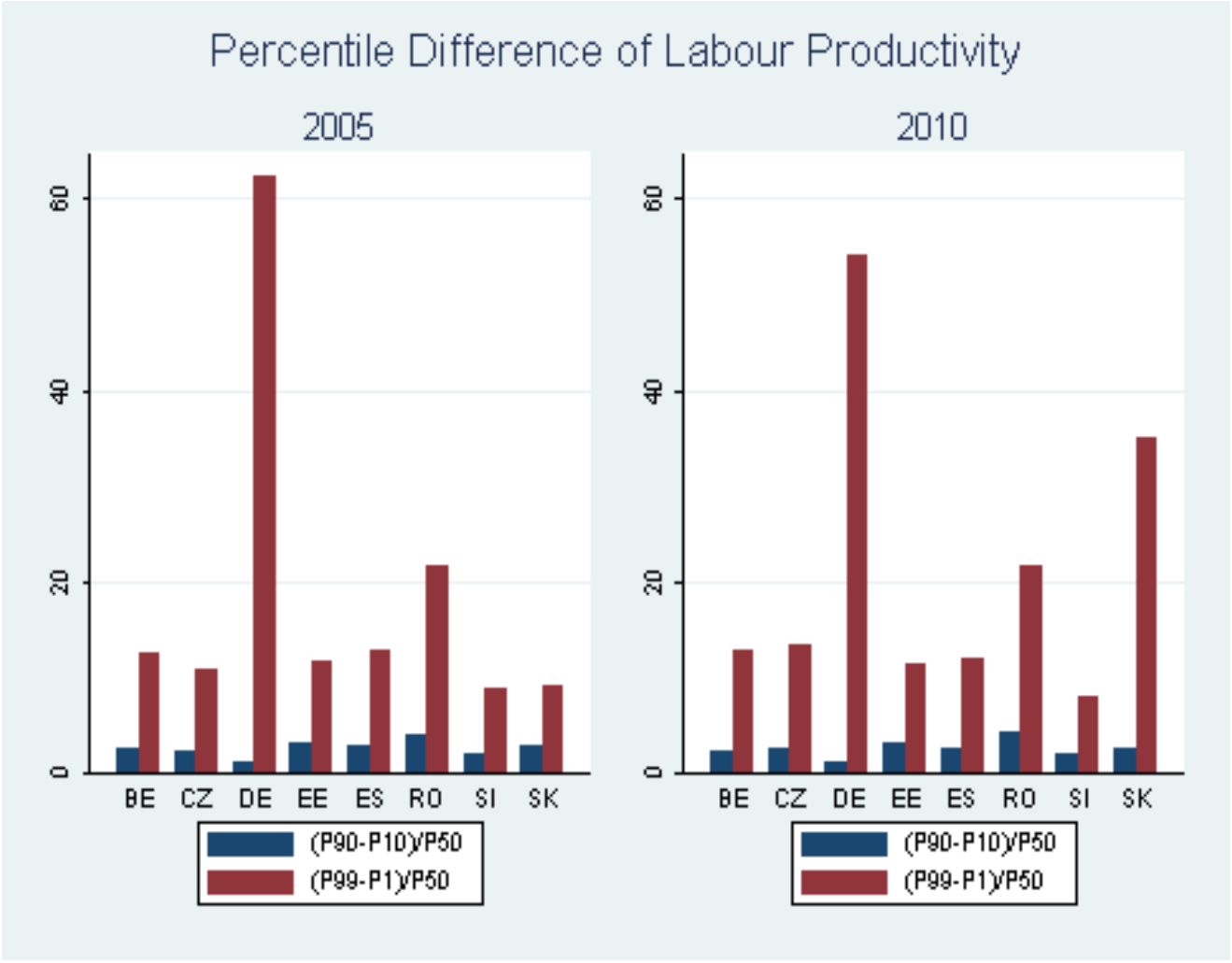
Germany



Spain



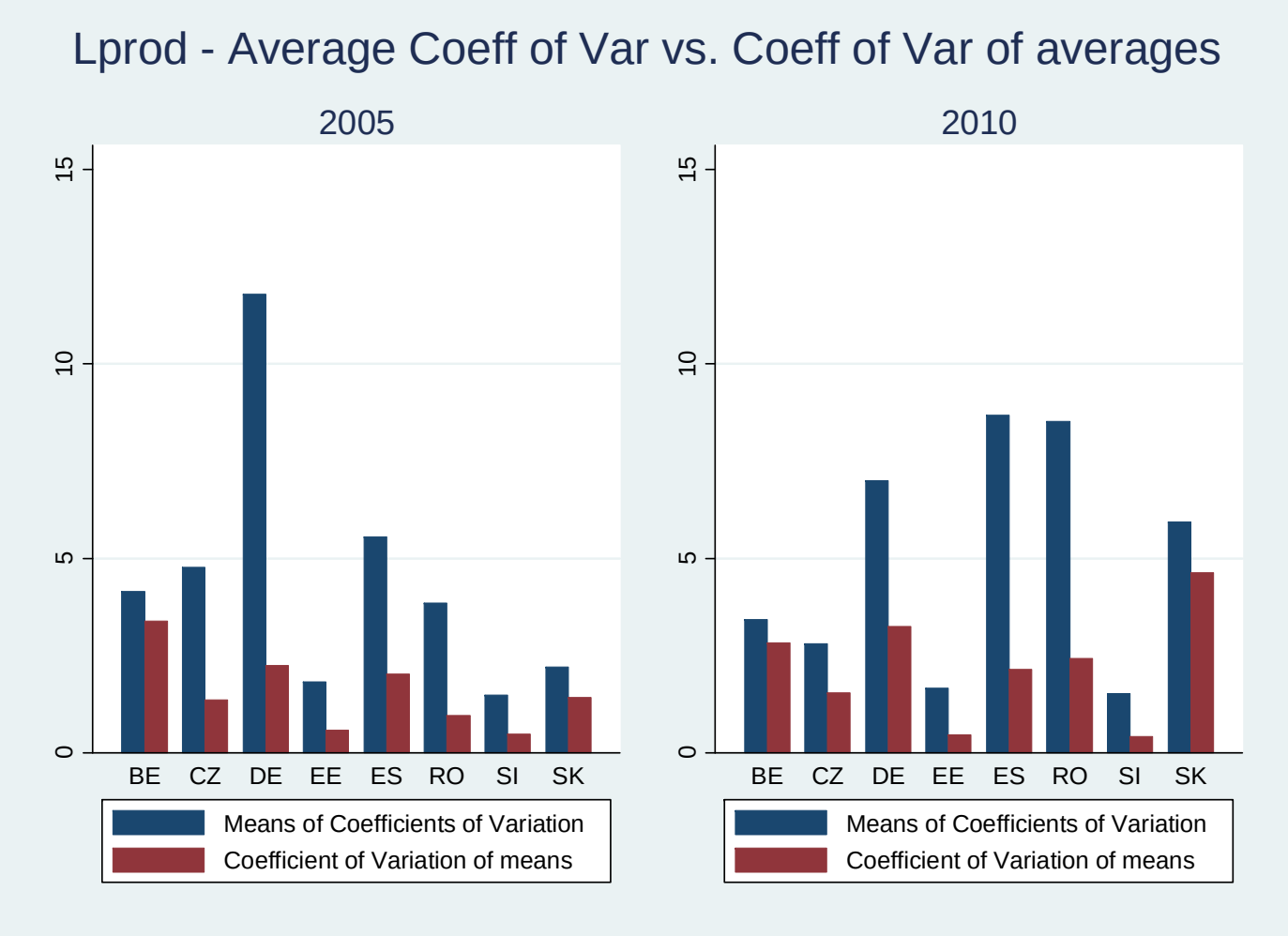
4.7 Labour Productivity Heterogeneity (cont)



- Crisis left unchanged productivity dispersions over country.
- The skewness is the highest in Germany.

Note: Computation with the unrestricted sample.

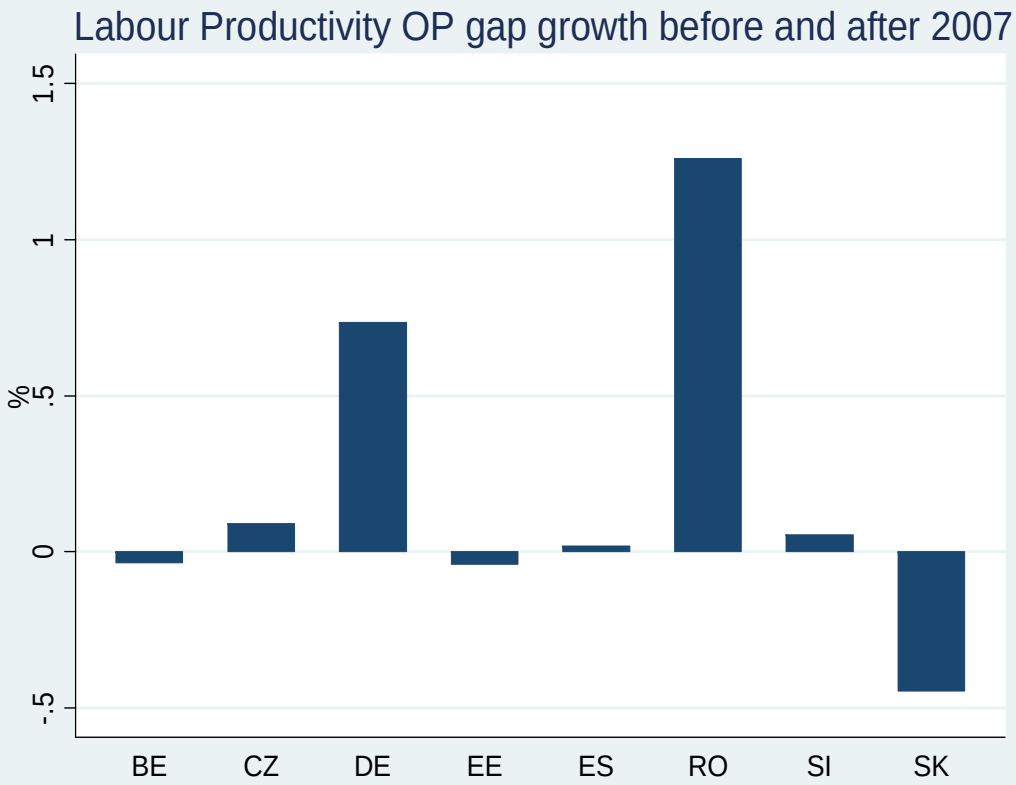
4.8 Labour Productivity Heterogeneity (cont)



Heterogeneity across sectors (red bar) is lower than heterogeneity within sectors (blue bar) across countries.

Note: Computation with the unrestricted sample.

4.9 Labour Productivity OP Gap Growth before and after the crisis



OP Decomposition

$$\Omega_t = \sum_i \theta_{it}\omega_{it} = \overline{\omega}_t + \sum_i (\theta_{it} - \overline{\theta}_t)(\omega_{it} - \overline{\omega}_t)$$

Where:

Ω_t **is industry index**
ω_{it} **is firm-level productivity**
θ_{it} **is the share of activity for the firm** i
$\overline{\theta}_t$ **and** $\overline{\omega}_t$ **are the un-weighted industry average of firm measures**

Note: Computation with the unrestricted sample.
Averages before crisis: 2005, 2006, 2007 and averages after crisis: 2008, 2009, 2010.

Conclusion

- **Four main preliminary findings:**

1. The aggregate and micro-based measures of ULC exhibit a consistent pattern for Germany, with some variations.
2. Countries have experienced a catching up process of labour productivity across sectors, however the rate of convergence is country-specific.
3. Labour productivity across firms is very skewed and this is persistent over time. In general within-sector heterogeneity is larger than across sector.
4. The OP gap confirms the role of resource reallocation: the latter is a fundamental (relatively undiscussed) channel of adjustment in the crisis.

- The output results will be used as inputs by the various WS2 research projects. Morover, they should trigger a significant improvement in the assessment of competitiveness (better indicators, link with macro).

- **Next challenges and steps:**
  - Strengthening cooperation with NCBs to fix the remaining glitches in data
  - Starting a discussion of the 'first best' indicators / comparisons with macro, also given the ongoing research projects in WS2

Thanks to all of you for great collaboration!

http://www.ecb.int/home/html/researcher_compnet.en.html

Appendix:

Variables in the Dataset
Country-Specific Notes
Methodology for OP Decomposition

Indicators	Description	Var_list		
		Level	Log	First difference d_lny = lny - lny[_n-1])
Number of Employees			lnl	d_lnl
Real value added (RVA)	Value Added/Deflator	rva	lnrva	d_lnrva
Capital/Labour Ratio	K/L	k_l	lnk_l	
Labour Productivity	RVA/L	rva_l	lnrva_l	d_lnrva_l
Capital Productivity	RVA/RK deflated K)	capitalprod	lncapitalprod	
Wage Share	W*L)/VA	wageshare		d_wageshare
Unit Labour Cost (ULC)	LC/RVA	ulc	lnulc	d_lnulc
Total Factor Productivity (TFP)	Wooldridge 2009 methodology GMM with year dummies)		tfp	d_tfp
Covariance with Size (ln L)	Covln L, TFP):	lnl_tfp_corr		
	Covln L, ln ULC)	lnl_lnulc_corr		
	Cov ln L, Wage Share)	lnl_wageshare_corr		
	CovL, lnRVA_L)	lnl_lnrva_l_corr		
Productivity Decomposition:				
Olley-Pakes Decomposition of:	Labour Productivity	Weighted by number of employees		
	Capital Productivity	Weighted by total asset		
	TFP	Inputs weights and Output weights		
Foster Decomposition of TFP	2 Year Lag	TFP, Labour Productivity, ULC		
	5 Year Lag	TFP, Labour Productivity, ULC		

Country	Needed Variables					
	Number of employees	Total assets (Capital)	Material costs	Cost of Employees	Added value	Turnover
BE	Average full time employment	Tangible fixed assets	Intermediate inputs in VAT (declarations)	Total Wages + employer's contributions to obligatory social security funds	Added value as reported in annual accounts	Total sales in VAT (declarations)
CZ	Total employment: Average full time employment available until 2007 only. I use average employment not at the end of period).	Tangible asset at the beginning of the period needed for production function estimation).	Available (materials without energy etc.).	Wages without employer's contributions. Note that employer's contributions are fixed percentage amount of wages.	Total sales turnover) - intermediate inputs: Measure based on total sales is available. Defined at current prices.	Receipts from sales of products and services.
DE	mixed	Tangible assets (intangible assets excluded)	Expenses for raw, auxiliary and process materials, for purchased goods + expenditure on external services	Wages and salaries + social security and expenditure on pension schemes and other benefits	Gross value added: turnover + increase in finished and unfinished goods + other company-produced additions to plant and equipment + other operating income – material costs – other operating expenses – other takes	
EE	Number of employees at the end of the year	Tangible assets (intangible assets excluded)	Intermediate inputs not separated in energy and other non-storable supplies or raw materials)	Wages + employer's contributions to obligatory social security funds	Total sales (turnover) - intermediate inputs	

Country	Needed Variables					
	Number of employees	Total assets Capital)	Material costs	Cost of Employees	Added value	Turnover
PL	Total employment	Balance sheet value of total assets	Material cost including energy	Costs of wages plus employee benefits social contributions, employee social funds etc).	Total sales – intermediate inputs as defined above	Total sales
SI	Average number of employees based on the number of work-hours in the period	Balance sheet value of total assets including tangible and intangible assets, financial investments, operating receivables)	Intermediate inputs i.e. costs of merchandise, material, services, and other operating expenses, excluding labour costs and write-downs in value)	Labour costs including wage bill, retirement insurance costs, other social insurance costs, other labour costs)	Gross operating returns minus intermediate inputs [note: gross operating returns include net sales turnover), net increase in the value of inventories of product and work in progress, capitalised own product and services, other operating revenues subsidies, grants, allowances, compensation, ..)	Net sales net revenues from sales of products, services, goods and material, on domestic and foreign markets)
SK	Average full time employment	Tangible assets	Material costs including energy	Wages + employer's contributions to obligatory social security funds	Production - intermediate inputs	Gross turnover
RO	First best	First best	First best	First best	Second best	
EFIGE	Amadeus	Amadeus	Amadeus	Amadeus	Amadeus	Amadeus

Methodology for the creation of weights for the OP Decompostion

Olley-Pakes Decomposition:

- **Labor Productivity**

Weight in OPD→ $\theta_{it} = {}^{l_{it}}/_{\sum_i l_{it}}$

- **Capital Productivity**

Weight in OPD→ $\theta_{it} = {}^{k_{it}}/_{\sum_i k_{it}}$

- **TFP**

Weight in OPD→ 1) $\theta_{it} = {}^{RVA_{it}}/_{\sum_i RVA_{it}}$

$$2)\ xqm_{it} = 0.5 * \left((m_{it}/RVA_{it})(m_{it-1}/RVA_{it-1})\right)$$

$$xqe_{it} = 0.5 * \left((lc_{it}/RVA_{it})(lc_{it-1}/RVA_{it-1})\right)$$

$$imp_{it} = \left((m_{it}{}^{xqm_{it}})(l_{it}{}^{xqe_{it}})\left(k_{it}{}^{(1-xqm_{it}-xqe_{it})}\right)\right)$$

$$\theta_{it} = {}^{imp_{it}}/_{\sum_i imp_{it}}$$