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Decentralisation of Collective Bargaining: A Path to Productivity?

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Comments and suggestions on the methods
and results presented are welcome.

Editor

Decentralisation of Collective Bargaining: A Path to Productivity?*

Abstract

Productivity developments have been rather divergent across EU countries and particularly between Central Eastern Europe (CEE) and elsewhere in the continent (non-CEE). How is such phenomenon related to wage bargaining institutions? Starting from the Great Financial Crisis (GFC) shock, we analyse whether the specific set-up of wage bargaining prevailing in non-CEE may have helped their respective firms to sustain productivity in the aftermath of the crisis. To tackle the issue, we merge the CompNet dataset – of firm-level based productivity indicators – with the Wage Dynamics Network (WDN) survey on wage bargaining institutions. We show that there is a substantial difference in the institutional set-up between the two above groups of countries. First, in CEE countries the bulk of the wage bargaining (some 60%) takes place outside collective bargaining schemes. Second, when a collective bargaining system is adopted in CEE countries, it is prevalently in the form of firm-level bargaining (i. e. the strongest form of decentralisation), while in non-CEE countries is mostly subject to multi-level bargaining (i. e. an intermediate regime, only moderately decentralised). On productivity impacts, we show that firms' TFP in the non-CEE region appears to have benefitted from the chosen form of decentralisation, while no such effects are detectable in CEE countries. On the channels of transmission, we show that decentralisation in non-CEE countries is also negatively correlated with dismissals and with unit labour costs, suggesting that such collective bargaining structure may have helped to better match workers with firms' needs.

Keywords: total factor productivity, firm-level contracts, multi-level contracts, centralised contracts, unit labour costs, dismissals

JEL Classification: J30, J51

1. INTRODUCTION

In the last decades there has been continuous decentralisation of collective wage bargaining regimes in most of the European Countries (OECD, 2006). As stated in the Lisbon Treaty (2009), the EU emphasises the role of the social partners, highlighting the need to facilitate dialogue while respecting their autonomy and diversity, in the best way to guarantee employment and performances. As a matter of fact, decentralisation of wage bargaining has been welcomed by many authorities and governments in the European Union as an important mean to improve industrial relations and firm performance, thanks to a better match between firms' need and workers' skills.

However, there is still an ongoing debate on whether decentralisation of wage bargaining can benefit firms' performance. Centralised collective agreements can better take into account macroeconomic consequences of bargaining, such as inflation (see Calmfors et al., 1988), or externalities related to consumer demand (see Alesina et al., 1997) or fiscal issues (see Flanagan, 1999). Decentralisation of industrial relations, instead, can better boost firms' efficiency thanks to contracts shaped on the specific needs of firms (see Boeri and van Ours, 2013). We enter into such debate taking as a point of departure the aftermath of the Global Financial crisis (GFC), when - with the exception of Belgium - all EU countries recorded a decrease in total factor productivity (TFP) with respect to pre-crisis trend.

As reported in Figure 1 (left panel), such fall was particularly sharp for the Central Eastern European countries (CEE) with respect to the rest of the EU countries (non-CEE), amid however a high variation among the respective countries (right panel). Our main research question is whether there is a link between wage bargaining institutions and TFP developments. More precisely, we aim at verifying whether more decentralised collective bargaining set-up before the outbreak of the GFC, were associated with better firms' performance in terms of TFP. We use for that – and this is novel – a firm-level based cross country perspective.

Figure 1. Deviation from Pre-Crisis Trend in Total Factor Productivity after the Crisis
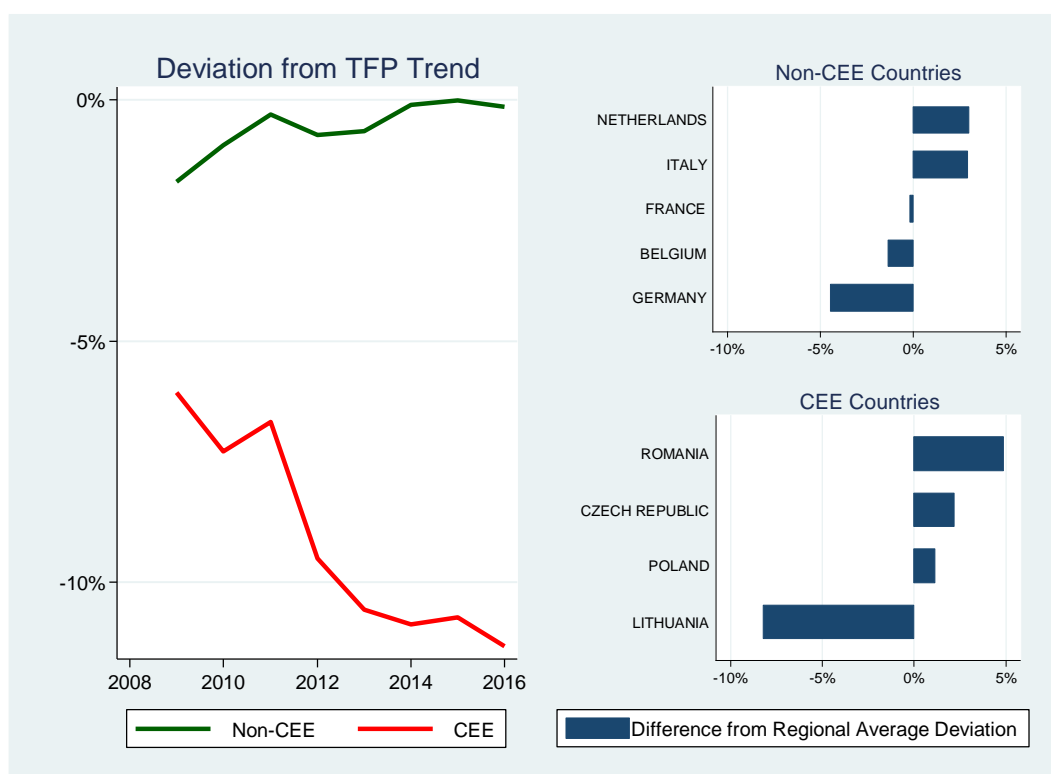
To this end, we merge two firm-level based datasets: Wage Dynamics Network's, which contains information on wage bargaining set-up, and CompNet's 6th vintage, which includes productivity indicators for several European countries. The resulting dataset includes information on the share of firms who are subject to either collective bargaining or individual set-up for four macro-sectors (manufacturing, construction, trade, services). Within the firms engaged in collective bargaining, the dataset is able to identify the share of firms which are subject to centralised or (more-) decentralised set-ups. Using this granular information, we assess whether the structure of wage bargaining in existence prior to the crisis – as proxied by the above shares – is related to the sectoral average TFP after the outbreak of the crisis, through OLS regressions. Given the very different nature of their underlying bargaining set-up, we separate our sample in two - Central Eastern European countries[3] (CEE), and the rest[4] (non-CEE). There are four main differences in such regimes:

1) In the CEE the bulk of the wage bargaining takes place outside collective bargaining schemes. The firm signs individual agreements with its workers and the share of collective bargaining is rather low (about 40%).
2) In the context of collective bargaining set-ups, firms in non-CEE countries adopt mostly a centralised system (through national or sectoral collective agreements), which is virtually not in place at all in CEE countries (excluding Romania).

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[3] CEE countries in our dataset are: Czech Republic, Hungary, Lithuania, Poland, and Romania.
[4] Non-CEE in our dataset are: Belgium, France, Germany, Italy, Netherlands, and Portugal.

3) When adopting a decentralised system – within collective bargaining – non-CEE countries embrace "multi-level bargaining", i.e. an intermediate form of decentralisation where sectoral negotiations are followed by firm-level collective contracts. For CEE countries instead decentralised set-ups consist of "firm-level bargaining".
4) The share of (the respective form of) "decentralised" contracts is on average higher in CEE countries than in non-CEE.

We concentrate on the interaction between decentralisation – as differently defined in the two groups of countries - and firms' total factor productivity, keeping unchanged the wage bargaining negotiation set-up at the time prior to the GFC. After controlling for country, sector, size, and year effects, our regressions show that decentralisation in firms located in non-CEE countries had a positive effect on their productivity in the aftermath of the GFC. In the CEE countries, there is no such evidence, instead. Our results are robust to the inclusion of several extra controls as well. Looking at two admittedly interconnected channels through which the decentralisation set-up may have interacted with productivity - namely (i) unit labour costs (ULC) and (ii) employment/wage developments - we show that in the non-CEE countries there may have been a better match between salaries and productivity for the firms subject to decentralised wage negotiations.

In the final part of the paper we study how the wage bargaining set-up has evolved in our country sample in the period after the GFC. For both groups of countries, "decentralisation" appears to have increased substantially, particularly among the CEE countries. Employing a "matching" strategy, we show that such trends keep correlating with productivity growth, but this time for the CEE region as well.

The rest of the paper is organized as follows: section 2 is dedicated to review the relevant literature and theory; section 3 describes data and some stylized facts, whereas section 4 reports the empirical framework and the results of the interaction between productivity and collective negotiation set-up. Section 5 looks at possible channels of transmission from bargaining to productivity, while section 6 is dedicated to a matching strategy to support the wage negation effect on productivity. Section 7 concludes.

2. RELATED LITERATURE

Our research is situated within the debate on whether decentralisation of collective bargaining can improve firms' performances, particularly productivity.

It is well established that decentralisation started occurring in most of the European countries from the 1980', where firm-level bargaining became more and more frequent and important with respect to higher levels of negotiation. Some scholars argued that this trend is due to increasing of volatility in labour market conditions (see Freeman and Gibbons, 1993). In addition, many observers pointed out that decentralisation is a consequence of a declining bargaining power of unions. However, this can only partially explain the phenomenon since evidence suggests that much of the decentralised bargaining involved work organization and restructuring, implying, hence, that work reorganization, pushed by new technologies, has been the main driver of decentralisation in collective bargaining (see Katz, 1993). In countries like

Germany and Italy, regulation of time and organization of the tasks became the central issue in collective negotiations. Moreover, although in some countries (e.g., Italy) higher level of bargaining addresses work time, these contracts only establish work hours targets, leaving the main decisions on how to implement and regulate work organization, as well as technological innovation and other local issues, to decentralised negotiations.

Moreover, Lindbeck and Snower (1996) point out that this innovation in information and production technologies also made profitable for firms to allow for greater decentralisation of decision-making and to establish new forms of work in teams with considerable discretion for workers. Additionally, they explain that work is evolving toward multi-tasking jobs and firms can incentivise workers to gain experience from one task to improve their performance in different tasks, thus increasing their productivity.

Therefore, to achieve these incentives, firms need to stipulate local collective contracts, shaped on the specific needs of each establishment. Thanks to such negotiations, firms are able to better organize the structure of the workplace and hierarchy of decision-making, as well as improve workers' performances in multi-tasking jobs. Lindbeck and Snower (2001) argue that those aims cannot be achieved by centralised collective bargaining, whose structure is too rigid and pursuing standardized principles for wage setting that do not take into consideration the conditions of the individual firm. The authors design a model in which the rise of multi-tasking jobs increase the efficiency costs of centralised bargaining. This is caused by the fact that there are complementarities among multiple tasks and decentralised collective agreements can take them into account, enhancing workers' training and experience among tasks and their increasing productivity.

Centralised collective bargaining, hence, is seen as an obstacle to firms' performance and productivity. Firm-level collective bargaining is better suited to favour a reorganisation of the workplace according the specific needs of each firms and to incentivise multi-tasking jobs. It is worthy noticing that, even when the firm is subject to a higher level of collective agreement, still plant-level bargaining rules on work organisation and performance related pay schemes, which both matter to increase firms' productivity.

As far as individual contracts are concerned, the literature does not seem to support the theory of efficiency allocation of resources, leading to higher productivity and hence wages. Many studies, instead, show that union members gain higher salaries (e.g. Christie, 1992; Hildreth, 2000; Forth et al., 2002; Blanchflower et al., 2003). In addition to that, Peetz and Preston (2009), examining wages in Australia under federally-registered individual contracts and collective agreements, find no evidence that individual bargaining leads to higher productivity and wages; the system tends to lower wages for workers with less bargaining power, without increasing efficiency.

Looking at existing empirical literature, most of the analysis is at a macro level or – when micro - country specific. A macro source for the trend in industrial relations is Eurofound, i.e. the European Foundation for the Improvement of Living and Working Conditions[5]. From such source, two main characteristics emerge from the European countries. First, there is a differentiation between West and East: most of the Western European countries have a centralized structure, where the sectoral collective agreements are dominant, while a decentralized in-company structure prevails among the Central Eastern European countries.

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[5] Online at www.eurofound.europa.eu.

Second, in the last decades there is a trend toward decentralisation in almost all countries: a multi-level structure emerges in many western countries, with more and more importance to the firm level collective agreements. Decentralisation also received a further stimulus after the GFC (see Visser, 2016). Other sources can be found in the International Labour Organization (ILO), the Institute for Labour Economics (IZA), and the Organization for Economic Cooperation and Development (OECD).

As for the micro-analysis, McGuinness et al. (2010) use a linked employer-employee dataset for private sector firms in Ireland and showed that decentralized bargaining increases wage dispersion, as expected by Lindbeck and Snower (1996). Dahl et al. (2013), employing a matched worker-firm dataset from Denmark, also show that wages are more dispersed under decentralised wage bargaining, while wages and return to skills higher. Finally, Andréasson (2014) exploited a unique employer-employee matched dataset for the private sector firms in Sweden between 2007 and 2010. He followed a pooled OLS strategy and a first difference OLS method, besides quantile regressions: this way, the author showed that the effect of decentralized bargaining on productivity is 5.3% for the mean firm and 5.6% for the median firm.

3. DATA AND STYLIZED FACTS

As mentioned, our dataset is generated by merging the CompNet's 6th Vintage with the WDN's 1st and 3rd waves.

In the WDN dataset, every firm is asked whether it applies collective contracts and, if the answer is yes, whether these contracts are signed inside the firm, outside of it, or at both levels. Given this information, we classify each company in one of four, as follows:

- Companies that apply only firm/plant-level collective contracts (FL);
- Companies that apply only sectoral/national collective contracts, i.e. centralized multi-employer agreements (CT);
- Companies that are subject to both the above set-ups, implying multi-level collective agreements (ML);
- Companies that do not undertake collective bargaining at any level, providing only individual contract to employees (IND).

We also consider the case of a firm with only plant-level contracts as multi-level bargaining, if the legislation in the respective country established a two-tier structure of industrial relations. Then, we take the weighted average of the above four categories at the macro-sector level, using firm size as weight. Consequently, we obtain the shares of firms that implement different typologies of collective agreements for four macro-sectors (manufacturing, construction, trade, services). In addition, for each macro-sector we keep information for three firm sizes before merging with the CompNet's dataset[6].

CompNet (6th vintage) has information for the period 1999-2015 for most of the countries included in its dataset at macro-sectoral level. 1st wave of WDN, instead, is related to 2007-

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[6] It must be noticed that size classes in WDN are slightly different from CompNet, which divides firms in 20-49, 50-249, 250+ employees size classes. As a matter of fact, WDN considers the following firm sizes: 20-49, 50-199, 200+ employees.

2008 and 3rd wave refers to 2010-2013, both presenting data in a cross-section manner. The countries included in the merged dataset are split in Central Eastern European countries (CEE), i.e. Czech Republic, Hungary, Lithuania, Poland, and Romania, and non-CEE, i.e. Belgium, France, Germany, Italy, Netherlands, Portugal. Most of them are surveyed in both waves of WDN, with the exception of Germany and Romania. The dataset is representative of firms with more than or equal to 20 employees.

The resulting dataset includes information for four macro-sectors (manufacturing, construction, trade, services) and three firm sizes (20-49, 50-249, 250+ employees), for the period 2004-2015, involving all the variables from CompNet 6th Vintage and the shares of collective bargaining level built on WDN.

The dataset is a unique source to study the evolution of collective bargaining across countries and sectors, and to relate it to firm characteristics at a macro-sectoral level.

For all the countries in the sample we take information from 1st wave of WDN. As for Germany and Romania, instead, we exploit 3rd wave of WDN since these countries were absent in the previous survey. For Germany, this is not a problem, since no wage bargaining reforms were implemented in the period across the two surveys, keeping the collective negotiations set-up quite unchanged. For Romania instead, we had to include the wage bargaining reforms undertaken in 2011, which abolished collective agreements at national level with in-company industrial relations. To do so, we have modified accordingly the collective bargaining categories for Romania: the firms that state not to be under any collective bargaining structure are assumed to be under centralized industrial relations, to mimic the pre-crisis set-up.

The resulting dataset point to two main differences between CEE and non-CEE as it concerns wage bargaining institutions.

1) In the CEE, the share of no adhesion to collective bargaining is very high (around 60% on average, as shown in Figure 2);

Figure 2. Percentages of Non-Collective Bargaining in 2007
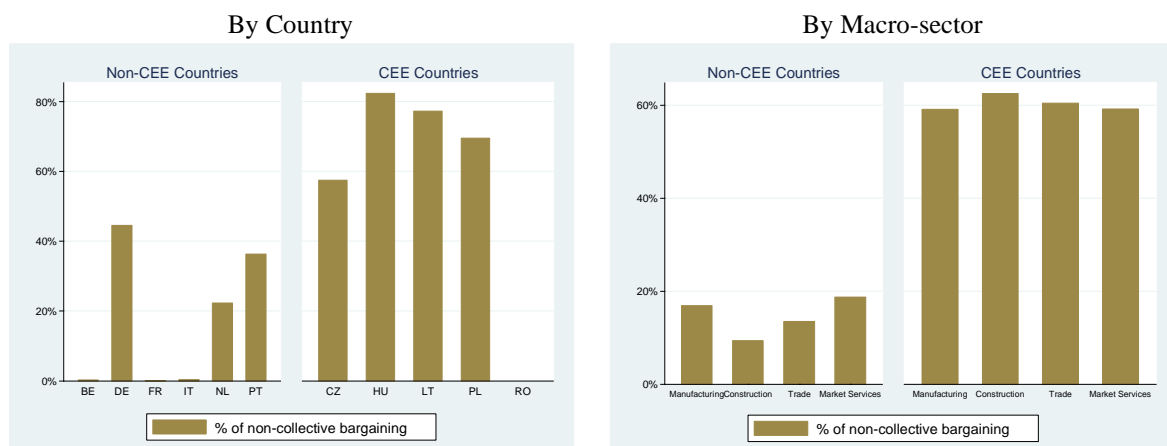
Source: WDN's 1st wave, with the exception of Germany and Romania, whose data are from WDN 3rd wave and accordingly modified.

2) The format of "bargaining decentralisation" that takes place in the two regions is rather different:
   - Firm-level collective bargaining in the CEE region;
   - Multi-level collective bargaining in the non-CEE region.

Figure 3 and 4 present the collective bargaining set-up in 2007, before the outbreak of the Global financial crisis, by countries and macro-sectors.

The main message is that, with respect to CEE countries, non-CEE firms are subject to:

- Lower share of decentralisation;
- Rather high share of centralisation, virtually nil in CEE with the exception of Romania.

This evidence is coherent with the above mentioned macro sources, with the difference that we can distinguish this by macro-sectors as well (see Figure 4).

Figure 3. Percentages of Collective Bargaining by Country in 2007
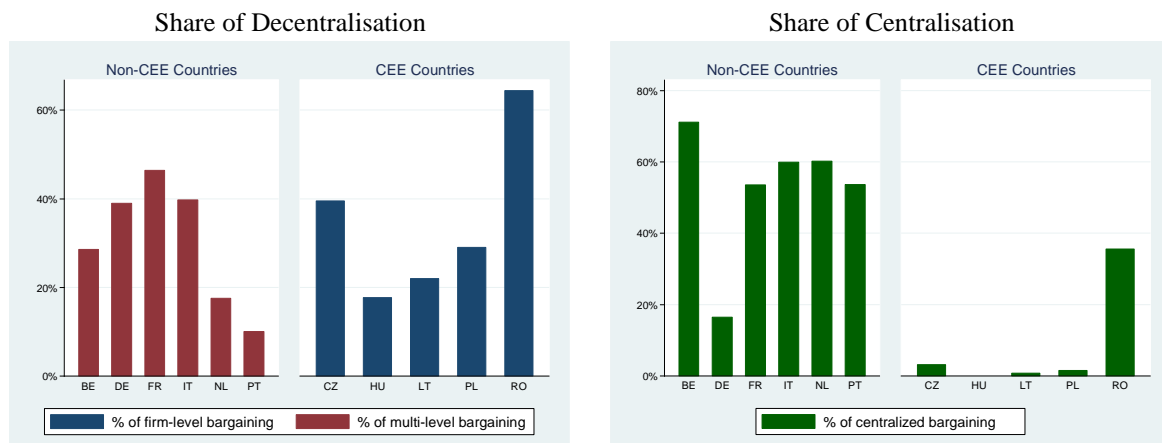
Source: WDN's 1st wave, with the exception of Germany and Romania, whose data are from WDN 3rd wave and accordingly modified.

Figure 4. Percentages of Collective Bargaining by Macro-sector in 2007
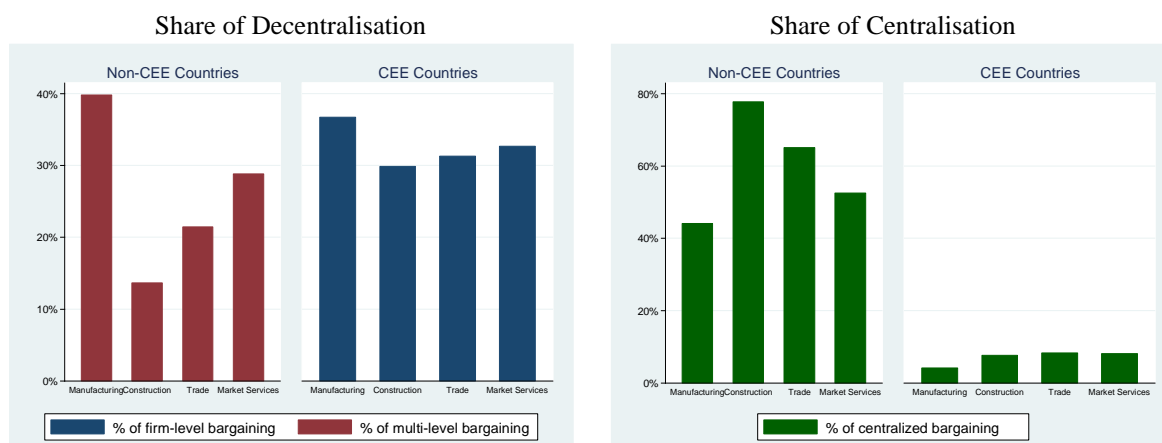
Source: WDN's 1st wave, with the exception of Germany and Romania, whose data are from WDN 3rd wave and accordingly modified.

How is the bargaining set-up related to productivity? Pooling all the above mentioned countries (CEE and non-CEE) Figure 5 (right panel) shows that average TFP - normalized by country-year TFP mean in each country and macro-sector in 2007 is rather strongly correlated with the share of firms with decentralised contracts, after controlling for country and sector fixed effects. No correlation is detected instead when considering firms adopting centralised collective contracts (Figure 5, left panel). The result is even more notable as we look at TFP for the following two years (2008, 2009), as shown in Figures A1 and A2 of the Appendix.

Figure 5. Correlation between TFP and Collective Bargaining Shares in 2007

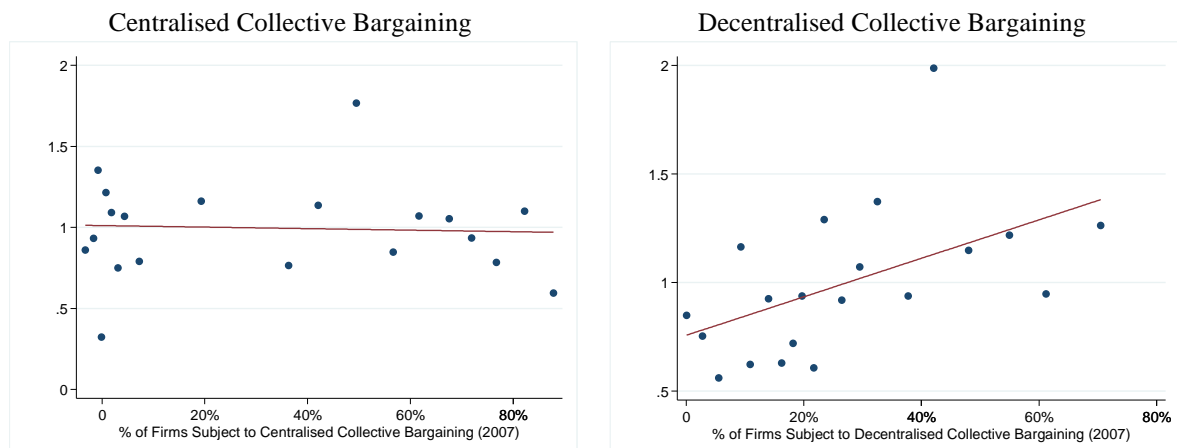Source: TFP measure comes from CompNet's 6th Vintage of data; Collective Bargaining Shares are calculated on the basis of WDN 1st wave. TFP is normalised by country-year TFP mean.

4. EMPIRICAL FRAMEWORK AND MAIN RESULTS

To assess the impact of collective bargaining on the response of firms after the GFC outbreak, and on their consequent performance in productivity, we keep fixed the 2007 level of decentralisation in each country–macro-sector observation.[7] In doing so, we evaluate the performance of pre-crisis collective bargaining structures, avoiding endogeneity issues due to changes in industrial relations as a response to the financial crisis. Therefore, our independent variable is the percentage of firms subject to decentralised collective agreements in 2007, just before the beginning of the GFC, which is considered here as an exogenous shock.

The OLS regression model, on which we base our analysis in this and the following section, is the following (clustered by macro-sector–year):

$$TFP_{mycs\,t} = \alpha + \beta_1 * DEC_{mcs\,2007} + \beta_2 * DEC_{mcs\,2007} * crisis_t + \gamma_1 * crisis_t + \delta_1 * D_{c\,t} + \delta_2 * D_{y\,t} + \delta_3 * D_{m\,t} + \delta_4 * D_{s\,t} + \varepsilon_{mycs\,t}$$

where *TFP* is average total factor productivity in the macro-sector–year–country–size (*mycs* in the subscript of the variables) and *DEC* is the share of decentralized agreements among firms which apply collective bargaining. As mentioned, we split the analysis for CEE and non-CEE

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[7] The bargaining structure is the ones included in the first wave of WDN (related to 2007), exploiting the third wave only for countries that are not reported in the first wave and which did not experience reforms in the structure of industrial relations during the crisis, namely Germany. For Romania, as stated above, we adjusted data of WDN 3rd wave to replicate the pre-crisis collective bargaining structure. This way, we analyse the performances of firms and their reaction to the crisis, given the structure of their industrial relationship before the Great Recession, thus limiting the problems of endogeneity underlined by the related literature.

countries, due to the structural differences in the respective wage bargaining institutions: the variable *DEC* will be *ML*, i.e. the share of multi-level contracts, for the non-CEE countries, and *FL*, i.e. the share related to firm-level contracts, for the CEE countries. We interact *DEC* with a dummy variable indicating the crisis period (2008-2012). By doing so, we can assess whether decentralisation had a different impact on *TFP* after the crisis outbreak with respect to the past. Finally, we include dummies for country, year, macro-sector, and size fixed effects. The coefficient we are interested the most is β_2, the effect of decentralisation on firms' productivity in the aftermath of the crisis outbreak.

All the following regressions cover the period 2004-2012.

The main results are reported in Table 1.

Table 1. Total Factor Productivity on Wage Bargaining Set-up

TFP	Non-CEE Countries	CEE Countries
ML	0.82***	
	(0.18)	
FL		0.14
		(0.61)
ML*Crisis	0.36**	
	(0.17)	
FL*Crisis		-0.14
		(0.61)
Constant	137***	27.19
	(45.01)	(63.54)
Observations	489	462
R-squared	0.23	0.68

OLS regressions include dummies for country, macrosector, year, and size effects, as well as controlling for crisis period. Clustered standard errors at macro-sector–year level in parentheses. *** p<0.01; ** p<0.05; * p<0.1.

Wage bargaining decentralization (i.e. *ML* and *FL,* respectively for non-CEE and CEE) has a remarkable different impact on *TFP* in the two regions. In the non-CEE countries, decentralisation correlates positively with productivity, with a stronger effect after the outbreak of the crisis. For the CEE countries, instead, we do not find any significant result. This may be due to the fact that the decentralisation was already quite homogeneously spread before the beginning of the crisis (see Figure 4), resulting in too little variance in collective bargaining structure among sectors.

The result is robust to all our set of extra controls, which consist of variables that can affect firms' total factor productivity including real capital over number of employees, real value added, capital productivity (defined as real value added over capital stock), total labour costs, total number of employees, and the sectoral share of individual bargaining. Robustness checks are reported in Table 2. In Table A1 of the Appendix, we also include macro-sector–year

dummies to control for differences across sectors that change over time and the results do not change.

Table 2. Robustness Check - TFP on Wage Bargaining Set-up and Extra Controls

TFP	Non-CEE Countries	CEE Countries
ML	1.41***	
	(0. 36)	
FL		0.80
		(0.65)
ML*Crisis	0.42**	
	(0. 19)	
FL*Crisis		-0.12
		(0.58)
Share of Individual Contracts	-0.79*	-1.95***
	(0.43)	(0.62)
Capital/Employment	-0.22***	0.49*
	(0.08)	(0.28)
Capital Productivity	3.08	-1.41***
	(1.97)	(0.39)
Total Wage	-0.01***	0.001
	(0.003)	(0.005)
Real Value Added	0.004***	-0.001
	(0.001)	(0.001)
Total Employment	0.04	0.18
	(0.14)	(0.17)
Constant	143.54**	-70.16
	(55.35)	(60.05)
Observations	488	418
R-squared	0.34	0.69

OLS regressions include dummies for country, macro-sector, year, and size effects, as well as controlling for crisis period. Clustered standard errors at macro-sector–year level in parentheses. *** $p<0.01$; ** $p<0.05$; * $p<0.1$.

All of the above show that decentralisation of wage bargaining in the non-CEE countries is linked to improvements in productivity. Sectors where firms were more subject to decentralised collective agreements seemed to have better reacted after the financial crisis of 2008.

Moreover, the percentage of firms outside collective bargaining (i.e. "individual contracts" in the table) significantly decreases the macro-sectoral average productivity performance, giving support to the literature which shows that individual contracts do not lead to more efficient allocation of resources and productivity (see Peetz and Preston, 2009). This can at least partially explain why we do not find a significant decentralisation effect for the CEE countries, where the most adopted wage bargaining regime are "individual contracts", (around 60% of

the firms) which are outside collective bargaining set-ups. This of course could also have blurred the results for the region.

5. POSSIBLE TRANSMISSION CHANNELS

This section looks at two admittedly interconnected channels through which the decentralisation set-up may have interacted with productivity, namely (i) unit labour costs and (ii) employment/wage developments.

On the first, Figure 6 shows that unit labour costs decreased on average after the crisis in the non-CEE countries, while tended to increase for CEE countries (left panel), with rather contained country variation excluding possibly Portugal and Lithuania. This appears to be in line with Lindbeck and Snower (2001), who suggest that decentralisation may help labour allocation within firms in accordance with skills and tasks. This, in turn, can generate a closer match between salaries and productivity and could explain at least partially firms' performance in the non-CEE countries.

Figure 6. Trends of Unit Labour Costs after the Crisis (Reference Year 2009)
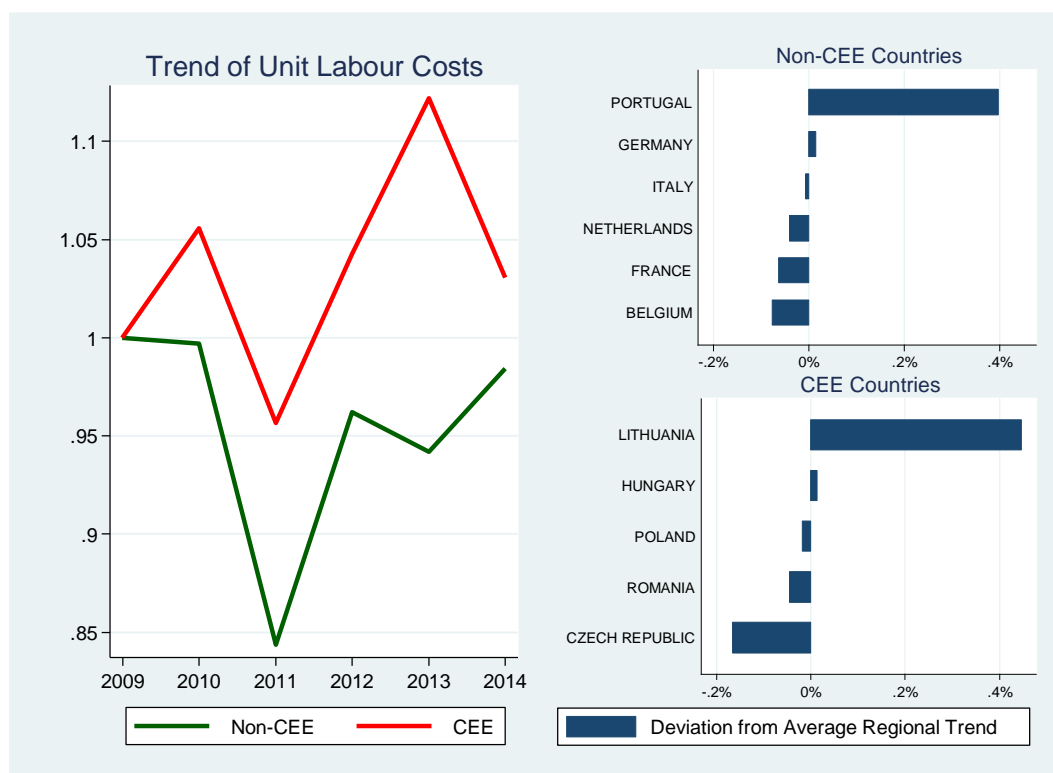
Souces: CompNet's 6th Vintage of data.

Regressing unit labour costs on the shares of collective bargaining appears to support the plausibility of this channel (Table 3).

Table 3. Unit Labour Costs on Wage Bargaining Set-up

Unit Labour Costs	Non-CEE Countries	CEE Countries
ML	0.0008	
	(0.0005)	
FL		0.0017
		(0.0019)
ML*Crisis	-0.0024***	
	(0.0006)	
FL*Crisis		0.0022
		(0.0025)
Constant	0.65***	0.75***
	(0.03)	(0.23)
Observations	479	392
R-squared	0.53	0.43

OLS regressions include dummies for country, macro-sector, year, and size effects, as well as controlling for crisis period. Clustered standard errors at macro-sector–year level in parentheses. *** p<0.01; ** p<0.05; * p<0.1.

Decentralisation (multi-level collective bargaining) in non-CEE region is negatively correlated with ULC, which means that firm competitiveness improved with decentralisation, as labour costs were kept in line with productivity. There is no significant effect, instead, in the CEE countries.

On the second channel, Figure 7 shows that despite some differences across countries, in the period under observation, overall employment grew.

Figure 7. Trends of Employment after the Crisis (Reference Year 2009)
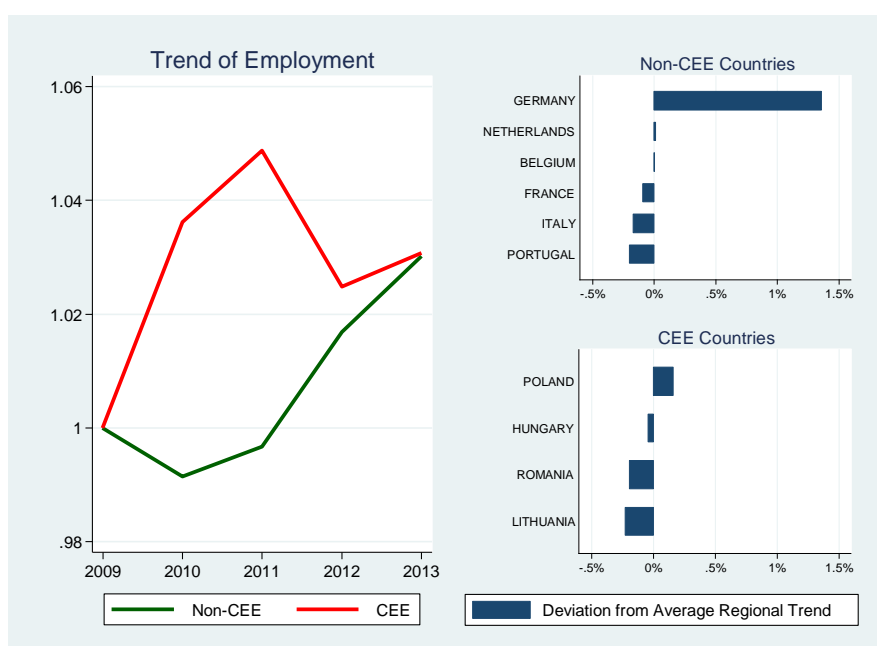
Souces: CompNet's 6th Vintage of data.

Table 4 summarizes the result of the regression analysis on such channel. After the crisis outbreak, decentralisation appears to have hindered dismissals in the non-CEE countries, as shown by the negative correlation, at a sectoral level, between decentralisation and the share of firms which have decreased their number of workers. Again, the CEE countries do not present the same relation after the financial crisis. Results for wage share and profits are reported in Tables A2 and A3 of the Appendix.

Table 4. Share of Dismissals on Wage Bargaining Set-up

Share of Dismissals	Non-CEE Countries	CEE Countries
ML	0.0006***	
	(0.0002)	
FL		0.0002
		(0.0005)
ML*Crisis	-0.0014***	
	(0.0002)	
FL*Crisis		-0.0008
		(0.0005)
Constant	-0.042	-0.003
	(0.031)	(0.059)
Observations	426	393
R-squared	0.64	0.47

OLS regressions include dummies for country, macro-sector, year, and size effects, as well as controlling for crisis period. Clustered standard errors at macro-sector–year level in parentheses. *** $p<0.01$; ** $p<0.05$; * $p<0.1$.

Finally, we find that in the sectors where multi-level bargaining was more widespread at the dawn of the 2008 crisis, the dispersion of total factor productivity increased, a plausible consequence of the fact that firms with better expansion possibilities were able to increase their performances by the more flexible bargaining structure and by the better matching of workers with tasks. Table 5 reports the result.

Table 5 TFP Dispersion on Wage Bargaining Set-up

TFP Dispersion	Non-CEE Countries	CEE Countries
ML	1.26***	
	(0.25)	
FL		0.33
		(0.62)
ML*Crisis	0.51*	
	(0.26)	
FL*Crisis		-0.82
		(0.51)
		(0.62)
Constant	176.39**	-27.16
	(64.43)	(73.58)
Observations	489	462
R-squared	0.27	0.69

OLS regressions include dummies for country, macro-sector, year, and size effects, as well as controlling for crisis period. Clustered standard errors at macro-sector–year level in parentheses. *** p<0.01; ** p<0.05; * p<0.1.

As shown in Table 6, the dispersion is due to a major increase in TFP for the firms at the top of the productivity distribution. It seems, hence, that decentralisation of collective bargaining created more efficiency opportunities to more productive and competitive firms. No impact, again, is found for the CEE countries.

Table 6. TFP Distribution on Wage Bargaining Set-up

TFP Distribution	Percentile 10		Percentile 25		Percentile 50		Percentile 75		Percentile 90	
	Non-CEE	CEE	Non-CEE	CEE	Non-CEE	CEE	Non-CEE	CEE	Non-CEE	CEE
ML	-0.00764		0.147***		0.481***		0.952***		1.757***	
	(0.0437)		(0.0434)		(0.0766)		(0.309)		(0.509)	
ML*Crisis	-0.0110		-0.0365		0.107		0.679*		1.147**	
	(0.0469)		(0.0449)		(0.0797)		(0.335)		(0.526)	
FL		-0.075		-0.024		0.106		-0.351		0.415
		(0.171)		(0.225)		(0.357)		(1.030)		(1.392)
FL*Crisis		0.171		0.138		0.141		0.330		-0.747
		(0.140)		(0.210)		(0.331)		(0.765)		(1.097)
Constant	12.67***	32.64*	18.73***	37.1	61.25***	32.70	239.8***	90.50	384.8***	24.21
	(2.739)	(18.26)	(3.186)	(22.88)	(15.79)	(35.47)	(81.96)	(105.6)	(137.8)	(144.8)
Observations	489	462	489	462	489	462	489	462	489	462
R-squared	0.829	0.668	0.860	0.658	0.352	0.633	0.168	0.625	0.176	0.664

OLS regressions include dummies for country, macro-sector, year, and size effects, as well as controlling for crisis period. Clustered standard errors at macro-sector–year level in parentheses. *** p<0.01; ** p<0.05; * p<0.1.

6. DYNAMICS AFTER THE CRISIS

Having established an interaction between wage bargaining set-up at the time of the crisis and post crisis firm results, we now turn to investigate how changes in the wage bargaining set-up having occurred since then may have affected firm productivity in the most recent period. Therefore, we analyse how changes in the collective bargaining institutions in the afterward of the financial crisis for the two groups of countries are connected to the development of productivity. Using to that end a difference-in-differences strategy, we found that CEE countries benefited from the increased share of firms subject to collective agreements.

For the firms that are surveyed in both 1st and 3rd waves of WDN, Table 7 reports the transitional matrix between wage negotiation set-ups, in CEE and non-CEE regions. Overall, there are not substantial changes in the structure of the wage bargaining set-up prevailing before and after the crisis (i.e. 2007 and 2012; see percentage changes in parenthesis in Table 7), except that the share of firms participating in collective agreements is increased for CEE - particularly of decentralised nature - and decreased for non-CEE. It remains still the case though that in CEE countries non collective bargaining is the most common arrangement.

Table 7. Transitional Matrix from 2007 to 2012

CEE

| | Transition to | | | | |
Transition from	Firm-level bargaining	Multi-level bargaining	Centralised level bargaining	No collective bargaining	Total
Firm-level bargaining	31	0	10	235	276
Multi-level bargaining	0	0	0	0	0
Centralised bargaining	0	0	0	9	9
No collective bargaining	318	0	50	1269	1637
Total	349 (+3.7%)	0 (=)	60 (+2.6%)	1513 (-6.4%)	1922

Non-CEE

| | Transition to | | | | |
Transition from	Firm-level bargaining	Multi-level bargaining	Centralised level bargaining	No collective bargaining	Total
Firm-level	0	0	0	0	0
Multi-level	0	199	297	79	575
Centralised level	0	295	508	168	971
No collective bargaining	0	35	117	72	224
Total	0 (=)	529 (-2.5%)	922(-2.7%)	319(+5.3%)	1770

Source: 1st and 3rd waves of WDN. The percentages in parenthesis are the percentage point change with respect to the total number of firms in the CEE or non-CEE sample.

Despite the higher resilience in terms of productivity for firms applying multi-level collective bargaining, after the crisis we see a higher share of firms going outside collective bargaining in the non-CEE region.

In the absence of an exogenous shock such as the GFC, analysing the effect of collective bargaining decentralisation is obviously fraught with endogeneity problem. To address such problem, we adopt a "difference-in-differences" procedure aimed again at testing how change in wage bargaining decentralisation affects productivity.

To this end we adopt the following "matching" procedure. For each macro-sector-country we regress average total factor productivity on average real value added, labour costs, and cash holdings, for the period 2004-2007. We, then, take the expected value of total factor productivity and we use it to match every macro-sector-country with the most similar counterfactual. In doing so, we match macro-sectors that present the most similar pattern in the variables that affect productivity before the crisis outbreak.

Subsequently, we calculate (i) the difference between the percentage of decentralisation in each macro-sector-country-size take across the two waves of WDN dataset, as well as (ii) the difference of total factor productivity for each macro-sector-country-size, between 2007 and 2012, 2007 and 2013, and between 2007 and 2014.

Finally, we calculate the difference of these differences between each macro-sector-country-size and its counterfactual. As a consequence of that, for each macro-sector-country-size in the dataset we create a difference-in-differences variable for total factor productivity and for decentralisation share. We then regress the TFP difference-in-differences variable on the decentralisation difference-in-differences indicator. Germany and Romania are excluded from this last empirical exercise since they are not included in the WDN 1st wave. The results for the difference between TFP of 2007 and 2012 are reported in Table 8, while results for the following years are reported in Tables A5 and A6 of the Appendix.

These results show that CEE countries are going in the right direction, since collective bargaining, in particular more decentralised solutions, are found to positively affect total factor productivity. Decentralisation of collective bargaining seems to have affected productivity more in the CEE region, where the share of collective negotiations increased.

Table 8. Δ in Δ TFP on Δ in Δ Decentralisation

Δ in Δ TFP 2007-2012	Non-CEE Countries		CEE Countries	
	(1)	(2)	(3)	(4)
Δ in Δ Decentralisation	0.54***	0.56*	1.40***	1.37***
	(0.16)	(0.28)	(0.11)	(0.15)
Constant	-9.23	-17.97	-37.43	-1.02
	(7.53)	(16.69)	(33.21)	(114.4)
Controls		X		X
Observations	39	39	22	22
R-squared	0.31	0.41	0.72	0.87

Model (1) and (3) represent the OLS estimates for the differences-in-differences regression of TFP on Share of decentralisation, in the non-CEE and CEE countries, respectively. Regressions (2) and (4) include also dummies for country, macro-sector, and size effects. Clustered standard errors at country–macro-sector level in parentheses. *** $p<0.01$; ** $p<0.05$; * $p<0.1$.

Overall, they tend to confirm our previous results for the non-CEE region, i.e. decentralisation tends to have fostered total factor productivity for the sectors where more firms turned to decentralised wage bargaining.

Unlike in previous analysis, we find that decentralisation had a positive effect on productivity also for the CEE countries if one takes into consideration the further changes in the wage bargaining set-up occurred in the aftermath of the GFC.

The results are even stronger for the following years, implying a long-term beneficial effect of collective bargaining decentralisation.

7. CONCLUSION

We created a unique dataset to analyse collective bargaining set-ups at a cross-sectoral micro-based level, and to assess its impact on productivity in the aftermath of the GFC. Our research shows that decentralisation of collective bargaining had a significant positive impact on firms' total factor productivity in the aftermath of the crisis for the non-CEE countries, while there is no clear evidence for the CEE countries. One possible explanation is that decentralisation set-ups prevailing in such country group (i.e. multi-level) allowed firms to better match wages and multi-tasking jobs. This would include a more efficient and productivity enhancing management of employment and wages developments. Also, we report evidence that decentralisation is associated with larger sectoral wage dispersion and TFP dispersion.

Looking at the period after the GFC, a diff-in-diff strategy would confirm that further decentralisation had an enhancing impact on productivity more recently as well, including in the CEE countries. For the latter group this implied also a substantial decrease of the share of firms not subject to (some sort of) collective agreements.

While having established a positive impact for decentralisation within collective bargaining, which has obviously some evident policy implications, our emphasis on cross country comparison has certainly implied some aggregation biases. Further research would therefore be valuable to understand more precisely which type of decentralisation has the strongest impact on firms' productivity, comparing different countries' performances in total factor productivity and other firms' outcome.

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APPENDIX

1. CORRELATION GRAPHS

Figure A1. Correlation between TFP (in 2008) and Collective Bargaining Shares (in 2007)
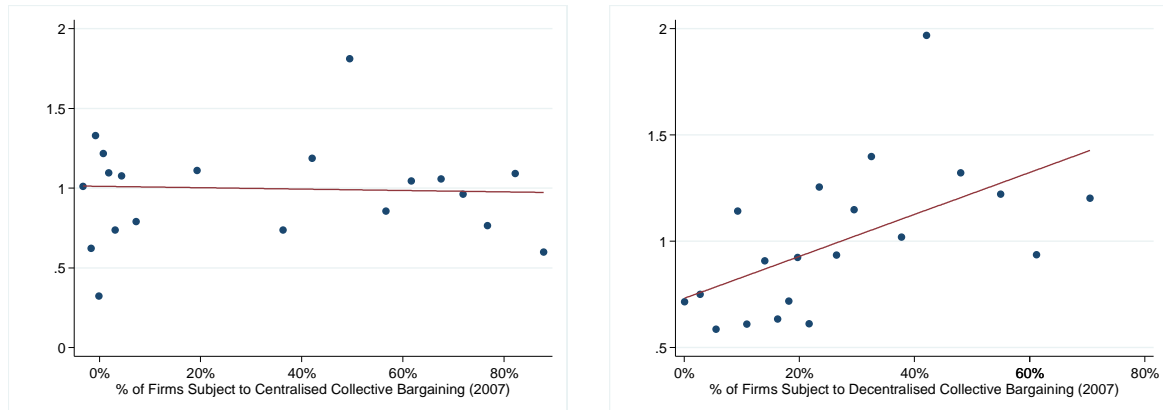
Source: TFP measure comes from CompNet's 6th Vintage of data; Collective Bargaining Shares are calculated on the basis of WDN 1st wave. TFP is normalised by country-year TFP mean.

Figure A2. Correlation between TFP (in 2009) and Collective Bargaining Shares (in 2007)
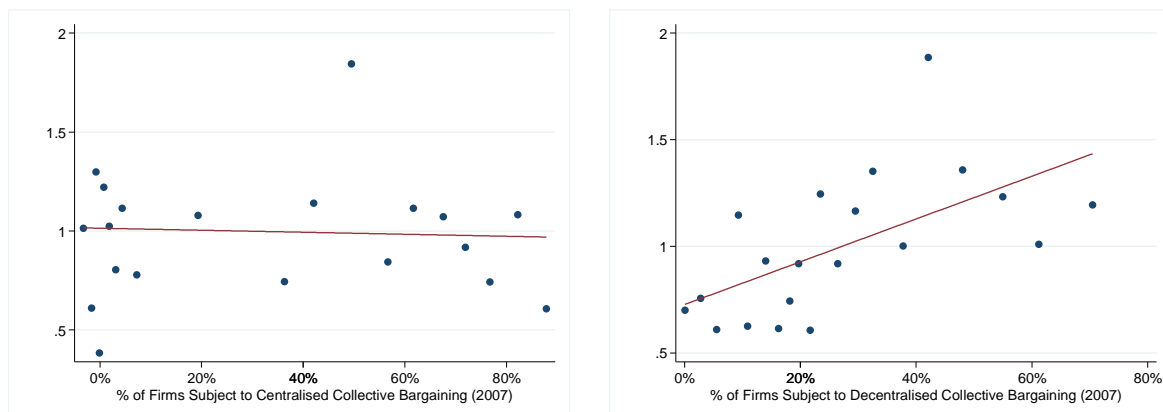
Source: TFP measure comes from CompNet's 6th Vintage of data; Collective Bargaining Shares are calculated on the basis of WDN 1st wave. TFP is normalised by country-year TFP mean.

2. ROBUSTNESS CHECK

Table A1. Robustness Check - TFP on Wage Bargaining Set-up and Extra Controls

TFP	Non-CEE Countries	CEE Countries
ML	1.32***	
	(0. 38)	
FL		0.88
		(0.71)
ML*Crisis	0.55*	
	(0. 27)	
FL*Crisis		-0.25
		(0.63)
Share of Individual Contracts	-0.84*	-2.00***
	(0.50)	(0.63)
Capital/Employment	-0.26**	0.54*
	(0.10)	(0.29)
Capital Productivity	2.96	-1.44***
	(2.28)	(0.45)
Total Wage	-0.01***	0.001
	(0.003)	(0.006)
Real Value Added	0.004**	-0.002
	(0.001)	(0.001)
Total Employment	0.04	0.16
	(0.14)	(0.18)
Constant	127.17**	-115.57**
	(51.58)	(56.79)
Observations	488	418
R-squared	0.35	0.70

OLS regressions include dummies for country, macro-sector, year, and size effects, as well as controlling for crisis period and macro-sector–year dummies. Clustered standard errors at macro-sector–year level in parentheses. *** p<0.01; ** p<0.05; * p<0.1.

3. WAGE SHARE, PROFITS, AND WAGE DISPERSION

The wage share, defined as labour costs divided by value added, declined after the GFC (Figure A3).

Figure A3. Trends of Wage Share after the Crisis (Reference Year 2009)
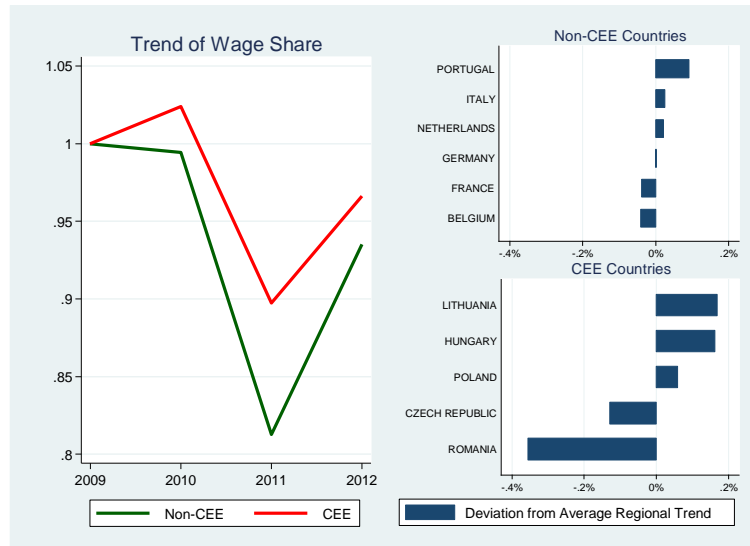
In the non-CEE region, decentralisation is found to decrease wage share (Tables A2) – as well as increasing profit margin (Table A3). Again, no impacts for CEE countries.

Our result is complementary to Boeri (2015), who shows that the share of labour costs over total costs is higher in multi-level collective bargaining than in fully centralised or firm-level bargaining. However, in Table A2 we relate wages to real value added and our finding seems to support the fact that, even if labour costs increase in multi-level bargaining, there is a gain in productivity that can offset such higher costs. This result is also coherent with Table 3 of Section 5 about ULC.

Table A2. Wage Share on Wage Bargaining Set-up

Wage Share	Non-CEE Countries	CEE Countries
ML	0.0005	
	(0.0005)	
FL		0.0004
		(0.0009)
ML*Crisis	-0.0016**	
	(0.0006)	
FL*Crisis		0.0003
		(0.0011)
Constant	0.76***	0.32***
	(0.034)	(0.107)
Observations	479	395
R-squared	0.12	0.17

OLS regressions include dummies for country, macro-sector, year, and size effects, as well as controlling for crisis period. Clustered standard errors at macro-sector–year level in parentheses. *** p<0.01; ** p<0.05; * p<0.1.

Table A3. Profit Margin on Wage Bargaining Set-up

Profit Margin	Non-CEE Countries	CEE Countries
ML	-0.0001***	
	(0.00004)	
FL		-0.00006
		(0.00006)
ML*Crisis	0.0002**	
	(0.00006)	
FL*Crisis		0.0001**
		(0.00005)
Constant	-0.006*	0.042***
	(0.003)	(0.008)
Observations	396	344
R-squared	0.60	0.59

OLS regressions include dummies for country, macro-sector, year, and size effects, as well as controlling for crisis period. Clustered standard errors at macro-sector–year level in parentheses. *** p<0.01; ** p<0.05; * p<0.1.

We also investigate the effect of decentralized collective agreements on wage dispersion, which is shown to increase for non-CEE countries, again supporting the idea that workers could be better matched with their own tasks and productivity under this wage bargaining set-up. We analyse the response across sectors of wage dispersion, measured as the ratio between the 90th and 10th percentile of the sectoral wage distribution, in Table A4. Decentralisation is shown to

increase wage dispersion (coherent to the results of Dahl et al., 2013). This can be evidence of the fact that, as stated above, decentralisation helps firms to better match workers with their tasks.

Table A4. Wage Dispersion on Wage Bargaining Set-up

Wage Dispersion	Non-CEE Countries	CEE Countries
ML	0.0017	
	(0.0084)	
FL		0.0056*
		(0.0028)
ML*Crisis	0.011*	
	(0.0055)	
FL*Crisis		-0.0031
		(0.0040)
Constant	3.33***	2.69***
	(0.46)	(0.31)
Observations	489	464
R-squared	0.24	0.73

OLS regressions include dummies for country, macro-sector, year, and size effects, as well as controlling for crisis period. Clustered standard errors at macro-sector–year level in parentheses. *** $p<0.01$; ** $p<0.05$; * $p<0.1$.

4. DIFFERENCE-IN-DIFFERENCES

Table A5. Δ in Δ TFP on Δ in Δ Decentralisation

Δ in Δ TFP 2007-2013	Non-CEE Countries		CEE Countries	
	(1)	(2)	(3)	(4)
Δ in Δ Decentralisation	0.72***	0.74**	1.54***	1.52***
	(0.17)	(0.28)	(0.09)	(0.13)
Constant	-13.48	-34.94	-33.12	112.1
	(9.60)	(47.58)	(32.88)	(84.21)
Controls		X		X
Observations	39	39	22	22
R-squared	0.40	0.49	0.80	0.90

Model (1) and (3) represent the OLS estimates for the differences-in-differences regression of TFP on Share of decentralisation, in the non-CEE and CEE countries, respectively. Regressions (2) and (4) include also dummies for country, macro-sector, and size effects. Clustered standard errors at country–macro-sector level in parentheses. *** $p<0.01$; ** $p<0.05$; * $p<0.1$.

Table A6. Δ in Δ TFP on Δ in Δ Decentralisation

Δ in Δ TFP 2007-2014	Non-CEE Countries		CEE Countries	
	(1)	(2)	(3)	(4)
Δ in Δ Decentralisation	0.80***	0.82*	1.54***	1.46***
	(0.14)	(0.22)	(0.13)	(0.14)
Constant	-15.06	12.27	-14.91	47.64
	(11.65)	(19.35)	(33.24)	(125.2)
Controls		X		X
Observations	39	39	22	22
R-squared	0.42	0.52	0.83	0.91

Model (1) and (3) represent the OLS estimates for the differences-in-differences regression of TFP on Share of decentralisation, in the non-CEE and CEE countries, respectively. Regressions (2) and (4) include also dummies for country, macro-sector, and size effects. Clustered standard errors at country–macro-sector level in parentheses. *** $p<0.01$; ** $p<0.05$; * $p<0.1$.

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