From macro to micro: the sources of competitiveness

Giorgio Barba Navaretti, University of Milan
Matteo Bugamelli, Bank of Italy
Emanuele Forlani, University of Pavia
Sante De Pinto, Centro Studi Luca d'Agliano

Italy's Lost Productivity and How to Get it Back
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Outline of the presentation

1. **Conceptual framework**: the link between aggregate exports and higher moments of productivity distribution

2. **Evidence for the EU** taken from Barba Navaretti, Bugamelli, Forlani, Ottaviano (2016), "It takes (more than) a moment: revisiting the link between firm productivity and aggregate exports"

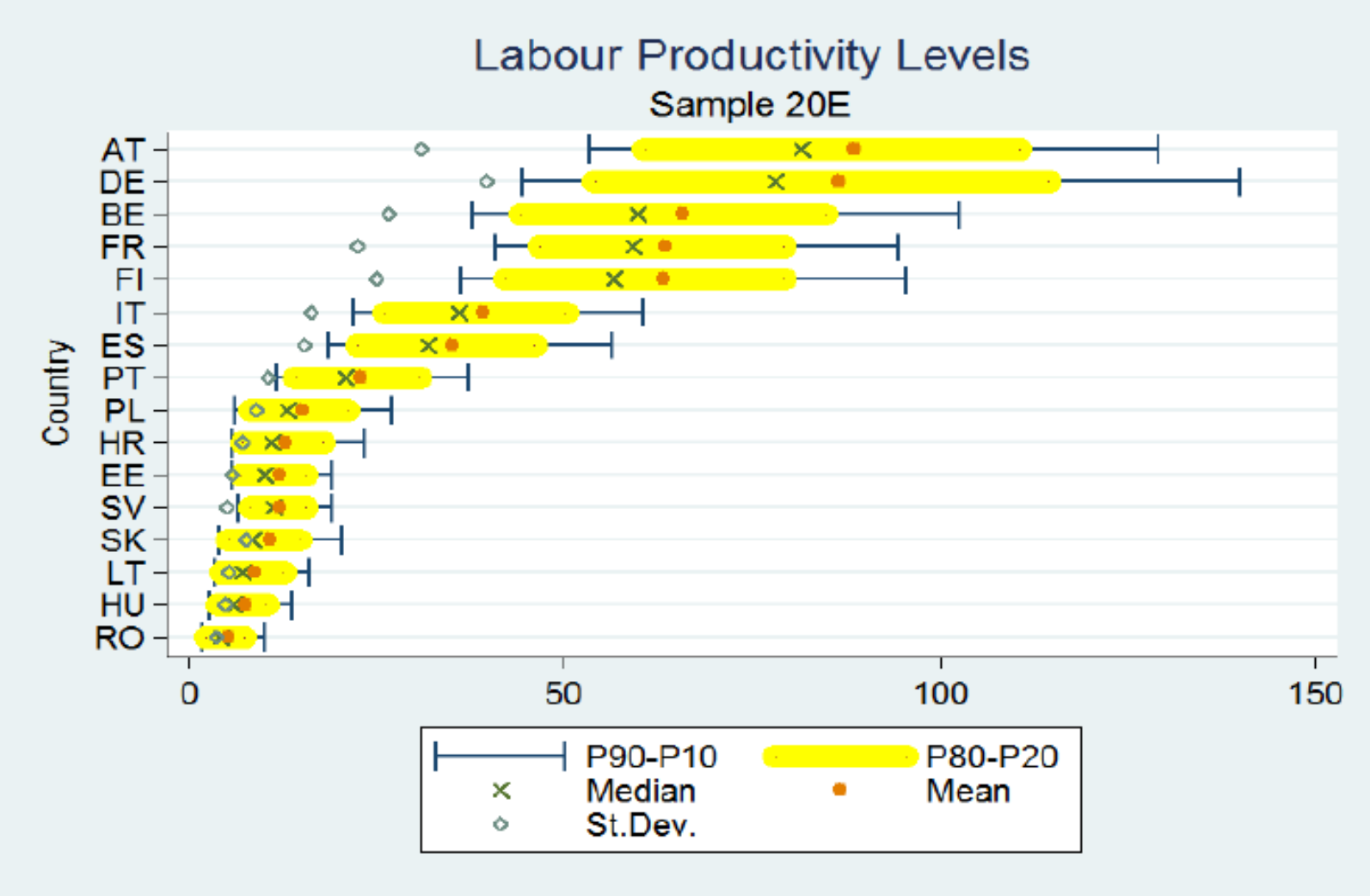
3. Deeper **descriptive insight for Italy**

The conceptual framework

Micro-ingredients of macro-competitiveness

- Which features of productivity distributions relate to aggregate exports?
  - ➢ (Ir)resistible prominence of average productivity ("first moment") in explaining aggregate export:
    - ✓ Macro practice (e.g. competitiveness measured by average unit labour costs)
    - ✓ Micro-macro trade literature ("standard trade model" à la Melitz 2003; Ricardian model à la Costinot et al 2012)
  - ➢ Contradicting hints
    - ✓ The distribution of firms' characteristics matters for aggregate outcomes (Gabaix 2011; "Happy Few" by Mayer and Ottaviano 2007)
    - ✓ Recent empirical studies provide evidence of large heterogeneity of firms' performances (TFP and labour productivity) both within and between countries

EU COUNTRIES: CHOOSE YOUR FAVOURITE MOMENT!



Source: CompNet database.

Theoretical Framework: The Standard trade Model

- Aggregate export from country *o* to country *d* in a "generalized trade model" with heterogeneous firms:

Special case: "standard trade model" *à la* Melitz (2003):

① CES sub-utility

② Iceberg variable cost τ_{od} and fixed trade costs f_{od}

③ Pareto distribution

$$X''_{od} = N_o \left(\bar{c}_{oo}\right)^{-k} \left(f_{od}\right)^{1-\frac{k}{\sigma-1}} \left(\tau_{od}\right)^{-k} \frac{y_d L_d \left(\bar{c}_{dd}\right)^{1-\sigma+k} \left(f_{dd}\right)^{\frac{k}{\sigma-1}-1}}{N_d^s \left(\bar{c}_d^s\right)^{1-\sigma}}$$

Eq.1

Exporter capability ("competitiveness")

Only first moment matter

Barba Navaretti-Bugamelli-Forlani-Ottaviano (BBFO, 2016)

The goal of the paper

- Test the null hypothesis of the "standard" model:
  - *According to Eq.1 only the first moment of the productivity distribution should matter for "competitiveness"*
- Do it in two stages:
  - Stage 1: run gravity regressions to estimate origin country fixed effects for a sample of Eurozone countries
    - Fixed effects measure the "competitiveness" of the sampled countries
  - Stage 2: test which moments of a country's firm productivity distribution are significantly related to its competitiveness

Data

- The "**CompNet database**"
  - comparable productivity indicators at country-sector-year level: unweighted average; median; coefficient of variation; 10^{th}, 20^{th}, 80^{th}, and 90^{th} percentiles; skewness
  - 15 countries: Austria, Belgium, Estonia, Finland, France, Germany, Hungary, Italy, Lithuania, Poland, Portugal, Romania, Slovakia, Slovenia, Spain
  - Period: 2001-2012; only manufacturing
  - built by members of CompNet: Central Banks and NSI
- ***OECD-STAN Bilateral Trade Database***: export values by destination, origin, year and sector
- ***CEPII***: distance, common border, common language, former colony
- **Egger&Larch, 2008**: Regional Trade Agreements

Empirical Analysis

First Stage: Graviy works

Gravity:

- Unbalanced panel of 472,321 observations
- Baseline: includes all bilateral export flows from CompNet countries *(o)* to destination countries *(d)* and 22 manufacturing sectors *(s)* from 2001 to 2012 *(t)*.
- We estimate:

$$Log(Export)_{o,d,s,t} = \alpha_{o,s,t} + \beta_{d,s,t} + \gamma_{o,d} \quad + \varepsilon_{o,d,s,t}$$

- $\alpha_{o,s,t}$:origin*year*sector fixed effects -> Competitiveness index
- $\beta_{d,s,t}$: destination * year*sector fixed effects
- $\delta_{o.d}$: dyadic terms (distance, common border, etc…)

- *Objective: compute fixed effects $\alpha_{o,s,t}$ as a measure of competitiveness of the sampled countries as suppliers, netting out importer-sector-time and country-pair specific characteristics*

Empirical Analysis

Second Stage: More than one moment?

$$Comp.Ind._{ost} = a_0 + a_1 Log(Mean)_{ost-1} + a_2 Log(firms)_{ost-1} + a_3 Log(wage)_{ost-1} + a_4 Asim_{ost-1} + a_5 Disp_{ost-1} + C_o + S_s + Y_t + e_{ost}$$

- The "standard trade model" predicts $a_4 = a_5 = 0$

Results

Yes, more than one moment: asymmetry matters a lot

Table 5: Baseline model - Productivity distribution and competitiveness index (sample20E)‡

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\text{Log(LProd(Mean))}_{ost-1}$	.0841***	.0804***	.0748***	.0944***	.1056***	.0919***	.0835***	.1021***	.0947***
	(.0232)	(.0231)	(.0223)	(.022)	(.0222)	(.022)	(.0214)	(.0222)	(.0216)
$\text{Log(firms)}_{ost-1}$	.5957***	.595***	.5966***	.5964***	.5772***	.5961***	.597***	.5776***	.58***
	(.0314)	(.031)	(.0303)	(.0314)	(.0319)	(.0312)	(.0304)	(.0317)	(.0308)
Log(wage)_{ost-1}	-.0627***	-.0654***	-.0701***	-.0599***	-.0598***	-.0615***	-.067***	-.0618***	-.0671***
	(.0142)	(.0144)	(.0142)	(.0138)	(.014)	(.0141)	(.0139)	(.0142)	(.014)
$\text{LProd(P90/P10)}_{ost-1}$		.0136*				.0072		.0093	
		(.0079)				(.0082)		(.008)	
$\text{LProd(P80/P20)}_{ost-1}$			.1054***				.0886***		.0983***
			(.0251)				(.0251)		(.0249)
$\text{LProd(Pears.)}_{ost-1}$				.4133***		.3913***	.2887**		
				(.1177)		(.1244)	(.1192)		
$\text{LProd(Skew.)}_{ost-1}$					.0761***			.0728***	.0681***
					(.0191)			(.0195)	(.0185)
Cons.	9.784***	9.77***	9.628***	9.634***	9.661***	9.634***	9.548***	9.657***	9.529***
	(.2088)	(.2092)	(.2087)	(.202)	(.2052)	(.2023)	(.2048)	(.2055)	(.2078)
Obs.	2789	2789	2789	2789	2789	2789	2789	2789	2789
R2	.9293	.9294	.93	.9309	.9298	.9298	.9298	.9302	.9309
Country fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Sector fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Clustering	Sector-year	Sector-year	Sector-year	Sector-year	Sector-year	Sector-year	Sector-year	Sector-year	Sector-year

‡ OLS model. Dependent variable: competitiveness index from Eq. 12 (see Col.3, Tab. 3). Time span: 2001-2012. Clustered robust standard errors are reported in parentheses. Significance level: * 0.10>p-value, ** 0.05>p-value, *** 0.01>p-value.

Empirical Analysis

Effect of Asymmetry is Sizeable

Increase of one standard deviation in:	%Δ Country Competitiveness
Average Productivity	6.2%
Pears Index	2.5%

Asymmetry has as a positive impact, smaller than that of average productivity but still sizable

So what?

- BBFO reject the null hypothesis of the "standard trade model" that only average productivity matters for aggregate exports
  - Also the dispersion and the asymmetry of productivity distributions have to be taken into account
- Two implications:
  - *Theory*: after rejecting CES and (especially) Pareto, what's the right model from which to derive a correct export equation to be estimated?
  - *Policy*: the overall industrial structure and the characteristics and performance of "best" firms (the right tail) are key to assess a country's export competitiveness

Going deeper into Italian data

Opening the black box for Italy

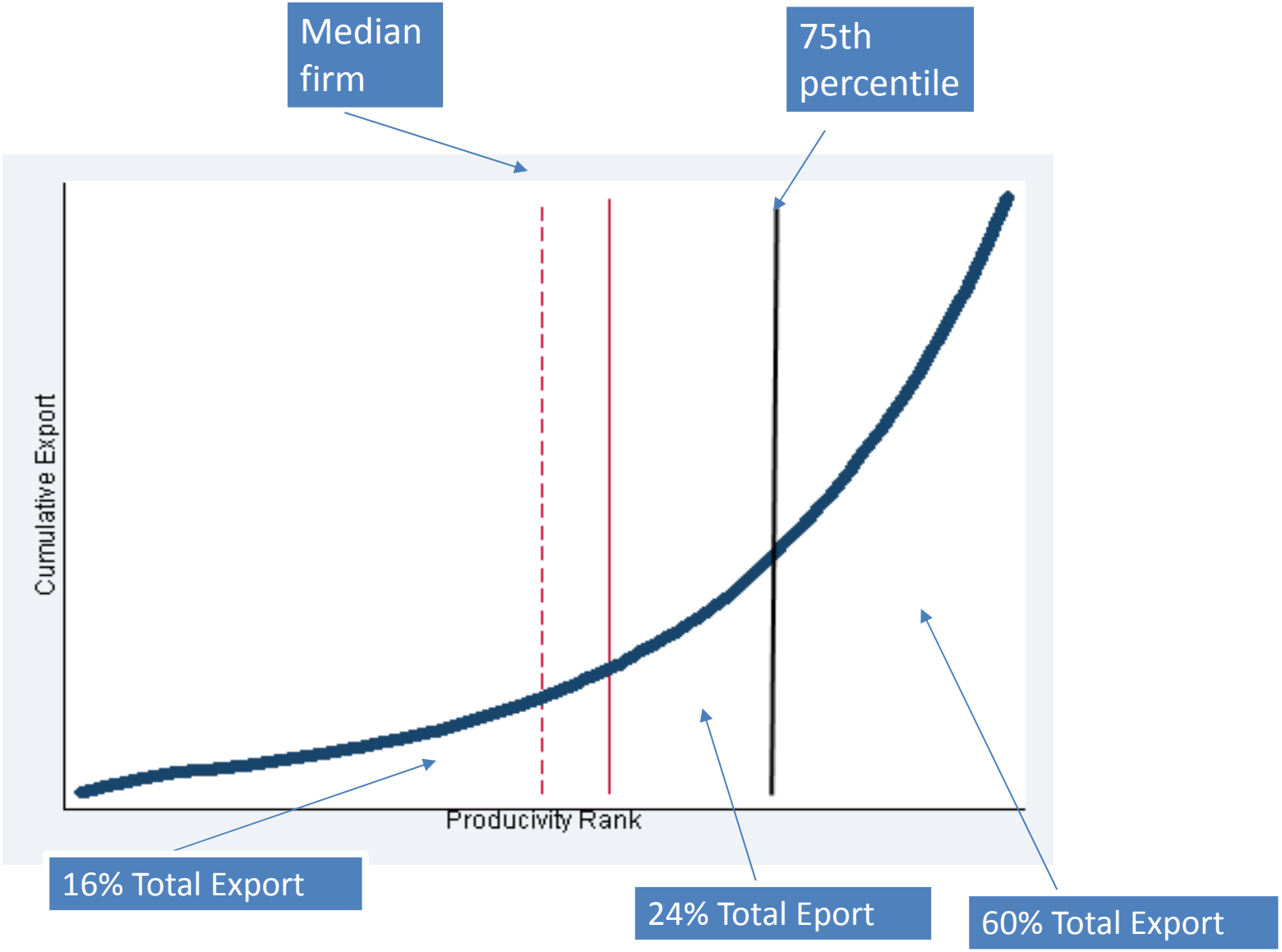
- BBFO provide a reduced form estimation of *aggregate* exports on (*semi-aggregate*) productivity moments for 15 EU countries
- But what do the micro data say about the link between productivity distribution and export performance in Italy?
  - Does the higher moments story work?
  - How is Italy's right tail of exporting firms (some evidence on happy few)?
  - What is its contribution as compared to that of the many exporters that are small-medium sized and less productive?

=> Here we start opening the black box with some preliminary evidence: identify which type of firms contribute to Italy's aggregate exports and exports' margins

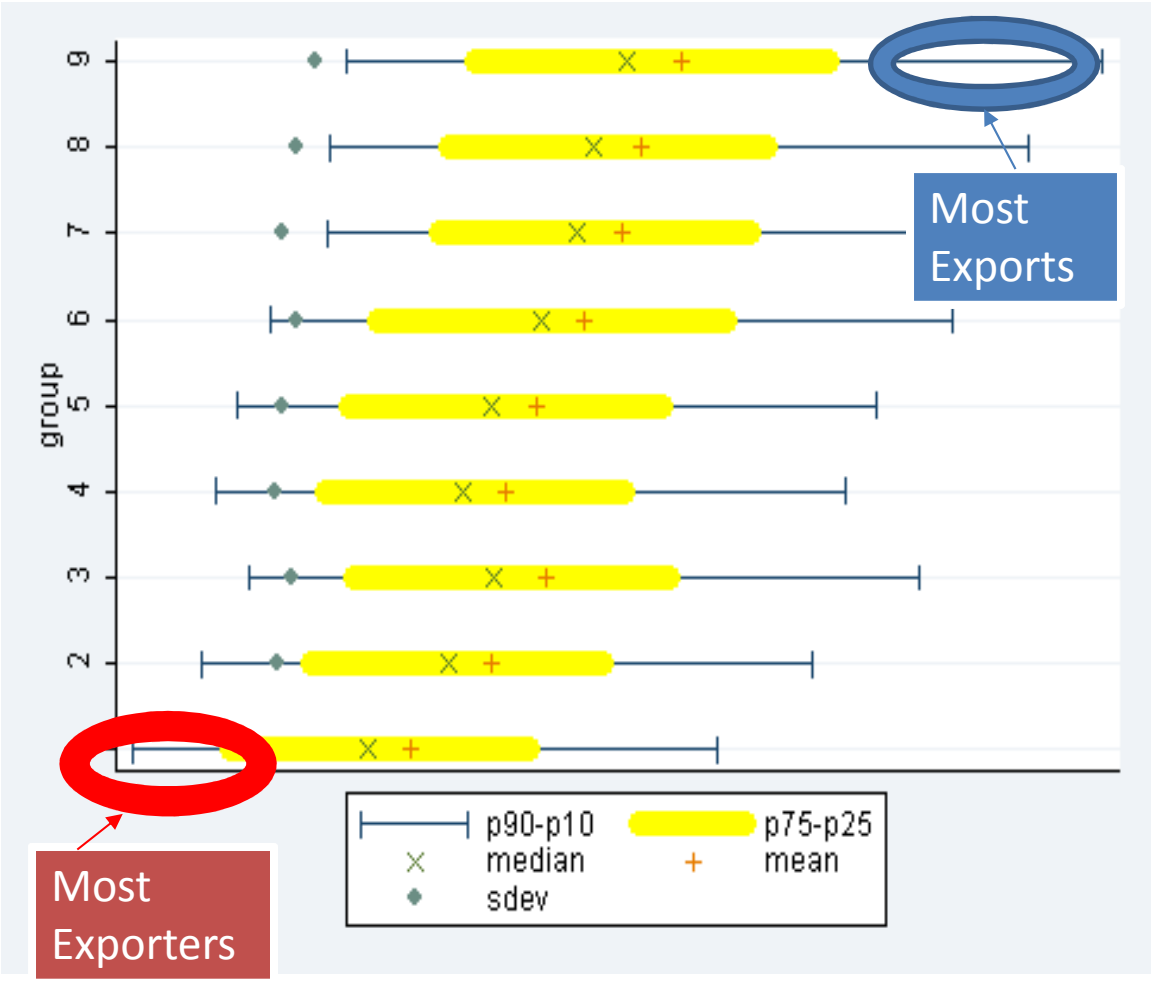
Istat data

- Data source: TEC-Frame SBS, Istat “laboratorio Adele”
- Data on value added, employment and export flows for the **universe of Italian manufacturing exporters** as of 2013
- Labour productivity defined as value added per worker
- Population of firms divided into nine groups, based on the number of products exported and the number of destinations reached:
  - # of exported product groups: 1-4, 5-11, more than 12
  - # of destination groups: 1-6, 7-17, more than 18

Large contribution of high-productive firms to total X

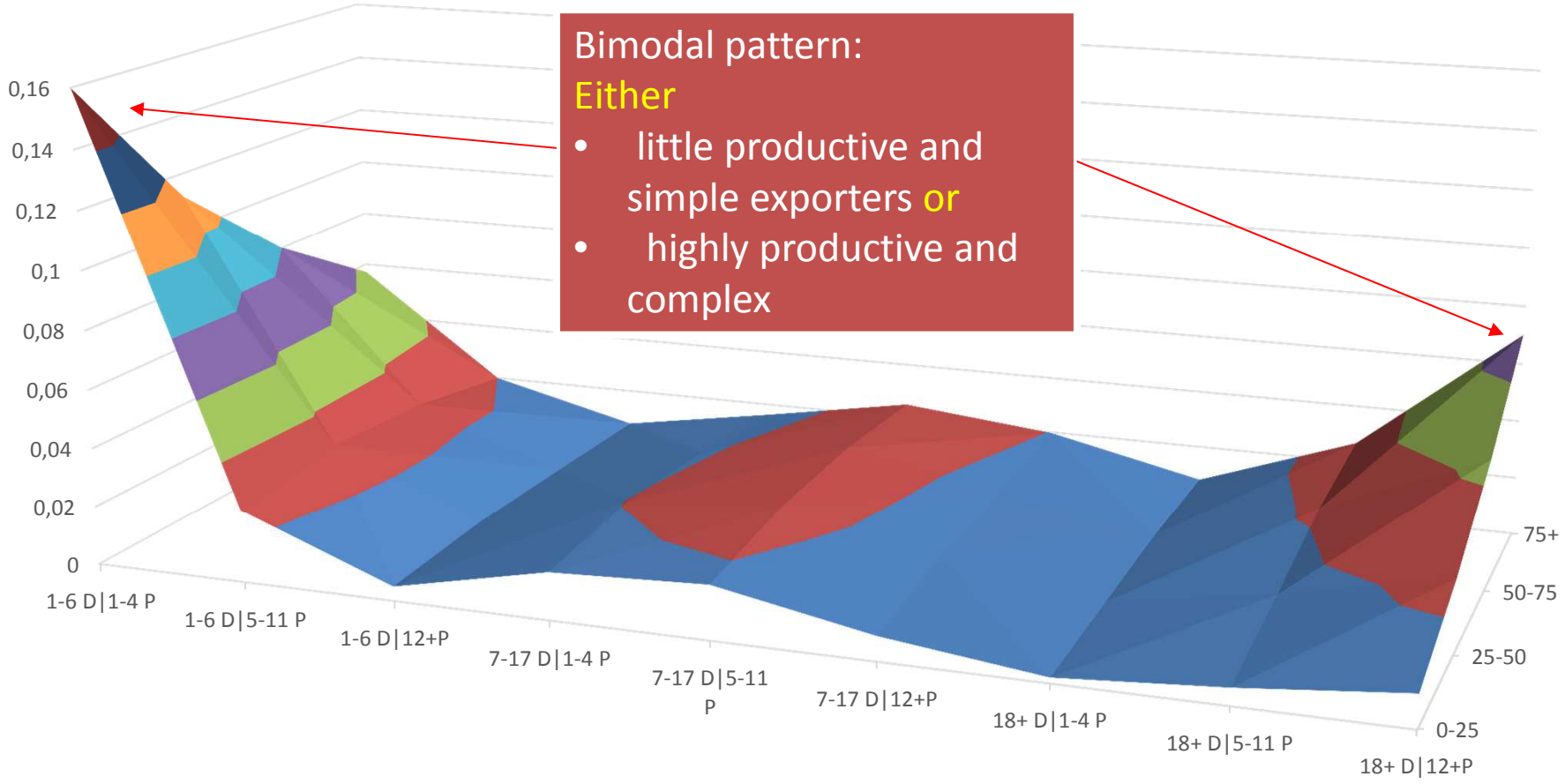


Large contribution of few «complex» firms to total X

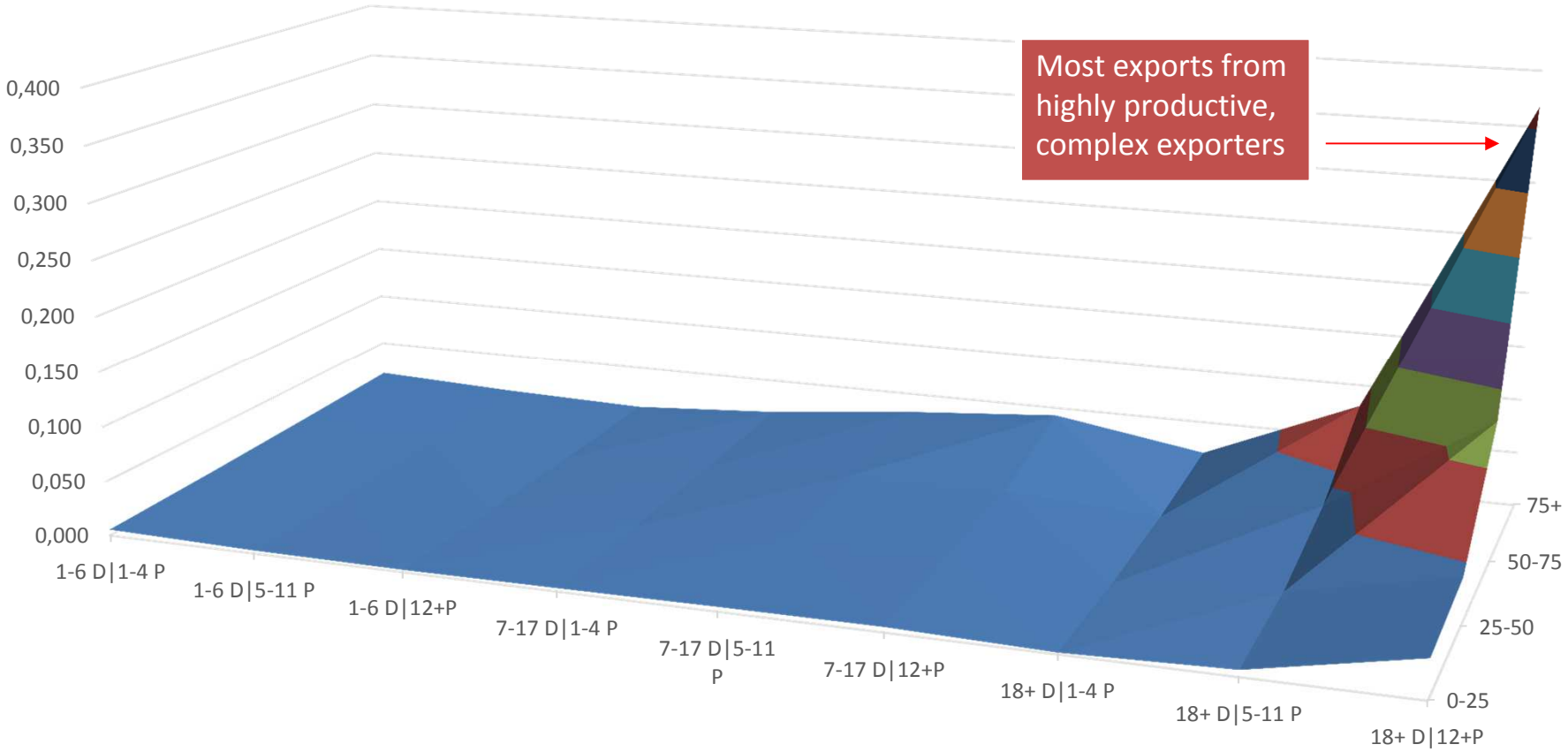


	% Firms	% Export
18+ Dest 12+ Prod	0.151	0.570
18+ Dest 5-11 Prod	0.068	0.134
18+ Dest 1-4 Prod	0.022	0.033
7-17 Dest 12+ Prod	0.058	0.073
7-17 Dest 5-11 Prod	0.094	0.063
7-17 Dest 1-4 Prod	0.071	0.036
1-6 Dest 12+ Prod	0.027	0.019
1-6 Dest 5-11 Prod	0.100	0.028
1-6 Dest 1-4 Prod	0.409	0.044

Distribution of Exporters by Productivity and Complexity



Distribution of Total Exports by Productivity and Complexity



Conclusions

- Aggregate export performance of most countries heavily depends on relatively few firms, typically highly productive and with complex organizational structures

- This applies to Italy, too: the right tail (high productive firms exporting multiple product to many destinations), matters for aggregate Italian exporters

- But: Italy's exporting sector is populated by a relatively larger (as compared to other advanced countries) share of small and «low» productive firms selling often to a single (guess EU) market

- These marginal exporters are: unable to reach distant and dynamic markets; constantly loosing world market shares; more exposed (also due to their sector and product specialization) to competition pressures from EMEs and LDCs. They also proved to be less resilient during the crisis.

Appendices

Empirical Analysis

Second Stage: Asimmetry and Dispersion Measures

Asymmetry

- For each country-sector-year triple, we measure the asymmetry of distribution using parametric *(Skewness index – third moment*) and non parametric (*Pearson's second skewness coefficient*) asymmetry indices

$$Pears._{o,s,t} = \left(\frac{mean_{ost} - median_{dst}}{st.dev._{ost}}\right),$$

Dispersion

- The ratio of the 80th to the 20th percentile of the productivity distribution (P80/P20)
- The ratio of the 90th to 10th percentile of the productivity distribution (P90/P10)

Empirical Analysis

Robustness I: Country-Year Fixed Effects; Sector-Year Fixed Effects (Table 6)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\text{Log(LProd(Mean))}_{ost-1}$	.0963***	.1068***	.0844***	.0949***	.0932***	.1021***	.0814***	.0903***
	(.0242)	(.0244)	(.0234)	(.0236)	(.0239)	(.0239)	(.0234)	(.0234)
$\text{Log(firms)}_{ost-1}$	.6208***	.5973***	.6215***	.601***	.5974***	.5799***	.5982***	.583***
	(.0336)	(.034)	(.0326)	(.0329)	(.0326)	(.0332)	(.0316)	(.032)
Log(wage)_{ost-1}	-.0542***	-.0543***	-.0611***	-.0613***	-.0596***	-.0597***	-.0664***	-.0666***
	(.0143)	(.0146)	(.0144)	(.0145)	(.0143)	(.0145)	(.0144)	(.0145)
$\text{LProd(P80/P20)}_{ost-1}$			.0902***	.1021***			.0875***	.0965***
			(.0256)	(.0254)			(.0271)	(.027)
$\text{LProd(Pears.)}_{ost-1}$	.473***		.345***		.3889***		.2624**	
	(.1193)		(.1206)		(.13)		(.1317)	
$\text{LProd(Skew.)}_{ost-1}$		.0858***		.0775***		.0678***		.0599***
		(.0199)		(.0193)		(.0211)		(.0205)
Cons.	8.097***	8.216***	8.283***	8.294***	11.3***	11.31***	11.2***	11.17***
	(.2748)	(.2776)	(.2166)	(.213)	(.155)	(.1564)	(.1617)	(.1646)
Obs.	2789	2789	2789	2789	2789	2789	2789	2789
R2	.9323	.9324	.9328	.933	.9322	.9322	.9327	.9328
Country X year fixed effects	yes	yes	yes	yes	no	no	no	no
Sector X year fixed effects	no	no	no	no	yes	yes	yes	yes
Sector fixed effects	yes	yes	yes	yes	no	no	no	no
Country fixed effects	no	no	no	no	yes	yes	yes	yes
Clustering	Sector-year	Sector-year	Sector-year	Sector-year	Sector-year	Sector-year	Sector-year	Sector-year

Specifications in columns 4, 5, 7 and 9 of Table 5

Empirical Analysis

Robustness II: Country-Year Clustering; WLS (Table 7)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Alternative clustering				WLS		
$\text{Log(LProd(Mean))}_{ost-1}$	.0844***	.0949***	.0814***	.0903***	.087***	.0973***	.0893***	.0974***
	(.0222)	(.0208)	(.02)	(.0194)	(.022)	(.0218)	(.0226)	(.0225)
$\text{Log(firms)}_{ost-1}$	.6215***	.601***	.5982***	.583***	.631***	.6124***	.6114***	.5979***
	(.0234)	(.023)	(.0236)	(.0233)	(.0343)	(.0346)	(.0334)	(.0337)
Log(wage)_{ost-1}	-.0611***	-.0613***	-.0664***	-.0666***	-.055***	-.0553***	-.0601***	-.0603***
	(.0147)	(.0144)	(.0133)	(.0128)	(.0138)	(.0139)	(.0137)	(.0138)
$\text{LProd(P80/P20)}_{ost-1}$	.0902***	.1021***	.0875***	.0965***	.1027***	.1162***	.0999***	.1106***
	(.0213)	(.0196)	(.0206)	(.0194)	(.0277)	(.0271)	(.0291)	(.0286)
$\text{LProd(Pears)}_{ost-1}$	.345***		.2624**		.364***		.283**	
	(.116)		(.1204)		(.1257)		(.1376)	
$\text{LProd(Skew)}_{ost-1}$		.0775***		.0599***		.076***		.0577***
		(.0192)		(.0184)		(.0197)		(.0207)
Cons.	8.283***	8.294***	11.2***	11.17***	7.117***	7.102***	11.03***	10.99***
	(.1772)	(.1704)	(.3227)	(.3171)	(.2511)	(.2531)	(.1575)	(.1598)
Obs.	2789	2789	2789	2789	2770	2770	2770	2770
R^2	.9328	.933	.9327	.9328	.9359	.9361	.9358	.9359
Country X year fixed effects	yes	yes	no	no	yes	yes	no	no
Sector X year fixed effects	no	no	yes	yes	no	no	yes	yes
Sector fixed effects	yes	yes	no	no	yes	yes	no	no
Country fixed effects	no	no	yes	yes	no	no	yes	yes
Clustering	Country-year	Country-year	Country-year	Country-year	Sector-year	Sector-year	Sector-year	Sector-year

Specifications in columns 1, 2, 5 and 6 of Table 6

Empirical Analysis

Robustness III: Country Sample Composition (Table 8)

Excluded Country	$\text{Log(LProd(Mean))}_{ost-1}$	$\text{Log(firms)}_{ost-1}$	Log(wage)_{ost-1}	$\text{LProd(Pears.)}_{ost-1}$	Obs.	R2
AUT	.0835***	.6282***	-.0514***	.5687***	2629	.9317
BEL	.1054***	.5857***	-.0665***	.3981***	2595	.9335
CRO	.0931***	.5815***	-.0658***	.392***	2709	.9282
EST	.0896***	.5842***	-.0512***	.4943***	2623	.9266
FIN	.1187***	.5756***	-.0562***	.3102**	2589	.9377
FRA	.1059***	.6004***	-.0641***	.3245***	2558	.9323
GER	.0842***	.6082***	-.0594***	.4337***	2558	.9171
HUN	.0843***	.5879***	-.0524***	.3009***	2601	.9308
ITA	.0854***	.572***	-.0751***	.3711***	2642	.9261
LIT	.0897***	.5768***	-.0817***	.4035***	2639	.9274
POL	.0951***	.5892***	-.0598***	.4335***	2697	.9305
PRT	.1206***	.6084***	-.0481***	.4678***	2663	.9317
ROM	.1071***	.6306***	-.0542***	.4242***	2602	.9351
SVK	.0761***	.6044***	-.0661***	.4027***	2586	.9299
SLO	.1051***	.6164***	-.0497***	.4624***	2586	.9291
SPA	.0805***	.5957***	-.0608***	.3866***	2558	.9288

Specification in column 4 of Table 5

Empirical Analysis

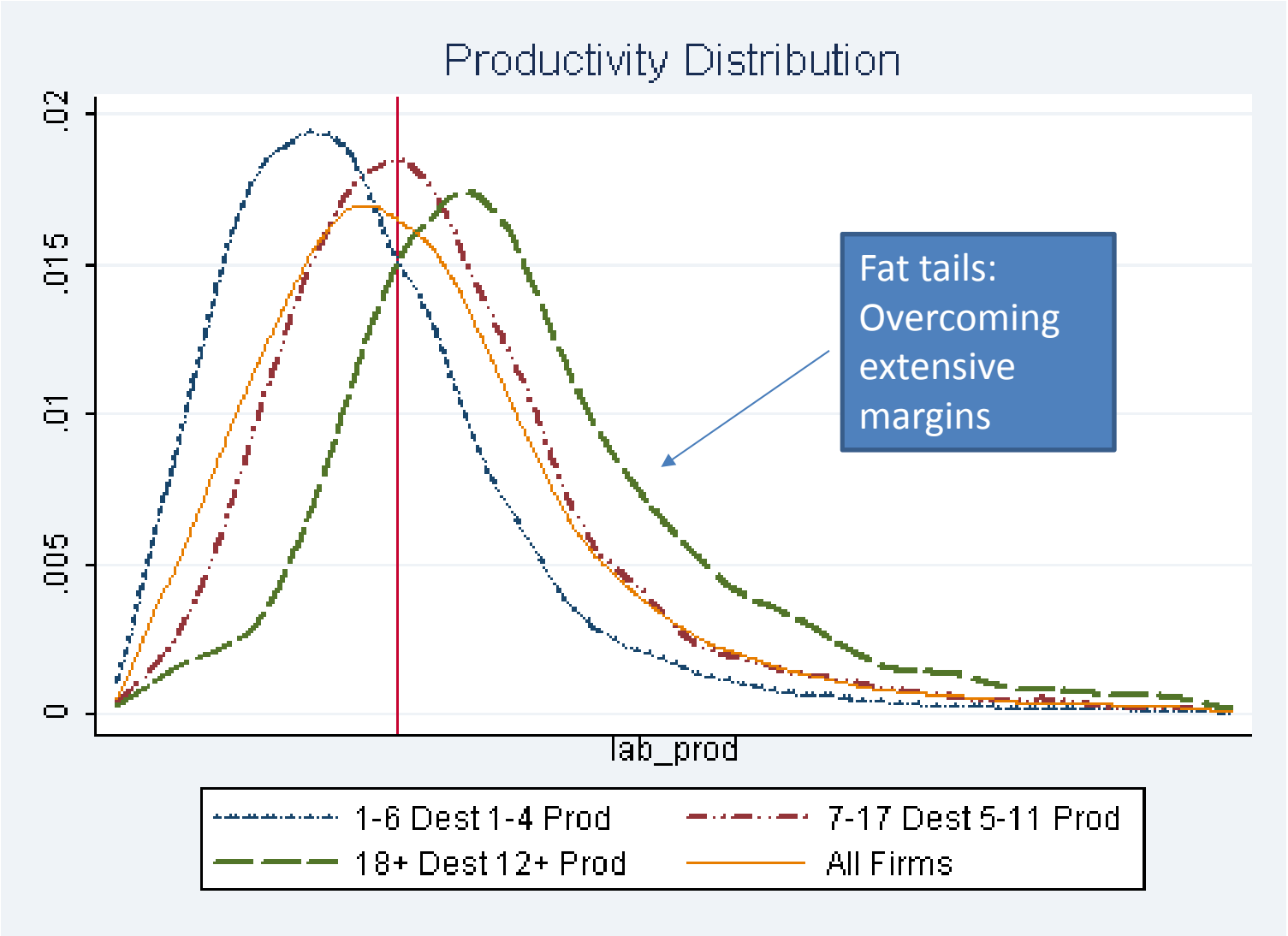
Second Step: Total Factor Productivity

The available data allow us to compute only two cross country comparable statistics on TFP: mean and asymmetry

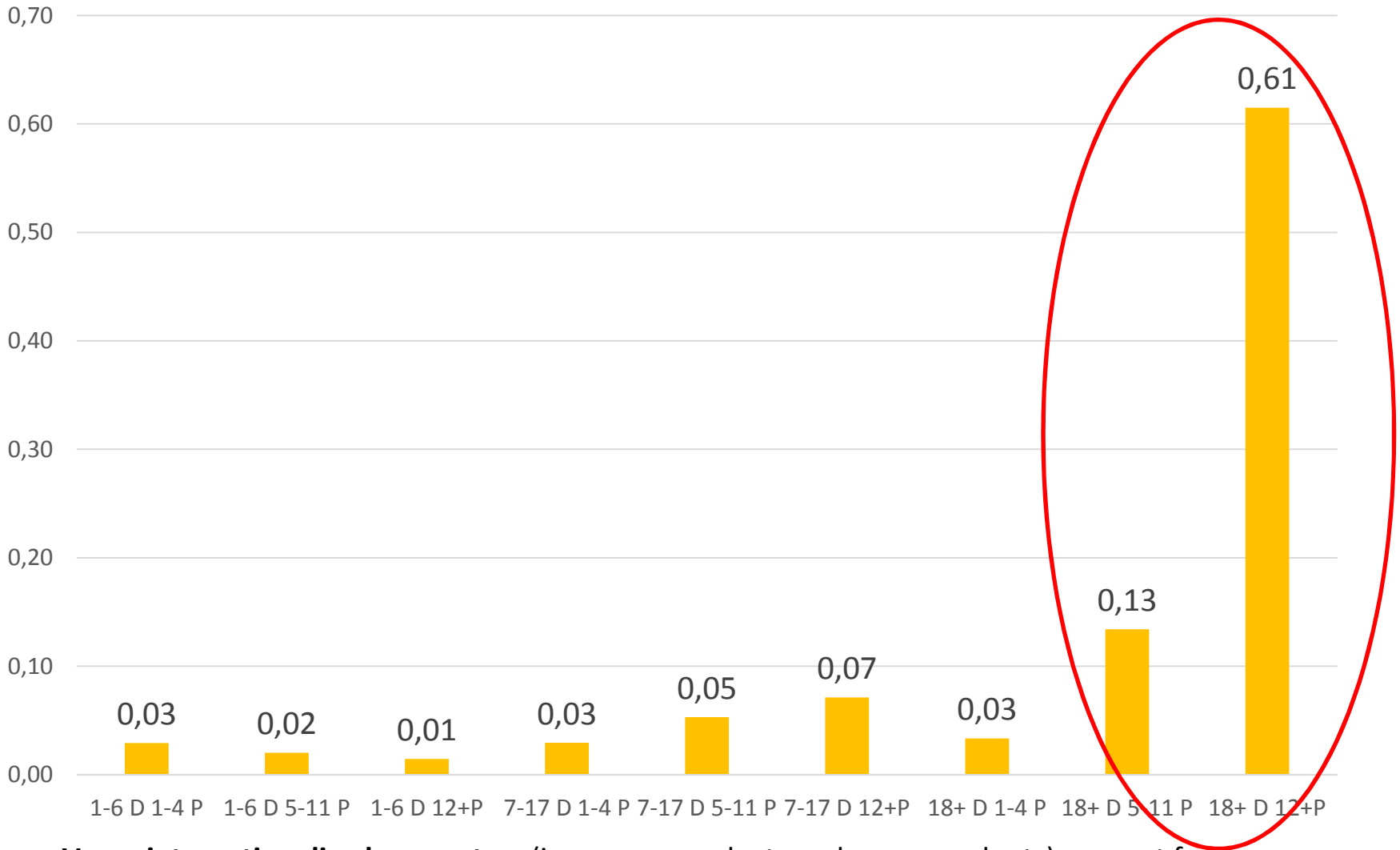
	(1)	(2)	(3)	(4)	(5)	(6)
$\text{Log(TFP(Mean))}_{ost-1}$	.0435**	.0527***	.0427**	.0519***	.0445**	.0535***
	(.0184)	(.0185)	(.0191)	(.0192)	(.0195)	(.0195)
$\text{Log(firms)}_{ost-1}$	.6162***	.6167***	.6202***	.6208***	.619***	.6199***
	(.0343)	(.0339)	(.0356)	(.0352)	(.0357)	(.0354)
Log(wage)_{ost-1}	-.0505***	-.0483***	-.0515***	-.0491***	-.0483***	-.0461***
	(.015)	(.015)	(.0159)	(.0157)	(.0158)	(.0156)
$\text{TFP(Pears.)}_{ost-1}$		.4085***		.3981***		.4124***
		(.111)		(.1178)		(.1253)
Cons.	10.02***	9.87***	10.32***	10.17***	11.66***	11.52***
	(.218)	(.2165)	(.1971)	(.2233)	(.1694)	(.1718)
Obs.	2464	2462	2464	2462	2464	2462
R2	.9327	.9332	.9341	.9346	.9351	.9355
Country fixed effects	yes	yes	no	no	yes	yes
Sector fixed effects	yes	yes	yes	yes	no	no
Country fixed effects	yes	yes	no	no	no	no
Country X year fixed effects	no	no	yes	yes	no	no
Sector X year fixed effects	no	no	no	no	yes	yes
Clustering	sector - year	sector - year	sector - year	sector - year	sector - year	sector - year

Specifications in columns 1 and 4 of Table 5

Adding a flavor of extensive margins



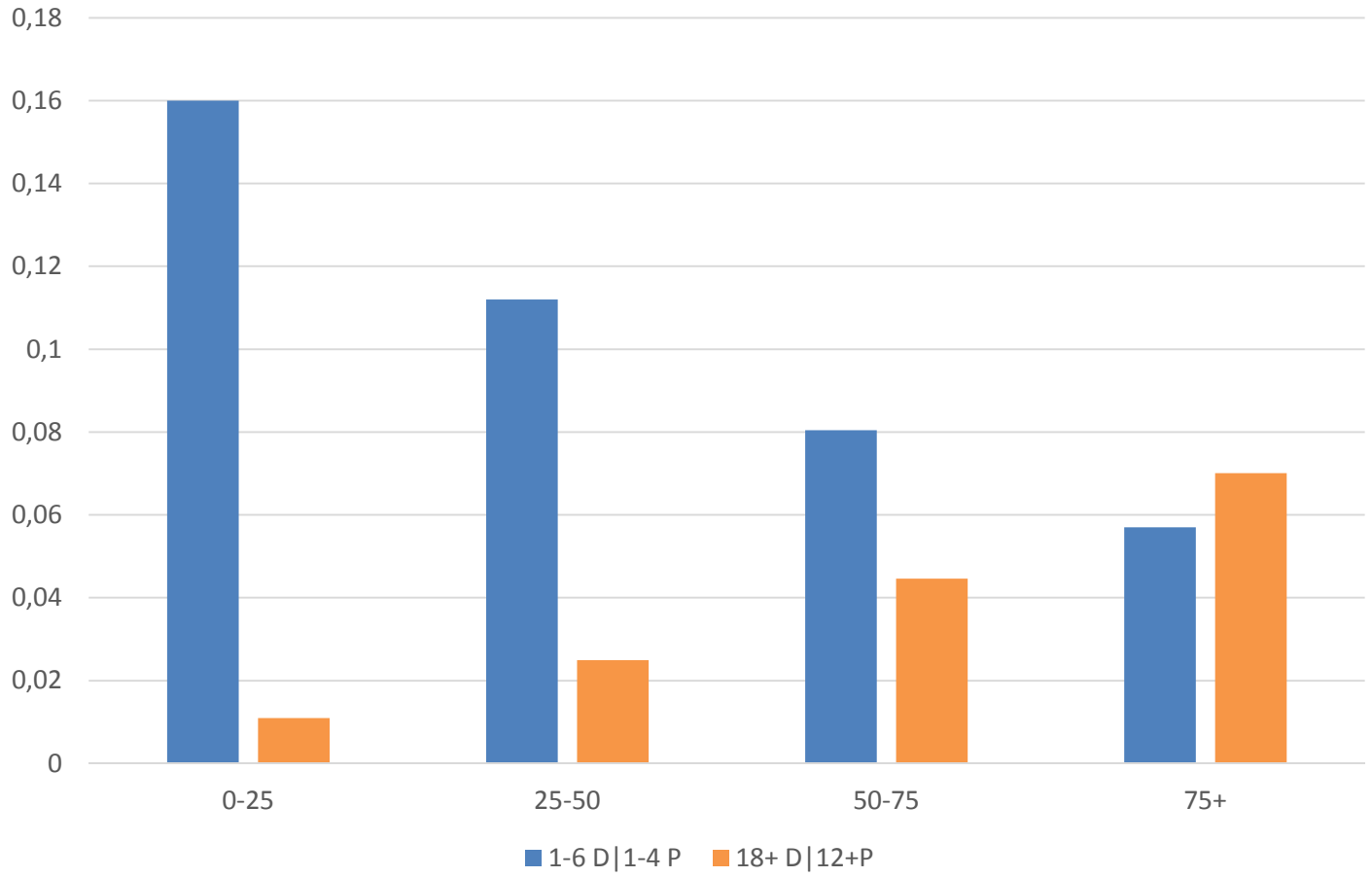
Export Composition - 75+ Percentile



- **Very «internationalized» exporters** (i.e., many products and many markerts) account for **74% of exports by most productive firms**
- **Very internationalized and most productive firms account for 45% of total exports**

Exporter composition by productivity group percentile

Extreme groups



Exporter composition by productivity group percentile

Extreme groups