

Competition, Firm Size and Returns to Skills: quasi-experimental evidence for Italy

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Abstract: We assess the impact of three quasi-natural experiments on returns to several types of skills, i.e. the 1993 Lira devaluation, the pre-euro 1997 Lira revaluation and of the process of market liberalization of the late 90s-early00s. We follow Guadalupe (2007) by assuming that the impact of the first two shocks is mediated by the trade exposure of sectors. For the liberalization shock, we follow Bassanini and Brunello (2011) by maintaining that competition increases only in three sectors: transport, energy and communication. Both types of experiments show that post-shock returns to skill increase in sectors that are more exposed to competition. In turn, the devaluation of the Lira in 1993 decreases returns to skills consistently with complementary evidence in Bugamelli et al. (2010). On average, instead, real wage premia decrease in sectors more exposed to competition. Finally, the increase in the skill premia occurs only in large and especially medium-sized firms. This novel result appears as the combination of two contrasting forces: 1. medium firms compete to attract the best workers and so pay higher skill premia, 2. large firms are forced to pay higher skill premia, but are also characterized by rent sharing with unions that reduce returns to skills.

Keywords: wage inequality; skill premia; product market competition; firm size

JEL Classification: J31; L11; D41

1. Introduction and related literature

Empirical evidence on the impact of market competition on skill premia and wage is rather scant due to tough data requirement needed to identify this impact. To the best of our knowledge, only two papers addressed this specific issue. Jean and Nicoletti (2004) carry out a cross-country analysis showing that more regulated sectors pay higher wages. This evidence is consistent with a rent sharing explanation of wages (e.g. Blanchard and Giavazzi 2003), but is silent on the returns to skills within sectors. Moreover, they are unable to identify any

causal impact of competition on wages and returns to skills. The paper of Guadalupe (2007) is therefore the unique attempt to estimate a causal relationship between market competition and wages using micro-data. For the UK, her main finding is that the unexpected revaluation of the pound, which mimics an increase in market competition, has widened the wage gap between skilled and unskilled. This result remains robust even when controlling for proxies of skill-biased technical change and, indirectly, for workers' sorting.

There are at least three simple theoretical reasons supporting this empirical finding. First, an increase in market competition positively affects returns to skills by increasing firms' competition to attract better workers (Boone 2001). Second, if enhanced firms' competition favours the adoption of advanced skill-intensive technologies, it is likely that the coalition between skilled-unskilled will break hence increasing skill premia (Acemoglu et al. 2001). Finally, notice that enhanced competition is equivalent to increased openness to trade that typically harms firms employing low- and mid-quality workers. At the same time, trade openness benefits more productive firms that employ highly skilled ones (e.g. Yeaple 2005, Sampson 2011). This latter explanation assigns a fundamental role to firms' characteristics that will be tested in our empirical analysis.

This paper attempts to assess the impact of market competition on wage and returns to skills using an empirical strategy similar to the one proposed by Guadalupe (2007). The three shocks considered here are the 1993 unexpected Lira devaluation, the pre-euro revaluation of the Lira and of the process of market liberalization in the late 90s-early00s.

We extend her analysis in three directions. Differently from Guadalupe (2007), our study allows comparing the effects of both an increase in competition (shock 1997 and around 2000) and the one of decrease in competition (shock 1993). This is useful to test whether the effect of opposite shocks is symmetric or not. The Lira revaluation in 1997 is fully equivalent to an increase in competition for those sectors that are more exposed to import penetration. Conversely, the 'devaluation shock' is not tantamount to a decrease in market competition as, within sectors more exposed to trade, better firms tend to export more. Devaluation should hence benefit more productive firms that are usually bigger, employ skilled workers and pay higher wages. This effect is likely offset the negative effect on the returns to skill of a decrease in competition.

Second, the rich dataset available to us (see below) make it possible to assess the effect of competition on different types of skills, namely: occupations, educational levels, family background, sector specific skills. The possibility of using several skill measures is particularly important in the Italian labour market where returns to skills seem to be rather

low and constant over time (e.g. Naticchioni et al. 2010, Oecd 2008). Moreover, specific skills seem to explain a substantial fraction of the export wage premia in related works (e.g. Macis and Schivardi 2012). Finally, unlike other countries, family background keeps having a strong residual influence on labour market outcomes for Italian prime age men, even when controlling for workers' skills and educational levels (Raitano and Vona 2011).

Third and more important, our data contain important firm-level information, i.e. the number of employees. Having a proxy of firm type is particularly important to test recent theoretical models where, under mild degree of complementarity between firms' and workers' characteristics, better firms benefit from trade openness so as better workers employed there (e.g. Helpman et al. 2010). Put it differently, information on firm size enables us to disentangle to what extent the effect of competition on wages is mediated by the degree of firms' heterogeneity within the sector.

Our analysis shows that these three extensions enrich findings in Guadalupe (2007). While substantially confirming the main result of Guadalupe (2007), i.e. that greater competition increases returns to skills, our first novel result is that the two opposite Lira shocks have indeed a symmetric effect. An increase (resp. decrease) of market competition decreases (resp. increases) the average wage and increases (resp. decreases) the return to white collar qualification. Similar results hold when considering education levels instead of occupational levels as proxy of skills. This result is in line with the characteristics of the Italian productive structure and on the effect of the 1993 devaluation on firms' dynamics. Specifically, Bugamelli et al. (2010) show that firms in low- and medium-tech sectors benefited the most from the 1993 devaluation. Since these sectors are typically unskill-intensive, demand of skilled workers should have declined following the devaluation and so returns to skills. Even more interesting from a theoretical perspective, the increase in the skill premia occurs only in large and especially medium-sized firms. This novel result may emerge as the combination of two contrasting forces: 1. following an increase in competition both medium and large firms compete to attract the best workers and so pay higher skill premia, 2. only large firms are heavily characterized by rent sharing that, in turn, mitigates the increase in returns to skills post-shock. Allied to this, large firms tend to pay lower skill premia when controlling for several workers and sector characteristics. This may also reflect the fact that managers of the few Italian large firms are not well-coded in our sample.

To Be Added: considering also workers specific skills (i.e. tenure in a given firm)

2. Dataset

We use a new and original retrospective panel on individual working histories, called AD-SILC, built merging longitudinal information provided by administrative archives with sample dataset. In particular, we merged the IT-SILC 2004 sample and administrative records from INPS archives of Employees and Self-Employed, from archives of firms (which since 1987 collect detailed information about employers in the private employment sector) and from Registers of Workers and Retired to obtain the entire working histories of around 25.000 private employees between 1987 and 2008.

The dataset built merging these datasets has three key advantages that allow extending the analysis of Guadalupe (2007). First, we have information on several skill proxies: qualification, education, family background, sector-specific skills--measured as the time a worker remains in a specific three digit sector. Second, we can control for contractual arrangements (part-time and full time), for some events happened during the year (receiving unemployment benefits or maternity allowances) and for annual earnings coming from other sources besides private employment. Third, we can control for firm size that enables us to test the influence of within sector firm heterogeneity on our results.

Further details about the dataset are the following:

- Sectorial information are collected only for private employees. Hence we refer only to private employees.
- Individuals are followed from their entry in the labour market up to 2009. Our starting year is 1987 for which we start having information on firm size and sectors.
- Records concerning private employees are matched with detailed information about firms provided by INPS, i.e. sector (3 digit ISIC), size of local unit and holding, location.
- Rich individual information collected by administrative records: e.g. contract arrangement, gross earnings, working weeks, occupation (White Collar and Blue Collar). Unfortunately, we have too few managers to have a finer skill classification. Notice, however, that the share of managers in our sample is in line with the share of managers in other samples. IT-SILC adds time invariant variables (e.g. education, family background) and conditions at 2005 (e.g. the 2 digit ISCO level). These information can allow to improve the skill classification of workers.

- Data shortcut: we consider only men between 15 and 59 to reduce attrition due to early retirement and maternal leave and household choices. We consider only private employees earning more than 50 euros per week. Earnings are considered at 2010 constant prices.
- (Log) Weekly gross wage is the dependent variable.

Remarks:

- We do not have information on the temporary-permanent employment arrangement because it is recorded in INPS archives only since 1998.
- Sectorial data for atypical workers (*collaboratori*) are not recorded => a rise of skill premia among employees could also be due to a substitution of the low paid high skilled with self-employed.

3. Empirical Strategy

Baseline:

Fixed effect estimator and OLS are used to check the effect of our proxy of competition on wages. We present results using White and Blue Collar as skill proxies, but main findings hold also for educational levels. Also adding a third occupational category, i.e. managers, do not alter the result as the skill ranking is preserved and magnified by the shock. However, we prefer not to include managers in our main specification as for a substantial fraction of managers we do not have information on the sector. The effect on the skilled wage is obtained by interacting our selected measure of skills with our proxies of competition (see below). Individual controls: age, seniority, skills (2 levels: WC versus BC), part time, unemployment spells plus year, sector 3-digit and region fixed effects. Specific sectorial features (at 2 digits ISIC) are added: e.g. R&D intensity, share of high skilled plus proxies of competition at the sectorial level. Proxies of competition:

1. Market openness to international trade: sectorial import penetration and export share on value added. These two variables are the crucial factor in order to differentiate the intensity of the shock across sectors. Sectors with higher import penetration and export share are more exposed to competition shocks, hence are the ones where skill premia should increase the most.

2. Index of product market regulation (PMR henceforth, source: OECD). The index is continuous and varies over time and across sectors (roughly 2 digits ISIC). However, it is a direct measure of competition only for a sub-set of sectors: energy and gas, communication and transport. For manufacturing, it is indirectly inferred using input-output table (see Conway and Nicoletti 2006 for details).

Difference-in difference estimators (DID), i.e. quasi-experimental evidence:

1. We follow Guadalupe (2007) and others by assuming that the impact of the Lira shocks, i.e. the devaluation of 1993 and the appreciation of 1997, is mediated by the trade exposure of sectors, i.e. the export share or the import penetration.
2. We follow Bassanini and Brunello (2011) by assuming that only these three sectors are hit by ‘competition shocks’. The others (i.e. mainly manufacturing) are assumed to have constant level of competition after the change in competition brought about by the single market program in 1992, therefore they play the role of ‘control group’. Among the three groups hit by the shock, the continuous measure of PMR allows to further distinguish how much competition changes in each sector.

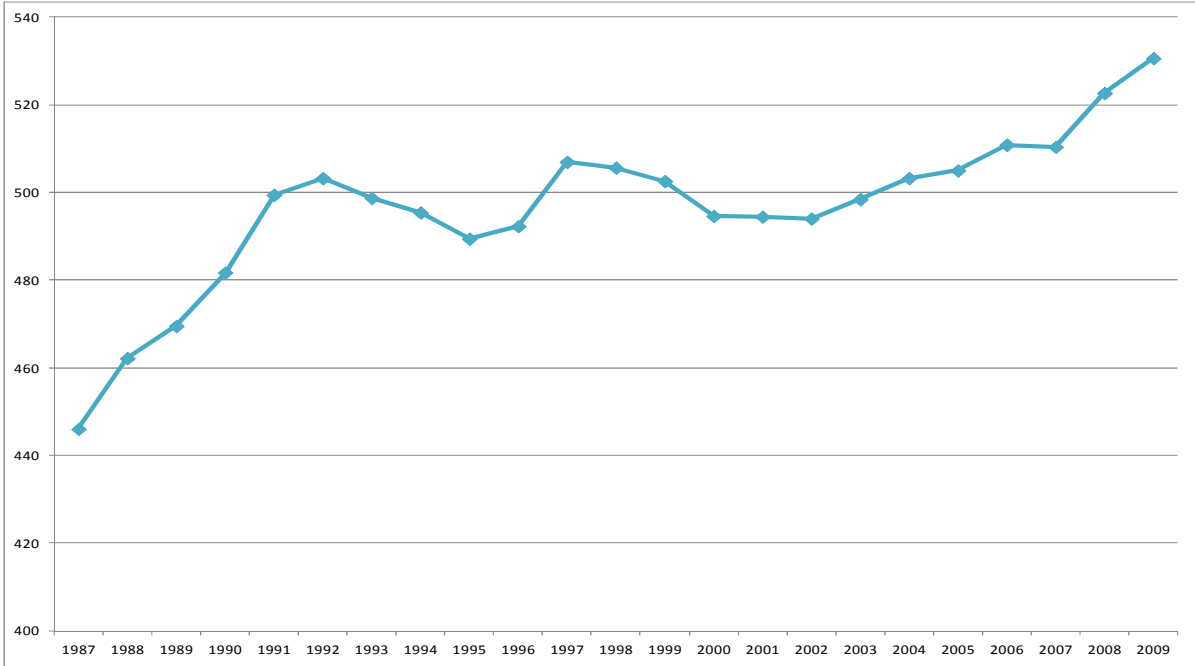
In all cases, the model is saturated with respect to the post-shock key variables, i.e. skills, proxy to competition, and also interactions between skills and time-varying confounding factors are added (firm size, R&D, share of graduates). Clearly, individual, year and sector fixed effects are always added as the individual and sector controls as in the previous specifications. Following Duflo et al. (2004), standard errors are computed using sectors as cluster units to reduce the ‘over-acceptance of H1 bias’ typical of DID estimators. Finally, in order to correctly disentangle the effect of each shock, we consider three sub-periods: 1987-1996 for the 1993 shock, 1993-2007 for the 1997 shock and 1987-2008 for the PMR shock. For the latter shock, we prefer to use all the available information as we exclude the years between 1999 and 2001 where the main liberalization occurred. However, results do not change by using shorter time windows. For the two earlier shocks, they partially overlap. The first one also overlaps with the single market program (SMP) shock that increased competition in a sub-set of selected sectors. To Be Added: different effect of the 1993 shock depending on the exposure to the SMP too, i.e. split for low and high exposure to SMP.

We allow the shock to have different effects depending on the firm size by considering the DID estimators separately for small (≤ 15 employees), medium (> 15 & ≤ 200) and large

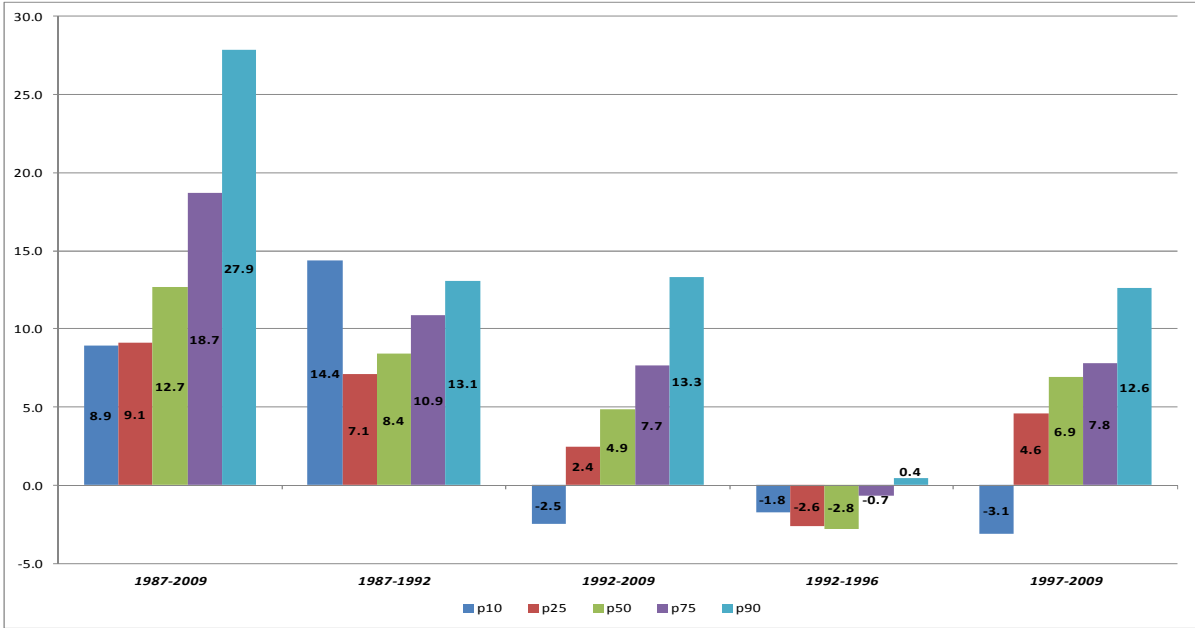
(>200) firms. This further exercise allows partially testing the predictions of recent trade models with heterogeneous firms and workers (e.g. Yeaple 2005).

4. Descriptive Evidence

Tab. 1: Mean gross wage in real terms



Tab.2 : Gross weekly earnings real growth in different percentiles and in sub-periods



Tab. 3: Gini coefficient



Tab.4: White Collar vs. Blue Collar

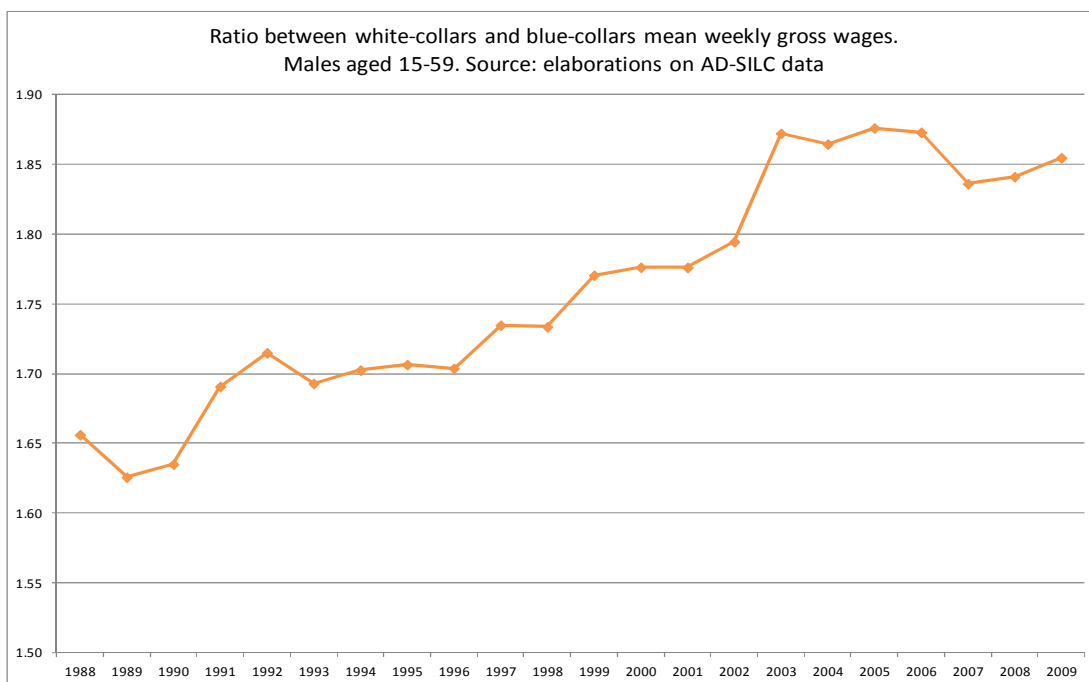


Table 5: decomposition, share of inequality within sectors



In Table 3, we show that inequality for men aged between 15 and 59 and employed in the private sector increases by 15.3%. A substantial fraction of this increase is captured by an increase in returns to white collar jobs, especially in the period 1996-2002 (Table 4).

In Table 5, we show that almost all the increase is explained by an increase within sector (consistent with evidence for other countries). This reinforce our empirical strategy based on the estimation of within-sector increases in skill premia.

5. Results

Yellow: statistically significant at .99%. Blue: statistically significant at .95%. Green: statistically significant at 90%.

Table 6: OLS and Fixed effect

	OLS			FE			FE		
	import	export	pmr	import	export	pmr	import	export	pmr
logsize	0.039	0.038	0.038	0.0234	0.0233	0.0231	0.024	0.024	0.024
	0.000	0.000	0.000	0.0000	0.0000	0.0000	0.000	0.000	0.000
WC*firmsize	-0.016	-0.015	-0.012	-0.0188	-0.0184	-0.0170	-0.017	-0.016	-0.014
	0.002	0.003	0.002	0.0000	0.0000	0.0000	0.000	0.001	0.000
rd_intensity_va							0.002	0.000	0.001
							0.210	0.944	0.607
WC*rd							-0.005	-0.004	-0.003
							0.005	0.079	0.081
import	0.002			-0.0001			0.000		
	0.037			0.9387			0.780		
WC*import	0.002			0.0013			0.002		
	0.003			0.0129			0.000		
export		0.001			0.0001			0.000	
		0.212			0.9413			0.955	
WC*export		0.002			0.0009			0.002	
		0.006			0.0147			0.001	
PMR			0.107			0.1049			-0.148
			0.195			0.3167			0.206
WC*PMR			-0.430			-0.4028			-0.528
			0.000			0.0000			0.000
N	136,588	136,588	128,157	136,588	136,588	128,157	102,333	102,333	95,344

Sectors more exposed to import penetration pay higher wages at 90% significance level (col. 1). The same holds for sectors that export more (col. 2) and for sectors less competitive (col. 3, i.e. higher PMR means less competition¹). However, this result is not robust when adding individual fixed effects. With regards to returns to skills, i.e. WC, they are systematically higher in sectors more exposed to trade and more competitive, i.e. lower PMR. This effect remains strongly significant in the FE specification.

¹ For these estimates we use the PMR for both key sectors (transport, energy and communication) and the other sectors as inferred using input-output tables. We thank Giuseppe Nicoletti for providing us the data on PMR for all sectors.

Table 7: Period 1987-1997, 93 shock using import penetration as mediating factor

			Firm Size		
	m1	m2	1_15	16-199	>=200
import	-0.0014	-0.0016	0.0007	0.0015	-0.0035**
	0.252	0.160	0.685	0.199	0.045
WC*import	-0.0002	0.0003	0.0006	-0.0014	0.0004
	0.733	0.580	0.718	0.172	0.488
Import*post1993	0.0008***	0.0008***	-0.0005	0.0009**	0.0007
	0.004	0.003	0.369	0.012	0.235
WC*import*post1993	-0.0009*	-0.0010**	-0.0004	-0.0010*	-0.0006
	0.079	0.041	0.677	0.080	0.262
WC*post1993	0.0773***	0.0786***	0.0407**	0.0811***	0.0725***
	0.000	0.000	0.017	0.000	0.000
logsize		0.0229***			
		0.000			
WC*firmsize		-0.0204***			
		0.000			
N	61,452	61,222	22,820	19,886	18,554

Table 8: Period 1993-2008, 97 shock using import penetration as mediating factor

			Firm Size		
	m1	m2	1_15	16-199	>=200
import	-0.0009	-0.0008	-0.0001	-0.0031***	-0.0008
	0.165	0.237	0.950	0.001	0.483
WC*import	-0.0002	-0.0002	0.0007	-0.0013*	0.0000
	0.704	0.611	0.537	0.074	0.989
Import*post1997	0.0004	0.0002	0.0002	0.0007**	-0.0003
	0.324	0.508	0.654	0.038	0.763
WC*import*post1997	0.0010**	0.0011***	0.0010	0.0017***	0.0009
	0.038	0.006	0.230	0.002	0.251
WC*post1997	0.0928***	0.0873***	0.0690***	0.0704***	0.0738***
	0.000	0.000	0.001	0.000	0.006
logsize		0.0216			
		0.000***			
WC*firmsize		-0.0152			
		0.000***			
N	105,982	105,717	38,438	35,476	31,859

In Table 7 for the 1993 shock, we show that the effect of a decrease in competition is positive and significant on real wages. Moreover, returns to skills decrease following a decrease in competition in spite of the strong increase in returns to WC jobs post 1993. Results remain

robust when using export share rather than import penetration². Interestingly, too, larger firms pay higher wages but lower skill premia. When we allow the effect of firm size to be non-linear and consider the effect of the shock separately for firms of different size, we show that returns to skills diminish only in medium-sized firms more exposed to external competition. Note that the decrease in returns to skills occurs also in large firms at cut-off 80% significance level.

Results are symmetric for the 1997 revaluation shock and confirm the findings of Guadalupe (2007). Here, it is even more evidence the inversely U-shaped effect of increased competition on returns to skills depending on firm size.

Table 9: Period 1987-2008, 99-01 shock on PMR

			Firm Size		
	m1	m2	1_15	16-199	>=200
PMR	0.0694	0.0384	0.2509***	-0.0095	0.0020
	0.383	0.665	0.005	0.870	0.990
WC*PMR	-0.1153*	-0.1294**	-0.1889***	0.0126	0.0146
	0.073	0.017	0.011	0.894	0.896
WC*post1999-2001	0.1763***	0.1851***	0.1395***	0.1513***	0.2156***
	0.000	0.000	0.000	0.000	0.000
PMR*post1999-2001	0.0851	0.0729	0.0355	0.0848***	0.0024
	0.121	0.118	0.693	0.093	0.970
WC*PMR*post1999-2001	-0.2166***	-0.2660***	-0.1346	-0.2248**	-0.3000***
	0.002	0.000	0.273	0.051	0.002
logsize		0.0240			
		0.000***			
WC*firmsize		-0.0194			
		0.000***			
N	108,514	105,717	40,453	35,464	32,403

Table 9 shows the effects on wage of the liberalization in large utilities and service sectors. Real wages tend to be increase more in sector where competition increases less, consistently with a rent-sharing explanation. In turn, returns to skills increase dramatically in sectors where competition increases more. All this effect is captured by medium and large firms.

² Note that the effect of the 1993 shock overlaps with the 1992 SMP shock, so the interpretation of the results is not straightforward. We will disentangle the effects of the two shocks by conditioning also for sectors more exposed to SMP.

6. Conclusions

- Competition increases within sectors wage inequality by raising the skill premia (consistently with Guadalupe 2007).
- No clear effects on average real wages.
- Results on skill premia are confirmed too: using education; adding other sectorial control variables (proxies of the technological level); estimating DID by means of export share as proxy of competition.

Exposition to competition is crucially mediated by firm size => results are stronger for medium and (to a less extent) large enterprises => composition effects within sectors and different bargaining structure and extent of rent sharing.

References

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