Product and labour market imperfections in the Italian manufacturing sector: a firm-level analysis

Product and labour market imperfections in the Italian manufacturing sector. A firm-level analysis.

Despite the extensive literature on product market power, evidence on markups at the firm level and which also accounts for labour market power is still limited. In this paper, we investigate the trends in both these market frictions in a large sample of Italian manufacturing firms over the period 2010-2018. In doing so, we devote particular attention to the factors underlying product market power, and especially to the way the markup is related to labour market power and the labour share of income. Our analysis reveals that, during the selected years, the manufacturing sector has experienced a limited rise in markups and a shift in labour market power away from firms and towards workers. These dynamics are mostly driven by within-firm changes. Additionally, the overall growth in bargaining power, which explains the muted positive trend in the labour share, is mainly ascribable to the rise in the average firm-level wages. However, the latter are likely to hide relevant inter-individual heterogeneity, as national data on wage inequality suggest, and monopsony power is still a widespread phenomenon, especially in the Mezzogiorno.

1. Introduction

Competition between firms is typically regarded as a key factor in a well-functioning economy. The pressure of competitors and new entrants leads firms to set prices that reflect costs, while, in the absence of competition, firms gain product market power and command high prices (De Loecker, Eeckhout, & Unger, 2020). In addition to lowering consumer well-being, significant levels of market power due, for instance, to ineffective product regulation policies or relevant barriers to entry, have relevant consequences both at the firm level and the aggregate level. Intuitively, higher prices can lead to lower consumption and then output, which in turn affect firms' labour demand, capital investment and innovation efforts. Changes in product market power have not only intra-firm effects: they are also one of the drivers of the redistribution of output and inputs across companies, which can result in resource misallocation and affect aggregate variables including labour productivity (Andrews & Cingano, 2014) and total factor productivity (Restuccia & Rogerson, 2013, 2017). Ultimately, these dynamics have ramifications for policy, such as antitrust, monetary policy and income redistribution (De Loecker, Eeckhout, & Unger, 2020). For these reasons, economists and policymakers have long been interested in the magnitude and the changes of product market power, in the effects on the economy and in the way market power is affected by various competition and trade policies.

Product market power, which is often referred to simply as market power, is usually proxied by the markup (also known as price-cost margin), that is the ratio between the price applied by a firm and corresponding the marginal cost. Unlike its definition, the computation is not straightforward, as marginal costs are not observable. Since the publication of the seminal paper by Hall (1986), who suggests measuring the marginal cost using the observed change in input cost corresponding to the variation of output from one year to the next, a large strand of literature has estimated markups drawing upon Hall's methodology, or applying an extension or refinement of the latter (e.g., Domowitz, Hubbard, & Petersen, 1988; Morrison, 1988; Roeger, 1995; Klette, 1999; Crafts & Mills, 2005). An important methodological advancement is made by De Loecker & Warzynski (2012), who develop a method that, unlike prior work, produces firm-level estimates of markups and controls for unobserved productivity shocks.

Since then, an increasing number of studies have estimated markups using microdata with the aim of understanding whether product market power increased during a certain time frame in a given economy or in a group of countries, how markup is related to certain firm-level and industry-level characteristics, such as market concentration, productivity and export status, or to what extent its variation has implications for relevant economic variables (e.g., Diez, Fan, & Villegas-Sánchez, 2019; De Loecker & Eeckhout, 2018; Calligaris, Criscuolo, & Marcolin, 2018; Diez, Fan & Villegas-Sánchez, 2019; van Heuvelen, Bettendorf, & Meijerink, 2019; De Loecker, Eeckhout & Unger, 2020; IMF, 2019). In particular, in an influential paper, De Loecker & Eeckhout & Unger (2020) document a significant increase in markups across US non-financial corporations over the last few decades, and show how product market power is related to investment rate, labour share and capital share, labour force participation, wage inequality, business dynamism and labour reallocation. This promising strand of research complements the macroeconomic literature on product market power, its underlying mechanisms and its effects on investment, factor shares and other variables (e.g., Forni, Gerali & Pisani, 2010; Eggertsson, Robbins & Getz Wold, 2021; Barkai, 2020; Dixon & Lim, 2020). It also contributes to a wider policy and academic discussion on the recent rise of product market

power which has been documented in the US and other developed economies, and which seems to have played a role in the decline of the labour share and the investment rate, as well as in other worrying trends, observed in various countries since the early 2000s[1].

However, so far there are few microeconomic studies that jointly analyse product and labour market power despite the fact that, as stressed by Blanchard & Giavazzi (2003) in a seminal theoretical work, product and labour markets are intimately related. In particular, although some contributions (i.e., Dobbelaere & Mairesse, 2013; Soares, 2020; Mertens, 2019 and 2020; Caselli, Nesta & Schiavo, 2021) have recently started to tackle these issues, there is still limited evidence on the relationship between firm-level product and labour market power, on their link with the labour share of income and other microeconomic factors that drive the dynamics of these indicators.

Accordingly, we attempt to advance knowledge on this topic by investigating the recent trends in both product market power and labour market power in a large sample of Italian manufacturing firms. To this end, we use firm-level data collected from Aida (Analisi Informatizzata delle Aziende Italiane-Bureau van Dijk) and apply a sophisticated procedure which mainly draws upon De Loecker & Warzynski's methodology (2012) and the subsequent refinements made by Mertens (2019) and Caselli, Nesta & Schiavo (2021) to better model imperfections in the labour market. First, we outline a preliminary account of markups and the indicator of product market power by illustrating some descriptive statistics. After that, we attempt to shed some light on the observed trends: specifically, we first uncover the underlying mechanisms and provide some tentative interpretations of the latter by performing a decomposition analysis; then, by means of a simple regression analysis, we conduct a more standard assessment of the association between market frictions and the factors identified by the past literature as potential determinants.

From our microeconomic analysis, it emerges that the manufacturing sector has experienced a limited rise in markups and a shift in labour market power away from firms and towards workers. These trends are mainly driven by within-firm changes. Additionally, the overall growth in bargaining power, which explains the muted positive trend in the (revenue-based) labour share, is mostly attributable to the rise in the average firm-level wages; however, the latter are likely to hide relevant inter-individual heterogeneity, as national data on wage inequality suggest, and monopsony power is still non-negligible, especially in the Mezzogiorno.

This paper contributes to the recent and promising line of research that jointly analyses frictions in the product and in labour market starting from firm-level data. Notably, it also expands the evidence on market frictions in Italy, a Western European country that, during the last two decades, has exhibited a mixed economic performance which, however, partly differs from the US one in terms of the variables scrutinized by De Locker, Eeckhout & Unger (2020)[2]. Even though Italy has been

[1] In (…) , we review the extensive macroeconomic and microeconomic literature that relates product market power to the variables identified in the study by De Loecker, Eeckhout and Unger (2020).

[2] In particular, in the last two decades it has experienced a gradual but steady growth in labour force participation, a trend in the labour share which, despite a contraction in the early 2000s, is less worrying than the US one, and an investment rate that has been recovering after the fall occurred in 2010. At the same time, it has exhibited a low business turnover rate (e.g., Cefis & Gabriele, 2009; Rungi & Biancalani, 2019), increasing income inequality (e.g., Ciani & Torrini, 2019; Devicienti, Fanfani & Maida, 2019) and growing capital misallocation (e.g., Gamberoni, Giordano & Lopez-Garcia, 2016), which have been regarded as possible symptoms of increasing product market power (see… for an overview of these trends in Italy and for a comparison with the US and the EU as a whole).

included in some cross-country studies on markups (e.g., Calligaris, Criscuolo & Marcolin, 2018; Díez, Fan & Villegas-Sánchez, 2019; Cavalleri et al., ECB, 2019; Battiati et al., 2022), empirical research on this subject (especially microeconomic research) has been limited so far. Giordano & Zollino (2017) compute macroeconomic total-economy estimates of Italy's markups since 1861 and sectoral markups for the time span 1970-2012, using different methodologies. With regard to the most recent decades, they document a reduction in markups after the completion of the Single Market, which accelerated after the inception of the European Monetary Union. Evidence of a pro-competitive impact of the euro adoption is also provided by Bugamelli, Schivardi & Zizza (2008), while Bugamelli, Fabiani & Sette (2015) show that, in recent years, import competition (especially from China) has contributed significantly to curbing price dynamics and firms' markups. Thus, it seems that the trend in product market power observed in Italy between the beginning of the nineties and the first decade of the new millennium differs from the dynamics reported for the US in the same period. Nonetheless, Bugamelli, Schivardi & Zizza (2008) and Bugamelli, Fabiani & Sette (2015) do not employ a direct measure of markups, and the work by Giordano & Zollino (2017) produces aggregate estimates. Moreover, none of them cover the most recent years. Cavalleri et al. (ECB, 2019), who investigate the trends in market concentration, markups and economic dynamism in Italy and other three Western European countries, compute both aggregate and firm-level measures of the variables under scrutiny and make some interesting comparisons across the four countries; however, the markup is simply calculated as the ratio between output and input (labour and materials) costs. An exhaustive and updated account of the evolution of product market power in Italy has been recently provided by Ciapanna et al. (2022), who resort to both macro and micro data and employ different measures and estimation techniques, including a production function-based methodology based on De Loecker & Warzynski's framework. However, they focus on product market power while neglecting labour market frictions.

The remainder of the paper is organized as follows. Section 2 describes the analytical framework and the data used to estimate the parameters of market inefficiencies. Section 3 provides a descriptive analysis of market imperfections in the Italian manufacturing sector. Section 4 illustrates the decomposition analysis. Section 5 summarizes the results of the regression analysis. Finally, Section 6 concludes.

2. Analytical framework

2.1 Estimation of the parameters of labour and product market imperfections

In order to identify product and labour market imperfections in the Italian manufacturing sector, we first estimate the parameter of corporate markup drawing upon De Loecker & Warzynski' s (2012) methodology. This approach assumes that firms minimize costs and at least one input (materials) is adjusted freely, while the other factors (capital and labour) may show frictions in their adjustment. Unlike previous contributions, this framework requires neither assumptions on demand and how firms compete, nor the computation of the user cost of capital, and provides firm-level, time-varying estimates while controlling for unobserved productivity.

By combining the optimal input demand conditions obtained from cost minimization with the standard definition of markup (i.e., price over marginal cost), De Loecker &Warzynski (2012) show

that the price-cost margin can be identified as the ratio of the output elasticity of materials and its revenue share:

$$\mu_{it} = \frac{\theta_{it}^{M}}{\alpha_{it}^{M}}, \qquad (1)$$

where μ_{it} is the markup of firm i at time t, θ_{it}^{M} is the output elasticity of materials and α_{it}^{M} is the revenue share of materials, also known as cost share or expenditure share of materials.

If $\mu_{it} = 1$, the firm operates in a product market characterized by perfect competition; if $\mu_{it} > 1$, there is imperfect competition in the product market and the firm owns some degree of product market power, namely, it charges a price that is higher than the marginal cost.

Then, we introduce our measure of labour market imperfections, that we label φ, as the ratio between the average labour cost paid by firms (w), which we observe in the data, and the marginal revenue product of labour (MRP^{L}):

$$\varphi_{it} = \frac{w_{it}}{MRP_{it}^{L}} \qquad (2)$$

The parameter φ captures the wedge between the cost of an additional unit of labour and the revenue it generates (both in nominal terms); therefore, it is a measure of (labour) market power on the side of firms' employees. If φ = 1, the wage is equal to the marginal revenue product of labour and the labour market is competitive. On the other hand, any departure from unity signals frictions, stemming from either the existence of labour market power owned by the firms, resulting in $\varphi < 1$ and implying that the marginal revenue of labour is higher than the wage, or from some degree of market power by firms' employees ($\varphi > 1$). The latter, which is generally defined as bargaining power or efficient bargaining, can be attributable, for instance, to the existence of hiring and firing costs, minimum wage, unionization and, more in general, to all factors that prompt the actual wage to exceed the competitive benchmark given.

As Mertens (2019, 2020) and Caselli, Nesta & Schiavo (2021) demonstrate, φ can be expressed in terms of the ratio of the output elasticity of materials over the revenue-based materials share and the output elasticity of labour over the revenue-based labour share:

$$\varphi_{it} = \frac{\frac{\theta_{it}^{M}}{\alpha_{it}^{M}}}{\frac{\theta_{it}^{L}}{\alpha_{it}^{L}}} \qquad (3),$$

where $\frac{\theta_{it}^{M}}{\alpha_{it}^{M}}$ represents the markup, θ_{it}^{L} is the output elasticity of labour and α_{it}^{L} is the revenue-based labour share of firm i at time t.

While the revenue shares can be easily computed using data from firms' balance sheets, the output elasticities need to be estimated. Accordingly, we estimate a production function and employ the methodology developed by Wooldridge (2009) and implemented in Petrin & Levinsohn (2012) to address the simultaneity bias. We adopt a translog specification, which yields firm-level time-varying output elasticities, and perform estimations sector by sector, to account for differences in technology. We assume that labour is a variable input, and instrument current labour and materials and their interactions with the first and second lags of labour as well as the second lags of capital and materials. We proxy output using delated revenues, as we do not have information on firm output prices. Additional details on the methodology used to estimate the production function are provided in the Appendix.

2.2 Data

We use data on a large panel of Italian manufacturing firms observed during the nine-year period 2010-2018. Data come from the Bureau van Dijk's database Aida. We retrieve information on revenues, labour costs, the number of employees, capital stock, intermediate inputs, sector and year of constitution (the latter being used to calculate the firm's "age"). We merge the microdata from Aida with industry-level data on the deflators of value added, intermediate inputs and tangible assets compiled by Istat Statistics and Oecd Stan.

The raw data require intensive cleaning to net out the influence of measurement error and extreme values in the analysis. Once we clean the dataset, delate the observations associated with atypical values of the output elasticities of inputs and exclude the firms that remain in the sample for less than five consecutive years, we end up with 287,630 observations, corresponding to 36,360 firms. Finally, in order to understand whether Italian multinational enterprises differ from domestic companies in terms of product and labour market power (see section 4.2), we identify the firms that have foreign subsidiaries by merging our final sample with the dataset of Italian multinational enterprises available in Aida.

3. Descriptive analysis

3.1 Basic descriptive statistics

In this section, we outline a descriptive analysis of product and labour market power in order to illustrate how market inefficiencies distribute across sectors and over time.

Table 1 reports mean, standard deviation and a number of percentiles for various firm-level variables. We can say that, all in all, our sample is relatively young, as the firms' mean age is 22 years and the median age amounts to 19. The average number of employees is about 30, which is consistent with the well-known fact that the majority of the Italian companies are small or medium-sized. Accordingly, it seems that the use of a dataset that covers only listed companies, which are expected to be larger, on average, than non-listed firms, does not particularly bias the analysis. We also notice that the average markup does not differ very significantly from the median and that both the 99th percentile (1.696) and the maximum value (3.24) are not particularly high, even though markups potentially range from zero to infinity. This is partly attributable to the preliminary data cleaning and

to the removal of atypical values of the output elasticities applied while performing the estimation, which prevent the results from being affected by outliers, and in particular by significantly high values.

Table 1. Basic descriptive statistics for firms in the sample

	mean	std. dev.	p25	p50	p75	p99
revenues	7,350.122	42,730.32	785.977	1,768.245	4,621.623	87,439.96
employees	30.419	119.309	7	13	26	293
capital	2,066.223	10,772.13	90.561	348.325	1,256.443	27,633.71
materials	5,009.502	32,109.74	414.687	1,031.279	2,950.009	61,728.74
gross wage per employee	34.83	13.098	26.076	34.201	42.393	71.53
age	22	14	10	19	30	66
markup	1.21	0.128	1.13	1.18	1.252	1.696

Note: The statistics reported in this table refer to the final sample used to estimate the production function, which comprises 287,630 observations. The variable "age" is derived by calculating the difference between each year and the year in which the firm entered the Business Register, defined as "year of constitution". The average age reported in Table 1 is based on 287,541 observations because information on the year of constitution was unavailable for some firms. Revenues, capital, materials and gross wage per employee are in thousand euro; capital refers to the amount of tangible assets, while the factor "materials" consists in the sum of purchases, services and variations of raw materials. Revenues, capital and materials are deflated using specific industry-level deflators.

Table 2 presents the average factor revenue shares for labour and materials, as well as the estimated output elasticities of labour, materials and capital derived at the sectoral level[3] from the translog production function as described in Section 2. The factor shares for labour and materials calculated for the whole manufacturing industry amount to about 60% and 25%, respectively. Thus, they quite conform to the usual manufacturing characteristics that the largest share of total sales is represented by costs for materials, whereas labour costs generally represent about one-third of total revenues. The estimated average factor elasticities $\widehat{\theta_M}$ and $\widehat{\theta_L}$, which are used to estimate the labour market parameters μ and φ, amount to 0.71 and 0.28, respectively. Overall, manufacturing firms operate near constant returns to scale, as the scale parameter $\hat{\lambda}$, which corresponds to the sum of the three factor elasticities, is close to 1. As expected, the mean parameter estimates vary across manufacturing sectors, which engage in different production process and thus typically employ different combinations of factors. As an illustration, the average revenue-based labour share ranges between 0.18 in Chemical and pharmaceutical products to 0.27 in Basic metals and fabricated metal products, whereas $\widehat{\theta_M}$ takes values ranging between a minimum of 0.67 (Basic metals and fabricated metal products) and a maximum of 0.79 (Food products, beverages and tobacco). Generally, the sectors characterized by relatively low labour share exhibit relatively high levels of material share. Returns to scale are never decreasing, but they are very close to unity in most of the sectors, with values varying between 1.000 (Food products, beverages and tobacco) and 1.034 (Transport equipment).

[3] We estimate the production function for each of the eleven manufacturing sectors listed in Table 3. To define such sectors, we follow the classification by "divisione ateco" used by Istat. We condense the observations corresponding to ate2/divisione ateco 20 and 21 in one sector (Chemicals and Pharmaceutical products) due to the limited number of observations. Moreover, we exclude divisione ateco 19 (Coke and refined petroleum products) due to its limited extension in the Italian manufacturing and to its peculiarities.

Table 2. Factor shares and output elasticities by sector

Sector	#firms	#obs.	α_L	α_M	$\widehat{\theta_M}$	$\widehat{\theta_L}$	$\widehat{\theta_K}$	$\hat{\lambda}$
All manufacturing	36,360	287,630	0.246	0.601	0.707	0.281	0.024	1.013
Food products, beverages and tobacco	3,485	27,357	0.184	0.68	0.792	0.174	0.035	1.000
Textiles, wearing apparel, leather and related products	4,032	31,523	0.261	0.598	0.685	0.294	0.029	1.008
Wood and paper products, and printing	3,476	27,381	0.238	0.609	0.711	0.286	0.015	1.012
Chemical and pharmaceutical products	1,364	11,038	0.178	0.675	0.763	0.228	0.025	1.016
Rubber and plastics products, and other non-metallic mineral products	1,805	14,105	0.236	0.613	0.743	0.252	0.026	1.021
Basic metals and fabricated metal products, except machinery and equip.	11,229	90,047	0.27	0.562	0.67	0.314	0.027	1.012
Computer, electronic and optical products	959	7,507	0.256	0.588	0.701	0.304	0.018	1.023
Electrical equipment	1,337	10,582	0.235	0.627	0.746	0.252	0.015	1.014
Machinery and equipment n.e.c.	3,790	30,127	0.238	0.613	0.715	0.278	0.02	1.013
Transport equipment	610	4,891	0.237	0.62	0.748	0.262	0.024	1.034
Furniture; other manufacturing; repair and installation of mach. and equip.	4,273	33,072	0.26	0.59	0.7	0.304	0.014	1.019

Table 3 condenses the average values of the two market imperfection parameters of interest $\hat{\varphi}$ and $\hat{\mu}$ referring to the whole manufacturing and to the various manufacturing industries. The mean markup is approximately 1.21 for the whole manufacturing sector, varying between 1.15 (Chemical and pharmaceutical products) and 1.24 (Rubber and plastics products). Thus, on average, manufacturing firms are able to charge a price which is higher than the marginal cost. With regard to labour market power, average φ is slightly above the unity, suggesting that the labour market in the Italian manufacturing sector is characterized by limited labour market imperfections. If we look at the single industries, we observe that Food products, beverages and tobacco displays the highest value of $\hat{\varphi}$ (1.28). On the other hand, Chemical and pharmaceutical products is the only sector in which average $\hat{\varphi}$ is below the unity (0.92), indicating the prevalence of monopsony power. This result may seem unexpected and is in contrast with that reported by Caselli, Nesta & Schiavo (2021) for the pharmaceutical sector in France during the period 1995-2007. However, only around 12 % of the firms included in Chemical and pharmaceutical products operate in the pharmaceutical industry, so it is likely that the small values of $\hat{\mu}$ and of $\hat{\varphi}$, which are associated with relatively high material share and a relatively low labour share, are mainly driven by the chemical sector.

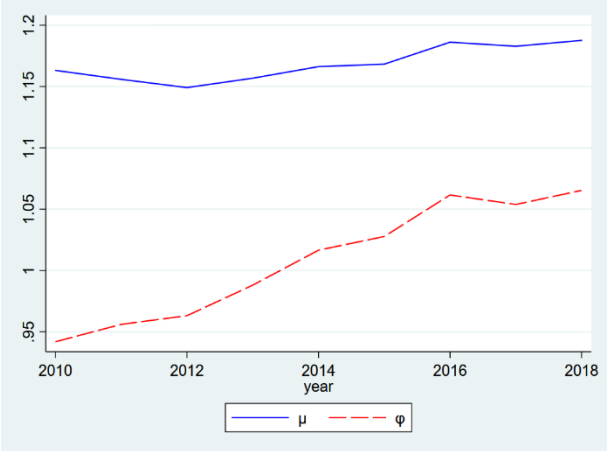
Table 3. Average market imperfection parameters by sector

Industry	$\hat{\mu}$	$\hat{\varphi}$
All manufacturing	1.209	1.102
Food products, beverages and tobacco	1.192	1.280
Textiles, wearing apparel, leather and related products	1.192	1.091
Wood and paper products, and printing	1.193	1.045
Chemical and pharmaceutical products	1.147	0.921
Rubber and plastics products, and other non-metallic mineral products	1.239	1.206
Basic metals and fabricated metal products, except machinery and equipment	1.226	1.082
Computer, electronic and optical products	1.223	1.081
Electrical equipment	1.215	1.180
Machinery and equipment n.e.c.	1.190	1.045
Transport equipment	1.233	1.153
Furniture; other manufacturing; repair and installation of machinery and equipment	1.222	1.111

Table 3 provides some preliminary information on the magnitude of the market imperfections in the Italian manufacturing sector. However, caution is generally required when interpreting estimated values, especially when comparing them with those from other studies. Indeed, authors' choices regarding the estimation of the production function can drive the estimates upwards or downwards (see for instance Basu, 2019 and Syverson, 2019). Anyway, researchers are typically more interested in the dynamics, rather than in the levels of market power.

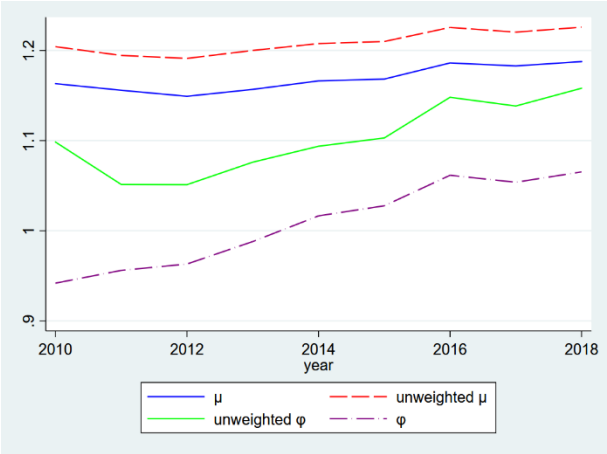
Figure 1 documents the evolution of average indicators of product and labour market power weighted by firms' employment shares. The markup μ declined from 2010 to 2012 and then reversed its trend, but it increased by only 2% between 2010 and 2018. This upward trend since 2012 also holds after excluding firms with relatively high markups (above the 90th percentile), suggesting that it is not mainly driven by firms in the right part of the distribution. During the same period, the indicator of labour market frictions φ experienced a 13% growth, which corresponds to a shift of labour market power away from firms and towards workers.

Figure 1. Average markup and labour market power weighted by firms' employment shares, 2010-2018



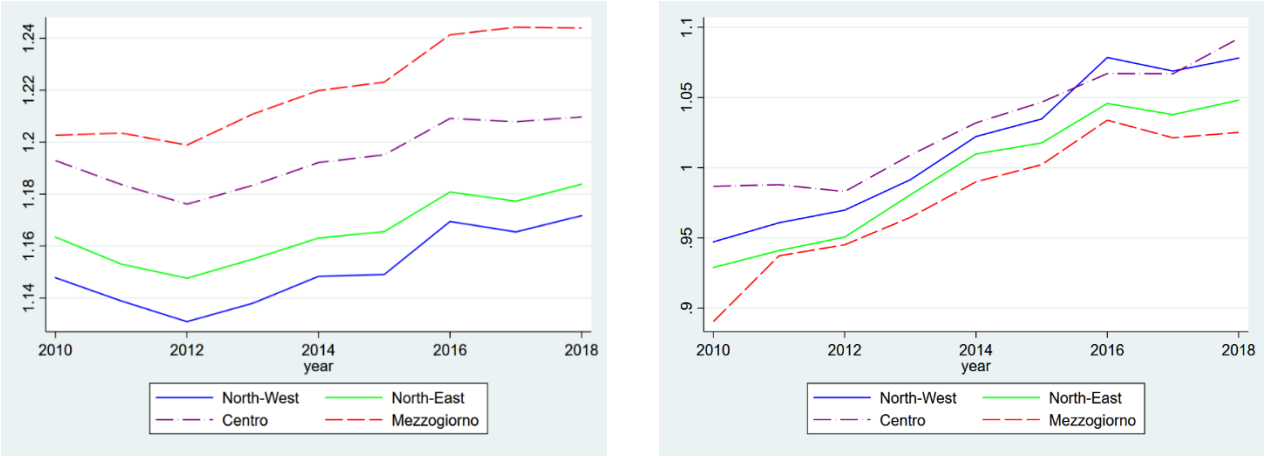
As shown in **Figure 2**, the weighted average of both μ and φ is systematically lower than the corresponding unweighted average. The overall picture does not significantly vary if we use the firms' revenue shares as weights. The trends of μ and φ, as well as the relationship between firm size and market imperfections, are analyzed more in detail in Section 4.

Figure 2. Markup and labour market power, weighted and unweighted averages, 2010-2018.



In light of the well-known significant within-country heterogeneity in terms of several socio-economic variables that characterizes this country, we assess how market frictions vary across four main macro-areas, namely North-West, North-East, Centro and Mezzogiorno. Looking at **Figure 3**, we see that all the areas exhibit an overall positive trend in both μ (panel a) and φ (panel b) over the years 2010-2018, but display different average levels of market imperfections. In particular, the Mezzogiorno is the Italian macro-region with the highest average level of product market power and the lowest average level of labour market power. This may be attributable to lower competition on the product market and to lower average wages possibly coupled with less effective workers' protection compared to the rest of the country.

Figure 3. Markup and labour market imperfections in the Italian macro-areas (weighted averages), 2010-2018



Note. The left panel refers to the markup, while the right panel refers to labour market power.

3.2 An overview of market regimes

The descriptive analysis conducted in Section 3.1 provides some preliminary evidence on the trend and the average level of market power. However, it does not show the percentage of firms associated

with the different types of product and labour market power (i.e., perfect vs imperfect competition; right-to-manage bargaining vs efficient bargaining vs monopsony), and how the latter changes over time. In order to provide a more comprehensive picture of market frictions, we employ our estimates to classify each firm-year observation of our sample into six different market regimes depending on the type of competition in the product and the labour market. Drawing upon Dobbelaere & Maitresse's (2013) framework, we identify two product market settings, i.e., perfect competition (PC) and imperfect competition (IC), and three labour market settings, namely, perfect competition or right-to-manage bargaining (PR), efficient bargaining (EB) and monopsony (MO). Intuitively, in a perfectly (imperfectly) competitive product market the firm charges a price equal to (higher than) the marginal cost. As for the labour market, in a perfect competition or right-to-manage bargaining setting, the marginal revenue of labour is equal to the wage, whereas in the monopsony (efficient bargaining) setting, the marginal revenue of labour is lower (higher) than the wage and the employer (the employees) has labour market power. Next, we identify six market regimes, each of which corresponds to one of the six possible combinations of the product and labour market settings defined above:

-perfect competition in the product market and perfect competition or right-to-manage bargaining in the labour market, denoted PC-PR;

-imperfect competition in the product market and perfect competition or right-to-manage bargaining in the labour market, denoted IC-PR;

-perfect competition in the product market and efficient bargaining in the labour market, denoted PC-EB;

-perfect competition in the product market and monopsony in the labour market, denoted PC-MO;

- imperfect competition in the product market and efficient bargaining in the labour market, denoted IC-EB;

-imperfect competition in the product market and monopsony in the labour market, denoted IC-MO.

Table 4 documents the distribution of the six regimes within the whole sample. IC-EB, which characterizes about half of the observations, is the dominant regime, followed by IC-MO (44.77%) and IC-PR (4.74%). Thus, taken together, IC-EB and IC-MO account for more than 90% of the sample, whereas the sum of the observations that fall into the regimes PC-PR, PC-EB and PC-MO represent a negligible fraction. Accordingly, almost all the manufacturing firms under scrutiny possess some degree of product market power and operate in an imperfectly competitive labour market.

The variations of the market regimes during the period 2010-2018 are illustrated in **Figure 4**. Finally, since almost all the firms have some degree of product market power, we restrict our attention to labour market regimes and check their territorial distribution. Table 5 shows that, in accordance with what emerges from panel b of Figure 4, monopsony power is more widespread in the Mezzogiorno and, to a lesser extent, in Central Italy compared to the Northern regions.

Table 5. Distribution of labour market regimes by macroarea (% values)

	MO	EB	PR
North-East	38.6	56.1	5.3
North-West	44.8	49.6	5.5
Center	48.8	45.7	5.4
South	54.4	39.7	5.9
Total	44.3	50.2	5.5

4. Decomposition analysis

4.1 FHK decomposition of product and labour market power

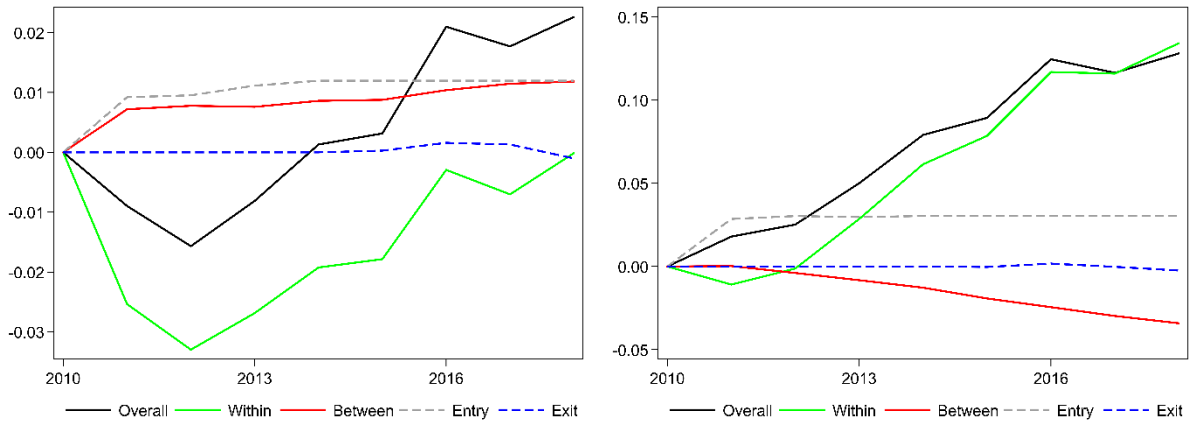
In this section, we attempt to shed light on the trends in product and labour market power presented in Section 3 by identifying the underlying mechanisms. To this purpose, we perform three decompositions. The first one is Foster, Haltiwanger & Krizan 's (2001) decomposition, which permits to divide the overall variation of a variable into the following components: (i) within-firm changes while keeping the employment or revenue shares constant, which correspond to variations in the unweighted average; (ii) between-firm changes due to a reallocation of employment or revenue shares across firms; (iii) the impact of the entry of new firms in the industry; and (iv) the impact of firm exit.

Figure 5 plots the average markup (left panel) and the average labour market power (right panel), as well as their four components derived using the FHK decomposition. The overall trend in both the indicators of market frictions is mainly driven by the within-firm component, which is an indication of the change in pricing power of firms on the one hand, and of a redistribution of labour market power from the employer to the employees, on the other hand. The effect of firm churning, whether entering or exiting the market, is substantially more limited[4]. Generally speaking, an increase in the unweighted markup may be attributable to lower competition in the product markets or to a bigger spread in firm productivity boosted by technological change (De Loecker, Eeckhout & Unger, 2020). However, the rise in product market power experienced by manufacturing firms between 2012 and 2018 is limited, and may represent a return to the pre-crisis levels, after a contraction that may be at least partly triggered by the economic recession that affected the Italian economy especially in the early 2010s. The declining trend of the between-firm component of φ points to a reallocation of employment toward firms where workers have lower levels of bargaining power, which, however, is more than offset by the rise in the unweighted average of φ. Reasons for observing a shift of labour market power towards the employees' side could be the presence of strong trade unions or inefficiently working employees that cannot be dismissed due to hiring and firing costs. However, this result seems somehow unexpected in light of the recent reforms concerning the Italian labour

[4] It can be observed that the entry component experienced a "jump" between 2010 and 2011. Several firms indeed entered the Aida dataset that year, irrespective of the year of foundation. We also tried to keep in the final sample only the firms for which data are available for the whole period; the main results in terms of trends of market frictions and their components do not significantly change.

market[5]; accordingly, this result deserves further investigation, which is the object of the next paragraph. Notably, an increase in bargaining power since the beginning of the 2010s was also found by Mertens (2019) in the German manufacturing sector. Additionally, Caselli, Nesta & Schiavo (2021) report a shift of labour market power from firms to workers in their sample of French manufacturing firms, but their analysis refers to a less recent time-frame.

Figure 5. FHK decomposition of product and labour market power, 2010-2018 (2010= 0).



The left panel displays the FHK decomposition of the markup, while the right panel refers to the parameter of labour market power.

4.2 Further investigation of the trend in labour market power

In order to shed light on the documented rise in bargaining power, following Caselli, Nesta & Schiavo (2021), we decompose φ into four fundamental dimensions, namely, observed wages (w), the markup (μ), the marginal product of labour (MP^L), and prices (P):

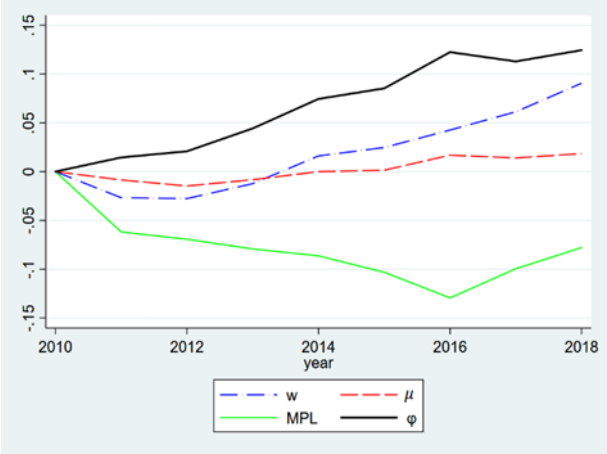
$$\varphi_{it} = \frac{w_{it}}{MRP^L_{it}} = \frac{w_{it}\,\mu_{it}}{P_{it}MP^L_{it}} \qquad (4)$$

[5] Since the late 1990s, the Italian labour market has undertaken a gradual process of reform which is supposed to increase labour market flexibility The Law 183 of 2014, mostly known as Jobs Act, is the last step of a reform process which started with the introduction of a set of temporary and para-subordinated contracts (the‘‘Legge Treu’’ of 1997) and continued with the Law n.30/2003 (“Legge Biagi”), which provided a common framework to atypical contracts, and law n. 92 by Minister Fornero. The so-called Riforma Fornero weakened the regime that protects regular workers against the risk of unfair dismissal, and at the same time attempted to improve the coverage of unemployment insurance benefits, in particular by replacing a rather broken web of individual schemes with a more unified system of unemployment protection (see for instance Cirillo, Fana & Guarascio, 2017, and Moreira et al. 2015, for a review). In the meantime, the OECD indicator of Strictness of employment protection referring to individual and collective dismissals, which remained constant from the first year available (1990) until 2013, declined by about 18% between 2013 and 2018. A decline in this indicator during the same period has been observed also in other European countries, such as Spain, Portugal and the UK.

As we do not observe direct information on firm-level prices and quantities are not available, our variable MP_{it}^{L} also includes the price component.

Figure 6 plots φ and its components. We observe that the overall positive trend of our indicator of labour market power is related to the (muted) increase in product market power and, primarily, to the rise in the average nominal gross wage, which more than compensates for the contraction of the value of the marginal productivity of labour that occurred between 2011 and 2016. A decomposition (here not shown) of labour costs into compensation of employees, social security contributions and other charges reveals that the increase in the average nominal gross wage is mainly attributable to an increase in the compensation of employees. Also, this positive trend in the average wages since 2012 still holds after removing from the sample the firms whose markup falls at least in the 90th percentile of the distribution; thus, it seems it is not driven by a relatively small share of firms.

Figure 6. Decomposition of labour market power (2010 = 0).

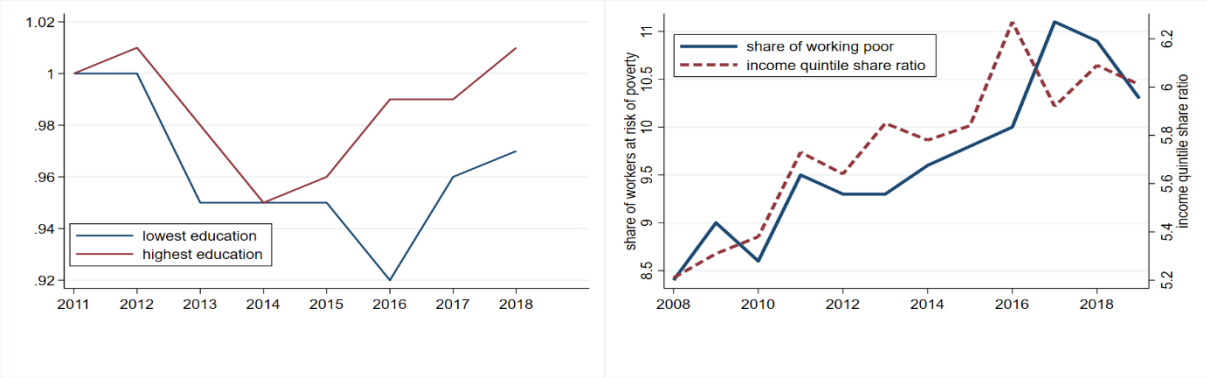


A rising compensation of employees coupled with a mixed trend in labour productivity may seem puzzling. However, when interpreting these results, we should keep in mind that we do not observe wages at the worker level, but only at the average firm level. So, it is possible that only the wages in the upper part of the distribution rose, and consequently pushed the average upwards. This potential explanation is supported by recent data on wage and employment compiled by the European Union Statistics on Income and Living Conditions (EU-SILC) and elaborated by ….. . In particular, EU-SILC data on the evolution of wages by educational attainment show that, on average, low-educated workers have experienced wage compression between 2011 and 2016, with the latter being the year recording the largest gap between low-educated and high-educated workers over the period under scrutiny (**panel a of Figure 7**). In the meantime, Italy has experienced an increase in the share of workers at risk of poverty, who are sometimes referred to as "working poor". The latter trend is

depicted in **Panel b of Figure 7**, which also plots the income quintile share ratio, namely the ratio of total income received by the 20 % of the population with the highest income (the top quintile) to that received by the 20 % of the population with the lowest income (the bottom quintile).

Figure 7. Trends in wages and wage inequality in Italy

(a) Income by level of education (b) Working poor and income quantile share ratio



Source: ….

4.3 Linking market power to the labour share of income

The evolution of product and labour market power can help explain the trend of another important variable which has been the object of intense scrutiny, namely the labour share of income[6]. Indeed, as shown in Section 2, the latter enters the equations of the markup and of labour market power. In this section, following Mertens (2019), we rewrite equation (3) in order to focus on the labour share, and in particular on how changes in this variable are explained by the variations in the other three variables. Looking at equation 5, we see that a rising (falling) revenue-based labour share is associated with increasing (decreasing) output elasticity of labour, decreasing (increasing) product market power, and increasing (decreasing) labour maker power detained by workers[7]. Specifically:

$$\alpha_{it}^{L} = \varphi_{it}\, \theta_{it}^{L}\, \frac{1}{\mu_{it}} \qquad (5)$$

Taking the logs of equation (5) yields a simple linear expression that decomposes $log(\alpha_{it})$ into three additive terms:

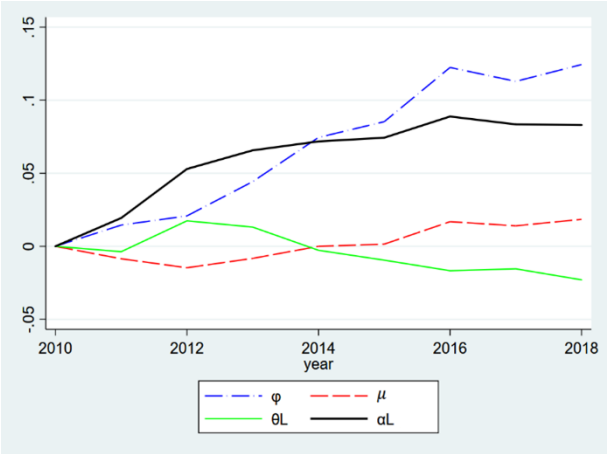
[6] For a review of the literature that study the link between product market power/markups and the labour share, see ….

[7] In Mertens (2019), the indicator of labour market power φ is calculated as MRP_{it}^{L}/w_{it}, hence an increase in Mertens' φ corresponds to a shift of labour market power from the employees to the employers, namely to a rise in monopsony power. In equation (5), which can be recovered by simply rearranging the terms of equation (3), φ is computed as w_{it}/MRP_{it}^{L}, consistent with our definition of labour market power introduced in equation (2) and applied in the rest of this work.

$$log(\alpha_{it}^{L}) = log(\varphi_{it}) + log(\theta_{it}^{L}) - log(\mu_{it}) \qquad (6)$$

The dynamics of the labour share and its components are represented in **Figure 8**. Without claims on the direction of causality, we can posit that, in recent years, the (revenue-based) labour share[8] slightly increased despite the (limited) rise of the markup and the contraction of the output elasticity of labour. The negative contribution of θ^L and μ to α^L is indeed more than offset by the positive trend in φ. Accordingly, as expected, product market power is negatively correlated with the labour share, while it is positively correlated with our measure of labour market power. A diminishing output elasticity of labour, which is also detected by Mertens in the German manufacturing sector, may reflect a change in the firms' production technology that boosts capital intensity and reduces the importance of labour to firms. Moreover, in line with Mertens, it is in contrast with the assumption of constant output elasticities of factors, thus stressing the need to choose a translog specification, rather than a Cobb-Douglas one (which does not allow elasticities to vary).

Figure 8 Decomposition of the labour share based Merten's (2019) decomposition



5. Regression analysis

The decomposition analysis of Section 4.2 provides some useful insights on the between and within-firm components of the trend in market power and on their association with a number of related variables, including the revenue-based labour share and the output elasticity of labour. In this section we make a step further and we look at how some firm characteristics are related to our measures of

[8] The value-added labour share, calculated as the ratio between compensation of employees and value added, exhibits a more ambiguous trend. We focus on the revenue-based labour share because it is the one that is linked to product (and labour) market power by the specific relationship captured by equation (5) and equation (6).

product and labour market power. To this end, we perform a simple regression analysis in which, using OLS techniques, we estimate the following equations:

$$\log(\mu_{it}) = \beta_0 + \beta_1 \mathbf{X}_{it} + \nu_j + \nu_t + e_{it} \quad (7)$$

$$\log(\varphi_{it}) = \gamma_0 + \gamma_1 \mathbf{Z}_{it} + \nu_j + \nu_t + e_{it}, \quad (8)$$

where the vectors $\mathbf{X}_{it}$ and $\mathbf{Z}_{it}$ comprise a set of firm-level variables and an industry-level variable, ν_j and ν_t capture, respectively, industry and time fixed effects, and e_{it} is the error term. The regressors included in $\mathbf{X}_{it}$ and $\mathbf{Z}_{it}$ are listed in **Table 6**.

Table 6 List of variables

variable	description
μ	markup (indicator of product market power)
φ	indicator of labour market imperfection
age	age (difference between year of constitution and current year)
tan_int	tangible intensity (tangible assets over revenues)
intan_int	intangible intensity (intangible assets over revenues)
K_Lratio	ratio between capital input and labour input
ms_ate2rev	employment share in an ate2-industry
empl	number of employees
HHI_ate2	industry-level Herfindahl-Hirschman index
Lshare_rev	revenue-based labour share
w	average gross wage per employee
foreign_subs	whether or not (1/0) a firm has foreign subsidiaries (dummy)
TFP	Total Factor Productivity

Note: with the expection of HHI_ate2, all the variables listed in this table are measured at firm level. While the dummy variable foreign_subs is time- invariant, the other firm-level regressors vary over time.

The results of the estimation of equation 7 are reported in **Table 7**. Without claiming any causality, we observe that older firms, which may face larger costs and higher competition and may find it difficult to keep up with the challenges posed by technological change, have smaller levels of product market power. The markup is instead positively associated with capital intensity of both tangible and intangible assets, where the latter partly captures digital technologies and innovation (for instance, Calligaris, Criscuolo & Marcolin, 2018 find a positive linkage between digitalization and markups). Like Dobbelaere & Keyota (2018), we also find a positive correlation between the markup and the industry-level Herfindahl-Hirschman index, which is a measure of market concentration. The results do not relevantly change if, following Mertens (2020), we use a province-level indicator of concentration.

The variables we are mainly interested in are empl, foreign_subs and TFP (which the estimation of the production function allows to easily retrieve). In section 3, we see that the weighted average

markup is lower than the unweighted average. At the same time, the between-firm component of the overall change in μ exhibits an average (limited) increase. These partly contradictory results may hint at a non-linear relationship between product market power and firm size. The latter was found for instance by Díez, Leigh, & Tambunlertchai (2018), as well as by previous studies that use a different methodology to estimate markups (e.g., Feeny, Harris, & Rogers, 2005; Ponikvar & Tajnikar, 2011). Accordingly, we include the firm's employment share in an industry (defined at ate2-level) and its quadratic term. The positive and significant coefficient of the quadratic term suggests that the relationship between markup and firm size is non-monotonic, namely, it is initially negative and, after a certain threshold, becomes positive. This suggests that firms must be prepared to wait until they have captured a certain share of the market before any contribution to product market power deriving from market dominance appears (Feeny, Harris, & Rogers, 2005).

In column 3, we add the logarithm of Total Factor Productivity. The relationship between TFP and markups is ambiguous. On the one hand, we can think that more productive firms are able to charge higher markups. For instance, Diez, Fan & Villegas-Sánchez (2019) find a positive link between markup and TFP. On the other hand, several empirical studies show that competition (which is typically associated with lower markups and market concentration) increases productivity, or that anticompetitive regulations have a negative effect on TFP or TFP growth (see van Heuvelen, Bettendorf & Meijerink, 2019 for a review). Dobbelaere & Kiyota (2018), who explore how different factors influence the probability of a firm to be in a regime of perfect competition, efficient bargaining and monopsony, respectively, observe that an increase in TFP reduces the likelihood of being characterized by a regime of imperfect competition, namely, by product market power. Similarly, we detect a negative association between markup and TFP.

Finally, in the fourth specification (column 4), we also include a dummy variable which indicates whether a firm engages in FDI. While several papers have assessed whether exporters exhibit higher markups (e.g., De Loecker and Warzynski, 2012; Kato, 2014; Bellone et al., 2016), evidence on the relationship between MNE status and product market power is still very limited. Dobbelaere & Keyota (2018) analyze the pricing behavior of both exporters and multinational companies (the latter being either foreign owned companies or Italian firms with foreign subsidiaries) and, controlling for differences in productivity, they find that being an MNE decreases the probability of being characterized by imperfect competition in the product market. In our study, being a firm with foreign subsidiaries is related with a lower markup compared to domestic companies. This result can be explained by strategies of dumping and transfer pricing exerting negative effects on markups, which would more than offset the gains connected with the channels of quality and demand elasticity. Finally, the inclusion of the log of φ among the regressors (here not shown) remarkably increases the R squared in all the four specifications, supporting the linkage between the parameters of markup and labour market imperfections as highlighted in Section 4.1.

Table 7. Factors associated with markup (OLS regression)

	(1)	(2)	(3)	(4)
	μ (log)	μ (log)	μ (log)	μ (log)

tan_int (log)	0.020***	0.020***	0.020***	0.020***
	(0.000)	(0.000)	(0.000)	(0.000)
intan_int (log)	0.004***	0.004***	0.004***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)
ms_ate2	-1.771***	-1.769***	-1.813***	-1.139***
	(0.256)	(0.255)	(0.248)	(0.148)
ms_ate2_sq	1.823***	1.819***	1.865***	1.187***
	(0.249)	(0.249)	(0.242)	(0.151)
HHI_ate2 (log)		0.010***	0.012***	0.011***
		(0.001)	(0.001)	(0.001)
age (log)	-0.025***	-0.025***	-0.024***	-0.023***
	(0.001)	(0.001)	(0.001)	(0.001)
TFP (log)			-1.291***	-1.129***
			(0.163)	(0.163)
foreign_subs				-0.039***
				(0.001)
Constant	0.280***	0.325***	2.693***	2.393***
	(0.002)	(0.006)	(0.300)	(0.299)
Time FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	238,595	238,595	238,595	238,595
R-squared	0.171	0.172	0.173	0.183

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 8 reports the results from estimating equation 8. Higher levels of labour market power owned by workers, or workers' bargaining power, are associated with a smaller firm size, higher capital intensity (both in terms of capital over revenues and capital over employment) and older age. The negative coefficient of the capital over labour ratio indicates that firms being less dependent on labour inputs possess more labour market power over their workforce. As expected, workers' bargaining power is positively related to both wages and labour share or, if we interpret the results from the point of view of the firm, firms possessing labour market power are able to depress compensation of employees for a given firm size. These results are consistent with Mertens' (2020) findings. Rather, contrary to expectations (as higher market concentration is typically associated with higher monopsony power), the HHI concentration index enters the regressions with positive sign. A positive relationship between workers' bargaining power and local concentration also emerges from Dobbelaere & Keyota's (2018) empirical analysis. Contrary to Dobbelaere & Keyota (2018), we find that firms with foreign subsidiaries have higher levels of workers' bargaining power. In general, we could expect that MNEs hold considerable levels of monopsony power, due for instance to intra-firm labour replacement and the substitutability of domestic workers by foreign workers. Our results may be attributable to the fact that MNEs typically pay higher wages, have to comply with strict regulations, are exposed to political and economic pressures exerted by the parent company's home country, the subsidiaries' home country and the international business community, and are subject to reputational damages.

Table 8. Factors associated with labour market imperfections (OLS regression)

	(1)	(2)	(3)	(4)
	φ (log)	φ (log)	φ (log)	φ (log)

empl (log)	-0.128***	-0.052***	-0.059***	-0.059***
	(0.001)	(0.001)	(0.001)	(0.001)
K/Lratio (log)	-0.055***			
	(0.001)			
tan_int (log)				-0.032***
				(0.001)
w (log)	0.767***			
	(0.003)			
Lshare_rev (log)		0.480***	0.484***	0.494***
		(0.003)	(0.003)	(0.003)
age (log)		0.057***	0.057***	0.066***
		(0.002)	(0.002)	(0.002)
HHI_ate2 (log)	0.007*	0.034***		0.036***
	(0.003)	(0.005)		(0.005)
foreign_subs			0.091***	0.091***
			(0.006)	(0.006)
Constant	-6.713***	1.197***	1.072***	1.174***
	(0.040)	(0.022)	(0.009)	(0.022)
Time FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	287,630	286,615	286,615	286,615
R-squared	0.593	0.428	0.431	0.441

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

5. Concluding remarks

The increase in corporate markups observed in the US and other advanced countries, which seems to have contributed to some worrying macroeconomic trends, has prompted research on the evolution, the determinants and the implications of product market power in a large array of countries. Recent empirical analysis has been supported by more sophisticated methodologies that produce firm-level and time-varying estimates and that permit to account for frictions in both the product and the labour market; however, microeconomic research that jointly analyses product and labour market power is still limited.

In this study, we aim to investigate the recent patterns in market imperfections in Italy focusing on a large sample of manufacturing firms observed during the years 2010-2018. In particular, we attempt to understand if markups are on the rise, which factors drive the observed variations and how market imperfections relate to each other, to the other variables to which are mathematically linked, and to a number of additional firm-level characteristics that, according to prior literature, may be positively or negatively correlated with market power.

The descriptive analysis shows that, during the period under scrutiny, the Italian manufacturing sector experienced a mild growth in markups and a more pronounced shift of labour market power from employers to workers. In both cases, the trend has been mainly driven by the within-firm component, compared to the between-firm one. The increment in bargaining power, which helps explain the slight grow in the revenue-based labour share, is mainly attributable to a rise in the firm average wage, which more than offsets the decline in the output elasticity of labour and the mixed trend in the marginal productivity of labour. The increase in the wage component is mostly ascribable to the increase in the compensation of employees. When interpreting these results, which may seem in contrast with the weakening of employment protection legislation recently experienced by the Italian

labour market, we have to keep in mind that we do not observe individual-level wages but only a firm-level average, and that, as reported by aggregate national statistics, the mean values are likely to be driven by the upper part of the wage distribution. This suggests that, although useful, firm-level estimations of market frictions may lead to too optimistic interpretations in terms of labour outcomes, and that, when available, a more fine-grained analysis may complement and clarify these apparently contradictory results.

Moreover, despite the rise of firms that operate in the regime of efficient bargaining, monopsony power is still quite widespread, especially in Southern Italy. The territorial analysis of market frictions, which reveals considerable within-country heterogeneity, can help policymakers make more targeted policies that account for regional disparities; in the case of national interventions, it can help to understand in which areas the implications of these policies should be more monitored. Further insights on how market frictions relate to some relevant firm characteristics come from the regression analysis. For instance, we see that, as observed in some previous studies, the relationship between markup and firm size is non-linear, and being a multinational firm decreases the probability of being characterized by imperfect competition in the product market.

The preliminary results of this paper can serve as the starting point of future research. For instance, individual-level data may be used to understand if the average increase in wages that has pushed the overall bargaining power upwards has been actually driven by a limited number of well-paid individuals. The finding concerning the presence of monopsony power could be employed to assess the potential effectiveness of some policy measure, such as the introduction of a national minimum wage, in alleviating this phenomenon, especially in the Mezzogiorno. Finally, in light of the ongoing wave of technological transformation, which is characterized by unprecedented rate of diffusion and pervasiveness, it may be interesting to explore the complex relationship between market imperfections, technological change and labour dynamics.

References

Ackerberg, D.A., Caves, K. and Frazer, G. (2015)*. Identification Properties of Recent Production Function Estimators. Econometrica, 83(6), 2411-2451.

Andrews, D., & Cingano, F. (2014). Public policy and resource allocation: evidence from firms in Oecd countries. Economic Policy, 29(78), 253-296.

Barkai, S. (2020). Declining Labour and Capital Shares. The Journal of Finance, 75(5), 2421-2463.

Basu, S. (2019). Are Price-Cost Markups Rising in the United States? A Discussion of the Evidence. Journal of Economic Perspectives, 33(3), 3-22.

Battiati, C., Jona-Lasinio, C., Marvasi, E. & Sopranzetti, S. (2022). Markups, productivity and Global Value Chains in the European economies. Economia Italiana, 1, 73-108.

Bellone, F., Musso, P., Nesta, L., & Warzynski, F. (2016). International trade and firm-level markups when location and quality matter. Journal of Economic Geography, 6(1), 67-91.

Blanchard, O., & Giavazzi, F. (2003). Macroeconomic effects of regulation and deregulation in goods and labour markets. Quarterly Journal of Economics, 118(3), 879-907.

Bugamelli, M., Fabiani, S., & Sette, E. (2015). The age of the dragon: Chinese competition and the pricing behavior of Italian firms. Journal of Money, Credit and Banking, 47(6), 1091-1118.

Bugamelli, M., Schivardi, F., & Zizza, R. (2008). The Euro and Firm Restructuring. NBER Working Paper No. 14454.

Calligaris, S., Criscuolo, C., & Marcolin, L. (2018). Mark-ups in the digital era. OECD Science, Technology and Industry Working Paper 2018/10.

Caselli, M., Nesta, L., & Schiavo, S. (2021). Imports and Labour Market Imperfections: Firm-Level Evidence from France. European Economic Review, 131,103632.

Cavalleri, M. C., Eliet, A., Mcadam, P., Petroulakis, F., Soares, A. & Vansteenkiste, I. (2019). Concentration, market power and dynamism in the euro area. ECB Working Paper Series No. 2253, ECB-European Central Bank.

Cefis, E., & Gabriele, R. (2009). Spatial disaggregation patterns and structural determinants of job flows: an empirical analysis. International Review of Applied Economics, 23(1), 89-111.

Ciani, E., & Torrini, R. (2019). The geography of Italian income inequality: recent trends and the role of employment. Questioni di Economia e Finanza (Occasional Papers) No. 492, Bank of Italy.

Ciapanna, E., Formai, S., Linarello, A. & Rovigatti, G. (2022). Measuring market power: macro and micro evidence from Italy. Questioni Di Economia e Finanza (Occasional Papers) No. 672, Bank of Italy.

Cirillo, V., Fana, M. & Guarascio, D. (2017). Labour market reforms in Italy: evaluating the effects of the Jobs Act. Economia Politica, 34, 211-232.

Crafts, N., & Mills, T. (2005). TFP Growth in British and German Manufacturing,1950-1996. The Economic Journal, 115, 649-670.

De Loecker, J., & Eeckhout, J. (2018). Global Market Power. NBER Working Paper No. 24768.

De Loecker, J., & Warzynski, F. (2012). Markups and Firm-Level Export Status. American Economic Review, 102(6), 2437-2471.

De Loecker, J., Eeckhout, J., & Unger, G. (2020). The rise of market power and the macroeconomic implications. The Quarterly Journal of Economics, 135(2), 561-644.

Devicienti, B., Fanfani, A. & Maida, A. (2019). Collective Bargaining and the Evolution of Wage Inequality in Italy. British Journal of Industrial Relations, 57(2), 377-407.

Diez, F., Fan, J., & Villegas-Sánchez, C. (2019). Global Declining Competition. IMF Working Paper No. 19/82.

Díez, F., Leigh, D., & Tambunlertchai, S. (2018). Global Market Power and its Macroeconomic Implications. IMF Working Paper No. 18/137.

Dixon, R., & Lim, G. (2020). Is the decline in labour's share in the US driven by changes in technology and/or market power? An empirical analysis. Applied Economics, 52(59), 6400-6415.

Dobbelaere, S., & Kiyota, K. (2018). Labour market imperfections, markups and productivity in multinationals and exporters. Labour Economics, 53, 198-212.

Dobbelaere, S., & Mairesse, J. (2013). Panel data estimates of the production function and product and labour market imperfections. Journal of Applied Econometrics, 28(1), 1-46.

Domowitz, I., Hubbard, G., & Petersen, B. (1988). Market Structure and Cyclical Fluctuations. Review of Economics and Statistics, 70(1), 55-66.

Eggertsson, G.B., Robbins, J.A. & Wold, E.G. (2021). Kaldor and Piketty's facts: The rise of monopoly power in the United States. Journal of Monetary Economics, 124(Supplement), S19-S38.

Feeny, S., Harris, M., & Rogers, M. (2005). A dynamic panel analysis of the profitability of Australian tax entities. Empirical Economics, 30, 209-233.

Forni, L., Gerali, A. & Pisani, M. (2014). Macroeconomic effects of greater competition in the service sector: the case of Italy. Banca d'Italia Temi di Discussione (Working Papers), No. 706.

Foster, L., Haltiwanger, J.C. & Krizan, C.J. (2001). Aggregate Productivity Growth: Lessons from Microeconomic Evidence. University of Chicago Press, 303–372. http://www.nber.org/books/hult01-1

Gamberoni, E., Giordano, C. & and Lopez-Garcia, P. (2016). Capital and labour (mis)allocation in the euro area: some stylized facts and determinants. Bank of Italy "Questioni di Economia e Finanza" (Occasional Papers) No. 349, Bank of Italy.

Giordano, C., & Zollino, F. (2017). Macroeconomic estimates of Italy's mark-ups in the long-run, 1861-2012. Bank of Italy Economic History Working Paper No. 39, Bank of Italy.

Hall, R.E. (1986). Market Structure and Macroeconomic Fluctuations. Brookings Papers on Economic Activities 2, (1986), 285-322.

IMF (2019). World Economic Outlook, April 2019. Growth Slowdown, Precarious Recovery. Washington, DC.

Kato, A. (2014). Does Export Yield Productivity and Markup Premiums? Evidence from the Japanese manufacturing industry, RIETI Discussion Paper 14-E-037, Research Institute of Economy, Trade and Industry (RIETI).

Klette, T. (1999). Market Power, Scale Economies and Productivity: Estimates from a Panel of Establishment Data. Journal of Industrial Economics, 47 (4), 451-476.

Levinsohn, J. & Petrin, A. (2003)*. Estimating Production Functions Using Inputs to Control for Unobservables. The Review of Economic Studies, 70(2), 317-341.

Marinescu, I., & Posner, E. (2018). A Proposal to Enhance Antitrust Protection Against Labour Market Monopsony. Roosevelt Institute Working Paper, Available at SSRN: https://ssrn.com/abstract=3317575 or http://dx.doi.org/10.2139/ssrn.3317575.

Mertens, M. (2019). Micro-mechanisms behind declining labour shares: Market power, production processes, and global. IWH-CompNet Discussion Paper No. 3/2019, Leibniz-Institut für Wirtschaftsforschung Halle (IWH).

Mertens, M. (2020). Labour market power and the distorting effects of international trade. International Journal of Industrial Organization, 68, 102562.

Moreira, A., Alonso-Domínguez, À., Antunes, C., Karamessini, M., Raitano, M. & Glatzer, M. (2015). Austerity-Driven Labour Market Reforms in Southern Europe: Eroding the Security of Labour Market Insiders. European Journal of Social Security, 17(2), 202-225.

Morrison, C. (1988). Unraveling the Productivity Growth Slowdown in the United States,Canada and Japan: The Effects of Subequilibrium, Scale Economies and Markups. Review of Economics and Statistics, 74(3), 381-393.

Naidu, S., Posner, E. & Weyl, G. (2018). Antitrust remedies for labour market power. Harvard Law Review, 132(2), 536-601.

Olley, S. and Pakes, A. (1996)*. The dynamics of productivity in the telecommunications equipment industry. Econometrica, 64, 1263-1297.

Petrin, A., & Levinsohn, J. (2012). Measuring aggregate productivity growth using plant-level data. RAND Journal of Economics, 43(4), 705-725.

Ponikvar, N., & Tajnikar, M. (2011). Are the Determinants of Markup Size Industry-Specific? The Case of Slovenian Manufacturing Firms. Panoeconomicus, 58(2), 229-244.

Restuccia, D., & Rogerson, R. (2013). Misallocation and Productivity: Editorial. Review of Economic Dynamics 16(1), 1-10.

Restuccia, D., & Rogerson, R. (2017). The Causes and Costs of Misallocation. Journal of Economic Perspectives 31(3), 151-174.

Roeger, W. (1995). Can Imperfect Competition Explain the Difference between Primal and Dual Productivity Measures? Estimates for U.S. Manufacturing. Journal of Political Economy, 103(2), 316-330.

Rungi, A., & Biancalani, F. (2019). Heterogeneous Firms and the North–South Divide in Italy. Italian Economic Journal, 5(3), 325-347.

Soares, A. (2020). Price cost margin and bargaining power in the European Union. Empirical Economics, 59(5), 2093-2123.

Syverson, C. (2019). Macroeconomics and Market Power. The Journal of Economic Perspectives, 33(3), 23-43.

van Heuvelen, G., Bettendorf, L., & Meijerink, G. (2019). Estimating Markups in the Netherlands. CPB Background Document, CPB Netherlands Bureau for Economic Policy Analysis.

Wooldridge, J. (2009). On estimating firm-level production functions using proxy variables to control for unobservables. Economic Letters, 104(3), 112-114.

……

……

*Note: the articles marked with an asterisk are quoted in the Appendix. Two references are not shown in order to preserve the anonymity during the reviewing process.

Appendix

A1. Estimation of the production function

In Section 2, following De Loecker and Warzynski (2012), we defined the firm-level markup as the ratio between of the output elasticity of materials and its revenue share:

$$\mu_{it} = \frac{\theta_{it}^{M}}{\alpha_{it}^{M}}, \qquad (1)$$

where μ_{it} is the markup of firm i at time t, θ_{it}^{M} is the output elasticity of materials and α_{it}^{M} is the revenue share of materials, also known as cost share or expenditure share of materials. While the expenditure share of materials can be easily computed using firm-level data that are generally available, the related output elasticity needs to be estimated.

In order to get unbiased estimates of θ_{it}^{M} at the firm-year level, we consider the following general production function Q for firm i at time t:

$$Q_{it} = Q_{it}(L_{it}, M_{it}, K_{it,} w_{it}) , \qquad (2)$$

where L_{it}, M_{it} and K_{it} are the firms' inputs (i.e., labour, materials and capital, respectively) and w_{it} is firm's productivity. Unobserved productivity shocks are potentially correlated with input choices, and if not controlled for, can lead to inconsistent estimates of the production function. Accordingly, we employ the Wooldridge-Levinsohn-Petrin (WLP) estimator, as derived from Wooldridge (2009) and implemented in Petrin & Levinsohn (2012). The WLP estimator does not assume constant returns to scale, is robust to the Ackerberg, Caves & Frazer's (2015) criticism of Levinsohn and Petrin's (2003) estimator and is programmed as a simple instrumental variable estimator. The potential endogeneity issues related to the simultaneous determination of inputs and unobserved productivity are addressed by introducing lagged values of specific inputs as proxies for productivity.

Specifically, the estimation strategy used in this paper consists in two steps.

First, we run:

$$q_{it} = g(l_{it}, k_{it}, m_{it}) + \in_{it} , \qquad (3)$$

where we use a third-order polynomial on all inputs to remove the random-error term $\in_{it}$ from the output and hence to obtain estimates of the expected output $\widehat{q_{it}}$. Then, we use a general production function of the following type:

$$\widehat{q_{it}} = f_s(l_{it}, k_{it}, m_{it}, \mathrm{B}) + \omega_{it} + \varepsilon_{it} , \qquad (4)$$

where $\widehat{q_{it}}$ is the natural log of real sales of firm i at time t, l_{it}, k_{it} and m_{it} are, respectively, the natural logarithms of the quantities of labour, capital and materials used by the firm and that get transformed into the output according to the production function f_s, B is the parameter vector to be estimated in order to calculate the output elasticities, ω_{it} is the firm-level productivity term that is observable by the firm but not by the econometrician, and ε_{it} is an error term that is unobservable to both the firm and the econometrician. Productivity is, thus, assumed to be Hicks neutral and specific to the firm, as in the approach using inputs to control for unobservables in production function estimations (Ackerberg, Caves & Frazer, 2015; Levinsohn & Petrin, 2003; Olley & Pakes, 1996). We assume that labour is a variable input, and instrument current labour and materials and their interactions with the first and second lags of labour as well as the second lags of capital and materials. To control for time-variant shocks common to all plants, we add year fixed effects.

We adopt a translog specification, which, unlike the Cobb-Douglas, permits us to recover firm-level time-variant output elasticities. The production function is a revenue function, since data on firms'

output prices are not available, and is allowed to change across different sectors, as implied by the subscript s. Leaving subscripts i and t aside for simplicity, the translog function f_s can be written as:

$$f_s = \alpha + \beta_L l + \beta_K k + \beta_M m + \beta_{L^2} l^2 + \beta_{M^2} m^2 + \beta_{K^2} k^2 + \beta_{KL} kl + \beta_{KM} km + \beta_{LM} lm \quad (5)$$

Thus, the parameter vector is made up of nine parameters for each sector.

The estimated parameters of the translog production function allow us to compute the output elasticity of materials. Using the estimates of the output elasticity and the calculated revenue shares of materials, we can now compute markups at the firm-year level based on Equation (1).