Globalization and the fall of markups

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The views expressed herein belong to the author and have not been endorsed by Narodowy Bank Polski.

Motivation

- **Secular trend in markups**
  - **Long-run rise in markups in the US** (Barkai, 2016; Caballero, Farhi, and Gourinchas, 2017; De Loecker and Eeckhout, 2017; Eggertsson, Robbins, and Wold, 2018; Hall, 2018).
  - **Heterogeneity outside the US, i.e., rising markups in advanced economies and stable in emerging countries** (De Loecker and Eeckhout, 2018; Diez, Leigh, and Tambunlertchai, 2018; Weche Gelübcke and Wambach, 2018)
  - Evidence on the role of superstar (Diez, Leigh, and Tambunlertchai, 2018) and reallocation towards high-markup sectors in US (Baqaee and Farhi, 2017)
- **Globalization (vertical specialization)**
  - Increasing degree of vertical specialization over past two decades and development of global value chains (Baldwin, 2012).
  - Positive effects of vertical specialization for converging CEE economies (Hagemejer and Mućk, 2019).
  - Asymmetric gains and GVC participation $\Longrightarrow$ *smile curve*.
- **Offshoring, exporting and markups**
  - **Direct evidence**: export premium in markups for Slovenian manufacturing in the 90ties De Loecker and Warzynski (2012) and export & import premium in markups at the centre of European GVC , i.e., France, Germany, Italy, Spain (Békés, Hornok, and Muraközy, 2016).
  - **Indirect evidence**: mixed evidence on role of offshoring in the decline in the labor share (Elsby, Hobijn, and Sahin, 2013; Gutiérrez, 2017; Autor, Dorn, Katz, Patterson, and Van Reenen, 2017).

Contribution

1. We document a secular fall in markups in a converging economy (Poland).
   - The documented decline in markups is robust to a choice of empirical strategy (measurement and estimation).
2. We show that falling markups in converging economy can, to a large extent, be explained by globalization trends and GVC position.
   - increasing dependence on foreign suppliers of inputs (with the largest effect in manufacturing)
   - competition becomes fiercer on foreign markets
   - almost neutral effect of distance to final demand due to larger heterogeneity of changes across industries
3. In addition, the fall in markups can be explained by a lack of global superstar firms.
4. We document so called smile curve which describes the relationship between distance to final demand/ GVC participation and markups.

Data

- Data
  - Annual firm-level data, covering years 2002-2016 from offical statistcs.
  - Financial reports and balance sheets of all Polish enterprises employing more than 9 employees.
  - Limitations:
    - No info on NACE rev.2 code for almost 21 thousand observations before 2005,
    - Initial sample: almost 0.77 million observations, in 10.3% cases – no information or no capital, 19.9% - no information or non-positive value added measures, jointly 0.58 million of usable observations (75.1% of initial sample)
    - Additionally, about 1.6 thousands observations (0.3%) from small sectors were dropped
  - Final sample: over 0.576 million observations on 82 thousand firms, observed for 6.4 years on average.
  - Data coverage: around 75% of value added and employment in the enterprise sector

Coverage

- Most important variables: **Value added** (according to the national account definition), **Employment** (full-time equivalent), **Capital** (measured as the beginning of period book value of fixed assets: buildings, machinery and vehicles).
- Value added, output, intermediate consumption and capital prices are taken from the Eurostat (measured at the industry level)

Methodology

- Methodology proposed by De Loecker and Warzynski (2012)
- The production function of a firm is: $Q(\Omega_{it}, V_{it}, K_{it}) = \Omega_{it} F_t(V_{it}, K_{it})$ where Ω_{it} is Hicks-neutral productivity, K_{it} is capital and V_{it} is a set of variable inputs
- The Lagrangian associated with the cost minimization problem is:

$$\mathcal{L}(V_{it}, K_{it}, \Lambda_{it}) = P_{it}^V V_{it} + r_{it} K_{it} - \Lambda_{it}(Q(\cdot) - Q_{it})$$

- When we define the markup μ as a price over marginal cost $\mu_{it} \equiv \frac{P_{it}}{\Lambda_{it}}$ a FOC can be rearranged as:

$$\mu_{it} = \theta_{it}^V \frac{P_{it} Q_{it}}{P_{it}^V V_{it}}.$$

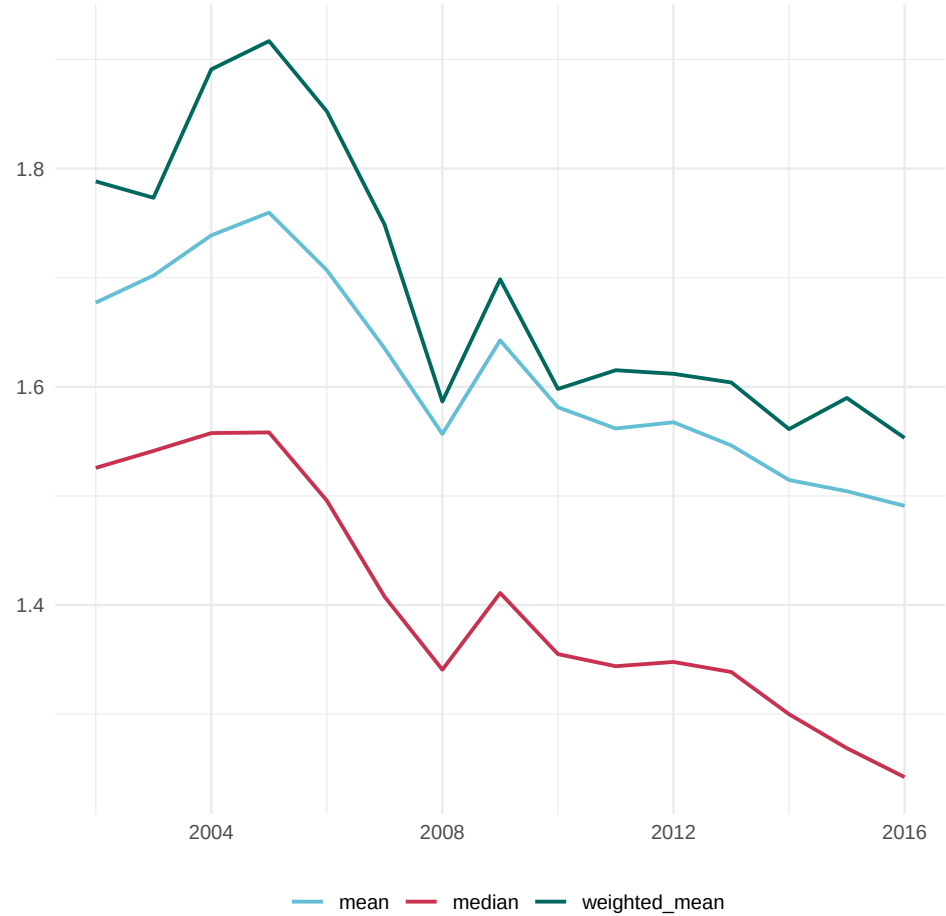
- We assume that labor is a variable input with no adjustment costs Discussion
- As we observe industry specific prices, the markup is identified up to a constant
- Estimation of production function
  - We use a translog production function (small letters denote variable in logs):

$$\tilde{q}_{it} = \beta_l l_{it} + \beta_k k_{it} + \beta_{ll} l_{it}^2 + \beta_{kk} k_{it}^2 + \beta_{lk} l_{it} k_{it} + \omega_{it} + \epsilon_{it}$$

  - controlling for the simultaneity, as in Ackerberg, Caves, and Frazer (2015)
  - We also control for firm exit, to account for selection bias, Olley and Pakes (1996)

Baseline results

Figure: Median, unweighted and weighted mean markups



- Falling tendency of median and means, both unweighed and weighted (by sales)
- 70% of firms experienced a fall of markups in 2002-2016
- Production function estimates:

#1 #2

Robustness check

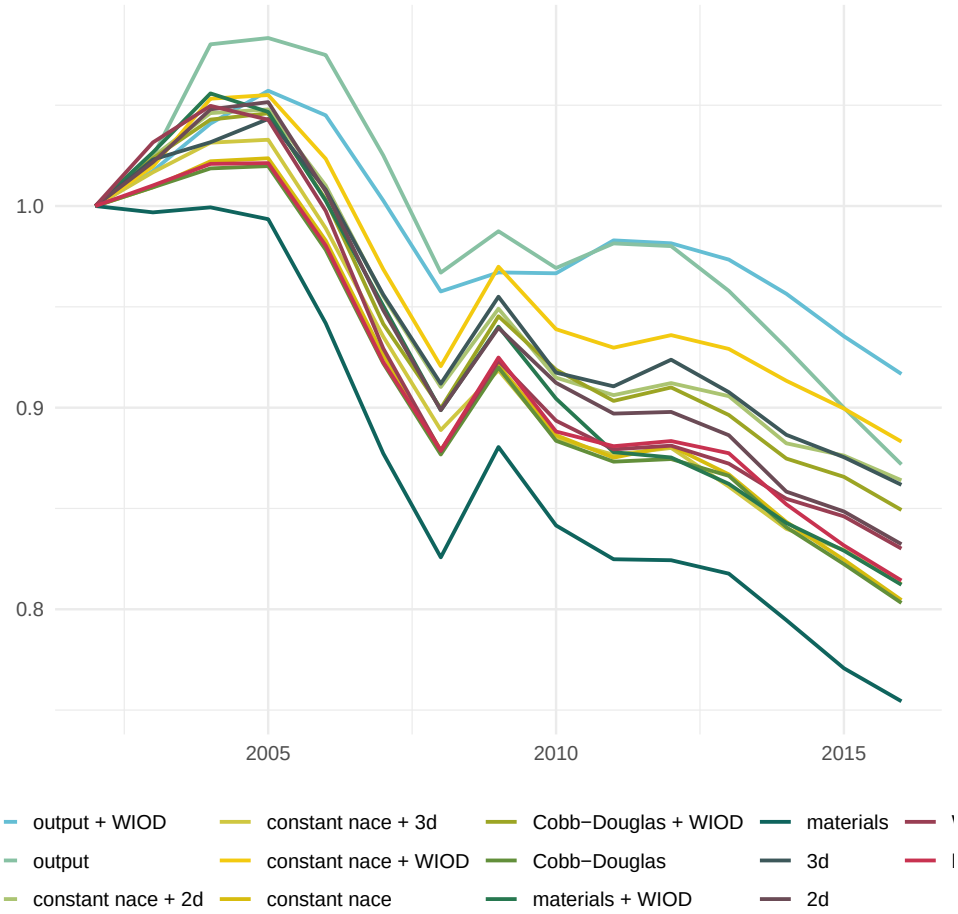


Figure: Evolution of median markups for different markup estimations

- Robustness
  - **WIOD, 2d, 3d** – we estimate PF parameters separately for WIOD, NACE-2digit and NACE-3digit sectors respectively
  - **materials** – we use materials instead of intermediate consumption as a proxy variable in PF estimation
  - **Cobb-Douglas** – we estimate CD production function instead of translog
  - **constant nace** – almost 15% of firms change their NACE code. In such cases, we keep NACE constant at the most recent value
  - **output** – we estimate PF for global output
- Rising dispersion in markups: #1 #2

Limited role of reallocation, entrants and exiters

Figure: Olley and Pakes (1996) decomposition, cumulated change since 2002

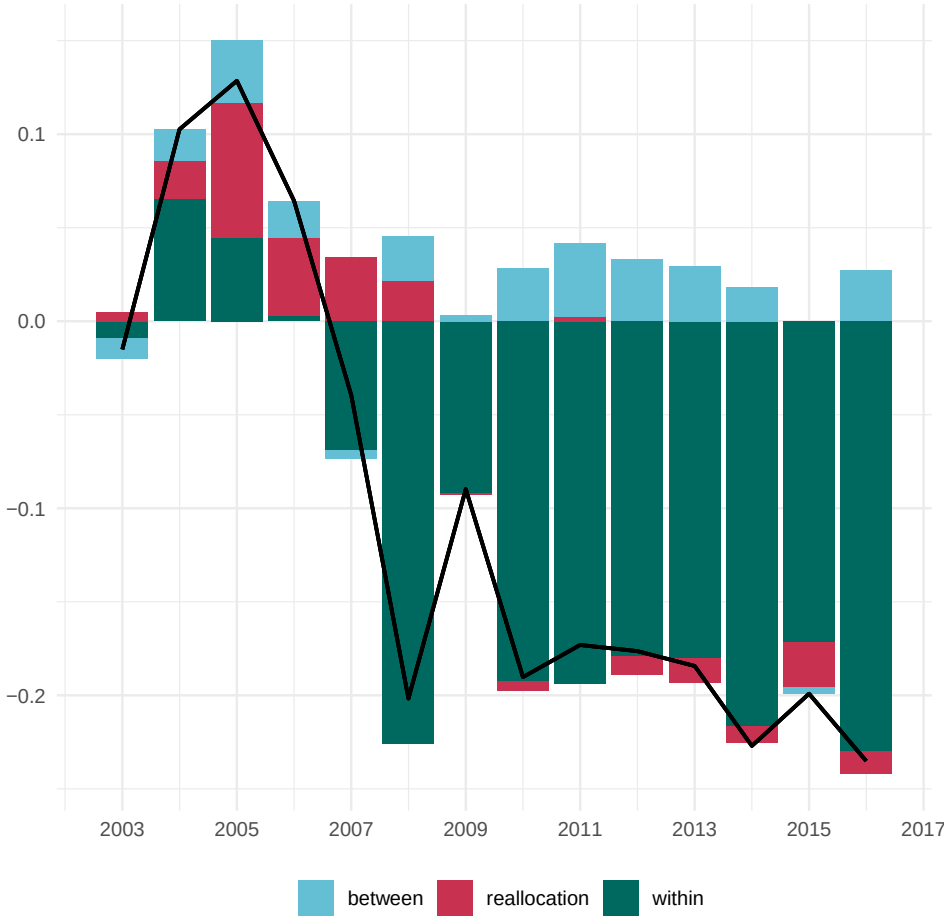
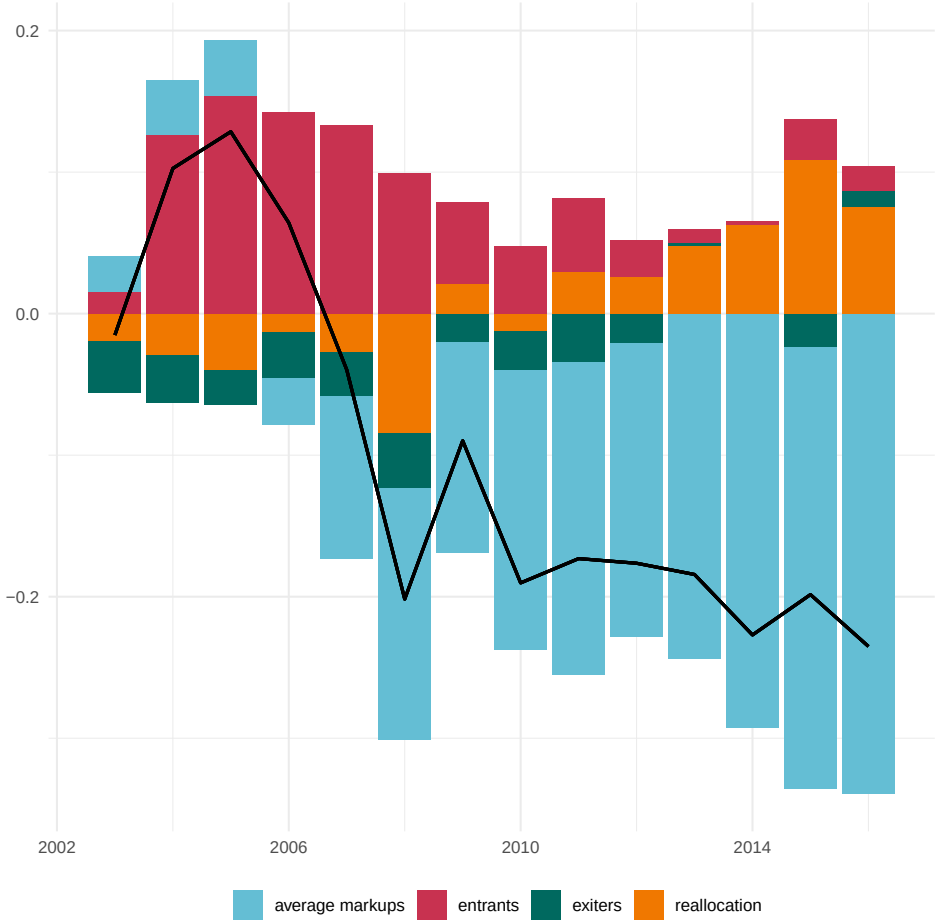


Figure: Melitz and Polanec (2015) decomposition, cumulated change since 2002



Robustness check

Technical notes

Robustness check

Evidence at the industry level

A limited role of super star firms and a falling export premium

Figure: Evolution of markups in efficiency classes (based on deciles of average firm logTFP distribution)

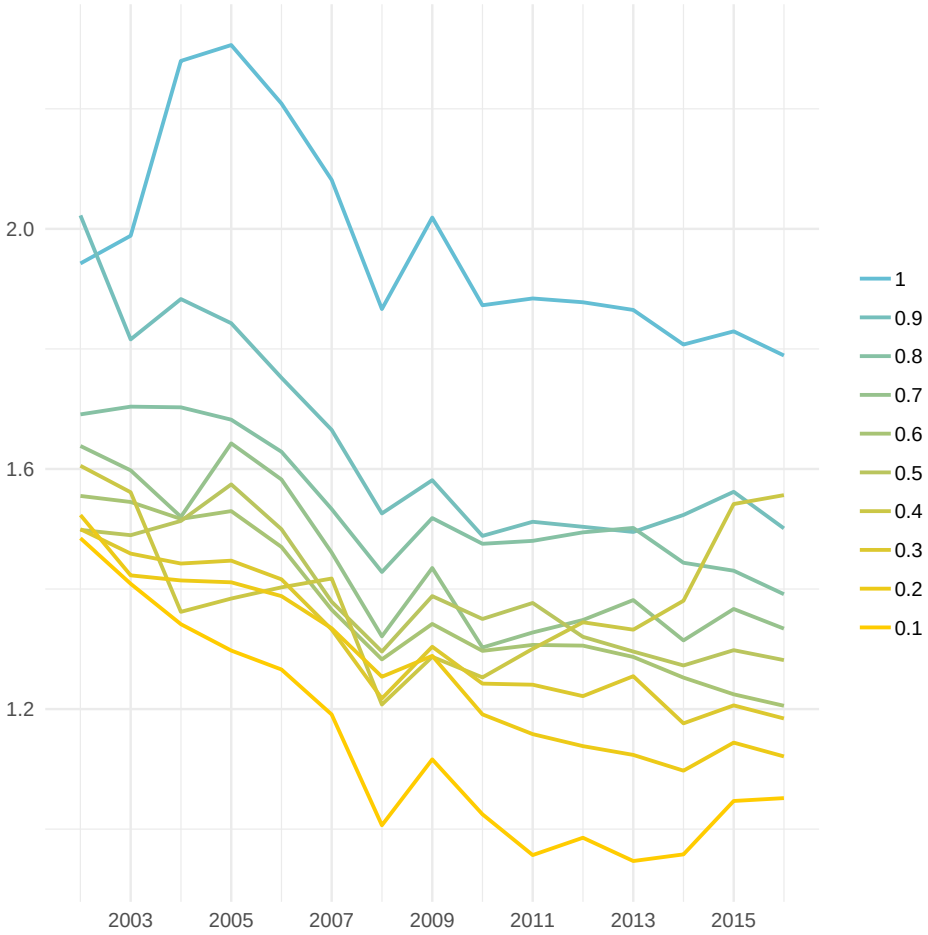


Figure: Markup changes by export share

Robustness check: Median | Mean | Weighted mean

Panel data analysis

Two empirical complementary strategies:

1. Dynamic panel data models at the industry level;
2. Between regression at the firm level.

Explanatory variables:

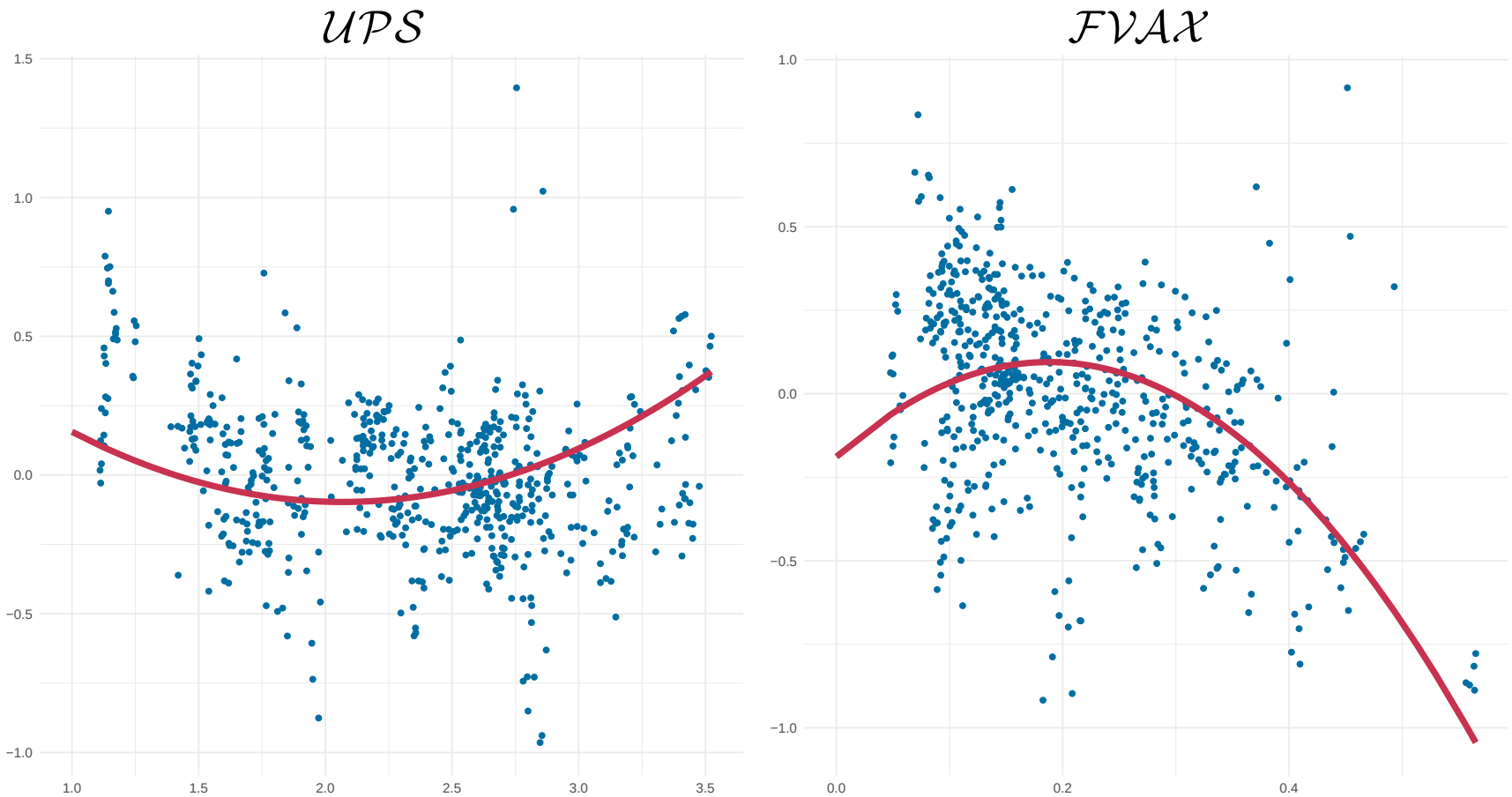
- **Globalization measures (available at the industry level)** based on the WIOD database (Timmer, Dietzenbacher, Los, Stehrer, and de Vries, 2015):
  - The Upstreamness ($\mathcal{UPS}$) measures the average distance to final consumer (Antras, Chor, Fally, and Hillberry, 2012; Miller and Temurshoev, 2017);
  - The Foreign Value Added at EXports ($\mathcal{FVAX}$) the share of foreign (imported) content in the the gross exports (Wang, Wei, and Zhu, 2013).
- **Market structure and demography of firms**
  - Inverted HHI indices (*a number of symmetric firms*) at the industry level calculated for: (i) total sales ($\mathcal{HHI}^{-1}_{total}$), (ii) domestic sales ($\mathcal{HHI}^{-1}_{domestic}$), and exports (iii) $\mathcal{HHI}^{-1}_{export}$.
  - Dummies/ ratios for entrants and exiters.
- **Productivity & selected firms features**
  - *tfp* - total factor productivity;
  - *l* - employment;
  - *outsourcing_share* - the share of outsourcing in gross output.
  - *energy* - the share of energy costs in gross output.

Table: Estimates of dynamic panel data models describing markups at the industry level

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\log \mu_{it-1}$	0.871^{***}	0.780^{***}	0.697^{***}	0.686^{***}	0.691^{***}	0.678^{***}	0.737^{***}
$\mathcal{UPS}$	-0.391^{***}	-0.711^{***}	-1.128^{***}	-1.074^{***}	-1.072^{***}	-1.219^{***}	-0.917^{***}
$\mathcal{UPS}^2$	0.095^{***}	0.145^{***}	0.276^{***}	0.260^{***}	0.259^{***}	0.294^{***}	0.222^{***}
$\mathcal{FVAX}$		3.777^{***}	3.147^{***}	3.217^{***}	3.032^{***}	3.231^{***}	3.013^{***}
$\mathcal{FVAX}^2$		-7.814^{***}	-8.088^{***}	-8.291^{***}	-7.756^{***}	-8.173^{***}	-8.014^{***}
tfp			0.697^{***}	0.682^{***}	0.659^{***}	0.709^{***}	0.627^{***}
$\mathcal{HHI}^{-1}_{total}$				-0.000		-0.000	
$\mathcal{HHI}^{-1}_{domestic}$					-0.000		-0.000^{*}
$\mathcal{HHI}^{-1}_{export}$					-0.000		-0.000
entry						0.210^{**}	0.323^{***}
exit						0.144^{***}	0.302^{***}
Constant	0.461^{***}	0.588^{***}	-2.182^{***}	-2.130^{***}	-2.025^{***}	-2.156^{***}	-2.083^{***}
Observations	552	552	552	552	551	552	551
Number of sectors	47	47	47	47	47	47	47
Sargan	[0.929]	[0.875]	[0.950]	[0.974]	[0.970]	[0.973]	[0.982]
AR(2)	[0.537]	[0.606]	[0.868]	[0.897]	[0.861]	[0.970]	[0.980]

Note: the superscripts ***, ** and * denote the rejection of null about parameters' insignificance at 1%, 5% and 10% significance level, respectively. The expressions in round and squared brackets stand for standard errors and probabilities values corresponding to respective hypothesis, respectively. AR(2) it the test for serial correlation developed by Arellano and Bond (1991) and the null hypothesis in this case is about the error term time independence (of order two). The Sargan statistics are used to test over-identifying restrictions and the null postulates validity of instruments.

Relationship between the markups and $\mathcal{UPS}$ and $\mathcal{FVAX}$



Note: red lines stand for the estimated relationship while blue points denote the markups adjusted by the fixed effects estimates as well as impact of other variables from model (7).

$\mathcal{UPS}$ and $\mathcal{FVAX}$ contribution to markup changes

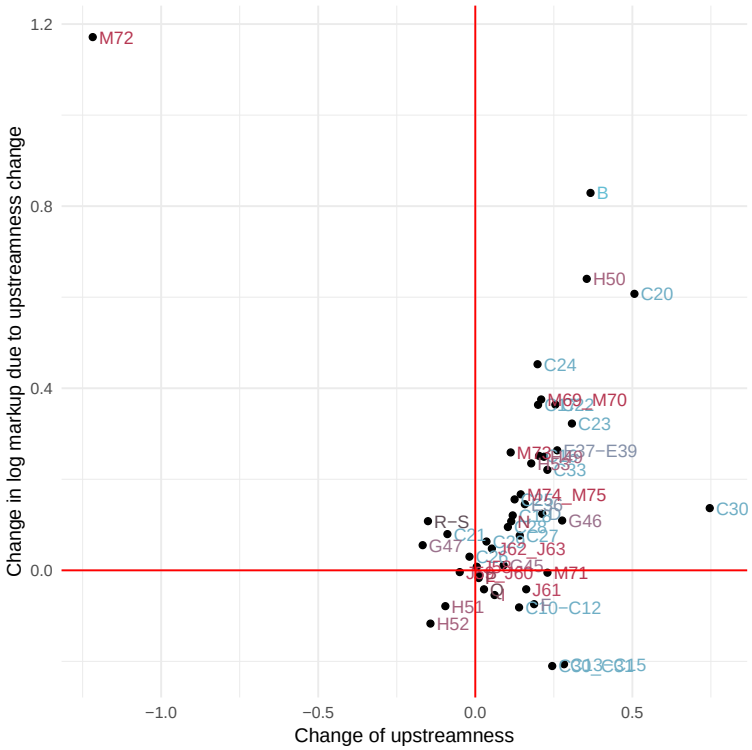


Figure: Sectoral changes of upstreamness and their contribution to sectoral markup changes

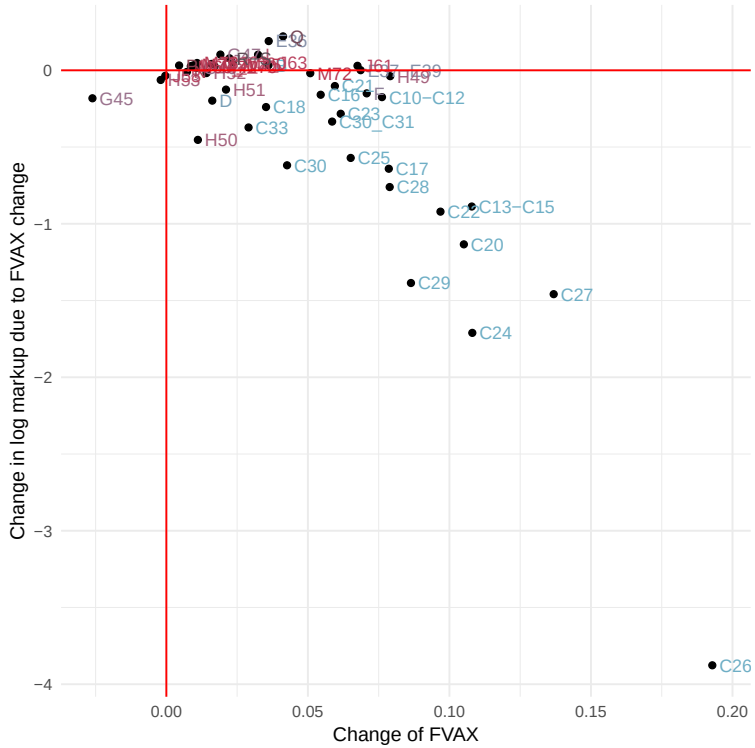
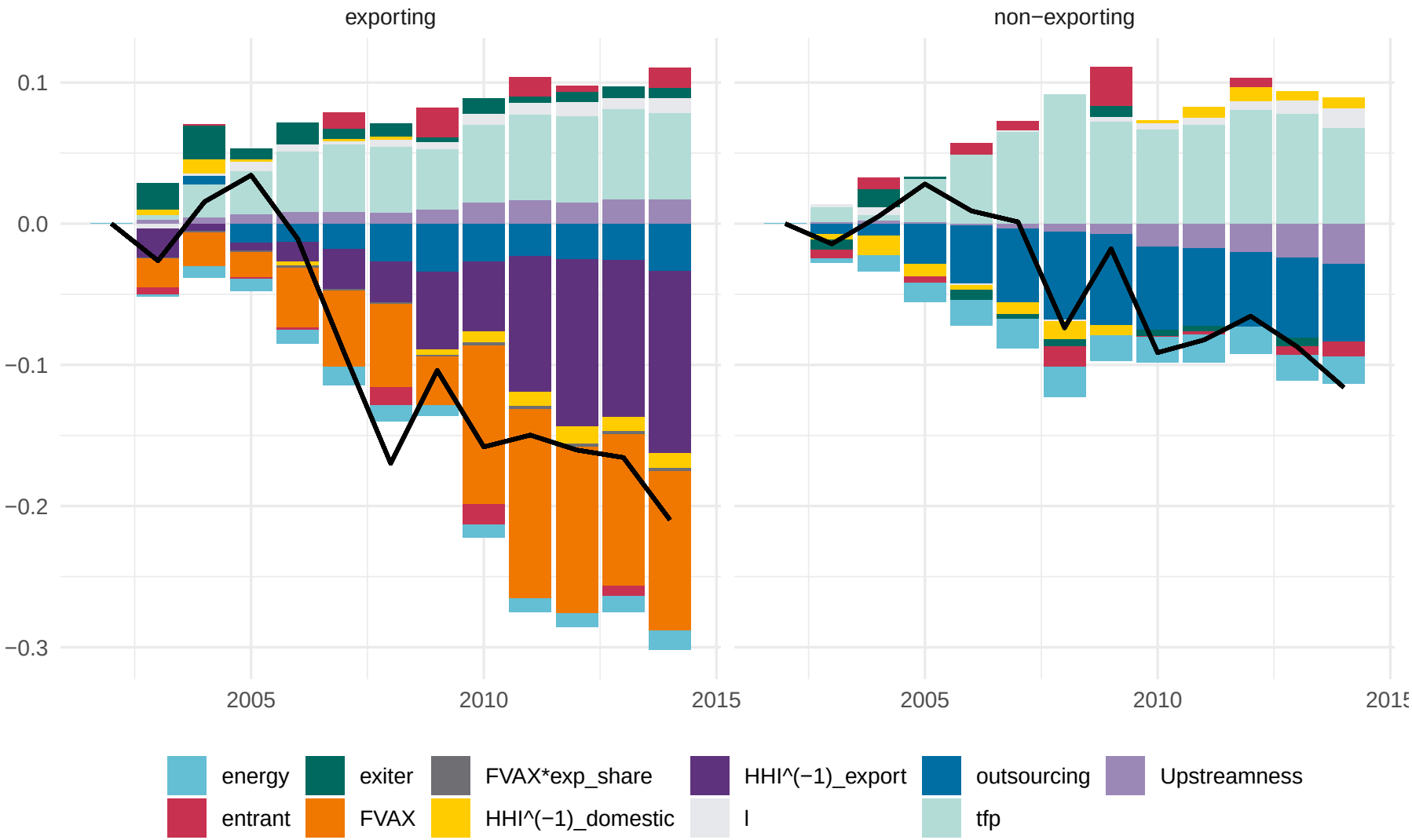


Figure: Sectoral changes of foreign value added in exports and their contribution to sectoral markup changes

Details | Robustness check – alternative measure of the GVC participation

Decomposition of the aggregate changes in markups (based on firm-level regression)



Summary

1. We document that, contrary to a recent research on markups dominated by highly developed countries, a secular fall in markups in a converging economy (Poland).
2. We show that falling markups in converging economy can, to a large extent, be explained by globalization trends
   - increasing dependence on foreign suppliers of inputs
   - competition becomes fiercer on foreign markets
   - almost neutral effect of distance to final demand due to sector heterogeneity
   - Békés, Hornok, and Muraközy (2016) shows higher markups associated with importing intermediates in West European firms
3. Limited evidence on 'superstar' firms – seems to be important in developed countries, as in Diez, Leigh, and Tambunlertchai (2018), also Baqaee and Farhi (2017) point at the role of increasing market share of high-markup firms (between effect)
4. We show different dimensions of widely known in the literature smile curves between GVC position and value added creation
   - We show that the smile-curve is also present in the markups
5. Extensions and interesting future research avenues
   - Transmission of markups into producer prices in Poland
   - Investigating the nature of the fall of markups: the role of changes in market structure vs. changes in price elasticities of demand

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Appendix

Globalization and the fall of markups

Data coverage

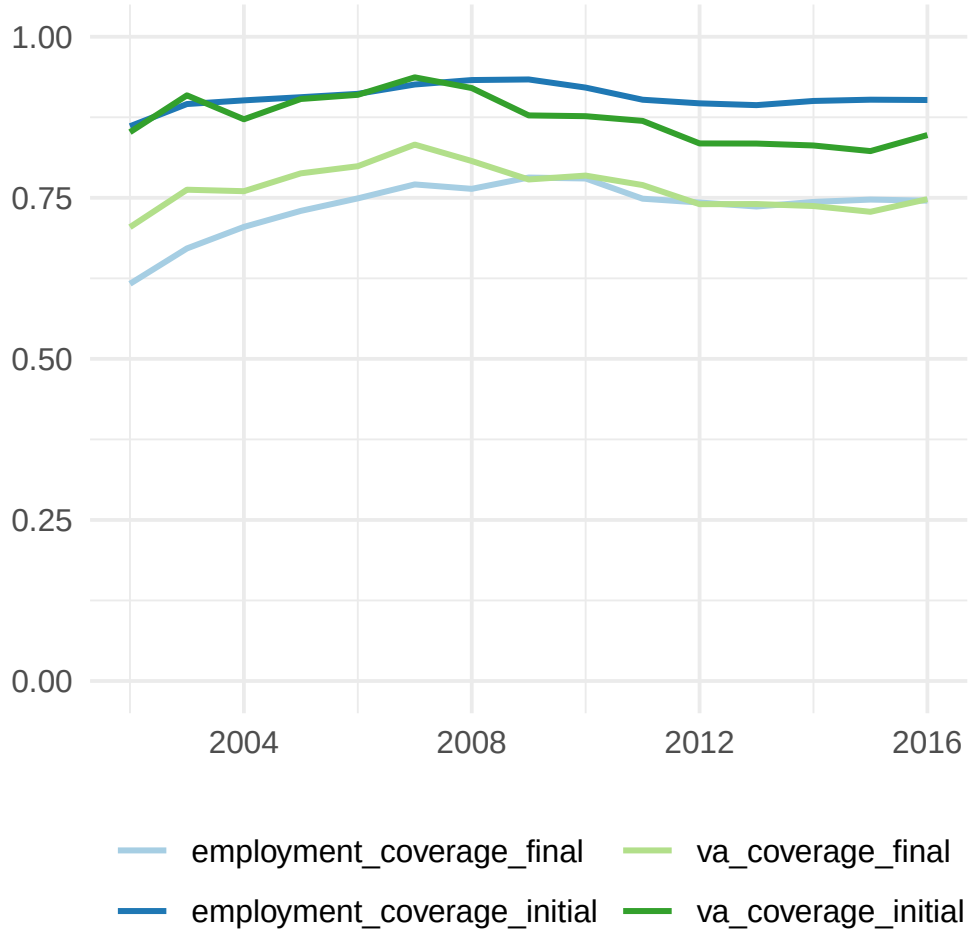


Figure: Employment and value added coverage (in non-financial enterprise sector)

Data

Estimation results

variable	coeff
β_l	0.832***
	(0.000168)
β_k	-0.0348***
	(0.000281)
β_{ll}	0.0168***
	(0.000147)
β_{lk}	0.0356***
	(0.000195)
β_{kk}	-0.00323***
	(0.000116)
Observations	576 407
Number of groups	82 142

- The production function parameters were estimated for all sectors jointly
- It allows us to construct TFP (Ω_{it}), which is comparable across sectors and time
- Robustness checks (PF estimated on different levels of aggregation and simplified to Cobb-Douglas) show that production function assumptions are not crucial for our results

Production function elasticities

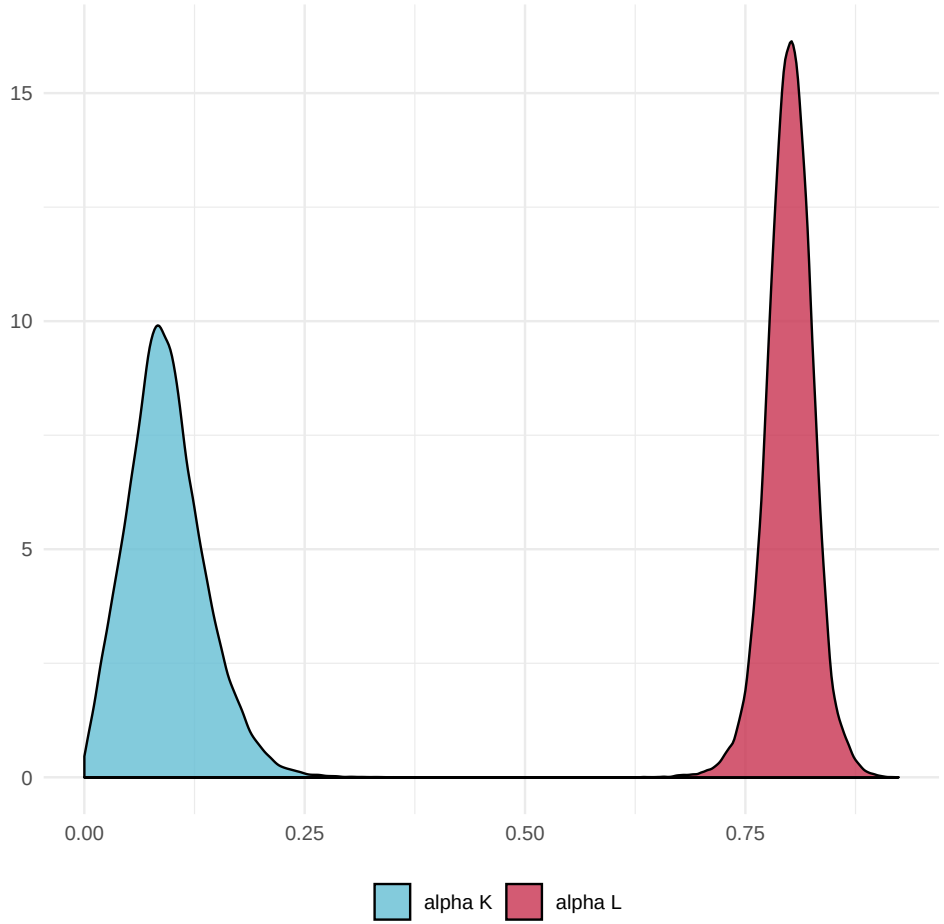


Figure: Production function elasticities

- Distribution of firm-level production function elasticities, averaged over time
- Trimming sample to positive elasticities – 1% of observations dropped out
- In further analysis, we also drop 2% of firms in each year with extreme markups

Results

Dispersion of markups

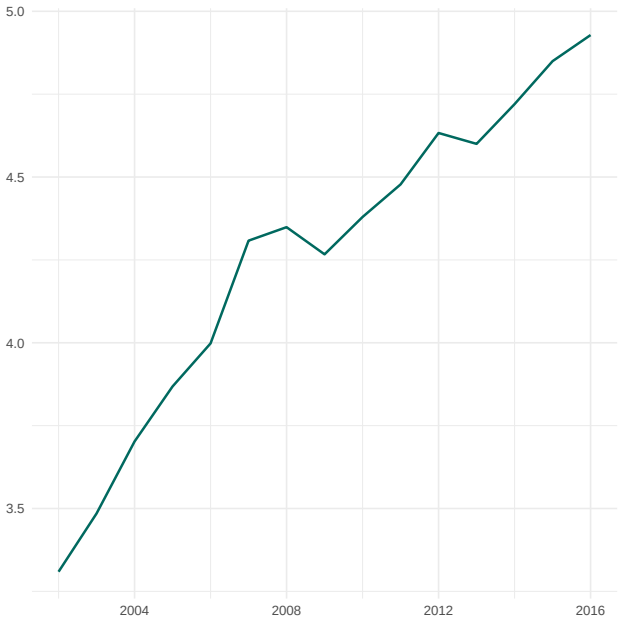


Figure: Interquantile range [q90/q10]

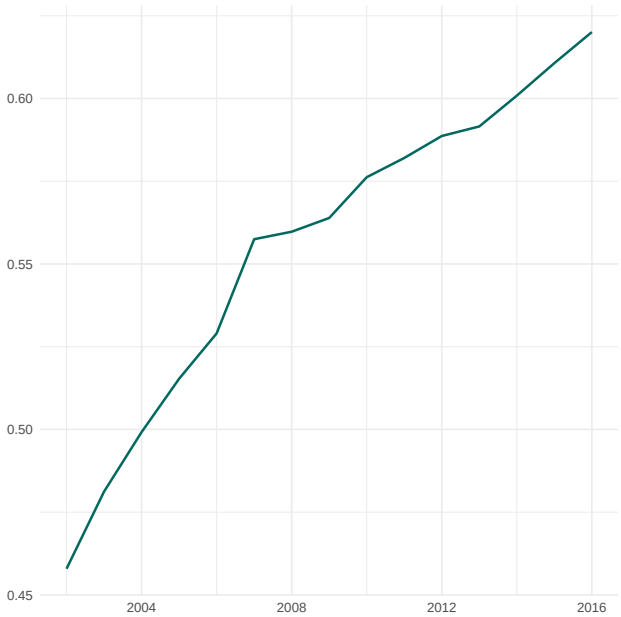


Figure: Standard deviation of log markups

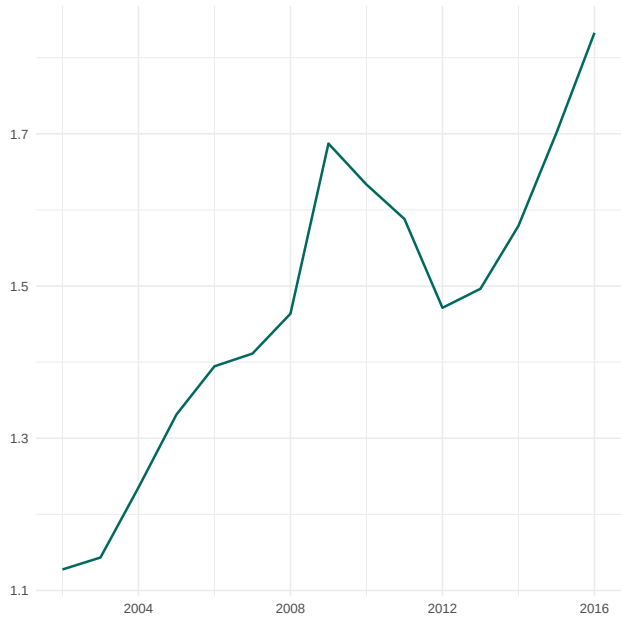


Figure: Skewness of markups

Evolution of distribution

Evolution of markup distribution over time

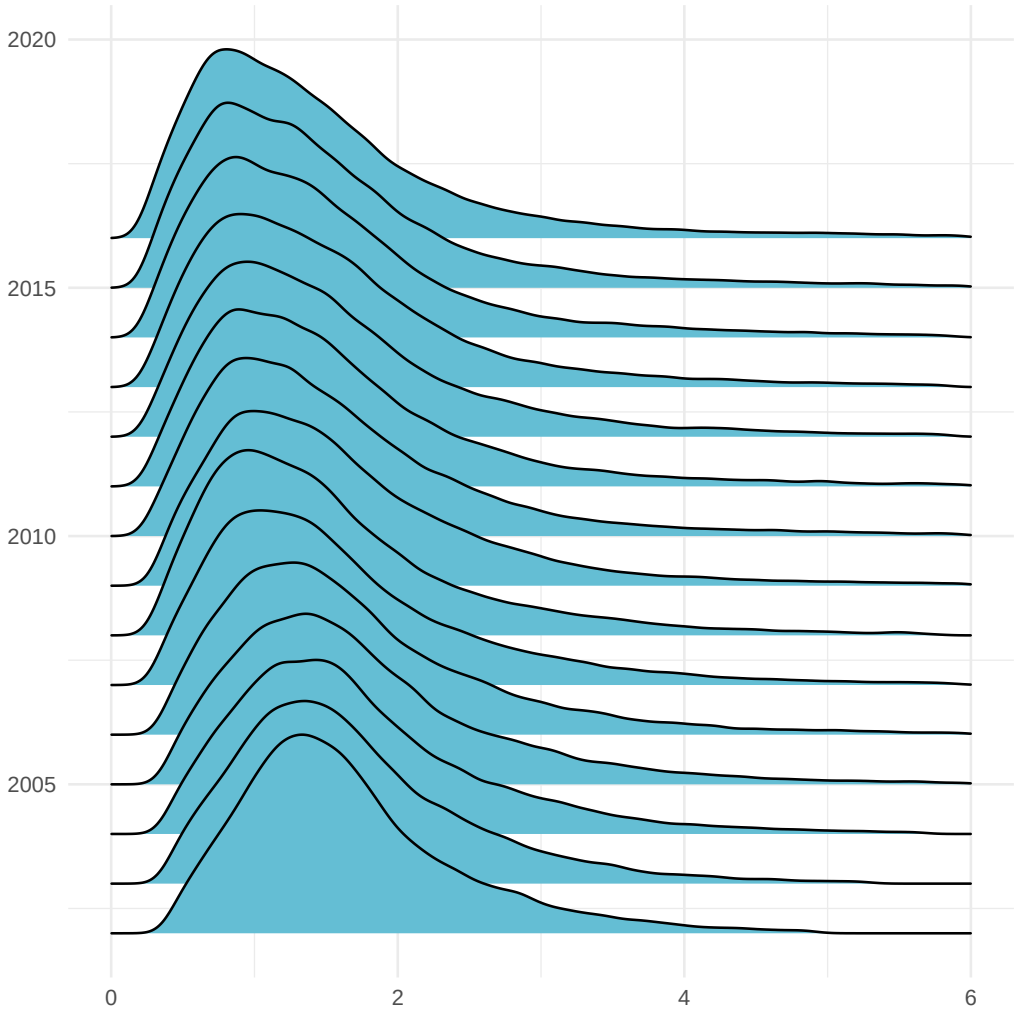


Figure: Evolution of distribution of markups over time

Decompositions: technical notes

- **Shift-share analysis** decomposes increase in weighted markup over time into three components:
  - due to a change of an average markup at the industry level (within component),
  - due to a change of the sectoral composition of the economy (between component),
  - due to the joint change in average markup and structural changes (reallocation component).

$$\Delta\mu_t = \sum_j s_{j,t-1}\Delta\mu_{j,t} + \sum_s \mu_{j,t-1}\Delta s_{s,t} + \sum_j \Delta\mu_{j,t}\Delta s_{j,t} \tag{1}$$

where $s_{j,t}$ is share in sales (weighting variable) of a sector j in period t

- **Dynamic decomposition**. In order to scrutinize the effects of entrants (E) and exiters (X) on markups we apply decomposition proposed by Melitz and Polanec (2015). The change in markup can be decomposed as follows:

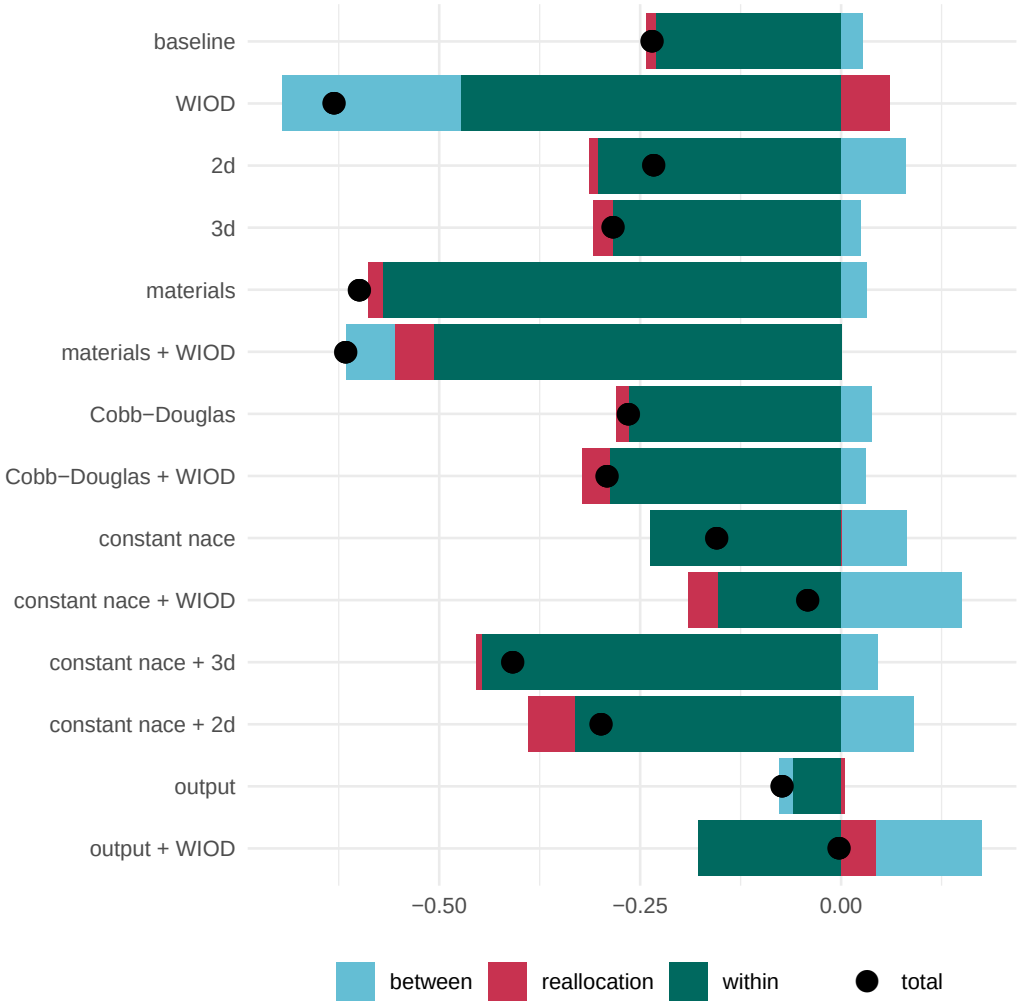
$$\Delta\mu_t = \Delta\bar{\mu}_{S,t} + \Delta\text{cov}_{S,t} + S_{E,t}\left(\mu_{E,t} - \mu_{S,t}\right) + S_{X,t-1}\left(\mu_{S1,t-1} - \mu_{X,t-1}\right), \tag{2}$$

where

- $\Delta\mu_{S,t}$ – the average markup change,
- $\Delta\text{cov}_{S,t}$ – reallocation effect,
- $S_{E,t}\left(\mu_{E,t} - \mu_{S,t}\right)$ – contribution of entrants,
- $S_{X,t-1}\left(\mu_{S1,t-1} - \mu_{X,t-1}\right)$ – contribution of exiters.

Main results

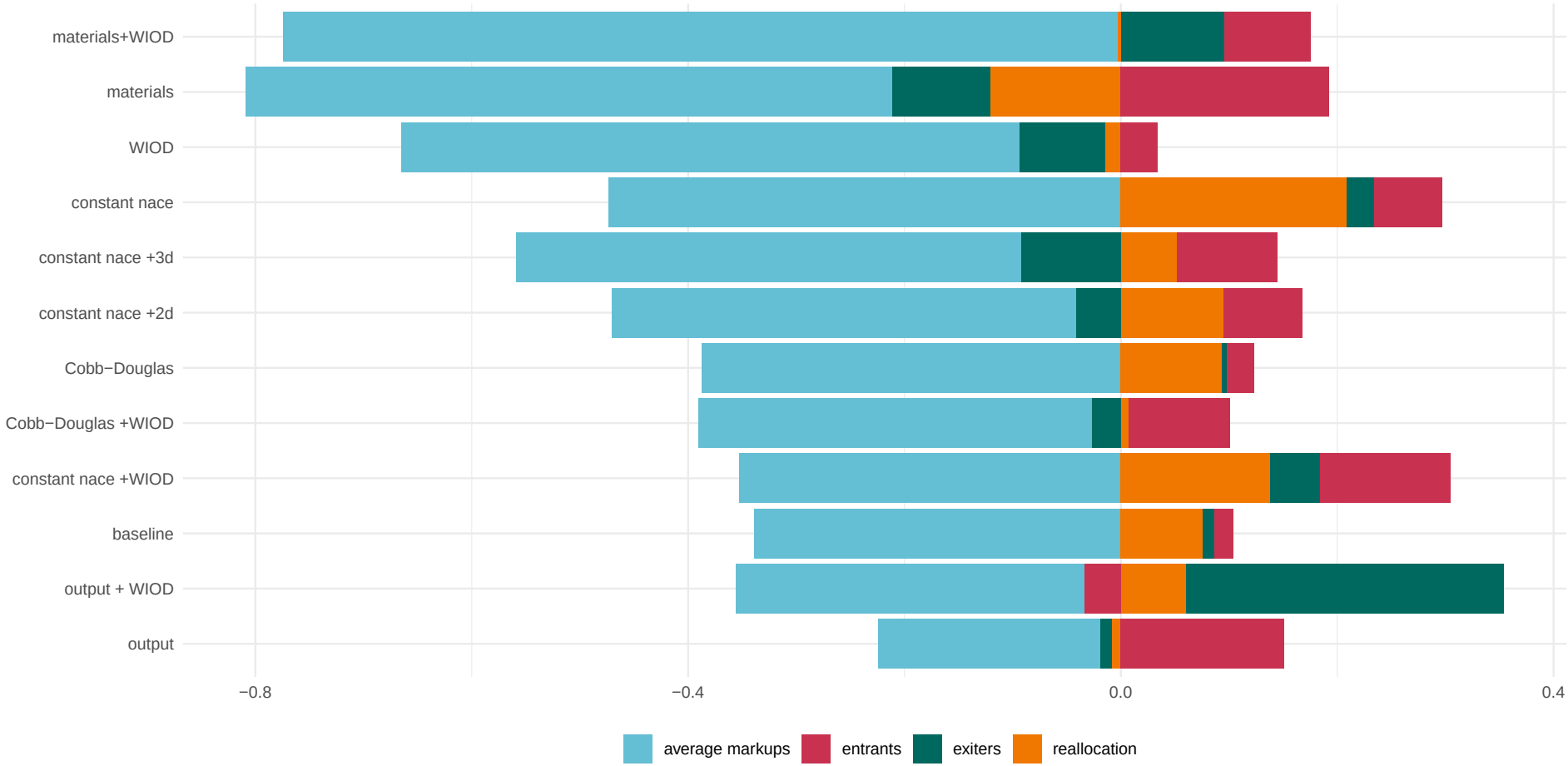
Shift-share – robustness check



Main results

Dynamic decomposition – robustness check

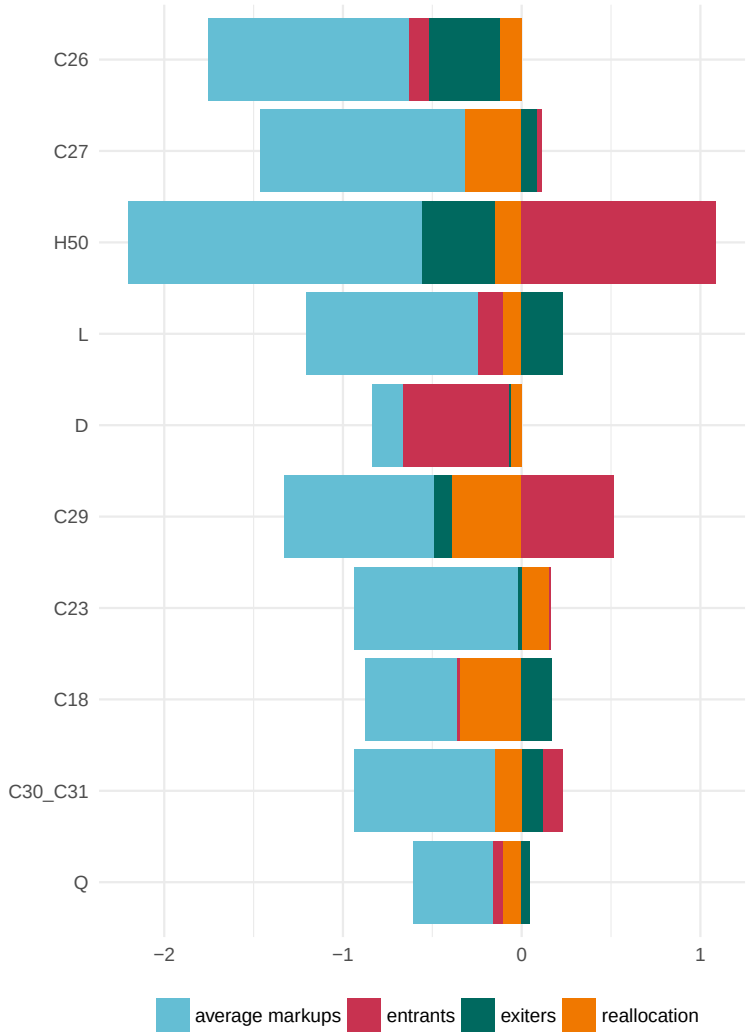
Figure: Markups changes, cumulated 2002-2016

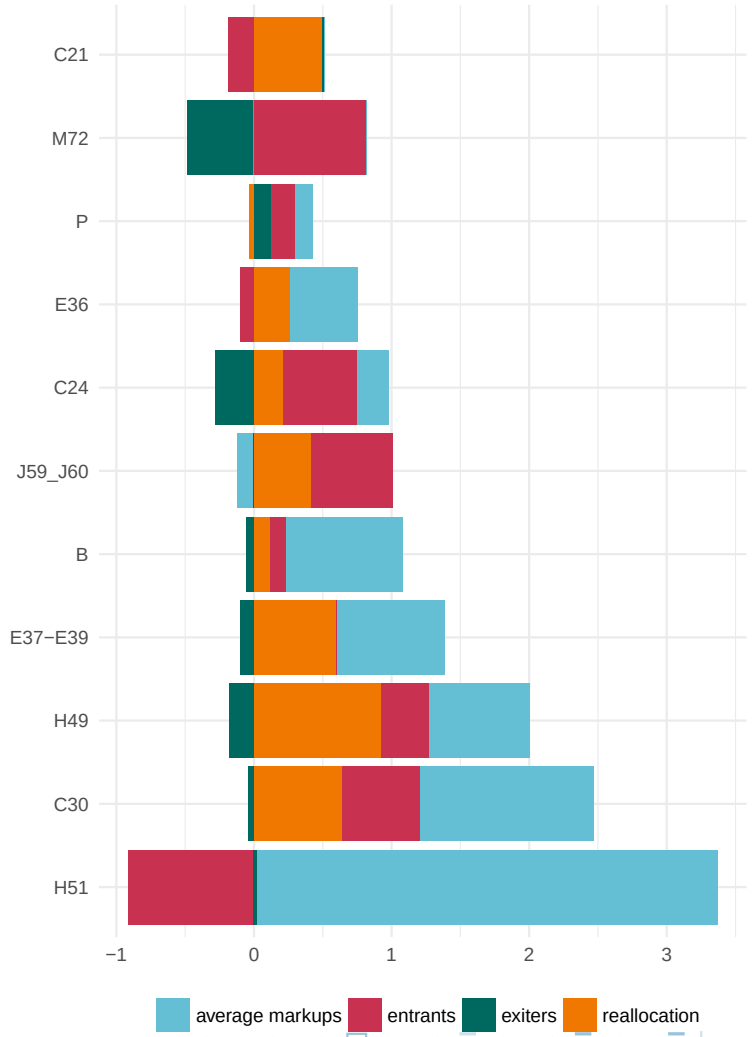


Main results

Dynamic decomposition – sectoral evidence

Figure: Markups changes, cumulated since 2002





Changes in the distribution of markups

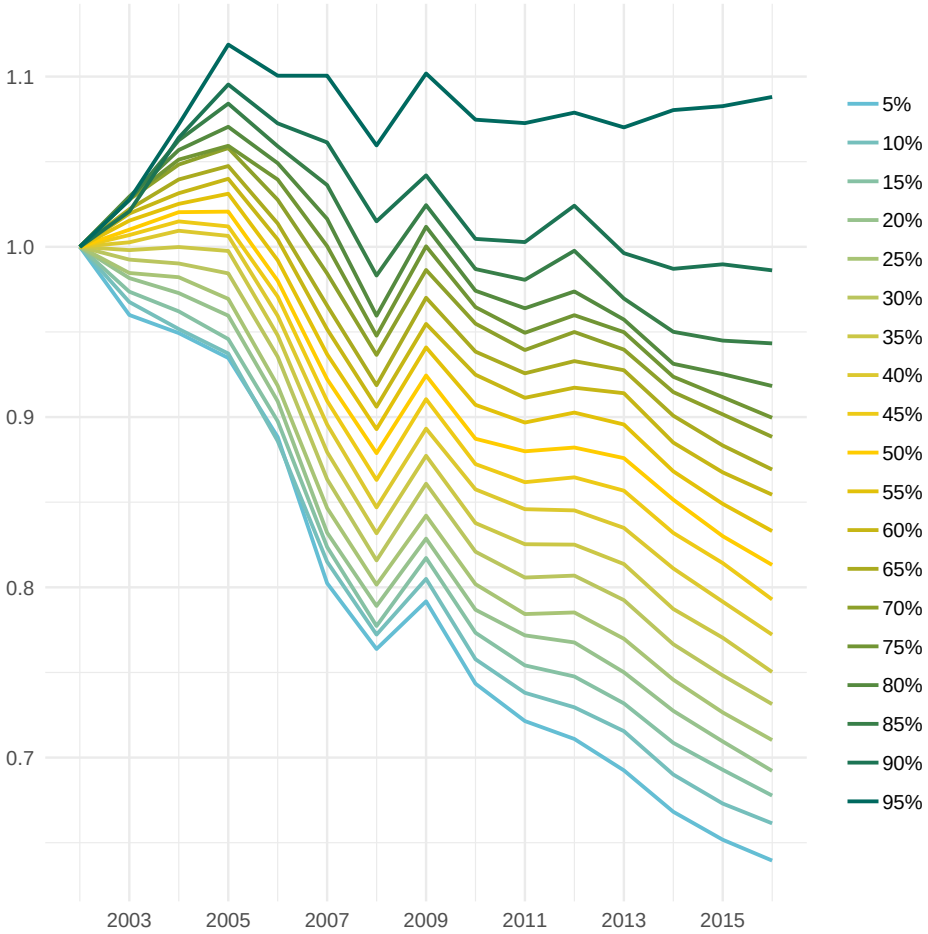
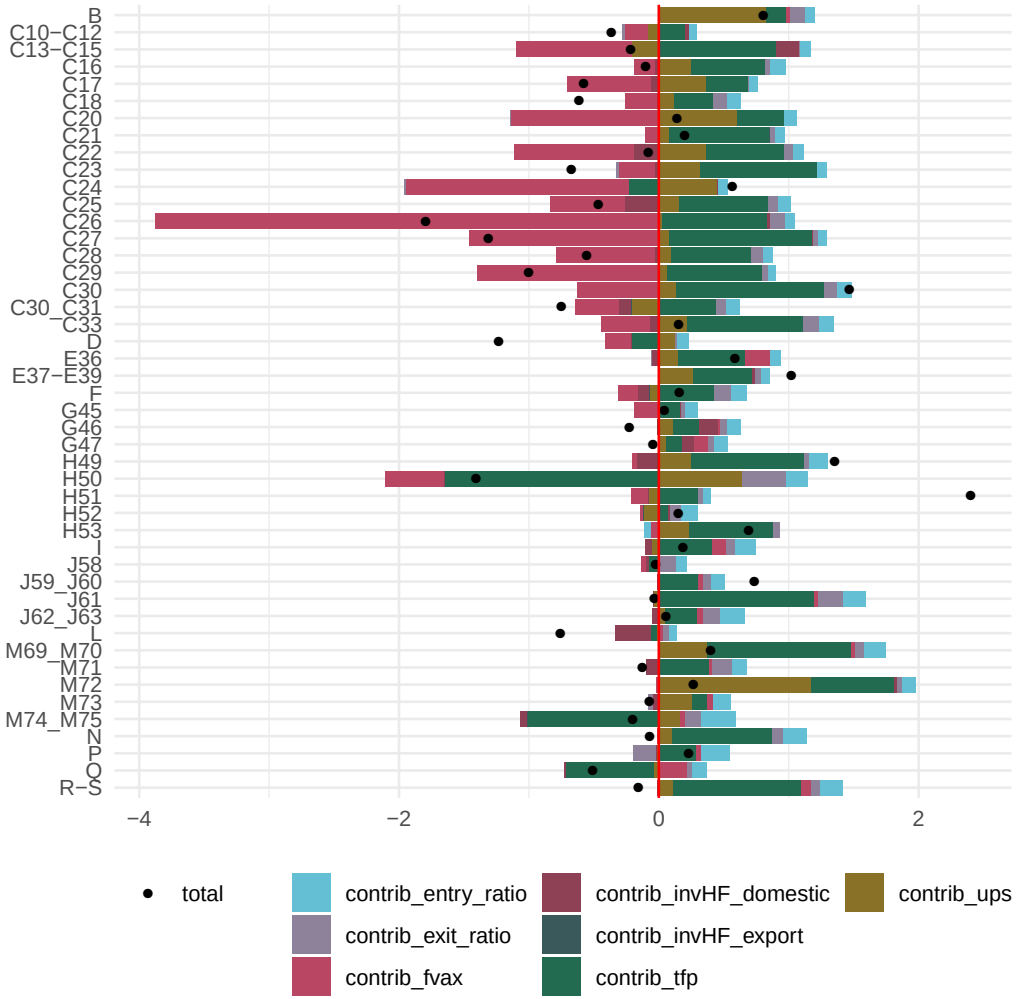


Figure: Changes of markups in quantiles, 2002 = 1

- The fall of markups was present at (almost) each position of distribution
- The fall was the most pronounced in enterprises with low markups
- Only in the 95% quantile markups actually increased since 2002
- It suggests that dispersion increased

Sectoral factors behind a markup fall



- TFP increases cost efficiency and usually positively affect markups, especially in manufacturing
- Foreign value added of exports affects negatively markups, mostly in manufacturing
- The effect of upstremaness is dispersed
- Main results

Figure: Decomposition of sectoral markup falls

Minima of $\mathcal{UPS}$ and $\mathcal{FVAX}$

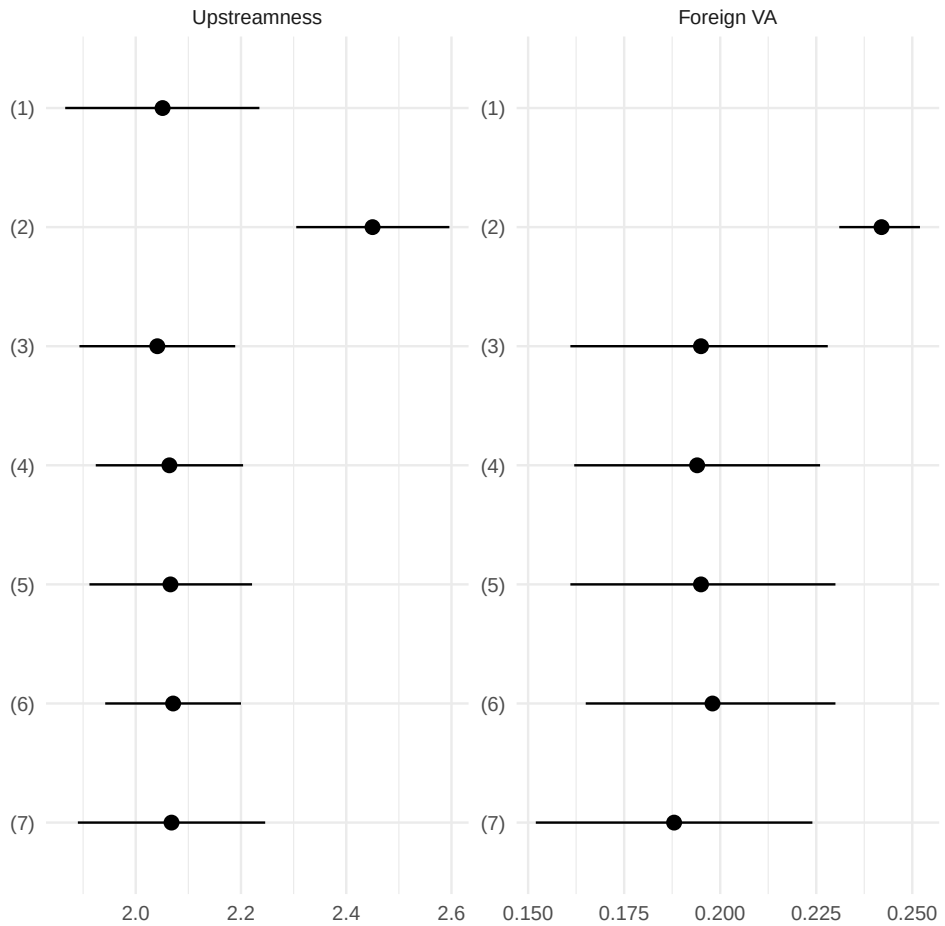


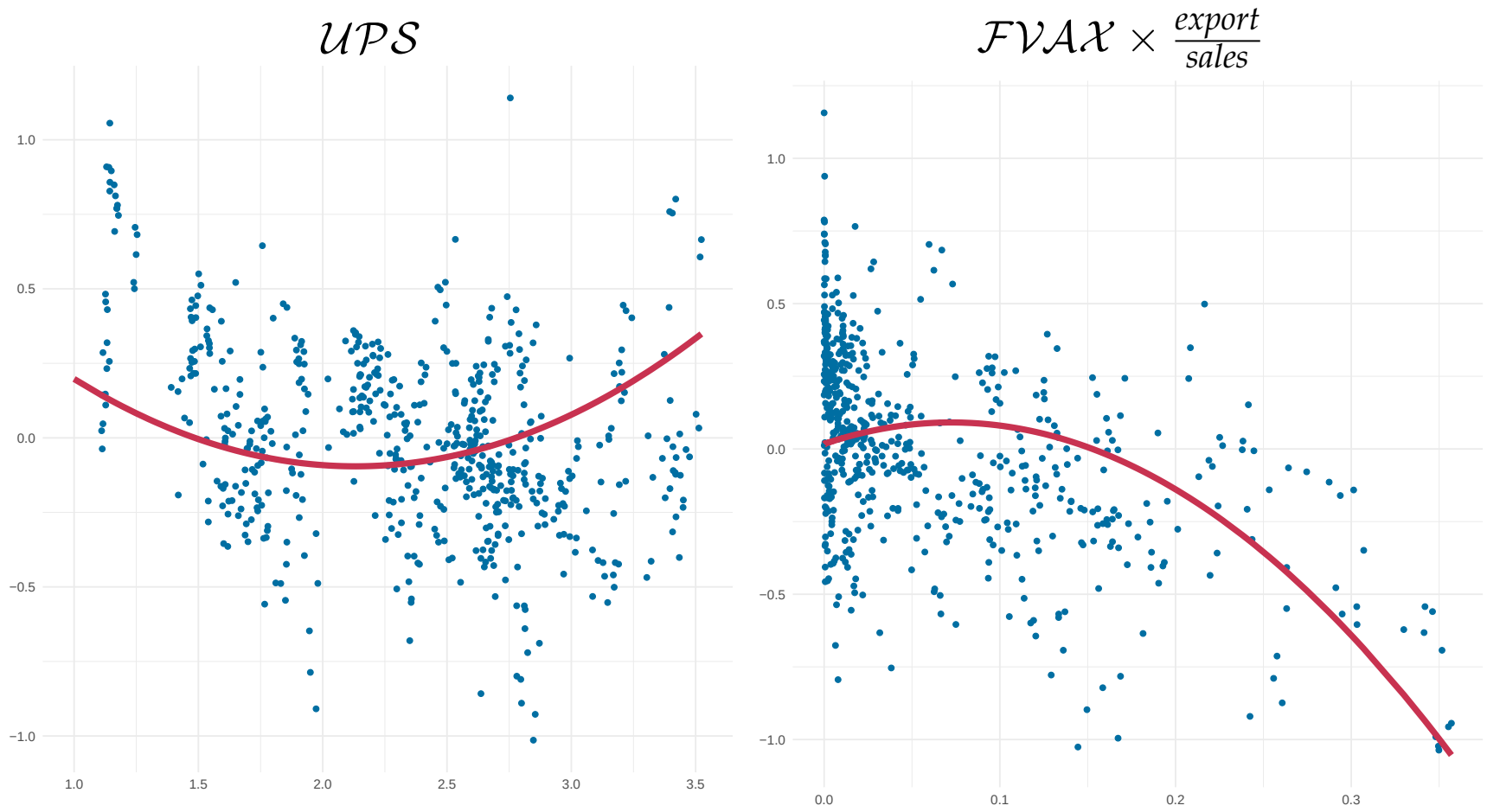
Figure: Minima of $\mathcal{UPS}$ and $\mathcal{FVAX}$

Table: Estimates of dynamic panel data models describing markups at the industry level – adjusted FVAX

	(1)	(2)	(3)	(4)	(5)	(6)
$\log \mu_{it-1}$	0.840^{***}	0.751^{***}	0.782^{***}	0.679^{***}	0.689^{***}	0.668^{***}
$\mathcal{UPS}$	-0.286	-0.925^{***}	-0.677^{***}	-0.958^{***}	-0.913^{***}	-0.976^{***}
$\mathcal{UPS}^2$	0.045	0.223^{***}	0.163^{***}	0.225^{***}	0.211^{***}	0.229^{***}
$\mathcal{FVAX} \times \frac{export}{sales}$	2.505^{***}	1.479^{**}	1.609^{**}	1.836^{**}	2.218^{***}	2.045^{***}
$\left(\mathcal{FVAX} \times \frac{export}{sales}\right)^2$	-11.422^{***}	-11.189^{***}	-12.101^{***}	-13.343^{***}	-14.914^{***}	-14.131^{***}
tfp		0.710^{***}	0.649^{***}	0.810^{***}	0.768^{***}	0.833^{***}
$\mathcal{HHI}^{-1}_{total}$			-0.000^{*}		-0.000	
$\mathcal{HHI}^{-1}_{domestic}$				-0.000		-0.000
$\mathcal{HHI}^{-1}_{export}$				-0.000		-0.000
entry					0.287^{***}	0.319^{***}
exit					0.108	0.119
Constant	0.451^{**}	-2.193^{***}	-2.133^{***}	-2.513^{***}	-2.420^{***}	-2.655^{***}
Observations	552	552	552	551	552	551
Number of sectors	47	47	47	47	47	47
Sargan	[0.955]	[0.964]	[0.972]	[0.989]	[0.995]	[0.996]
AR(2)	[0.480]	[0.695]	[0.664]	[0.829]	[0.848]	[0.946]

Note: the superscripts ***, ** and * denote the rejection of null about parameters' insignificance at 1%, 5% and 10% significance level, respectively. The expressions in round and squared brackets stand for standard errors and probabilities values corresponding to respective hypothesis, respectively. AR(2) it the test for serial correlation developed by Arellano and Bond (1991) and the null hypothesis in this case is about the error term time independence (of order two). The Sargan statistics are used to test over-identifying restrictions and the null postulates validity of instruments.

Relationship between the markups and $\mathcal{UPS}$ and $\mathcal{FVAX} \times \frac{export}{sales}$



Note: red lines stand for the estimated relationship while blue points denote the markups adjusted by the fixed effects estimates as well as impact of other variables from model (7).

Main results

Minima of $\mathcal{UPS}$ and adjusted $\mathcal{FVAX}$

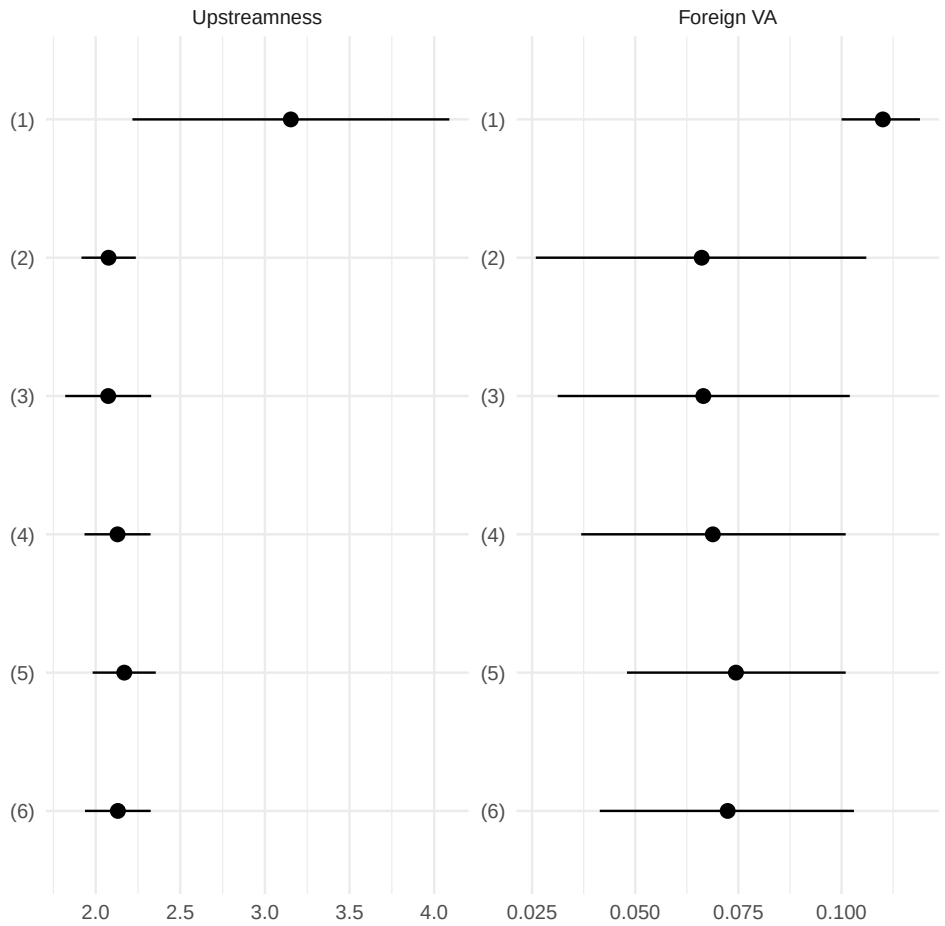


Figure: Minima of $\mathcal{UPS}$ and adjusted $\mathcal{FVAX}$

Main results

Between regressions – exporting firms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
tfp	0.393^{***}	0.369^{***}	0.350^{***}	0.370^{***}	0.408^{***}	0.491^{***}	0.538^{***}
$\mathcal{UPS}$	-0.614	-0.614	-0.386	-0.427	-0.150	0.0286	-0.226
$\mathcal{UPS}^2$	0.145	0.151	0.0971	0.107	0.0571	0.0124	0.067
$\mathcal{FVAX}$		4.396	4.816^{*}	5.690^{**}	2.728	2.690	0.846
$\mathcal{FVAX}^2$		-9.722^{*}	-10.66^{*}	-12.24^{**}	-8.795^{*}	-8.594^{*}	-4.468^{**}
$\mathcal{FVAX} \times \frac{export}{sales}$			-0.314	-0.153	-0.132	-0.0301	-0.427
$\left(\mathcal{FVAX} \times \frac{export}{sales}\right)^2$			-0.0383	-0.421	-0.0344	-0.0674	0.511
$\mathcal{HHI}^{-1}_{total}$			-0.0005				
$\mathcal{HHI}^{-1}_{domestic}$				0.000	0.001	0.000	0.000
$\mathcal{HHI}^{-1}_{export}$				-0.003^{***}	-0.004^{***}	-0.004^{***}	-0.001^{***}
outsourcing					-0.607	-0.565	-0.894^{***}
$outsourcing^2$					-0.218	-0.256	0.169
energy						2.166	0.262
l						-0.292^{***}	-0.271^{***}
l^2						0.024^{***}	0.021^{***}
Constant	-0.791	-1.142	-1.236	-1.361	-1.210	-1.002	-0.396
Entrants and exiters dummies	✓	✓	✓	✓	✓	✓	✓
Sectoral dummies							✓
Observations	32519	32519	32519	32519	32519	32519	32519
R^2	0.069	0.090	0.099	0.114	0.213	0.248	0.470

Note: the superscripts ***, ** and * denote the rejection of null about parameters' insignificance at 1%, 5% and 10% significance level, respectively. The expressions in round brackets stand for clustered standard errors.

Between regression – non-exporting firms

Between regressions – non-exporting firms

	(1) domestic	(2) industry	(3) services	(4) manufacturing	(5) domestic	(6) industry	(7) services	(8) manufacturing
tfp	0.563***	0.540***	0.632***	0.640***	0.593***	0.668***	0.572***	0.700***
$\mathcal{UPS}$	1.323**	−1.009	1.631**	−1.278**	−0.188	−0.875*	0.405	−0.118
$\mathcal{UPS}^2$	−0.310**	0.243	−0.393**	0.288**	0.0190	0.189*	−0.112	0.009
outsourcing	0.398	−0.922***	−0.135	−1.078***	−0.344	−1.029***	−0.143	−1.086***
$outsourcing^2$	−0.981***	0.786**	−0.657**	0.759***	−0.216	0.645***	−0.414*	0.701***
l	−0.151**	−0.159*	−0.111	0.074	−0.176***	−0.133	−0.179***	0.0909
l^2	0.002	0.008	−0.004	−0.032*	0.005	0.001	0.005	−0.035*
energy	0.762	5.501*	0.537	4.779*	−0.259	−2.933**	0.156	−2.154
$\mathcal{HHI}^{-1}_{domestic}$	−0.000	−0.001	−0.001	0.000	0.000	−0.000	0.000	−0.000
Constant	−2.518***	−0.327	−2.897***	−0.795	−0.096	0.142	−1.391	−2.151***
Entrants and exiters dummies	✓	✓	✓	✓	✓	✓	✓	✓
Sectoral dummies					✓	✓	✓	✓
Observations	41314	8111	33203	6067	41314	8111	33203	6067
R-squared	0.220	0.261	0.288	0.341	0.429	0.456	0.431	0.446

Note: the superscripts ***, ** and * denote the rejection of null about parameters' insignificance at 1%, 5% and 10% significance level, respectively. The expressions in round brackets stand for clustered standard errors.

Between regression – exporting firms

Derivation of a markup formula

- We use the method proposed by De Loecker and Warzynski (2012). The production function of a firm is:
$$Q(\Omega_{it}, V_{it}, K_{it}) = \Omega_{it} F_t(V_{it}, K_{it})$$
where Ω_{it} is Hicks-neutral productivity, K_{it} is capital and V_{it} is a set of variable inputs (e.g. labor)
- The Lagrangian associated with the cost minimization problem is:
$$\mathcal{L}(V_{it}, K_{it}, \Lambda_{it}) = P_{it}^V V_{it} + r_{it} K_{it} - \Lambda_{it}(Q(\cdot) - Q_{it})$$
with a FOC that can be rearranged as:
$$\frac{\partial Q(\cdot)}{\partial V_{it}} \frac{V_{it}}{Q_{it}} = \frac{1}{\Lambda_{it}} \frac{P_{it}^V V_{it}}{Q_{it}}$$
- $\theta_{it}^V \equiv \frac{\partial Q(\cdot)}{\partial V_{it}} \frac{V_{it}}{Q_{it}}$ is production function elasticity w.r.t. variable production factor V_{it}
- We define the markup μ as a price over marginal cost $\mu_{it} \equiv \frac{P_{it}}{\Lambda_{it}}$ and get
$$\mu_{it} = \theta_{it}^V \frac{P_{it} Q_{it}}{P_{it}^V V_{it}}.$$
- We do not need to make assumptions on demand and how firms compete
- We also assume that labor is a variable input with no adjustment costs and no price distortions Discussion
- As we do not observe P_{it}, the procedure identifies a markup up to a constant Methodology

Estimation of production function

- We use a translog production function (small letters denote variable in logs):

$$\tilde{q}_{it} = \beta_l l_{it} + \beta_k k_{it} + \beta_{ll} l_{it}^2 + \beta_{kk} k_{it}^2 + \beta_{lk} l_{it} k_{it} + \omega_{it} + \epsilon_{it}$$

- We follow the literature and control for the simultaneity and selection bias
  - We assume an AR(1) process of log productivity ω_{it}
  - We use the approach, pioneered by Olley and Pakes (1996) to account for simultaneity in the above equation and follow the Levinsohn and Petrin (2003) to use an inverse demand function for intermediate consumption in the second stage estimation (assuming that this demand function is monotone and invertible).
  - Moreover, we use the correction of Ackerberg, Caves, and Frazer (2015) to account for a possible functional dependence problem to identify labor input coefficients
  - We also control for firm exit, to account for selection bias, as stressed by Olley and Pakes (1996)
- It follows that $\theta_{it}^L = \beta_l + 2\beta_{ll} l_{it} + \beta_{lk} k_{it}$
- As we observe sectoral prices only and $\tilde{Q}_{it} = P_{it} Q_{it} / P_j$, so we need to correct the observed labor share $LS_{it} = \frac{P_{it}^L L_{it}}{P_j \frac{\tilde{Q}_{it}}{exp(\epsilon_{it})}}$ and $\mu_{it} = \frac{\theta_{it}^L}{LS_{it}}$
- Methodology

Monopsony power

- Is it possible markup fall is generated by changes in monopsony power?
- Consider a Lagrangian associated with cost minimization under monopsony:

$$\mathcal{L}(V_{it}, K_{it}, \Lambda_{it}) = P_{it}^{V}(V_{it})V_{it} + r_{it}K_{it} - \Lambda_{it}(Q(\cdot) - Q_{it})$$

with a f.o.c. with respect to a factor V:

$$\frac{\partial P_{it}^{V}(V_{it})}{\partial V_{it}} V_{it} + P_{it}^{V} = \Lambda_{it} \frac{\partial Q(\cdot)}{\partial V_{it}}$$

When you define $\frac{\partial P_{it}^{V}(V_{it})}{\partial V_{it}} \frac{V_{it}}{P_{it}^{V}} \equiv \eta_{it}$ as an elasticity of input price w.r.t. quantity demanded (the measure of monopsony power) then using the same definition of markup $\mu_{it} = P_{it}/\Lambda_{it}$ the above equation can be rearranged as:

$$\mu_{it} = \theta_{it}^{V} \left(\frac{P_{it}^{V} V_{it}}{P_{it} Q_{it}}\right)^{-1} (1 + \eta_{it})^{-1}$$

- We may overestimate the markup by ignoring potential monopsony power.
- It also means that if the change of monopsony power is to be behind the fall of markups, monopsony power (in the labor market) need to rise, which is plausible, but rather improbable, given worsening demography, rising firm number and improvement in labor market during markup decline period

The potential interference from labor adjustments costs or monopsony power

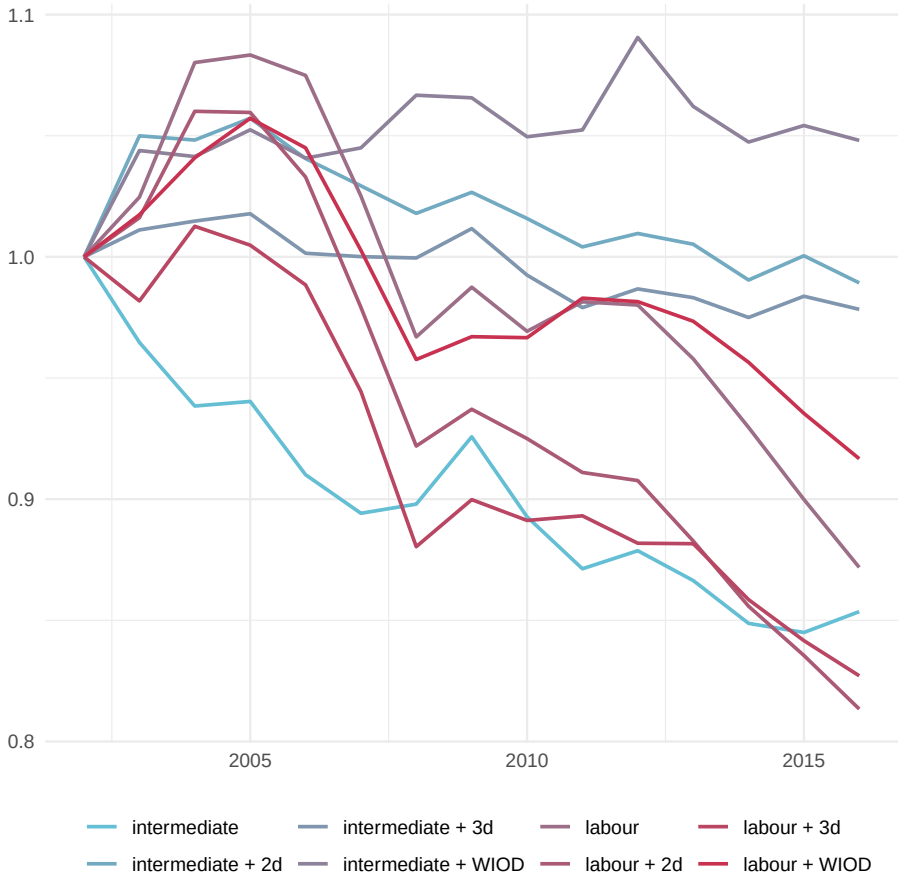


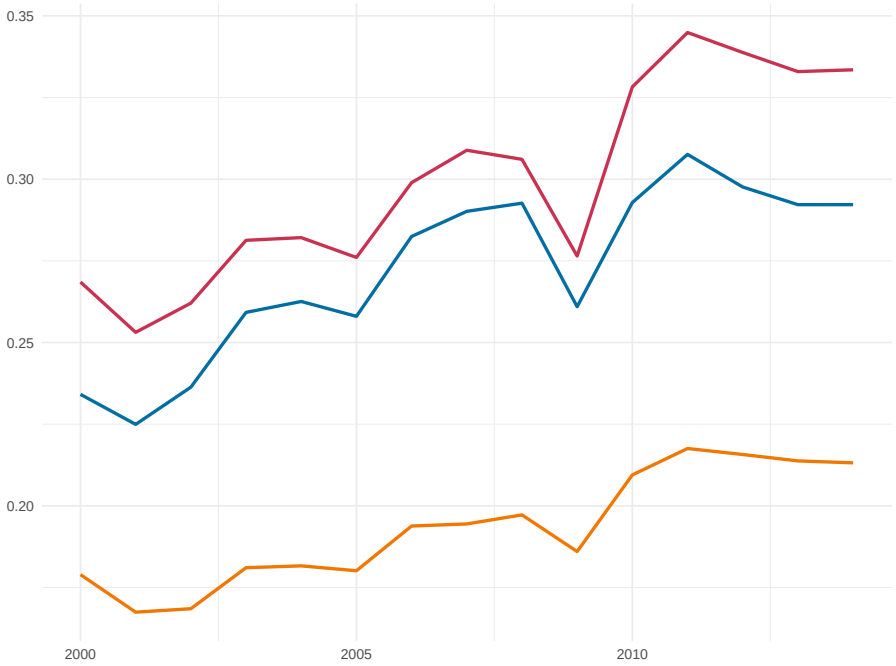
Figure: Median markups based on labor and intermediate input elasticities

- PF for global output, with: intermediate inputs, labor and capital (and intermediates serving as a proxy variable)
- It allows to check if markups based on labor and intermediates elasticities and revenue shares differ
- It allows to check if decline of markups is driven by rising labor adjustment costs (or monopsony power)
- Median markups (as well as mean) are generally falling also for intermediate inputs, but the fall is less pronounced

Markup derivation

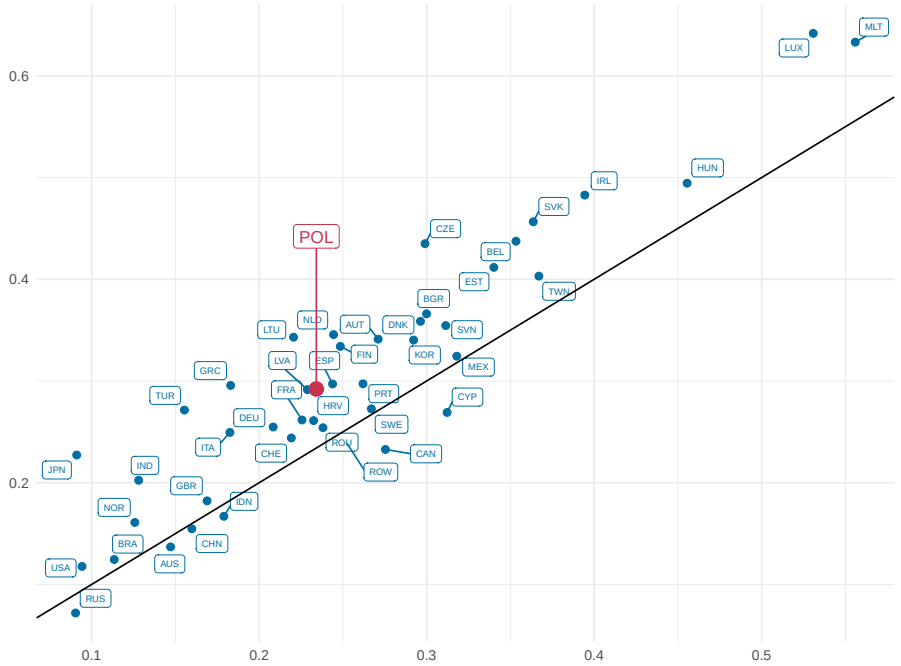
Foreign value added ($\mathcal{FVAX}$) at exports in Poland

$\mathcal{FVAX}$ in Poland



Note: the blue line stands for the $\mathcal{FVAX}$, the orange line denotes the average of the $\mathcal{FVAX}$ at the industry level while the red line represents the $\mathcal{FVAX}$ adjusted by structure of German exports.

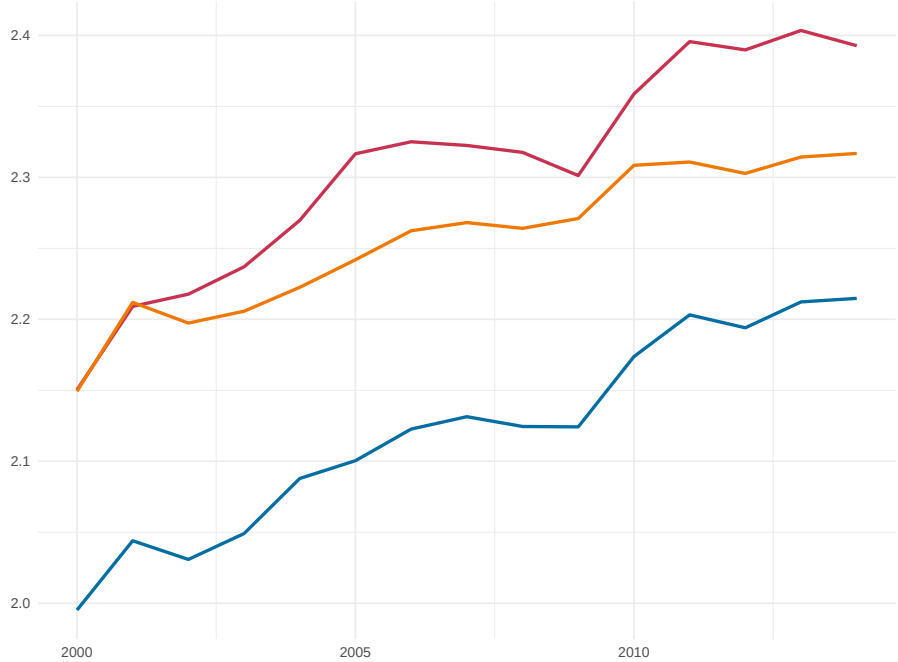
$\mathcal{FVAX}$ in 2000 (horizontal axis) and in 2014 (vertical axis)



Note: the black solid line stands for the 45 degree line which represents no change in $\mathcal{FVAX}$ between 2000 and 2014

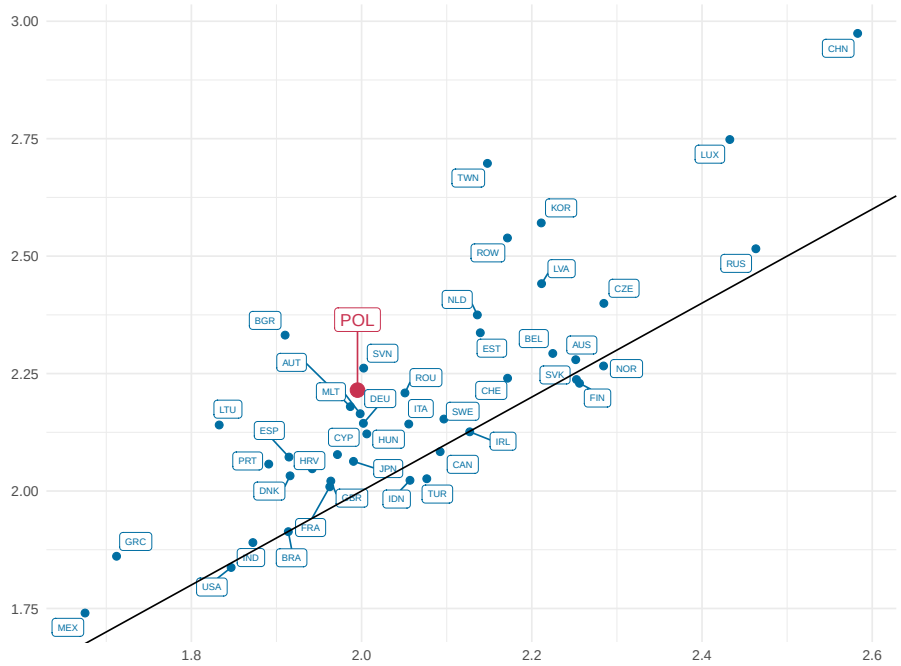
The Upstreamness ($\mathcal{UPS}$) in Poland

$\mathcal{UPS}$ in Poland



Note: the blue line stands for the $\mathcal{UPS}$ weighted by gross output , the orange line denotes the average of the $\mathcal{UPS}$ at the industry level while the red line represents the $\mathcal{UPS}$ weighted by gross exports.

The output-weighted $\mathcal{UPS}$ in 2000 (horizontal axis) and in 2014 (vertical axis)

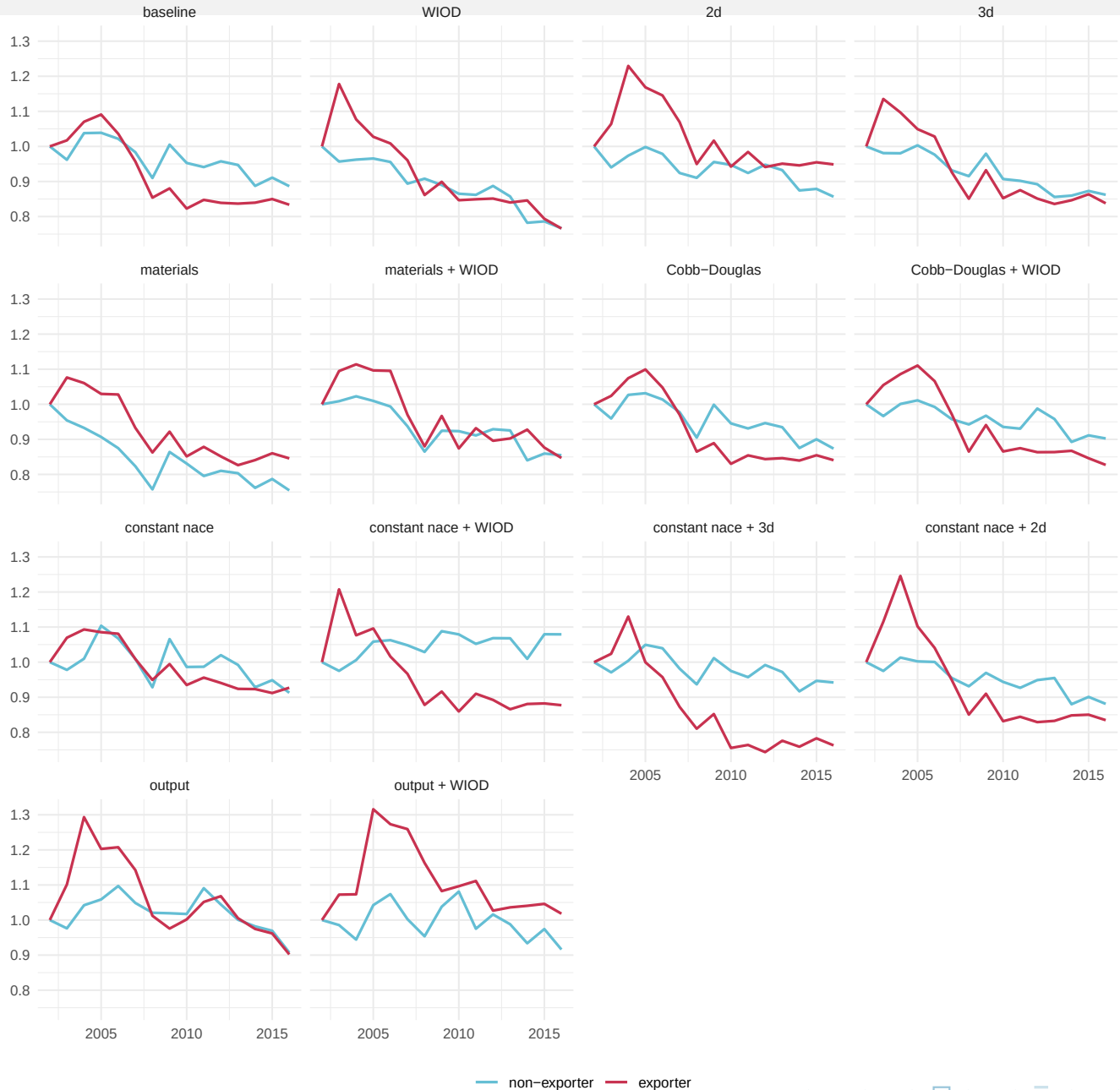


Note: the black solid line stands for the 45 degree line which represents no change in output-weighted $\mathcal{UPS}$ between 2000 and 2014

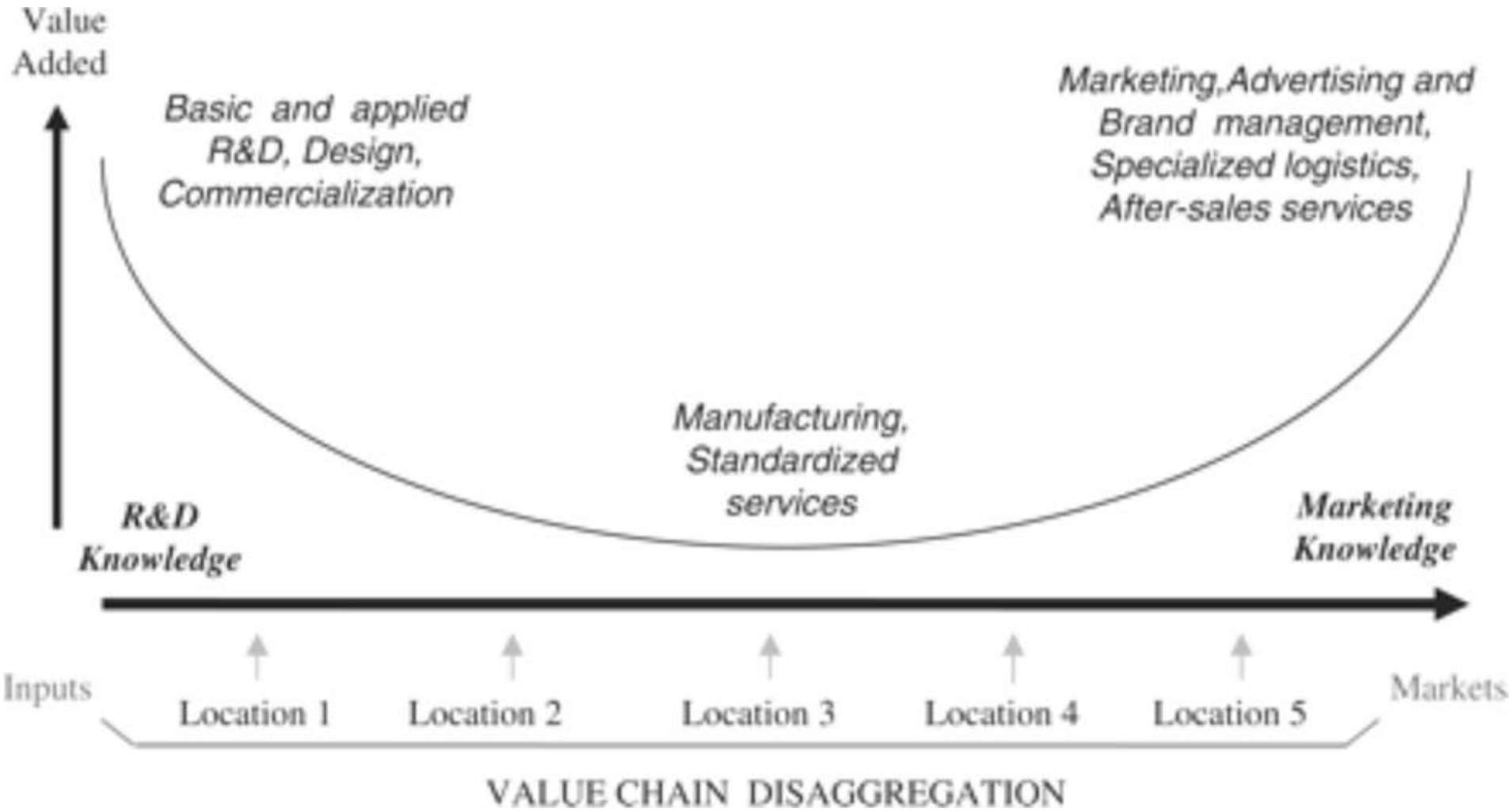
The median markups for exporters and non-exporting forms (2002=1)

The mean markups for exporters and non-exporting forms (2002=1)

The average (weighted mean) markups for exporters and non-exporting forms (2002=1)



Smile curve



Source: Mudambi (2008)

Motivation