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ABSTRACT

Firm-level distributional dynamics: Labour share in Italian medium-large firms

In this paper, we explore the main drivers of firm-level labour share focusing on a sample of medium-large Italian firms. Taking advantage of the *Rilevazione Imprese e Lavoratori* (RIL) run by Inapp in 2010 and 2015, we explore the main drivers of changes in labour share on a heterogeneous sample of firms emphasizing different mechanisms at work among those firms showing higher labour share and firms with lower labour share. The results suggest an overall pattern of polarization: "more unequal firms" register a decline in labour share over the crisis, while the so-called "more equal firms" show an increase of the labour share even during the crisis period. After controlling for several characteristics, we find that outsourcing is the main channel adopted by firms to put a downward pressure on labour share. Among those firms with higher labour share, unionization improves the functional distribution of income, while the introduction of some forms of process innovations is associated to a positive change in labour share, in particular, for those firms at the bottom of the distribution.

KEYWORDS: labour share, weges, firm-level studies

JEL CODES: J3, L2, D33

1. Introduction

In the last three decades, labour share has declined in all OECD countries, in Italy from 66.9 percent in 1970 to 50 percent in 2018 (AMECO), reflecting in an increasing profit share in total income (Karabarbounis and Neiman 2014). This pattern has led to higher economic inequality in the developed world, mainly because labour income is much more evenly distributed than non-labour income (Checchi and García-Peñalosa 2010; Atkinson 2009; Glyn 2009). Among the determinants of a declining labour share, many explanations have been put forward, ranging from technological progress, globalization to institutional changes favoring the bargaining position of capital over the one of labor (Siegenthaler and Stucki 2014). Most empirical studies focusing on the determinants of the labour share are either based on country (European Commission 2007; Checchi and García-Peñalosa 2010) or on industry-level data (Azmat *et al.* 2012; Hutchinson and Persyn 2012; Elsby *et al.* 2013; Pianta and Tancioni 2008; Bogliacino *et al*. 2017). Few studies have clearly investigated the relationship at the firm level, stressing the role of technological change as well as institutional forces (union coverage, level of bargaining, temporary jobs) that can influence the distribution of revenues between workers and the ownership. As stated by Siegenthaler and Stucki (2014), a firm-level analysis enables to control for composition biases due to changes in the sectoral composition of the economy (Arpaia *et al.* 2009; De Serres *et al.* 2001; Young 2010; Elsby *et al.* 2013) or by changes in the composition of firms rather than by within-firm changes in labour share.

More recently, the analysis on the relationship between firm labour share and technology and innovation has been articulated at local labour market level starting from the idea that the effects of technology adoption on labour might be offset within local labour markets (Ciarli *et al.* 2018). On one hand, initial industrial specialization and composition of skills in routinised and non-routinised jobs, might affect the rate of adoption of technologies (Autor and Dorn 2013; Goos *et al.* 2014); on the other hand, it can influence the bargain power of workers (Guellec and Paunov 2017). As Adrjan (2018) suggests, local labour markets with a greater proportion of groups with a lower bargaining power, for example short-term or part-time workers, are associated with a lower labour share, and firms located in that local labour markets can take advantage from the presence of workers less able to affect rent-sharing policies. From a different perspective, a recent stream of studies has emphasized the role of financialisation on firms' labour share detecting that the increased shareholder value orientation has exerted a downward pressure on the labour share, while technological change and market concentration did not play an important role for the decline of labour share (Guschanski and Onaran 2018). The firm level dimension of the analysis allows exploiting heterogeneity across firms in terms of macro-sectors, technological groups and firms' dimension as well as to control for unobserved heterogeneity between firms.

In the theoretical literature, four main hypotheses have been put forward to explain changes in labour share: the technological change hypothesis suggesting an increasing substitution between capital and labour; the bargaining power hypothesis that considers the decline of the bargaining power of labour as the main explanatory factor. The third hypothesis stresses the role of superstar firms explaining that the decline in labour share is due to a smaller number of very productive firms that grow faster than lower productive firms leading to higher market concentration. Finally, a further stream of

studies focuses on globalization as a channel going from internationalization to changes in the labour share.

This paper contributes to the existing literature shedding lights on the main drivers of labour share exploring some of these several mechanisms on a sample of heterogeneous Italian firms. In particular, we focus on a comprehensive set of aspects related to globalization patterns (FDI, outsourcing, export, foreign participation), technological change (process and product innovation), labour market institutions and the bargaining power of labour (union representation, union members, two-tier bargaining). We hypothesize that these forces might diverge across firms according to their initial labour share.

The aim of the paper is twofold: to provide an analysis of the determinants of labour share at firm level focusing on Italy, and to evaluate their impact along the entire labour share distribution. We use the *Rilevazione Imprese e Lavoro* dataset for 2010 and 2015 containing information on a representative sample of Italian firms[1]. This dataset is particularly useful because it allows exploring the dynamics of labour shares both in small and large firms using a wide set of information. We hypothesize different mechanisms at work among firms differentiated according to their labour share. To evaluate the impact of each driver along the entire labour share distribution we apply the Recentered Influence Function (RIF) method proposed by Firpo *et al.* (2009). The RIF-regression method allows to compute a decomposition in a path-independent way and to obtain an unconditional mean interpretation of the coefficient estimates.

The rest of the paper is organized as follows: Section 2 summarizes the hypotheses put forward by the literature on the wage share; Section 3 discusses the estimation strategy used in the analysis. Section 4 explains the methodology used in the analysis, Section 5 discusses the main results. Section 6 concludes.

2. Background discussion

The question of how rents are distributed among the factors of production, the core of the Classical economics, has gained renewed attention because of the substantial decline in labour share of national income since the 1970s in most of European countries. Indeed, many studies have documented a decline in labour share for the majority of developed countries over recent decades (Elsby *et al*. 2013; Karabarbounis and Neiman 2014; Piketty 2015). The OECD (2012) has observed that, over the period from 1990 to 2009, the share of labour compensation in national income decreased in 26 out of 30 advanced countries for which data were available. The median (adjusted) labour share of national income across developed countries fell from 66.1 per cent to 61.7 per cent (OECD 2015). Other international institutions have observed a similar downward trend (IMF 2007; European Commission 2007; ILO 2011). The decline in the labour share has shed new lights on the functional distribution of income between capital and labour re-opening the debate on the main drivers that affect both capital and wages growth. This labour share's trend contrasts with the predictions of a

[1] The RIL survey is run by the *National Institute of Public Policy Analysis* (Inapp) and is available upon request on the website.

constant labour share of most macroeconomic models, in particular, it contradicts the historical stylized fact of long-run stability of the labour share noted by Keynes (1939) and Kaldor (1957).
The renewed attention toward factors remuneration goes in hand with the debate on economic inequality. Indeed, the growth of inequality that took place in the post 1980s has been increasingly affected by the functional (i.e. across factors of production) distribution (OECD 2008; 2011; Bogliacino and Maestri 2014; Piketty 2015). The decline of labour share implies an increase in economic inequality in the developed world mainly because labour income is much more evenly distributed than non-labour income (Checchi and Garcìa-Peñalosa 2010; Atkinson 2009; Glyn 2009). On the contrary, the capital share appears to increase in most OECD countries (Arpaia *et al*., 2009; Checchi and Garcia-Penalosa 2010; Stockhammer 2013; Schlenker and Schmid 2015).

2.1 The level of analysis

Focusing on empirical studies on labour share, a major distinction concerns the level of the analysis. Many empirical studies are based on country data (see, e.g., Checchi and Garcia-Peñalosa 2010; Damiani *et al*. 2018). Some studies use industry-level data (Azmat *et al*. 2012; Hutchinson and Persyn 2012; Elsby *et al*. 2013; Alvarez-Cuadrado *et al*. 2018; Pianta and Tancioni 2008; Bogliacino *et al*. 2017). Only few studies have focused on firm-level data (Growiec 2012; Siegenthaler and Stucki 2014; Autor *et al*. 2017; Adrjan 2018; Guschanski and Onaran 2018). According to Siegenthaler and Stucki (2014), there are advantages of using firm-level data. A firm-level analysis allows, indeed, to take into account composition biases due to the fact that an important fraction of the decline in the aggregate labour share can be attributed to changes in the sectoral composition of the economy (Solow 1958; De Serres *et al*. 2001; Arpaia *et al*. 2009; Young 2010; Elsby *et al*. 2013). From this point of view, Autor *et al*. (2017) underline that the reallocation between firms is a central factor in the fall of the labor share instead of a within-firm phenomenon. However, this result is debated and suggests the relevance of controlling for composition effects given by reallocation of firms across sectors and reshaping of the structure of economies toward services.
At the country level, several measurement issues need to be addressed such as accounting for the contribution of intangibles to income, or the imputation of labour and capital income earned by entrepreneurs, unincorporated business and self-employment. The estimates of the gross labour share should also consider the net labour share once tax deductions are included. Aggregate studies that do not explicitly consider how much of the fall in labour share is due to changes in the composition of firms, rather than by within-firm changes, in labour shares could be biased. Furthermore, firm-level studies in a panel structure allow controlling for endogeneity and unobserved time-invariant heterogeneity (Siegenthaler and Stucki 2014). The lack of firm-level studies is partly due to the availability of adequate data including information on labour costs, value added, as well as, financial variables and other potential drivers for wage determinants. Moreover, as acknowledged by Siegenthaler and Stucki (2014), even the analysis of the determinants of labour share performed at the micro level would require an adequate time span since factors shaping labour changes occur in the medium-long term and should be distinguished by short-term business cycle effects. From this point of view, one advantage of country and industry level studies derives from the possibility of considering long-time span variations in factor remunerations over decades focusing on structural factors reshaping employment, occupations, wages and profits

2.2 The determinants of labour share

Beside the level of analysis, there is a large consensus on the main causes of the recent decline in labour share. Many empirical studies have tried to investigate the determinants of the functional distribution of income focusing both on capital and on labour emphasizing the role of technical change. Indeed, in the economic theory the idea that technical change is not neutral is probably due to Hicks (1932), although labor saving bias of machines was clearly present also in Marx and Ricardo, which suggests that labor saving innovation is driven by falling prices of capital. This theoretical discussion of the 1960s received a renovated interest in the 1990s debate over the massive introduction of ICT (Information and Communication Technologies) and its effect on the dynamics of wages (Berman *et al*. 1994).

Focusing on the capital-labour elasticity of substitution, neoclassical economists put forward the argument that the cost of capital relative to labour has fallen driven by declines in prices due to the introduction of ICT; this change in relative capital price should affect factor shares when the capital-labour elasticity is greater than one (Karabarbounis and Neiman 2014). Bentolila and Saint-Paul (2003), building on a frictionless neoclassical growth model and assuming constant return to scale of production function, argue that the labour share is a unique function of the capital-output ratio. In this framework, if capital and labour are substitutes, a higher capital intensity reduces the labour share; conversely, if capital and labour are complements, capital can even increases the labour share. However, the empirical literature does not support the role of relative capital price reduction in the decline of labour share that occur when the capital-labour elasticity of substitution is greater than one. There is evidence of elasticity of substitution below one (Chirinko 2008; Oberfield and Raval 2014; Lawrence 2015) and the assumption of labour-augmenting technological progress does not have support in the empirics. Departing from the Neoclassical perspective, Pianta and Tancioni (2008) analyze the effect of technical change, distinguishing product and process innovation, on wages and profits. They found that profits are driven by the 'Schumpeterian' effects of new products. Wages, on the contrary tend to be pushed upwards by new products, in highly innovative sectors, whereas process innovation drive them downward in low-tech industries. On this line, Guellec and Paunov (2017) study the relationship between digital innovation, market structures and the distribution of income. Building on a Schumpeterian perspective, they argue that new digital innovation – allowing for economies of scale and low costs of innovation – increases creative destruction and high market rents for investors and top managers, but they reduce wages. "Winner-take-all market" structures affect the distribution of income facilitating higher market concentration and higher market rents and therefore leading to labour share reduction. Other evidence supporting the effects of "winner-take-all markets" on the decrease in the labour share includes Barkai (2016) and Autor *et al*. (2017). Barkai (2016) detects a negative relationship between labour share and markups confirming the link between the former and rent sharing. On the same line, Autor *et al.* (2017) show for US and other developed countries that the decline in labour share is stronger in those industries with stronger market concentration that is associated to more technology-intensive industries.

Another stream of studies has focused on the effects of globalization on the labour share in high-income countries detecting a negative relationship between the intensification of competition and the entry of labour-abundant countries having a wage-compressing effect on workers' remuneration (IMF 2007). Several studies have shed lights on the redistribution from labour to capital occurring through

offshoring (Burke and Epstein 2001). At the sectoral level, Bogliacino *et al*. (2017) identify the impact of demand, innovation and offshoring on capital and labour remuneration detecting a negative relationship between offshoring and low-skilled workers' remuneration. Innovation and offshoring favor high-skilled workers, offshoring exerts downward pressure primarily on low-skilled wages and profits are positively correlated with high-skill wages, negatively correlated with medium-skill wages and not correlated with low-skill wages. Overall, the empirical evidence has not been conclusive on the relationship between labour share and offshoring. Guerriero and Sen (2012) find a positive effect of international trade on labour share. Autor *et al.* (2017) underline that sectors not exposed to import have also recorded a reduction in labour share as traded sectors, therefore the role of international trade on labor remuneration needs to be qualified in terms of skills. Some studies have focused on the join effect of trade and financial markets underling that some groups of workers, particularly top executives, may have benefited from this process of "financialization". According to Bell and Van Reenen (2013), the extent and size of gains from offshoring are limited.

Another stream of studies sheds lights on the role of institutional factors and deterioration of labour power. Factors such as union density, minimum wage legislation, unemployment benefits and coverage deserve a particular attention. The decline of union density, proxied by the number of trade union members as a percentage of employees, is usually positively correlated with a decline in labour share. Indeed, the decline in union density is linked to weakening of workers' bargaining power negatively affecting workers' ability to negotiate a larger share of labour compensation (OECD 2015). From a country-level perspective, Damiani *et al*. (2018) analyze the role liberalization of temporary contracts in some EU countries detecting a strong negative relationship between legislations, favoring the extensive use of temporary contracts, and labour share. The diffusion of temporary contracts modifies the nature of employment relations making more difficult for trade unions to recruit members and therefore leading to labour share compression (OECD 2012). Among institutional factors, empirical evidence suggests that the role of factors affecting the bargaining power of workers is largest on labour share compared to unemployment benefits or other mechanisms that can affect workers' reservation wages. As underlined in OECD (2011) and Bogliacino and Maestri (2014), institutional reforms in the labour markets appear to be responsible for most of the change in wage inequality and factors remuneration. As argued by Bogliacino *et al*. (2017), the way in which rents are shared should be made dependent on a bargaining between labour and capital (and where institutional factors certainly play a role).

To sum up, several causes of the trend in the global share have been proposed. On one hand, one explanation considers the role of technological change and its impact on prices of capital relative to labour, which, according to a neoclassical framework, can push firms to substitute labour with capital. On the other hand, following a neo-Schumpeterian approach, another explanation focuses on the increase firms' market share and market power through the introduction of digital innovation. Another stream of studies has explicitly considered the role of deregulation or other institutional factors shaping labour market relations in favor of labour. The literature has discussed both explanations at the country and at the sectoral level, disregarding the role of firms' heterogeneity in terms of productions and wage-setting processes.

In this work, we argue that the main drivers of labour share are not equally affecting the internal distribution of income and a certain degree of heterogeneity should be taken into account when analyzing the internal subdivision of rents. In what follows, we articulate this point by showing

descriptive evidence on labour share changes across firms and, in the empirical section, we explore the main drivers regarding to globalization, labour market institutions and technological change.

3. Empirical framework

3.1 Data and empirical strategy

The data used in the analysis are drawn from the last two waves of the *Rilevazione Imprese e Lavoro* (RIL) dataset conducted by Inapp for 2010 and 2015 on a representative sample of Italian firms. Each wave interviews over 30.000 firms operating in non-agricultural private sector. A subsample of the included firms (around 30 percent) is followed over time making the RIL dataset partially panel.
The RIL data collects a rich set of information about the composition of the workforce, including the amount of training investments, hiring and separations, the use of flexible contractual arrangements, the asset of the industrial relations and other workplace characteristics. Moreover, the data contains an extensive set of firm level controls, including the managerial and corporate governance characteristics, productive specialization and other firm strategies (such as innovation and export activities). However, the RIL dataset has incomplete information on financial and accounting variables, which had to be recovered from another source. To this purpose, we use the national tax number (*codice fiscale*) to merge RIL data with AIDA archive provided by the Bureau Van Dijk. The AIDA dataset offers comprehensive information on the balance sheets of almost all the Italian corporations operating in the private sector, except for the agricultural and financial industries. In particular, this dataset contains yearly values of such variables as cost of labour, revenues, value added, net profits, book value of physical capital, total wage bill and raw-material expenditures. Then, we are able to use indicators of labour productivity (value added per employee), fixed capital (the total amount of physical asset per employee) and other balance sheet variables. All these financial variables have been deflated according to specific deflators (the index of industrial production) provided by the national statistics institute (ISTAT). The resulting "RIL-AIDA" merged sample was the restricted to limited liability firms that disclose detailed accounts in accordance with the scheme of the 4th Directive CEE.
The value of labour share is the dependent variable of our analysis. The firm-level labour share is computed as the ratio between the cost of employees and the value added as reported in the balance sheet. Since at firm level total labour cost can exceed the amount of value added, and, since during periods of crisis the value added can be negative, following Perugini *et al*. (2017), we consider these observations as outliers trimming firms at the top and bottom 5 percent of the labour share distribution. Moreover, as for sample selection, we consider only those firms with a positive value added over the considered period, and with at least 50 employees. The explanatory variables used in the regressions analysis can be grouped in the following three categories: globalization, technological change and institutional factors. Globalization refers to variables measuring firm's involvement in internationalization. The variables used are the share of firm's export over the total value added (EXP), whether the firm is running at least part of its production activity in another country via direct investments (FDI), whether the firm has outsourced part of its production (OUT), and whether the firm belongs to a foreign group (FG). The last three characteristics are dummy variables. The extent of firm's exposition to technological change is measured by two binary variables: whether the firm has

introduced process or product innovation (PDI, PCI) in the past three years. Four variables capture institutional determinants of labour share: share of workers affiliated to unions (UNION), presence of union representation (RSU), share of temporary workers (TEMP), and whether the firm applies two-tier bargaining in the wage bargaining on the top of centralized bargaining (TTB). Finally, a set of variables is introduced as controls: the educational attainments of managers, the age and occupational distribution of workers within firms and a set of dummies for industrial sectors at the two-digit level (NACE Rev.2) and region where firms operate (NUTS-3).
Based on the above discussion, the empirical specification that we adopt is the following one:

$$LS_i = \beta_0 + \beta_1 \mathrm{EXP}_i + \beta_2 \mathrm{FDI}_i + \beta_3 \mathrm{OUT}_i + \beta_4 \mathrm{FG}_i + \beta_5 \mathrm{PDI}_i + \beta_6 \mathrm{PCI}_i + \beta_7 \mathrm{UNION}_i + \beta_8 \mathrm{RSU}_i + \beta_9 \mathrm{TEMP}_i + \beta_{10} \mathrm{TTB}_i + \alpha_n \mathrm{X}_i + \gamma Z_j + \delta Y_r + \varepsilon_i \quad (1)$$

where LS_i is the labour share of firm *i*, X_i is the vector of firm-level control variables, Z_j is the vector of sector dummies, Y_r is the vector of region dummies, and ε_i is the residual term. The analysis is implemented on the cross-section of RIL 2010 and 2015 waves. The total number of observations is 6,810 (2,410 in 2010 and 4,400 in 2015[2]). Since the aim of the paper is to analyze the impact of each set of determinants along the entire labour share distribution, our empirical analysis is, firstly, developed using the RIF-regression method (its detailed description is provided in the next section), and, secondly, by proposing an unconditional quantile decomposition. In both cases, standard errors are computed by using the bootstrap procedure as required by the RIF-regression method.

3.2 High-labour share and low-labour share firms: some descriptive evidences

What are the main features of high and low labour share Italian firms? In this section, we describe which kind of firms populate the two groups of "more equal" and "more unequal" firms by focusing on different quantiles of the labour share distribution (25th, 50th and 75th).
Looking at the mean, the summary statistics in table 1 suggest that the labour share substantially does not change over time. Analysing its dynamics along the distribution, we observe that, while at the 25th percentile labour share seems to not change, at the 75th percentile it increases about by 2 percentage points (from 83% to 85%). To understand which of the two components of labour share, the total cost of employees or the value added, mostly affects the labour share' trend, we focus on each one. Table 1 highlights that, over the considered period, both components tend to increase along the entire distribution, and their increase is about 10 percent. Indeed, union density, that is the number of trade union members as a percentage of total employees or as a percentage of total employment, from 2010 to 2015, decreases by 18 percent, suggesting a potential decrease in the labour share. The decline in union density has often been linked to the weakening of workers' bargaining power, negatively affecting their ability to negotiate a larger share of productivity growth as labour compensation.

[2] The sample dimension is higher in 2015 than in 2010 because of the increase in the number of firms interviewed in the RIL 2015 wave.

For what concerns those variables linked to globalization and technological changes, both outsourcing and the share of export (computed as the ratio between the amount of export and the total of value added) slightly increases, both at the mean and at the bottom of the distribution.

Table 1. Descriptive statistics

	2010				2015			
	Mean	**p25**	**p50**	**p75**	**Mean**	**p25**	**p50**	**p75**
Labour share	0.731	0.607	0.739	0.839	0.734	0.603	0.743	0.855
Mean values by main quantile of labour share	Overall	< p25	p25/P75	>p75	Overall	< P25	P25/P75	> P75
Total labour cost (per employee)	399.1	434.0	390.8	380.2	439.2	470.1	426.4	433.0
Value added (per employee)	621.3	1019.7	536.3	385.6	678.8	1095.8	586.8	451.7
K-L ratio	16244.8	40395.3	8279.4	8220.7	12068.8	25443.7	8132.0	6560.6
Size	238.7	199.0	259.7	234.2	230.8	187.9	218.3	293.7
Share of union members	0.208	0.170	0.205	0.257	0.170	0.145	0.165	0.201
RSU	0.367	0.405	0.353	0.358	0.373	0.366	0.405	0.324
Outsourcing	0.037	0.035	0.032	0.048	0.090	0.090	0.109	0.056
FDI	0.110	0.154	0.101	0.084	0.100	0.133	0.107	0.055
Process innovation	0.489	0.539	0.519	0.369	0.475	0.551	0.509	0.341
Product innovation	0.558	0.577	0.588	0.470	0.517	0.583	0.543	0.407
Foreign group	0.116	0.162	0.111	0.077	0.111	0.118	0.109	0.109
Share of export over total V.A.	0.181	0.206	0.188	0.137	0.209	0.269	0.228	0.122
Share of temporary workers	0.125	0.121	0.132	0.115	0.083	0.086	0.086	0.072
Share of female workers	0.352	0.329	0.349	0.382	0.330	0.308	0.320	0.369
Manager's education:								
Less than secondary	0.461	0.506	0.438	0.464	0.481	0.521	0.448	0.503
Secondary	0.429	0.436	0.424	0.435	0.416	0.402	0.434	0.396
Tertiary	0.110	0.058	0.138	0.101	0.103	0.076	0.119	0.100
Share of workers by age:								
Less than 25	0.058	0.052	0.064	0.050	0.057	0.054	0.056	0.060
25-34	0.255	0.260	0.258	0.245	0.226	0.227	0.223	0.231
35-49	0.496	0.491	0.496	0.500	0.476	0.486	0.481	0.458
Over 50	0.188	0.184	0.185	0.199	0.247	0.249	0.249	0.240
Share of workers by occupation:								
Blue collars	0.559	0.501	0.572	0.595	0.567	0.514	0.592	0.571
Clerks	0.384	0.426	0.375	0.360	0.380	0.418	0.362	0.378
Professionals	0.040	0.051	0.038	0.032	0.036	0.047	0.031	0.034
Managers	0.017	0.022	0.015	0.014	0.017	0.020	0.015	0.017
Observations	**2,410**	**624**	**1,173**	**613**	**4,400**	**1,065**	**2,149**	**1186**

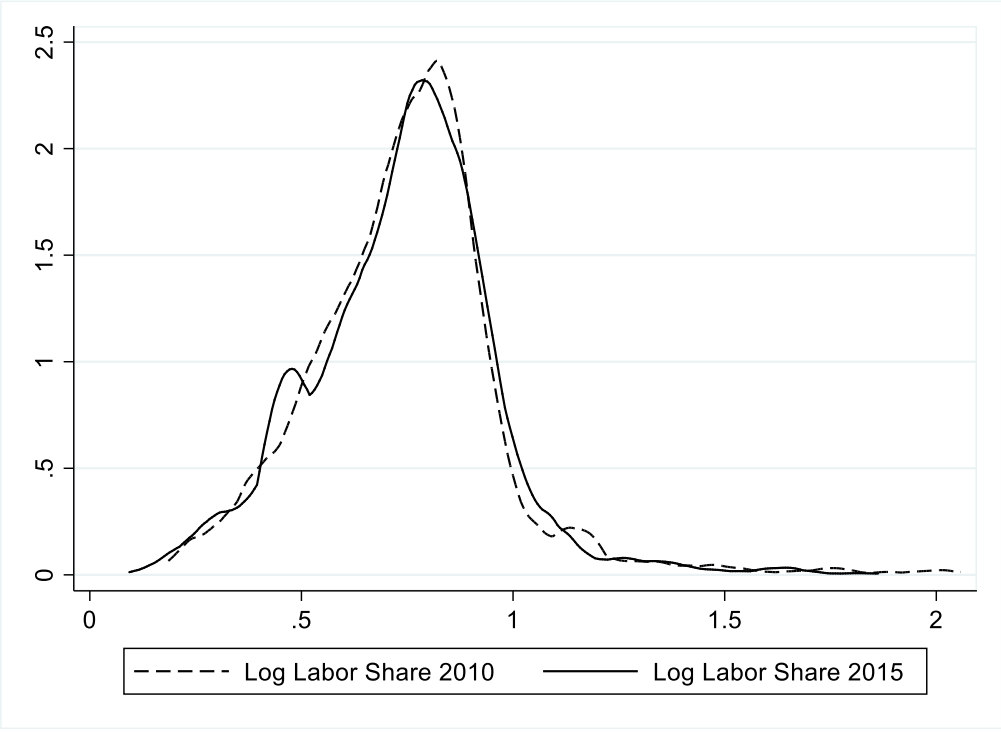
Note: Authors' elaboration based on the RIL-AIDA merged dataset. All values have been computed using sample weights. All monetary values are expressed in 2010 prices. All estimates include sector and region dummies

The share of firms involved in foreign direct investments, in process or product innovations, or being part of foreign groups, decrease over time. This reduction holds at the top of the labour share distribution but not at the bottom where we observe an increase. Table 1 clearly highlights that firms

with lower labour share – let's say more unequal firms – are on average smaller than those firms registering a higher labour share; while more equal firms – firms with a higher labour share – register on average both lower labour costs and lower value added. These firms are also less capital intensive – registering over time a lower value of capital per employee. Surprisingly RIL sample shows that the cluster of firms with lower labour share is mainly composed by smaller firms, high productive and with higher-labour costs per employees. Conversely, the cluster of more equal firms (registering a higher labour share) seems to be mainly composed by less productive firms paying lower wages and being less-capital intensive.

Table 1 highlights a substantially constant level of labour share over the considered period. In figure 1, we plot the labour share distribution for 2010 and 2015, and we observe that the two distribution are not statistically different to each other at a 5 percent level of significance confirming the previous result. Indeed, both distributions in 2010 and 2015 show a high dispersion around the median. Matching the distribution shown in figure 1 with the descriptive statistics in table 1, it emerges that on the left side of the distribution are concentrated more productive firms with wages above the mean, while on the right side of the kernel we see larger firms with lower labour costs and lower value added per employee.

Figure 1. Log labour share density function in 2010 and 2015

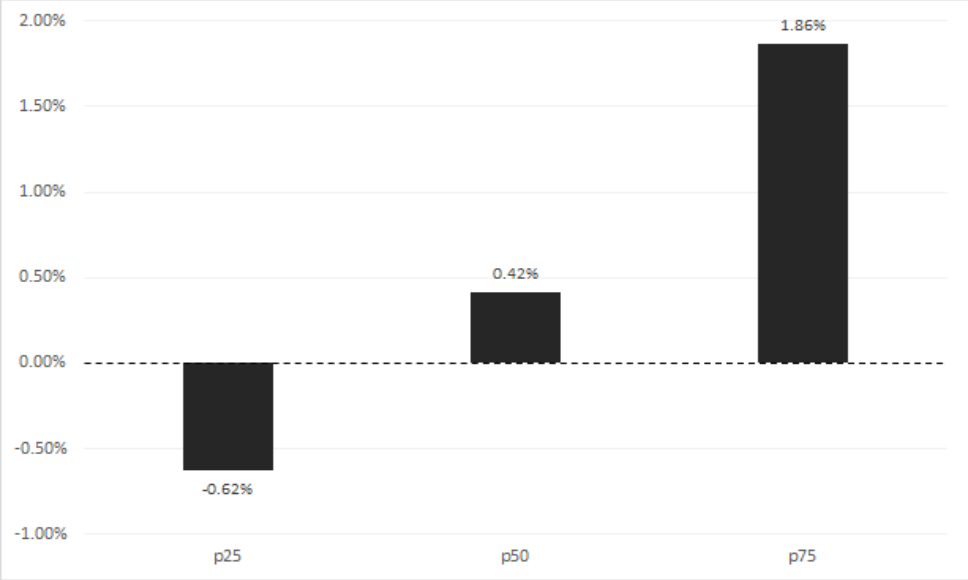


Note: Authors' elaboration based on the RIL-AIDA dataset

However, the analysis of the labour share at the aggregate level need to be interpreted with some caution. Indeed, figure 2 immediately reveals that the distribution of the firm-level labour share at different quantiles does not mimic the evolution of the aggregate labour share. The aggregate labour share seems to not change, while, the bottom quartile (25^{th}) strongly decreases, and the top quartile (75^{th}) co-moves with the median and increases as well.

This evidence highlights diverging trends in the labour shares and points to the importance of decomposing the role played by the different factors (globalization, institutional factors and technological change) along the entire distribution. This is on what we turn our attention to next.

Figure 2. Percentage variation of labour share by main quantiles of labour share (2010-2015)



Note: Authors' elaboration based on the RIL-AIDA dataset

4. Methodology

To analyse the determinants of labour share in 2010 and 2015 at different quantiles of the labour share's distribution, we first use the Recentered Influence Function (RIF) regression, proposed by Firpo *et al.* (2009). This estimation methodology is based on the influence function (IF), a statistical method exploited to evaluate the robustness of any given parameter of a distribution to the presence of outliers (Hampel 1974). The RIF of a given parameter is simply obtained by summing the parameter and the influence function at that parameter. In our specific case in which we want to analyse the evolution of the labour share at different quantiles of the distribution, the IF assumes the following three forms:

- $\frac{\theta-1}{f_{Q_\theta}}$ $when\ LS < Q_\theta$
- 0 $when\ LS = Q_\theta$
- $\frac{\theta}{f_{Q_\theta}}$ $when\ LS > Q_\theta$

where Q_θ is the labour share at the θth quantile and f_{Q_θ} is its density function. Given that, the RIF is equal to IF+Q_θ, we can simply estimate the RIF-regression by using Ordinary Least Squares (OLS).[3]
The main problem deriving from using the RIF-regression to analyse the determinants of labour share over the distribution is that, as in the case of the simple OLS regression, we have coefficients which are biased since our explicative variables are likely to be correlated to the error term in equation (1). Therefore, to evaluate the determinants of labour share, we use a decomposition method, that does not require our selected covariates to be strictly exogenous. In detail, we decompose the estimated variation of the labour share occurred between 2010 and 2015, at different quantiles of the distribution using two representative samples of Italian firms observed by year.[4] For each group, we estimate equation (1) (i.e. in the first group we have the labour share computed at the firm level and firms' characteristics observed in 2010 and, in the second group, the labour share and the same set of firms' characteristics observed in 2015). The decomposition is thus obtained after estimating a RIF-regression of the labour share on firms' characteristics for each of the two groups. More formally, the marginal effect of covariates at the θth quantile is obtained by estimating through OLS the following expression:

$$E[RIF(LS; Q_\theta)|X] = EX[RIF(LS; Q_\theta)|X] = \mathrm{E}(\beta_\theta \mathrm{X}) \quad (2)$$

Then, a decomposition *à la* Oaxaca-Blinder is performed to split the total variation in explained and unexplained effect. This means that the labour share variation occurred between 2015 and 2010 can be expressed according to the following expression:

$$E[RIF(LS_{2015}; Q_\theta)|X_{2015}] - E\left[RIF\left(LS_{2010}; Q_{\theta_,}\right)|X_{2010}\right] = \bar{X}_{2015}\beta_{2015,\theta} - \bar{X}_{2010}\beta_{2010,\theta} = \Delta_\theta \quad (3)$$

where Δ_θ is the gap in the labour share between the two years considered at the θth quantile and, for each θth quantile, the decomposition takes the following form:

$$\hat{\Delta}_\theta = \hat{\Delta}_{U,\theta} + \hat{\Delta}_{E,\theta} = (\beta_{2015,\theta} - \beta_{2010,\theta})\bar{X}_{2015} + (\bar{X}_{2015} - \bar{X}_{2010})\beta_{2010,\theta} \quad (4)$$

where the total gap between the two groups at the θth quantile is decomposed in an unexplained effect $\hat{\Delta}_{U,\theta}$, which is the effect due to variations, between 2010 and 2015, in the returns of covariates, and in a composition effect $\hat{\Delta}_{E,\theta}$, which is instead related to variations in the distribution of the same covariates between the two years. Additionally, we further decompose the two effects into the contribution of each single covariate to obtain the so-called detailed decomposition.
However, the decomposition extended for different parameters of the distribution can be biased given that the conditional expectation expressed in equation (1) holds linearly only (Barsky *et al*. 2002; Fortin *et al.* 2011). This is the reason why, according to what suggested by Di Nardo *et al*. (1996), it is necessary to correct the quantile decomposition by reweighting the distribution of covariates in our

[3] Observe that coefficients of a RIF-regression can be also estimated by using non-parametric estimation methods.
[4] For detailed information on decomposition methods frequently used in economics, see Fortin *et al.* (2011).

baseline period (i.e. 2010) to have the same distribution of covariates in the second period (i.e. 2015). Then, in order to remove the bias and obtain the "true" explained and unexplained effects, we need to reformulate equation (4) in this way:

$$\hat{\Delta}_{PU,\theta} = \left(\beta_{2015,\theta} - \beta_{2010(2015),\theta}\right)\bar{X}_{2015} \quad (5)$$

$$\hat{\Delta}_{PE,\theta} = \left(\bar{X}_{2010\,(2015)} - \bar{X}_{2010}\right)\beta_{2010,\theta} \quad (6)$$

where the subscript 2015 expressed in parenthesis means that we are estimating specific parameters using the 2010 sample after reweighting the distribution of covariates to have the same distribution of 2015.

The main advantage of using this empirical approach is that, unlike the case in which we use the simple RIF-regression, we can replace the strong strict exogeneity assumption with the weaker ignorability assumption. The ignorability assumption indeed only requires that the covariance between the vector *X* and the error term does not vary from group 1 to group 2 (Firpo *et al*. 2018). Accordingly, even if our covariates are correlated to the error term after controlling for the whole set of control variables in the two year-specific regressions, if endogeneity does not vary from 2010 to 2015 and the ignorability assumption holds, then:

- we can interpret the unexplained part of the decomposition as the causal effect of a covariate on labour share;
- the explained part of the decomposition is related only to changes in the distribution of X.

According to the decomposition method adopted, we expect the coefficients of the unexplained part to be different from the ones obtained by estimating the simple RIF-regression if some kind of endogeneity exists in the two specific-year models. The ignorability assumption is not a very strong assumption in our case given that endogeneity is unlikely to change so much in a very short time period, especially after controlling for the rich set of covariates including 2-digit sectoral and regional dummies. However, we decide not to interpret the "unexplained" estimated coefficients as the causal effect of a given variable on labour share given that we cannot completely check if some residual time varying endogeneity persists in our empirical even after implementing the decomposition.

5. Results

In this section, we discuss the main results obtained from the RIF analysis. As a first stage, we estimate equation (1) where the dependent variable, labour share, is regressed on a set of firm-level variables (table 2). The richness of the RIL database allows us to simultaneously consider a wide range of firm-level characteristics. Among the main driver of labour share, the share of union members is always positively associated to labour share both among "equal" and "unequal" firms, and both in the 2010 and 2015.

The share of union members seems to be the strongest predictor of labour share and, considering the empirical literature on the relationship between labour share and unions, this result is not surprisingly (see, e.g., Damiani *et al*. 2018). Similarly, but with a negative sign, the introduction of a process

innovation is associated to a contraction of firm-level labour share mainly in 2010. In 2015, this effect only holds for less productive firms being in our sample more equal firms.

As expected from the literature, the introduction of production innovations might lead to temporary extra-rents subsequently divided between owners and workers improving the functional distribution of income (Van Reenen 1996; Pianta and Tancioni 2008). The advantages of a temporary monopoly position gained by the innovative firm seems to be reflected in a positive sign on the coefficient of product innovation for less "unequal" firms. Indeed, it has to be acknowledged that those unequal firms according to table 1 in the descriptive statistics section are the ones registering higher value added per employee and therefore are supposed to be more productive compared to more equal firms with higher labour shares. However, the positive association between the introduction of product innovation and firm labour share disappears in 2015.

A second major pattern arises from the share of temporary employees which is systematically associated to lower labour share along the entire distribution both in 2010 and 2015, with the exception of more productive firms in 2010 (being the ones at the lower part of the labour share distribution).

Focusing on the variables measuring international behaviour of firms, it emerges that outsourcing is negatively associated to labour share mainly in 2015 and among more "equal" firms. In addition, firms' involvement in foreign direct investment (FDI) seems to compress labour share at the bottom of the labour share distribution – among high productive firms – while the realization of FDI seems not affecting labour share at the top of the distribution among less productive firms. In terms of quality of management, it emerges that when high-qualified managers exert the management of the firm, labour share improves mainly at the bottom of the distribution where we detect firms that are more productive.

Finally, as mainly other studies underline, we found a negative coefficient for the intensity of capital per employee that is negatively related to labour share. An increase by one percentage point in the capital intensity of firms reduces labour share by less than 1 percent suggesting a negative relationship between labour (number of employees affecting the wage share paid to workers) and the introduction of machines (measured by the intensity of capital).

As a further exercise, we decompose the change in labour share by quantiles according to equation (3) in an explained component, accounting for variations over time on the distribution of covariates, and, in an unexplained component, accounting for returns of covariates, meaning how much each driver might actually explain changes in the firm-level labour share. While the first component proxies variations over time being a composition effect given by an increase for each quantile of those firms registering a specific driver, if the ignorability assumption holds the, second component – the unexplained one – can be broadly intended as the causal effect of each driver on changes in labour share (table 3).

Given that, our exercise highlights that along the entire distribution of labour share, the share of firms declaring to pursue outsourcing strategies has increased over time both among high productive and high paying firms (registering in our sample a lower labour share) and both among low paying and low productive firms (with a higher labour share). Among the latter, we register also an increase in the share of temporary employees; conversely, among high productive firms (at the bottom and at the median of the labour share distribution) an on-going process of de-unionization is occurring.

Table 2. RIF-regression at main quantiles of the labour share distribution in 2010 and 2015

	2010			2015		
	p25	**p50**	**p75**	**p25**	**p50**	**p75**
Log K-L	-0.0015	-0.0032**	-0.0026	-0.0074***	-0.0072***	-0.0064***
	[0.0030]	[0.0016]	[0.0017]	[0.0023]	[0.0013]	[0.0011]
Outsourcing	0.0496	0.0432	0.0469	0.0059	-0.018	-0.0403***
	[0.0795]	[0.0406]	[0.0390]	[0.0356]	[0.0205]	[0.0130]
FDI	-0.0892*	-0.0552**	-0.019	-0.0497	-0.0385*	-0.0093
	[0.0515]	[0.0264]	[0.0226]	[0.0377]	[0.0207]	[0.0131]
Share temporary contract	0.0532	-0.1513***	-0.1246**	-0.1751*	-0.1082**	-0.1563***
	[0.1019]	[0.0549]	[0.0527]	[0.0893]	[0.0456]	[0.0374]
Share export	-0.0412	-0.0015	0.0271	-0.1717***	-0.0932***	-0.0446**
	[0.0673]	[0.0352]	[0.0337]	[0.0474]	[0.0257]	[0.0177]
RSU	-0.0514	-0.009	0.0166	0.0454*	0.0148	0.0013
	[0.0343]	[0.0187]	[0.0189]	[0.0244]	[0.0145]	[0.0104]
Share Union members	0.3132***	0.1700***	0.1246***	0.1635***	0.1615***	0.1160***
	[0.0659]	[0.0407]	[0.0476]	[0.0509]	[0.0320]	[0.0264]
Foreign group	-0.0576	-0.0408	-0.0355	0.0835**	0.0334	0.0402**
	[0.0552]	[0.0273]	[0.0262]	[0.0379]	[0.0211]	[0.0163]
Process innovation	-0.0669*	-0.0504**	-0.0442**	-0.0229	-0.0164	-0.0300**
	[0.0376]	[0.0207]	[0.0222]	[0.0282]	[0.0161]	[0.0121]
Product innovation	0.0681*	0.0213	-0.0106	-0.0131	-0.0037	-0.0101
	[0.0382]	[0.0206]	[0.0219]	[0.0265]	[0.0155]	[0.0116]
Log_employees	-0.0069	-0.0138	0.0123	0.0068	-0.0071	0.0005
	[0.0171]	[0.0102]	[0.0121]	[0.0128]	[0.0087]	[0.0076]
Share managers	-1.2883*	-0.7387**	-0.2392	-0.3594	0.0078	0.0986
	[0.7008]	[0.3742]	[0.3551]	[0.3510]	[0.2055]	[0.1707]
Share professionals	-0.072	-0.0972	-0.0904	-0.6978***	-0.3375***	-0.1432*
	[0.3497]	[0.1574]	[0.1336]	[0.2317]	[0.1199]	[0.0859]
Share clerks	-0.0389	0.0227	-0.0343	-0.0602	0.0392	0.0278
	[0.0682]	[0.0393]	[0.0416]	[0.0475]	[0.0287]	[0.0228]
Share female	0.0919	0.0393	0.0547	0.0842	0.0343	0.0258
	[0.0928]	[0.0491]	[0.0476]	[0.0597]	[0.0341]	[0.0274]
Manager: Secondary Educ.	0.0105	-0.0012	-0.0091	0.0066	-0.0092	-0.0154
	[0.0328]	[0.0182]	[0.0183]	[0.0238]	[0.0136]	[0.0106]
Manager: Tertiary Educ.	0.1266***	0.0225	-0.0088	0.0679*	0.0358*	-0.0045
	[0.0462]	[0.0293]	[0.0281]	[0.0357]	[0.0211]	[0.0159]
Share 25-34	-0.13	-0.0739	-0.0416	-0.0112	-0.0002	-0.0203
	[0.1031]	[0.0578]	[0.0577]	[0.0614]	[0.0378]	[0.0302]
Share 35-49	-0.0438	-0.0673	-0.0087	-0.041	0.0022	-0.0296
	[0.0886]	[0.0500]	[0.0583]	[0.0551]	[0.0330]	[0.0258]
Share over 50	-0.0311	-0.0272	-0.0146	0.079	0.0614*	0.0147
	[0.1406]	[0.0747]	[0.0893]	[0.0594]	[0.0364]	[0.0299]
Constant	-1.0810***	-0.6235***	-0.4615***	-0.3015	0.0214	0.2463*
	[0.1953]	[0.1292]	[0.1321]	[0.2075]	[0.1496]	[0.1266]
Regional dummies	yes	yes	yes	yes	yes	yes
Ateco 2dg dummies	yes	yes	yes	yes	yes	yes
Obs.	2091	2091	2091	4177	4177	4177
R2	0.1841	0.2158	0.1849	0.1596	0.1969	0.2134

Note: Authors' elaboration based on the RIL-AIDA merged dataset. Significance levels: *0.1, **0.05, ***0.01. Omitted categories are: share less than 25, for workers age; primary education, for manager's education; share of blue-collars for occupation. Bootstrapped standard errors (reps 100) in brackets

Focusing on the unexplained coefficients, it emerges that outsourcing is a clear firm-strategy to compress labour share among both high-productive and low-productive firms. Besides outsourcing, we find that being part of a foreign group is constantly associated with higher labour share along the entire distribution, meaning that both high-productive and low-productive firms being part of foreign group have registered an increase in labour share over time compared to those firms that do not participate in multinational consortia.

Indeed, we also detect different drivers along the distribution of labour share; in detail, we see that among firms with lower-labour share the introduction of process innovation increases the labour share. These firms are the more productive firms and the ones that introduce innovations over 2010-2015. Conversely, we detect that among those firms with higher labour share, an increase in firm unionization positively affects the labour share. The same effect is due to the share of temporary employees, an increase in the share of workers with temporary work arrangements seems to push up the labour share at least in low-productive firms. This result might be explained by the occupational dynamics registered over 2010-2015 when firms – mostly low-productive firms – have hired workers by temporary contracts.

Table 3. Detailed decomposition of changes in labour share between 2010 and 2015

	Explained		**Unexplained**	
	Coeff.	**S.E.**	**Coeff.**	**S.E.**
		P25		
Outsourcing	0.007**	0.003	-0.017***	0.007
FDI	0.001	0.001	0.001	0.006
Share temporary workers	0.010	0.006	0.003	0.013
Share Union members	-0.006*	0.004	-0.005	0.017
Foreign group	0.002	0.002	0.019***	0.008
Process innovation	0.003	0.003	0.037*	0.023
Product innovation	-0.004	0.003	-0.038	0.024
		P50		
Outsourcing	0.004*	0.002	-0.010**	0.004
FDI	0.001	0.001	0.003	0.004
Share temporary workers	0.009***	0.003	0.008	0.007
Share Union members	-0.004*	0.002	0.008	0.010
Foreign group	0.001	0.001	0.010***	0.004
Process innovation	0.001	0.001	0.012	0.013
Product innovation	0.001	0.002	0.007	0.014
		P75		
Outsourcing	0.003*	0.002	-0.011**	0.004
FDI	0.000	0.001	0.001	0.003
Share temporary workers	0.013***	0.004	0.011*	0.006
Share Union members	0.000	0.002	0.021**	0.009
Foreign group	0.001	0.001	0.009***	0.003
Process innovation	0.001	0.001	-0.003	0.011
Product innovation	0.002	0.002	0.011	0.012

Note: Authors' elaboration based on the RIL-AIDA merged dataset. All other control variables, regional and 2dg sectorial dummies are included. Significance levels: *0.1, **0.05, ***0.01

Summing up, our results suggest that over 2010-2015 changes in the labour share were mainly driven by outsourcing strategies implemented by firms that have reduced firm labour share by on average 0.02 percent. Conversely, over 2010-2015 being part of a foreign group pushes up the labour share by 0.01 percent with respect to firms not involved in international consortia. Besides these two common drivers, explaining changes in the labour share both in firms with higher and lower labour share, we observe specific drivers of labour share by each quantile of the distribution. Among them, process innovation plays a crucial role pushing up labour share among more productive firms, while unionization and temporary employment explain increases in labour share among less productive firms.

6. Concluding remarks

The increase in inequality experienced over the last decade has fuelled an intense debate on the main drivers accounting for the distribution of rents inside the firm between workers and owners. From this perspective, little attention has been given to the functional distribution of income mainly studied at the macro level disregarding the locus of firm where the bargaining of rents occurs. By taking advantage of the *Rilevazione Imprese e Lavoratori* run by Inapp, we study which ones are the major drivers of labour share changes in a short period of five years (2010-2015). We decompose the labour share variation occurred between 2010 and 2015 over the labour's share distribution starting from two separate RIF regressions and we provide detailed coefficients for each specific variable of interest. Given the short-time period, it is possible to interpret unexplained parts of the detailed decomposition as the impact of a specific variable on labour share if endogeneity does not vary between 2010 and 2015 (i.e. ignorability assumption). However, since it is not possible to test for the validity of the ignorability assumption, we do not interpret our coefficients as the causal impact on labour share of each specific variable even.

Our analysis sheds lights on two major points. First, high-productive and high-paying firms are those registering lower labour share, while less productive and low-paying firms register on average a higher labour share mainly due to poor economic performances that do not allow increasing the value added realized by firms. More surprisingly, labour share of high-productive and high-paying firms has decreased on average over time, while in low-productive firms labour share has increased over time. Second, our analysis highlights that outsourcing production is the main strategy pursued by firms to contract labour share and this result holds along the entire distribution. Conversely, the participation to an international group is associated to a higher labour share. Indeed, a major role is also played by unionization – at least among firms with higher labour share – and process innovation – among firms with lower labour share. However, the negative association between outsourcing and labour share is higher at the 25th percentile of the labour share distribution. On the contrary, unions are more strongly and positively correlated with labour share at the 75th percentile. These two main results related to specific drivers might explain why labour share is increasing (decreasing) at the top (bottom) of the labour share distribution shedding some lights on side effects deriving from policies oriented to facilitate firms' offshoring strategies.

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