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Productivity-Wage Nexus: Distributional approach on firms in Portugal

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Motivation

- Slowdown in productivity growth of industrial countries
- Anchor for generalized rising living standards



Productivity gains \Rightarrow Wage increases

otherwise income inequality \uparrow

- 70% of Portuguese families' income comes from wages (*ILO, 2018*)

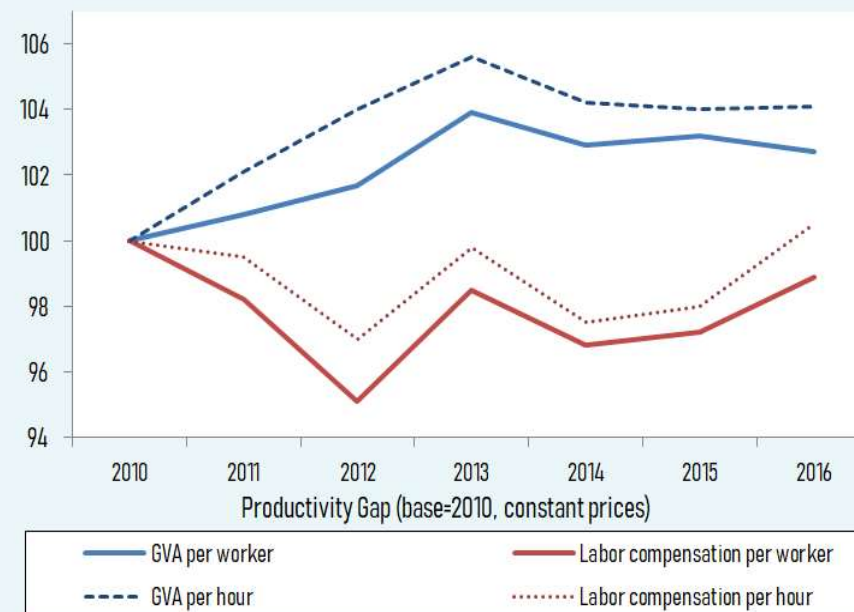


Fig. 2 - Labour productivity (blue) and compensation (red) per worker and per hour worked (OECD, 2010=100)



Data and Variables

- Database: *Informação Empresarial Simplificada (IES)* → 2010-2016
- $LP = \text{GVA}/\text{workers}$ $\text{Wage (avg.)} = \text{total remuneration}/\text{workers}$
- $\text{Training} = \text{on-the-job formation}/\text{T. labour costs}$
 $\text{Non-standard cont.} = (\text{temporary} + \text{part-time} + \text{independent})/\text{workers}$
 $\text{Board compensation} = \text{remuneration of Corporate Bodies}/\text{T. wage bill}$
 $\text{Labour Market deregulation} = \text{Fraser Inst. 5B Index}$ (*Gwartney et al, 2012*)
 $\text{Minimum wage (annual)}$ from OECD Labour Force Statistics

All results refer to correlations and should not be viewed as causal



Great Divergences

$$(\log Y_{\text{Percentile high}} - \log Y_{\text{Percentile low}})_{st} = \alpha + \beta_t \text{year}_t + \delta_s + \varepsilon_{st}$$

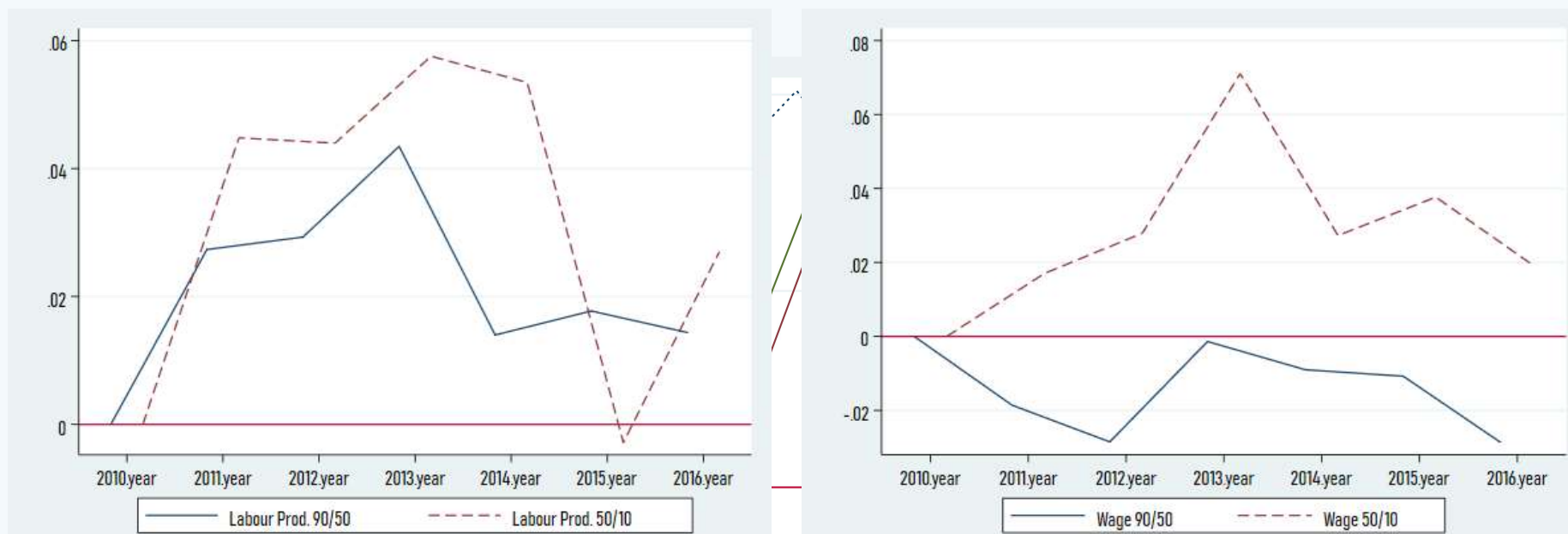


Fig. 4 - **Labour Productivity**. - top (blue) and bottom (red) halves
 Fig. 5 - **Average Wages**. - top (blue) and bottom (red) halves



Fig. 3 - Labour Prod., Wages and OECD income p90/p10

- Divergence of labour productivity was driven by both halves
- Divergence of wages was only driven by bottom half (p50/p10)

→ Higher LP dispersion was not followed by higher Wage dispersion in firms above medians

Dispersion's relationships

$$\log(Y \text{ dispersion})_{jt} = \alpha + \beta \log(X \text{ dispersion})_{jt} + year_t + \delta_s + \varepsilon_{st}$$

	(1)	(2)	(3)	(4)	(5)	(6)
Output 2	log LP (p90/p50)	log TFP (p90/p50)	log TFP_ols (p90/p50)	log LP (p50/p10)	log TFP (p50/p10)	log TFP_ols (p50/p10)
log Wage (p90/p50)	-1.048 (0.844)	0.243 (0.939)	0.198 (0.289)			
log Wage (p50/p10)				0.576** (0.226)	0.650** (0.237)	0.654** (0.233)
Observations	134	126	135	134	126	135
Number of sectors	20	18	20	20	18	20
Sector and Year fixed effects	YES	YES	YES	YES	YES	YES
R ² adjusted	0.195	0.009	0.024	0.258	0.055	0.127

- There's a significant relationship between the overall dispersions of different measures of productivity and average wages (p90/p10)
- But not for top halves dispersions (p90/p50)
 - top companies might not be sharing prod. gains with workforce



Levels and growths relationships

$$Level(Y)_{ist} = \alpha + \beta growth(X)_{is(t) \text{ or } (t-1)} + year_t + \delta_s + \varepsilon_{is}$$

Table 2	(1)	(2)	(3)	(4)
	Avg. Wage	Avg. Wage	Lab. Prod.	Lab. Prod.
L.P. growth(t)	1.054*** (0.0451)			
L.P. growth(t-1)		0.00160 (0.0218)		
Wage growth(t)			36.61*** (0.516)	
Wage growth(t-1)				2.464*** (0.440)
Observations	852934	626337	852934	626337
Number of firms	226597	181901	226597	181901
Year and Sector F.E.	YES	YES	YES	YES
R ²	0.0176	0.0112	0.0337	0.0104

- Positive correlations are also significant in terms of levels and growths
- Contemporaneous growth acceleration of one variable is associated with a level upsurge of the other
- Past wage growth acceleration is associated with higher present GVA per worker
- However, past LP growth acceleration does not seem to correlate with present wage levels.



L.P. growth/Wage growth

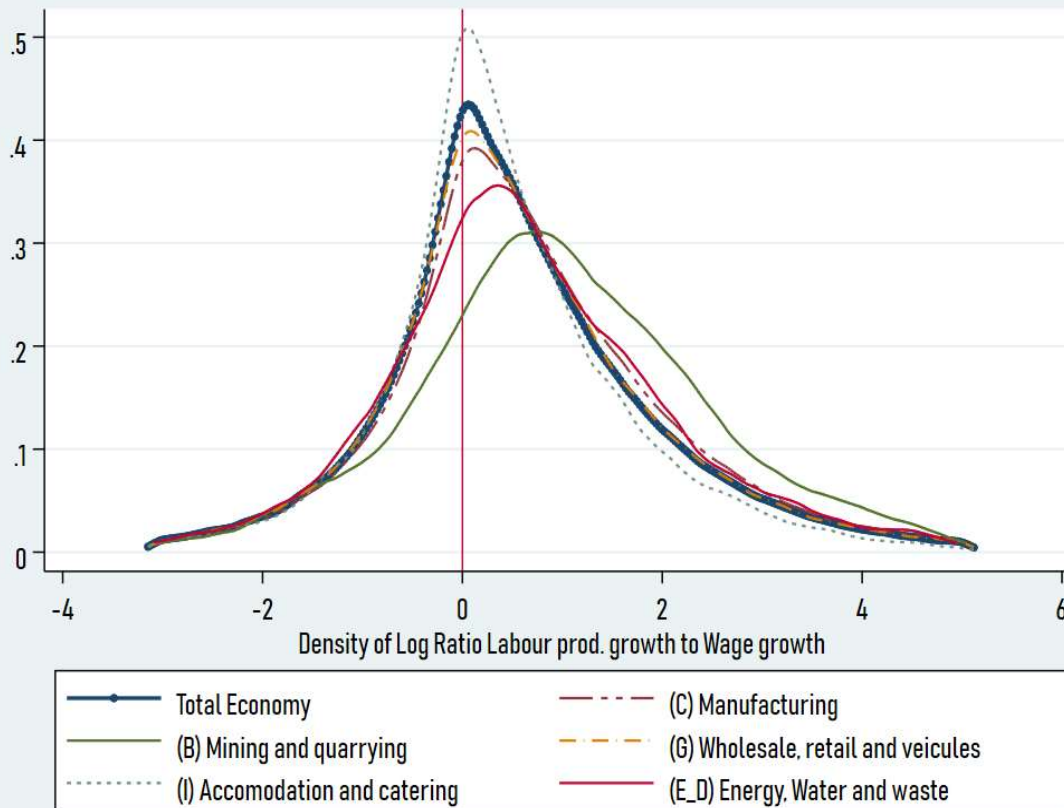
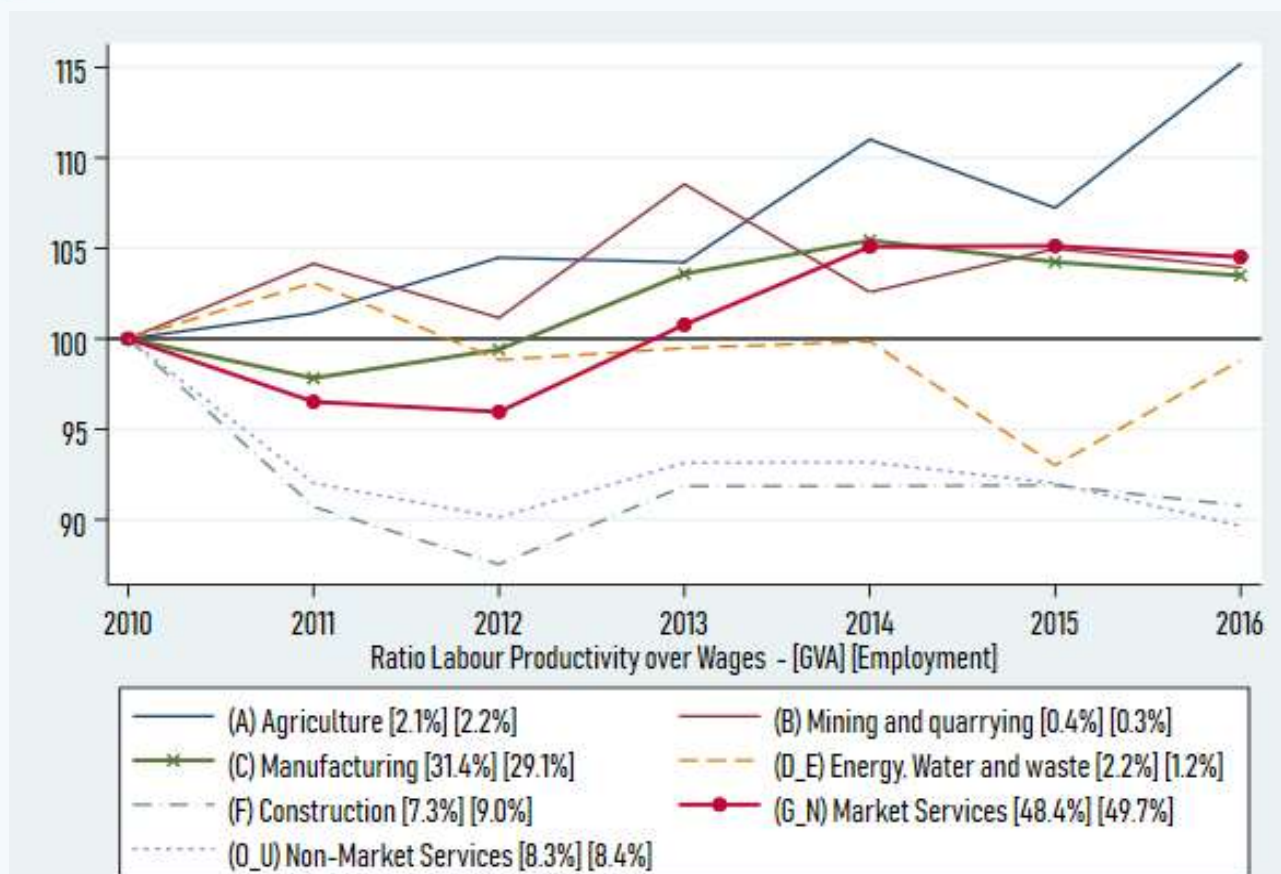


Fig. 6 - Red line represents the situation where wage growth matches that of GVA per worker. As an example of interpretation, a mode of 0.1 indicates that most firms should have raised wages by 10.5% more, if the aim was to match growths.

- At odds with the neoclassical theory of marginal product of labour...
- 2/3 of companies in each year did not raise average wages in line with labour productivity



Decoupling by sectors



- Sectoral heterogeneity in terms of decoupling
- Market Services (G_N) and Manufacturing (C) are the main sources for overall productivity-wage gap due to their weight
- Construction sector's (F) and Non-Market Services (O_U) severe declines of 15% and 10% (2012)

Fig. 8 - Evolution of the ratio of productivity to wages by sector, 2010=100



Determinants – average firm

$$\log(\text{Labour Productivity} / \text{Wage})_{it} = \alpha + \mathbf{X}'\boldsymbol{\beta}_{it} + \text{year}_t + \delta_i + \varepsilon_{it}$$

Table 4 - Fixed effects models - log (LP/wage) ratio

	(1)	(2)	(3)	(4)	(5)
Training	1.160***			1.040***	1.018***
Export status	0.0725***			0.0601***	0.0614***
Non-standard cont.	0.0495***			0.0691***	0.0671***
Innovation status		-0.00543**		-0.00795*	-0.00620
Electricity costs		-0.734***		-0.710***	-0.722***
Net Interest		0.0274***		0.0155**	0.0189**
L.M. deregulation			0.00645***	0.0224***	0.0184***
Minimum wage			-0.00000471	-0.0000176**	-0.0000191**
Board compensation			0.316***	0.159***	0.125***
Size					-0.0272***
Leveradge					-0.00000818*
Capital intensity					0.0139***
Capital intensity^2					-0.0000135***
NPL / Equity					0.00000160***
Observations	152,796	479,444	714,261	108,176	99,684
Number of firms	64,546	150,497	213,504	44,722	41,134
Firm and Year fixed effects	YES	YES	YES	YES	YES
R^2 within	0.0116	0.0814	0.0229	0.0775	0.0933
R^2 overall	0.0134	0.0776	0.0345	0.0854	0.148
R^2 between	0.0183	0.0798	0.0364	0.0887	0.152

Robust standard errors are clustered at the firm level: * p < 10%, ** p < 5%, *** p < 1%.

- Labour market flexibility, Higher share of Non-standard contracts and Board compensations tend to weaken the link between prod. and wages
- Surprisingly, so does investment in on-the-job Training
- Minimum wage increases are associated with stronger link
- Larger firms tend to have stronger nexus



Determinants – LP and Wage percentiles

Unconditional Quantile Regressions with Fixed Effects

	LP Q(10)	LP Q(50)	LP Q(90)	Wage Q(10)	Wage Q(50)	Wage Q(90)
Average Wage	0.474***	1.257***	3.731***			
Labour Productivity				0.0451***	0.104***	0.320***
Training	9488.7***	18007.4***	58816.0***	-2479.6**	-8264.2***	-13190.5***
Non-standard cont.	-2842.1***	-17.28	4165.1**	-3103.5***	-1208.0***	1146.4
L.M. deregulation	-14.39	46.66	235.9	-176.8***	-76.96**	-337.7***
Minimum wage	1.088***	0.986***	1.021	0.464***	0.186**	-0.442
Board compensation	-982.4***	753.2	10283.4***	-2201.4***	-1323.0***	761.5
Size	41.24	338.7	-2661.4***	376.8***	1955.9***	2647.8***
Observations	99684	99684	99684	99684	99684	99684
Number of industrie	82	82	82	82	82	82
Industry and Year fixed effects	YES	YES	YES	YES	YES	YES
R ²	0.103	0.328	0.181	0.0904	0.221	0.190
R ² overall	0.117	0.357	0.195	0.0995	0.240	0.203
R ² between	0.221	0.650	0.620	0.200	0.555	0.433

Robust standard errors are clustered at the firm level : * p < 10%, ** p < 5%, *** p < 1%.

Note: This table does not show the complete regressions for presentation purposes.

Training:

substantially ↑ LP but
↓ wages, particularly in top firms
→ executives discount these costs

Non-standard contracts:

lowers wages in bottom paying 50%;
lowers LP for low-performing firms
and raises LP for top-performing
→ contract conversion and nature

LM deregulation:

↓ wages and had no apparent effect on LP
→ decoupling/prod-wage gap

Min. Wages:

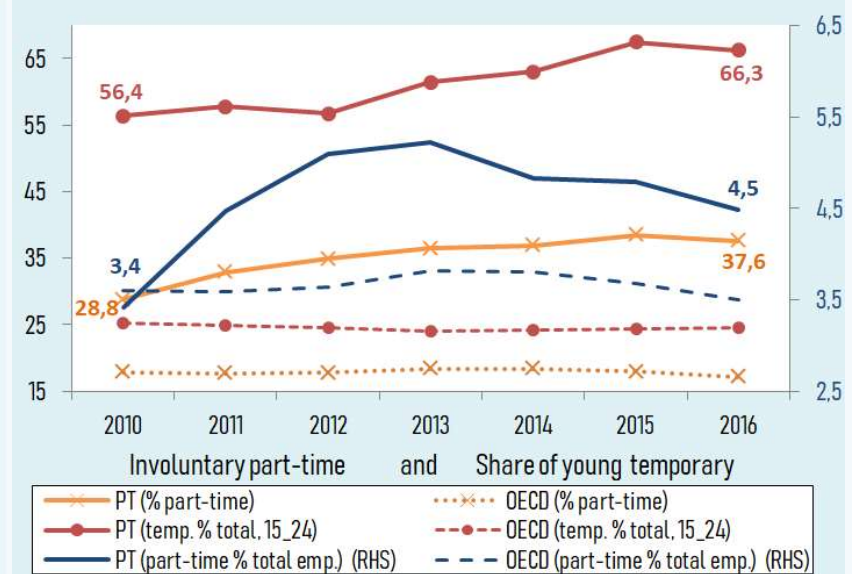
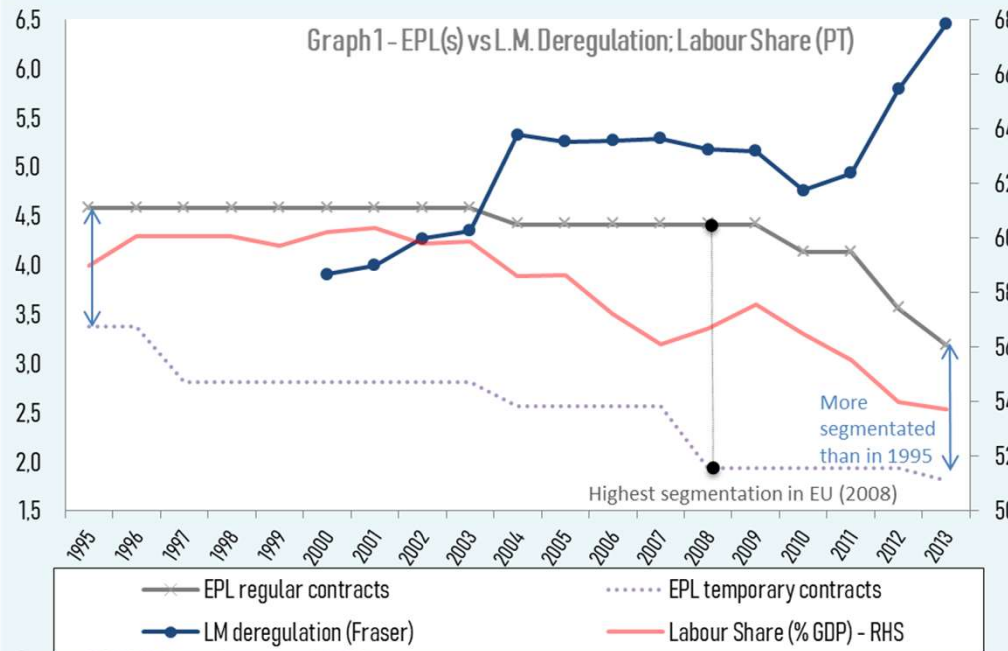
increases both LP and wages for below median firms
→ tackles wage inequality and LP divergence

Board comp.:

higher LP for top-performing but only negative effects on wages
→ decoupling/prod-wage gap



EPL vs Labour Share

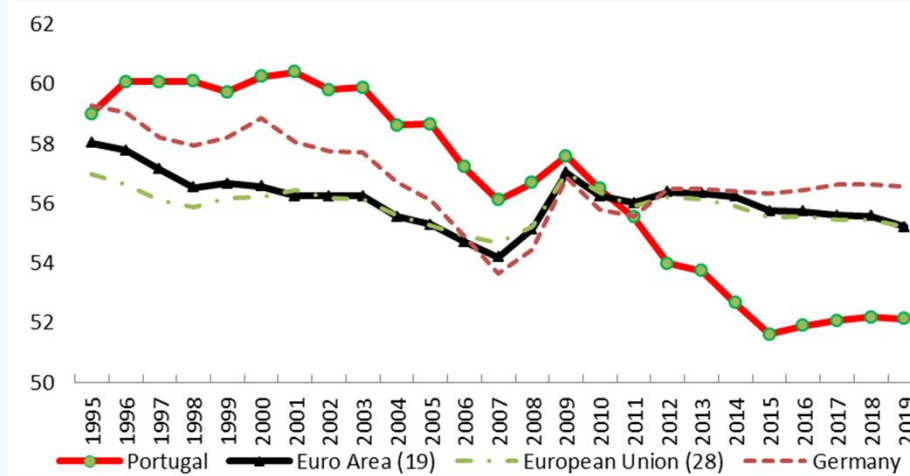


- Lower EPL of regular cont. did not correct segmentation as EPL of temp. also decreased
- Lower EPLs → decline of the Labour share (IMF, 2018)
- Segmentation increased:
 ≈ 2/3 young workers have temporary contracts (10pp ↑) + >2/3 are involuntary
 > 1/3 part-time contracts are involuntary (also ≈10pp ↑ and >double OECD avg.)

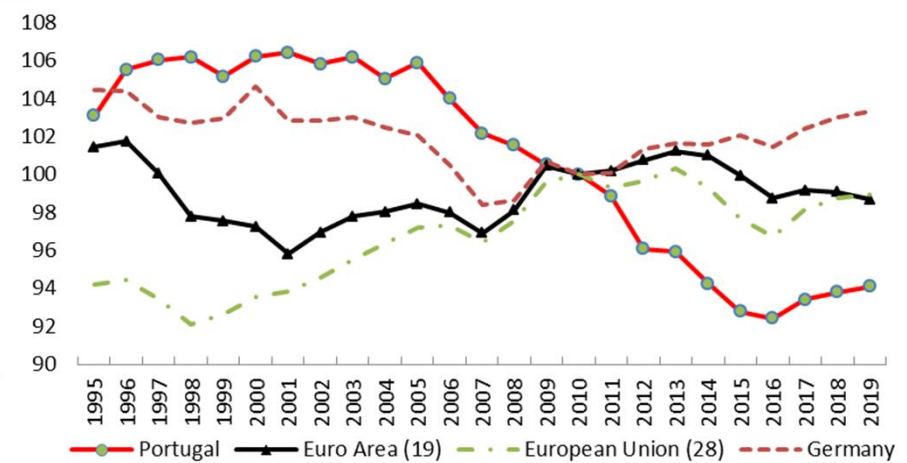


Labour Share vs ULC

Adjusted Labour Share (market prices) - AMECO



Real ULC rel. to the rest of 37 indus. countries - AMECO



$$ULC = \frac{Wn}{(GVAn/P)/L} = \frac{Wn * L}{GVAn} * P = \frac{\text{Total Labour Comp.}}{GVAn} = \text{Labour Share} * P$$

Felipe (2005, 2011)

- To promote ULC reduction \Leftrightarrow decrease Labour share (if deflator is constant)
→ can have recessive effects on wage-led economies (Onaran and Obst, 2016)



Main Conclusions

- Top-half productivity dispersion \Rightarrow top-half wage dispersion
→ productivity gains of top-performing companies might not be shared with the workforce.
- *Productivity-Wage Gap* has widened in all major sectors, except for Construction and Non-Market Services, notoriously affected by the crisis.
- Labour market deregulation did not correct segmentation by further reducing the protection of non-standard employment, providing incentives for companies to hire through these contracts.
- *LM flex:* \downarrow wages + ? productivity
Non-standard contr.: \downarrow wages + \downarrow productivity (below median)
Min. wage: \uparrow wages + \uparrow productivity (below median)



Thank you for your attention

Outline

- Motivation
- Data and Variables
- Great Divergences?
- Productivity-Wage Links and Gap
- Determinants
- Labour Share and ULC
- Conclusions

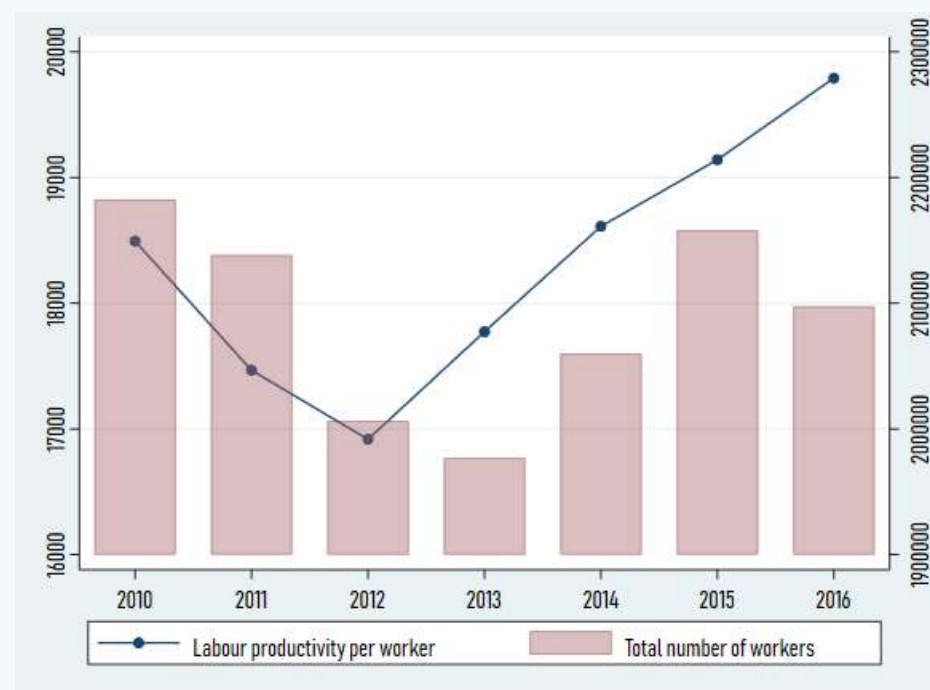
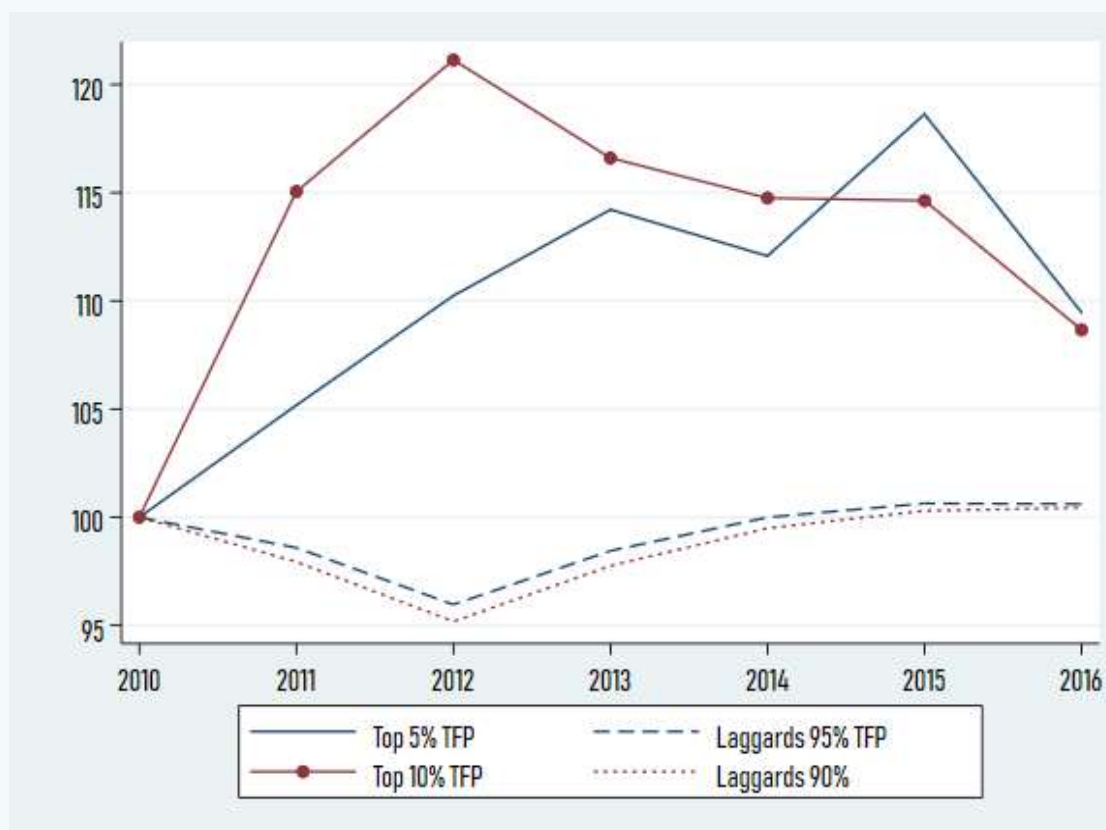


Fig. 1 - Labour productivity and number of workers (bars)



Frontier firms (TFP)



Top 5% and 10% of firms within each 2-digit industry in terms of TFP, 2010=100



Decoupling

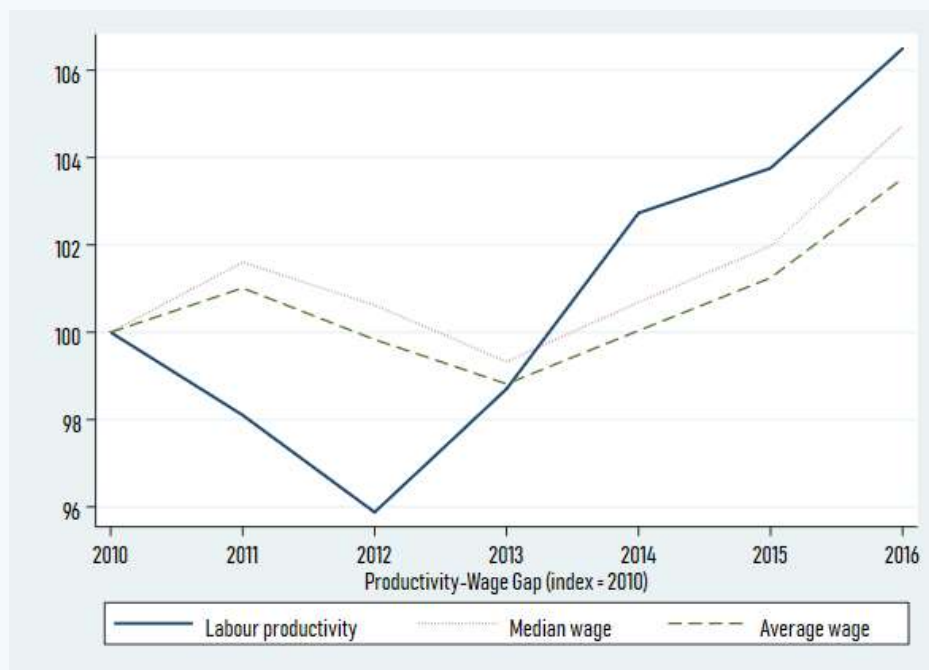


Fig. 7 - Evolution of industry mean of labour prod. (blue) and average and median wages (green and red). Next indexes are calculated within each industry and then annually averaged. 2010=100

- LP closely follows real GDP growth
- As real output growth returns to positive values (2014)
→ productivity-wage gap appears, even with nominal wage upturns
- Decoupling is much more pronounced at the macro-level (Figure 2)
→ only EMU country where real avg. comp. declined 2000-2016 (EC, 2018)



Table 5	Logit model - Top 1% TFP dummy					
	(1)	(2)	(3)	(4)	(5)	(6)
Average wage	0.0000799***				0.0000563***	0.0000589***
Irregular cont. (%)	-0.151**				-0.515***	-0.558***
Board comp.		-0.620***		-0.620***	-0.574***	-0.576***
Training		-0.273		-0.392	-0.219	-0.210
Size		0.582***		0.621***	0.410***	0.485***
Age		0.00261*		0.00338**	0.00294*	0.00339**
Export status			0.193***	-0.492***		-0.574***
Innovation status			0.388***	0.0826*		-0.00148
log(Herfindahl)			0.152***	0.123***		0.0747***
Observations	808461	191921	1113268	191921	165654	165654
Pseudo-R ²	0.0223	0.0309	0.00461	0.0342	0.0386	0.0418
Correctly classified cutoff = 0.01	72.62%	55.99%	60.82%	54.33%	59.55%	59.94%

Standard errors are available upon request: * p<10%, ** p<5%, *** p<1%.



Table 6	Alternative Logit model - Top 1% TFP dummy					
	(1)	(2)	(3)	(4)	(5)	(6)
Wage Premium	0.940***				0.881***	0.896***
Temp. Cont.	-0.000000691				-0.0470***	-0.0373***
Part-time Cont.	-0.000225				-0.0248**	-0.0316**
Indep. Workers	0.0000231				0.00238*	0.00232*
Board (Man. Bonus)		-0.771***		-0.761***	-0.420***	-0.419***
Training per worker		0.0000114		0.0000131	-0.0000443	-0.0000407
Size		0.583***		0.694***	0.672***	0.778***
Age		0.00266*		0.00363***	0.00106	0.00142
Exports / Turnover			-0.177***	-0.940***		-1.015***
Innov. (R&D)			-0.0657	-0.856***		-0.640***
log(Herfindahl)			0.164***	0.140***		0.141***
Observations	457302	191757	1113268	191757	122804	122804
Pseudo-R ²	0.0175	0.0309	0.00215	0.0388	0.0468	0.0528
Correctly classified cutoff = 0.01	50.20%	56.00%	57.55%	56.28%	57.99%	61.07%

Standard errors are available upon request: * p<10%, ** p<5%, *** p<1%.