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RECESSION

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Abstract

A recent literature documents a secular increase in the sales-weighted markups in the United States, a phenomenon that was driven by large and productive firms at the top of the profit distribution. Using rich balance-sheet data, this paper documents the behavior of markups in Spain before, during, and in the aftermath of the Great Recession. We document that markups rose during the financial crisis. Unlike in the U.S., these dynamics were led by small firms: in response to a drop in sales, these firms were unable to increase their productive efficiency when average costs increased. As a consequence, and in order to escape a sharp decline in profit rates, they increased their markups. Simultaneously, large firms were able to increase efficiency, and their markups remained relatively constant. We argue that the increase of relative markups by small firms came at the expense of losing market share, which in the very short run proved to be preferred than exiting the market.

Keywords: markups, market power, average costs, labour market, firm size.

JEL classification: D2, D4, E2, E3, J3, L1.

Resumen

Este documento de trabajo supone una contribución a la literatura reciente que documenta el aumento secular de los márgenes ponderados por las ventas en varios países. En Estados Unidos, este fenómeno ha sido impulsado por empresas grandes y productivas. Utilizando los datos detallados de la Central de Balances, este trabajo ilustra el comportamiento de los márgenes en España antes, durante e inmediatamente después de la Gran Recesión. Documentamos que los márgenes aumentaron durante la crisis financiera. A diferencia de Estados Unidos, esta dinámica fue liderada por pequeñas empresas. Concretamente, en respuesta a la caída de sus ventas, estas empresas no pudieron aumentar su eficiencia productiva cuando crecieron los costes promedio. Como consecuencia, y para escapar de una fuerte caída de las tasas de beneficio, aumentaron sus márgenes. Simultáneamente, las grandes empresas pudieron incrementar su eficiencia y sus márgenes se mantuvieron relativamente constantes a lo largo del mismo período. Argumentamos que el aumento de los márgenes relativos de pequeñas empresas derivó en una pérdida de cuota de mercado por parte de las pequeñas empresas, estrategia que a corto plazo demostró ser preferible a salir del mercado.

Palabras clave: márgenes, poder de mercado, costes medios, mercado laboral, tamaño empresarial.

Códigos JEL: D2, D4, E2, E3, J3, L1.

1 Introduction

The recent debate on the evolution of market power in the United States has reached a certain consensus. DeLoecker *et al.* (2020) document a secular increase in the sales-weighted average markup, from about 20% in 1980 to nearly 70% in 2014. This rise was mostly driven by within-industry compositional changes, specifically from those firms with markups at the top deciles of the distribution. Moreover, these dynamics were accompanied by a rise in firm profitability. The findings are consistent with those of Autor *et al.* (2017), showing that there has been a secular decline in the labour share in the U.S. since the 1980s, and especially in the 2000s. Indeed, Autor *et al.* (2020) find that the average labour share has remained constant, and that the reason why the aggregate labour share has declined is that there has been a within-industry reallocation of activity among heterogeneous firms toward those with low and declining labour shares. Their explanation relies on the emergence of superstar firms, namely a small number of firms which are able to harness a large share of the market through winner-takes-most dynamics. Several candidates have been proposed to explain this evolution in market structure, including the diffusion of global competitive platforms, new technology goods with low marginal costs, and the international integration of product markets, among others. All in all, it appears as though within-industry firm heterogeneity is a crucial element to understand the overall patterns of market power in the U.S.

There is less consensus, however, regarding whether similar patterns have emerged in Europe. Autor *et al.* (2017) find support for the decline in labour shares as a fraction of value added in several countries. However, in contrast of what was observed in the U.S., Gutiérrez and Philippon (2017a,b, 2018) argue that patterns of rising concentration and rising profits rates are not visible in Europe. This fact suggests that globalization and technological change might not have been at the core of the rise in concentration in the U.S. Instead, they argue that while U.S. markets were more competitive than Europe's until the 1990s, this trend has recently reversed. The explanation could lie in antitrust enforcement and product market regulations, which have become more aggressive in Europe than in the U.S. in recent years. According to this hypothesis, European institutions are more independent than their U.S. counterparts, enforcing pro-competitive policies more strongly than any individual country ever did. In turn, this offers an explanation why political and lobbying expenditures have increased much more in the U.S. than in Europe.

This paper contributes to this debate by showing new evidence on the evolution of markups, profit rates, and concentration in Spain, for the 2004-2017 period. The Spanish experience is of

particular interest in the European context because of at least three reasons. First, it offers an insightful case study for the evolution of markups for firms at the low end of the productivity distribution. Indeed, according to a Banco de España (2019) annual report, the average productivity of Spanish firms is lower than that of French, German and Italian firms, regardless of their size. This is partly because Spanish firms tend to have lower levels of human capital and technology. However, the gap is overwhelmingly high for small firms, which on average underscores the productivity level of their European counterparts by 40 percentage points.

Second, the available firm-level data in Spain, from the Spanish Commercial Registry, is of high quality in terms of both coverage and balance-sheet information. In particular, our dataset covers 80% of all limited responsibility firms including many small firms since 2004 (see Almunia *et al.* (2018) for details). Moreover, the great level of detail in balance-sheet information allows us to separate out variable inputs (such as materials and workers with fixed-term contracts) from fixed inputs (such as other operating expenses and workers with open-ended contracts). This is a notable improvement in terms of data quality relative to the existing markup estimation literature that uses the production-side approach popularized by DeLoecker and Warzynski (2012). Indeed, this literature has typically relied on less disaggregated data in terms of the unit of observation, the balance-sheet item level, or the level of representativeness of the sample.

Third, the Spanish labour market is highly frictional, allowing us to interpret labour as an input with high adjustment costs for firms. Markups estimated with respect to labour may therefore provide a misleading picture of market power in Spain. Yet, labour costs make up for a sizable fraction of the typical Spanish firm's balance sheet. Indeed, there is evidence that during the crisis workers with open-ended contracts experienced almost no loss in terms of earnings (see Anghel *et al.* (2018)). Therefore, a complete picture of the evolution of firm-level markups in Spain requires the analysis of the evolution of input shares over time separately for each input in the production function, which we provide using our detailed balance-sheet data.

The main contribution of our paper is to show that, in the context of a low-productivity country in which firms operate in frictional input markets, the evolution of firm-level markups can be explained by firms' efforts to rebalance their cost structure between variable and fixed inputs, a behavioral response to the cycle, rather than by reasons of a more structural nature. Our main finding is that the evolution of the average markup was led primarily by firms at the low end of the productivity distribution, who were forced to increase their markups in order to reduce the risk of exit and survive during the economic downturn. By contrast, firms at the top of the distribution

experienced small or negligible changes in markups. These observations are in stark contrast to the empirical findings in the United States, where the evolution of markups more likely reflected a rise of market power by large and very productive firms rather than an effort of firms to restructure the composition of costs in response to the cycle. These results suggest that the evolution of markups may not reflect aggregate changes in the competitive structure of markets, but rather an idiosyncratic response of firms to economic conditions. More generally, we confirm the insight made by DeLoecker and Warzynski (2012) that markup measurement is highly sensitive to the production input that the markup is estimated with. In the case of Spain, using the evolution of the labour share to infer the behavior of markups would generate misleading results. This is because this input may have large adjustment costs in low-productivity economies such as Spain. Therefore, our results yield the methodological implication that taking into account the structure of costs of firms is essential to understand the true behavior of markups.

The remainder of the paper proceeds as follows. Section 2 describes the data and presents the methodological and empirical framework. Sections 3.1 and 3.2 present the evolution of the main variables starting by the estimation of markups and the evolution of profit rates, defined by the ratio of earnings before interest, tax, depreciation and amortization (EBITDA) over turnover. These results will lead us to propose, in Section 3.3, potential explanations based on the different compositional changes in the structure of costs across firms, both within and across sectors. Section 3.4 analyzes the effects that these changes may have had in terms of the concentration of sales and exit of firms within and across sectors. The paper concludes in Section 4.

2 Data and Methodology

Data Our data covers the period 2004-2017, and comes from an unbalanced panel of confidential firm-level data from the Spanish Commercial Registry (*Registro Mercantil Central*). The dataset presents a good coverage of the market economy. Interestingly, it covers the last few years of the expansionary period (2004-2007), the crisis years (2008-2013), and the first few years of the recovery (2014-2017). The final dataset has approximately 3.8M firm-year observations, with about 300,000 firms per year on average. Sector information of the firm is at the 4-digit NACE Rev. 2 level. We drop observations with missing or zero sales, employees, materials, or fixed assets, and drop outliers from the labour and material share distribution, since these inputs will be used in the production function estimation step. Moreover, we focus on industries that have at least ten firms

per year, and use 2-digit-level value-added deflators for materials, sales, and fixed assets, which we take from the Spanish National Accounts.

Importantly, the information in the database allows us to identify various elements of the cost structure of firms: (i) material inputs, composed of purchases of inputs that are a function of the level of production; (ii) other operating expenses (*oope*), composed of a heterogeneous group of costs (e.g. services provided by other independent firms, renting, transportation, utilities, insurance, professional services, R&D or marketing), which are not directly related to the level of production; (iii) labour costs, computed as compensation to the employees of the firm, with additional information on the number of workers employed with fixed-term contract versus those with open-ended ones; and (iv) financial expenses, including interest payments, depreciation, and amortization. It is this level of disaggregation which allows us to argue that the evolution of firm-level markups in Spain is, to a large degree, driven by changes in the composition of firms' balance sheets during the cycle.

Estimating Markups Firm-level markups are estimated using the DeLoecker and Warzynski (2012) method, a model-free approach that has gained popularity in the literature. In an economy with $i = 1, \dots, N_t$ cost-minimizing firms each year t , firm i is assumed to use the gross-output production function $Q_{it} = Q(\Omega_{it}, \mathbf{V}_{it}, \mathbf{F}_{it})$, where Ω_{it} is firm-specific productivity, which the firm *observes* when making input decisions; \mathbf{F}_{it} is a vector of fixed or near fixed inputs, such as capital, and other inputs with high adjustment costs, such as labour employed under open-ended contracts and other operating expenses (such as outsourcing expenditures); and $\mathbf{V}_{it} = (V_{it}^1, \dots, V_{it}^J)$ is a vector of intermediate inputs, such as materials and temporary employment.

The first-order condition of the cost-minimization problem with respect to some variable input $V \in \mathbf{V}$ implies that:

$$\frac{\partial Q_{it}}{\partial V_{it}} \frac{V_{it}}{Q_{it}} = \frac{1}{\Lambda_{it}^V} \frac{P_{it}^V V_{it}}{Q_{it}}$$

where $\Lambda_{it}^V \geq 0$ is the Lagrange multiplier associated with minimizing costs relative to input V . The left-hand side of this equation is the elasticity of output to variable input V , so the optimality says that cost minimization is achieved if the firm equalizes the output-elasticity of that input to the term $\frac{1}{\Lambda_{it}^V} \frac{P_{it}^V V_{it}}{Q_{it}}$. Noting that Λ_{it}^V , the shadow value of the objective function as the constraint is relaxed, proxies the marginal cost of the firm relative to input V , we may define the firm's markup

as $\mu_{it}^V \equiv \frac{P_{it}^Q}{\Lambda_{it}^V}$, where P_{it}^Q denotes the output price. Using the optimality condition, we then obtain a formula for the markup:

$$\mu_{it}^V = \frac{\mathcal{E}_{it}^V}{\alpha_{it}^V} \quad (1)$$

where $\mathcal{E}_{it}^V \equiv \frac{\partial Q_{it}}{\partial V_{it}} \frac{V_{it}}{Q_{it}}$ is the elasticity of output relative to input V , and $\alpha_{it}^V \equiv \frac{P_{it}^V V_{it}}{P_{it}^Q Q_{it}}$ is the share of input V 's expenditures on total sales. Our goal is then to estimate μ_{it}^V for every Spanish firm and year from 2004 to 2017 by using equation (1), and study how estimates differ depending on the choice of V . For this, we need to estimate (i) the output elasticity of the variable input to production (\mathcal{E}_{it}^V); and (ii) the input share of sales (α_{it}^V). To estimate α_{it}^V , we use data directly:

$$\alpha_{it}^V = \frac{C_{it}^V}{S_{it}}$$

where $S_{it} \equiv P_{it}^Q Q_{it}$ are firm sales, and $C_{it}^V \equiv P_{it}^V V_{it}$ is the cost of input V . To estimate $\mathcal{E}_{it}^V \equiv \frac{\partial \ln Q_{it}}{\partial \ln V_{it}}$, we need to posit a production function, Q . The only requirements for the production function are: (i) observed productivity Ω_{it} must be Hicks-neutral; (ii) technology parameters are time-invariant and common across producers within the same sector.¹ That is, $Q(\Omega_{it}, \mathbf{V}_{it}, \mathbf{F}_{it}) = \Omega_{it} \tilde{Q}(\mathbf{V}_{it}, \mathbf{F}_{it}; \boldsymbol{\beta})$, where $\boldsymbol{\beta}$ is the vector of industry-specific technology parameters. In the data, we rely on 2-digit sector deflated sales (in logs) to estimate the 4-digit sector output elasticities, $y_{it} \equiv \ln Y_{it}$, and assume that they equal desired output ($q_{it} \equiv \ln Q_{it}$) plus a term ϵ_{it} capturing unanticipated productivity shocks and possible measurement error (both of which unobserved by the firm when choosing inputs), so that $y_{it} = q_{it} + \epsilon_{it}$. Therefore, the specification in logs is:

$$y_{it} = \omega_{it} + \tilde{q}(\mathbf{v}_{it}, \mathbf{f}_{it}; \boldsymbol{\beta}) + \epsilon_{it} \quad (2)$$

where lower-case letters denote logged variables. Here, the left-hand side is given directly by the data, and in the right-hand side the parameter vector $\boldsymbol{\beta}$ must be estimated. Estimating (2) directly by OLS could potentially suffer from simultaneity bias (if unobserved productivity shocks in ϵ_{it} are correlated with input choices), serial correlation bias (if the observed productivity ω_{it} has correlated effects), and selection bias (if, over time, sample selection occurs among exiting low-productivity firms). To deal with these issues, we proceed using the Olley and Pakes (1996) two-stage approach. First, proxy observed productivity by:

$$\omega_{it} = h_t(\mathbf{v}_{it}, \mathbf{f}_{it}) \quad (3)$$

¹To exploit as much variation as possible, we estimate elasticities at the most disaggregated level available in the data, namely 4-digit industries. Moreover, we do not consider changes of technology as a consequence of the crisis, as this would have been problematic given the limited sample size at this level of disaggregation.

where h_t is a non-parametric function (e.g. a polynomial) of variable inputs, capital, labour, possibly other fixed inputs, and time dummies. By positing (3), we are presuming that current input use responds to current productivity shocks, but lagged input values do not. Under this productivity proxy, output q_{it} is now proxied by:

$$\phi(\mathbf{v}_{it}, \mathbf{f}_{it}; \boldsymbol{\beta}) \equiv h_t(\mathbf{v}_{it}, \mathbf{f}_{it}) + \tilde{q}(\mathbf{v}_{it}, \mathbf{f}_{it}; \boldsymbol{\beta}) \quad (4)$$

Then, we run OLS on $y_{it} = \phi(\mathbf{v}_{it}, \mathbf{f}_{it}; \boldsymbol{\beta}) + \epsilon_{it}$. Finally, for each firm i and period t , we obtain an estimate $\hat{\boldsymbol{\beta}}$, and use it to predict expected output, $\hat{\phi}_{it} \equiv \phi(\mathbf{v}_{it}, \mathbf{f}_{it}; \hat{\boldsymbol{\beta}})$, and the residual, $\hat{\epsilon}_{it} = y_{it} - \hat{\phi}_{it}$. Now, we can compute productivity for any $\boldsymbol{\beta}$ via equation (4), $\omega_{it}(\boldsymbol{\beta}) \equiv \hat{\phi}_{it} - \tilde{q}(\mathbf{v}_{it}, \mathbf{f}_{it}; \boldsymbol{\beta})$. To make progress, we assume that ω_{it} follows an AR(1): $\omega_{it} = \rho_{\omega}\omega_{i,t-1} + \xi_{it}$. That is, by equation (3), we presume that lagged input use is correlated with current input use only because the productivity process is persistent. Next, nonparametrically regressing $\omega_{it}(\boldsymbol{\beta})$ on its lag $\omega_{i,t-1}(\boldsymbol{\beta})$, we recover the innovations as $\xi_{it}(\boldsymbol{\beta}) \equiv \omega_{it}(\boldsymbol{\beta}) - \hat{\rho}_{\omega}\omega_{i,t-1}(\boldsymbol{\beta})$. To obtain our final estimate for $\boldsymbol{\beta}$, we use the moment condition:

$$\mathbb{E} \left[\xi_{it}(\boldsymbol{\beta}) \begin{pmatrix} \mathbf{v}_{i,t-1} \\ \mathbf{f}_{it} \end{pmatrix} \right] = \mathbf{0}$$

From this, we can estimate $\boldsymbol{\beta}$ by GMM. Using the estimate $\hat{\boldsymbol{\beta}}_{GMM}$, we can directly calculate the markup as $\hat{\mu}_{it}^V = \hat{\mathcal{E}}_{it}^V \frac{S_{it}}{C_{it}^V}$, where $\hat{\mathcal{E}}_{it}^V$ is the implied output elasticity.

3 Empirical Results

3.1 Markup Analysis

Our baseline firm-level markups use materials as the variable input of choice. We do this because, given the rigidities in the Spanish labour market, this is the input in our balance-sheet data with arguably the least adjustment costs in production. To implement the estimation procedure, we use a Cobb-Douglas production function of the type $q_{it} = \beta_l l_{it} + \beta_m m_{it} + \beta_k k_{it} + \omega_{it} + \epsilon_{it}$, implying that the markup is simply $\mu_{it} = \beta_m \frac{S_{it}}{M_{it}}$, where M_{it} are total material expenditures of firm i in year t .²

² For robustness, Figure ?? in Appendix also compares results to a Translog production function, which allows for time-varying elasticities of output to the variable input. The results are hardly affected by this assumption, so we will keep the Cobb-Douglas specification throughout.

We average markups using firm-level sales shares, as follows:

$$M_t = \sum_{i=1}^{N_t} \omega_{it} \mu_{it}, \quad \text{where } \omega_{it} \equiv \frac{S_{it}}{\sum_{i=1}^{N_t} S_{it}}$$

Figure 1 shows the evolution of the sales-weighted markup, normalized to one at the base year (2004). Markups were relatively constant between 2004 and 2007 and sharply increased between

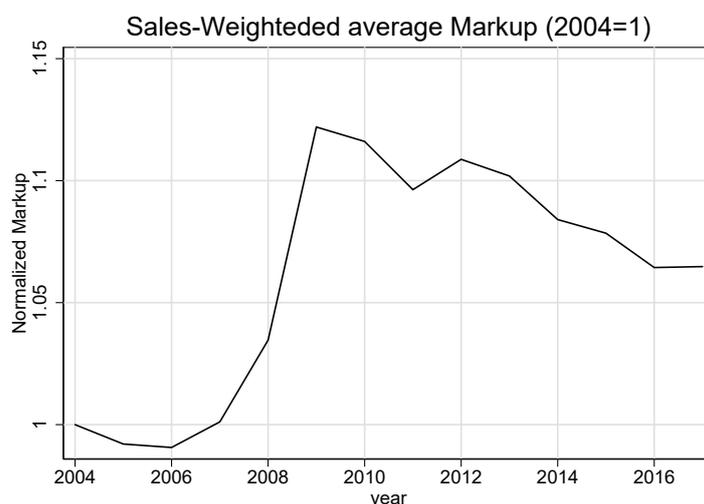


Figure 1: Sales-weighted average markup in Spain (2004=1).

2008 and 2009. The overall rise of markups between 2004 and 2009 was of around 13ppt. The growth in markups during the crisis years was comparable to that observed in the U.S. Since that year, markups steadily decreased by some 5ppt until 2017.

Figure B.1 in the Appendix shows the evolution of markups by different branches of activity, compared to that of the whole economy from Figure 1. Markups in nearly all sectors picked up between 2007 and 2009. However, heterogeneity arises in terms of the changes thereafter. Markups in Manufacturing and in some service sectors fell down to levels similar to the initial period. On the contrary, a structural increase in markups during the 2009-2017 period was observed in Supplies, Construction, and Real Estate. The moderate decline of markups in most service sectors is in contrast to the patterns found in the U.S. by DeLoecker *et al.* (2020).

Appendix A shows results for alternative specifications using markups estimated relative to other inputs that have been traditionally considered in the literature. Using labour expenses instead of materials leads to a completely different evolution of the average markups (see Figure A.2). Indeed, markups relative to labour dropped sharply between 2008 and 2009 and steadily recovered after 2010. However, computing markups using only temporary workers leads to a qualitatively

very similar evolution of markups relative to the baseline estimation with materials (see Figure A.3). As it will become clear in Section 3.3, a large share of the adjustment of labour following the recession was made via the firing of workers with temporary contracts, which account for about rates seen in the previous sections. Variable costs are composed of materials and a small fraction of labour costs including those workers holding temporary contracts, whereas fixed costs include other operating expenses and the bulk of labour costs. To understand the connection between different types of costs, markups and profit rates, it becomes useful to recall the following basic accounting identity:

$$\frac{\pi_{it}}{S_{it}} = 1 - \frac{1}{\mu_{it}} \frac{AC_{it}}{MC_{it}}$$

which shows that profit rates at the firm level are proportional to markups and inversely related to the ratio between average costs (AC) and marginal costs (MC). Recall that the markup is inversely related to the variable input (here, material) share. Therefore, higher fixed costs (such as utilities and labour expenses) lead to higher average costs relative to marginal costs. Hence, firms can increase profit margins by raising markups or by increasing efficiency through lower average costs.

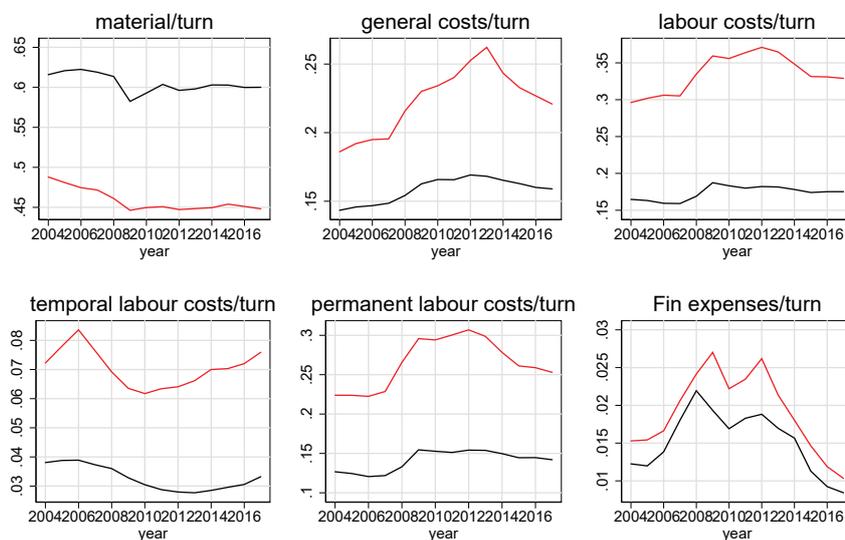


Figure 7: Structure of costs. [Red] *Unweighted input share*; [Black] *Sales-weighted input share*. *fin expenses* includes financial expenses including interest payments, depreciation, and amortization.

As seen in Figure 7, there exist sizable differences in Spain in the cost structure of firms by size, especially regarding the contribution of materials and labour expenses. In particular, the weighted average material share represents around 60% of sales, whereas this ratio is close to 45% for the unweighted average. This means that large firms spend more than small ones in materials relative

is similar to the one found in DeLoecker *et al.* (2020), with the exception that in their case the right tail gathered a large and very productive group of firms. In contrast, in the Spanish data it is a small group of small and unproductive firms who, given their cyclical behavior of variable inputs, are the most important drivers of the increase in the overall average markup. Markups in the remaining deciles steadily increased and reached a 5 percentage-point rise in 2017 compared to 2004.

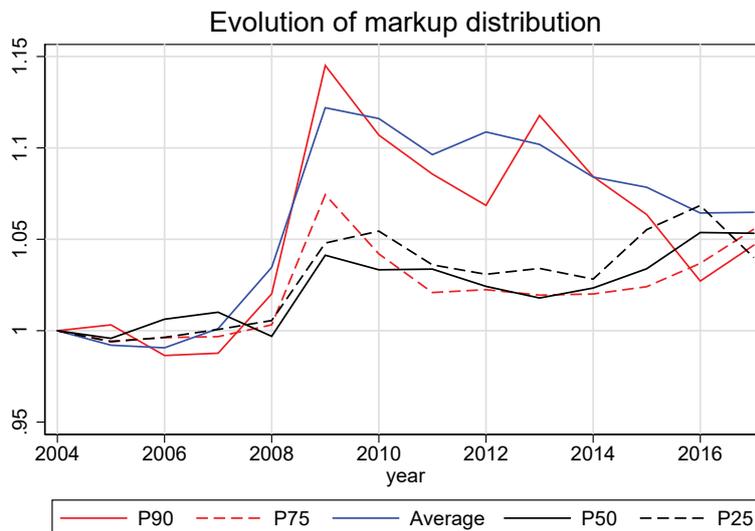


Figure 3: Evolution of the sales-weighted markup distribution, by percentile.

An alternative way of showing the aforementioned results is by decomposing the weighted average markup into two terms: a simple average of firm level markups, $\bar{\mu}_t = \frac{1}{N_t} \sum_{i=1}^{N_t} \mu_{it}$, and a covariance term between relative firm size and levels of markups:

$$M_t = \sum_i \omega_i \mu_i = \bar{\mu}_t + \underbrace{\sum_i (\omega_{it} - \bar{\omega}_t)(\mu_{it} - \bar{\mu}_t)}_{\text{Covariance size vs. markup}}$$

Figure 4 shows the result of this decomposition. The fact that the unweighted markup grew more during the period 2004-2009 than the weighted one reflects that markups were increasing more rapidly among small firms. According to the right-hand side panel of the figure, the initial covariance between the size of the firm and markups was negative suggesting that small firms set higher markups. Moreover, during those years, the covariance became even more negative meaning that small firms were rising markups relative to large firms. After 2012, the distance between small and large firms decreased again.

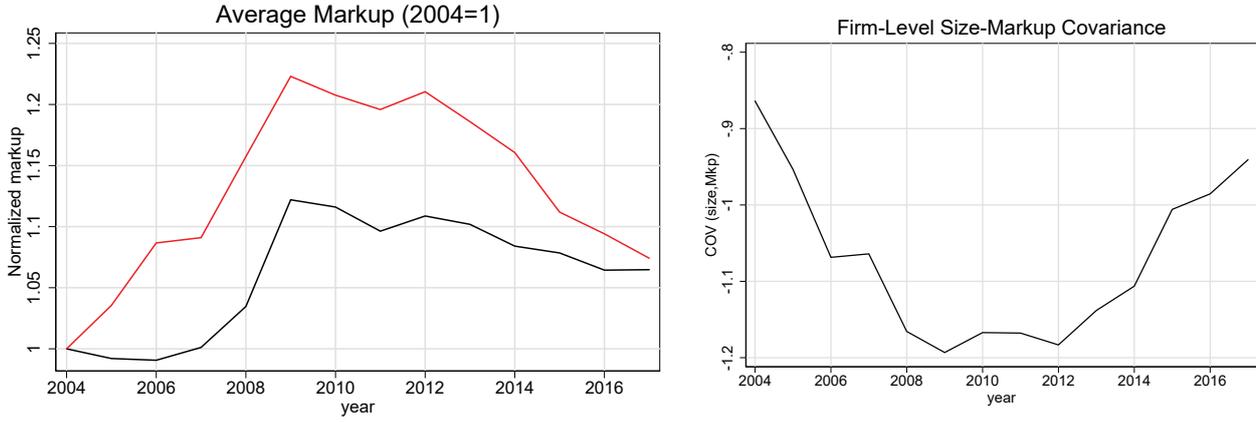


Figure 4: *Left:* [Red] *Unweighted markup* ($\bar{\mu}_t$); [Black] *Sales-weighted markup* (M_t). *Right:* Covariance term between relative firm size and relative markup.

The countercyclical pattern of markups for the unweighted average holds true at the sectoral level as well. Figure B.2 in the Appendix depicts the same decomposition by sector over time. The speed at which the unweighted average of markups decreased after 2010 was different across sectors, being very rapid in Manufacturing and relatively slow in Supplies and some of the service sectors. On the other hand, though the covariance term is negative in most cases, the evolution over time is slightly different across sectors. In Supplies and Construction, for instance, the covariance turns positive in the aftermath of the crisis, signaling changes in the composition of these industries whereby larger firms increased their markups relative to smaller ones. In other sectors, by contrast, such as Retail or Transportation, we observe a negative correlation between relative firm size and markup (relative to the average one in the sector), with smaller firms being the main drivers of the average markup in the aftermath of the recession.

The previous decomposition compares firms of different size regardless of the sector they belong to. In order to take this into account, we may perform a similar decomposition by sector. Defining $M_t = \sum_s \omega_{st} M_{st}$, where $\omega_{st} \equiv \frac{\sum_{j \in s} P_{jt} Q_{jt}}{\sum_i P_{it} Q_{it}}$ is the sales share of sector s in the economy, and $M_{st} \equiv \sum_{i \in s} \omega_{it} \mu_{it}$, we may decompose the weighted sector average with the unconditional average across sectors and the covariance between the sector weight and the sector markup:

$$M_t = \bar{M}_t + \underbrace{\sum_s (\omega_{st} - \bar{\omega}_{st})(M_{st} - \bar{M}_t)}_{\text{Covariance between sector size and markup}}$$

Figure 5 shows the result of this decomposition. We find, similar as with the firm-level analysis, that those sectors with lower markups on average represent a larger share of overall value added. During the period 2004 and 2017, the covariance became less negative, however, reflecting that those sectors with higher markups were gaining weight during the recovery period.

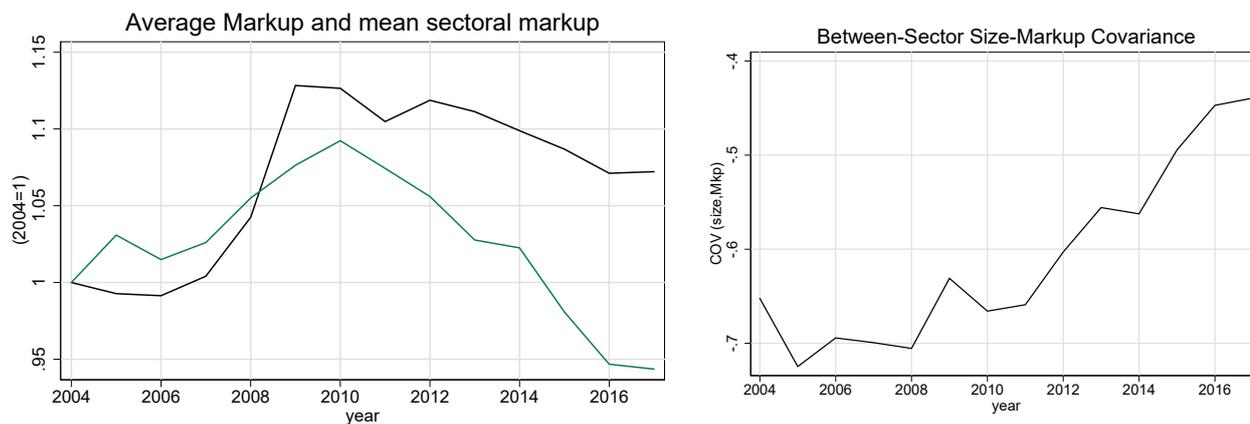


Figure 5: *Left:* [Red] *Unweighted markup* ($\bar{\mu}_t$); [Black] *Sales-weighted markup* (M_t). *Right:* Covariance term between relative firm size and relative markup.

3.2 Profit Rates

As the previous section has shown that smaller firms tend to have higher markups in the overall economy, it becomes relevant to understand whether this relationship between size and price markups is related to profitability or, rather, to technological considerations such as the structure of firm's costs. To explore these dimensions, in this section we describe the pattern and the evolution of observed profit margins, defined as the ratio of earnings before interest, tax, depreciation and amortization (EBITDA) over turnover (Figure 6). The first thing one should notice is that, despite having higher markups, small firms faced a smaller profit rate than bigger firms. The weighted average is close to 10% for the period before the crisis, and close to 5% for the unweighted average. During the crisis, profit rates decreased for both weighted and unweighted averages, but the drop was much more pronounced for the unweighted average, indicating that smaller firms decreased their profit margins relatively more. In the period after 2012, there has been a slight recovery of profits although not strong enough to reach the levels observed in 2007 (9% for the weighted average and 3% for the unweighted). These findings are in line with the evidence on profit rates presented in Gutiérrez and Philippon (2018). Overall, the results suggest that the growth in markups in Spain was not accompanied by a rise in the profitability of firms, suggesting that the evolution of markups may be unrelated to market power and connected with the internal structure of costs of firms.

This picture emerges at the sector level as well. Figure B.3 in the Appendix shows that most branches of activity exhibit a similar behavior of profit shares during this period. Indeed, both unweighted and weighted averages in virtually all sectors face a procyclical movement in profit rates.

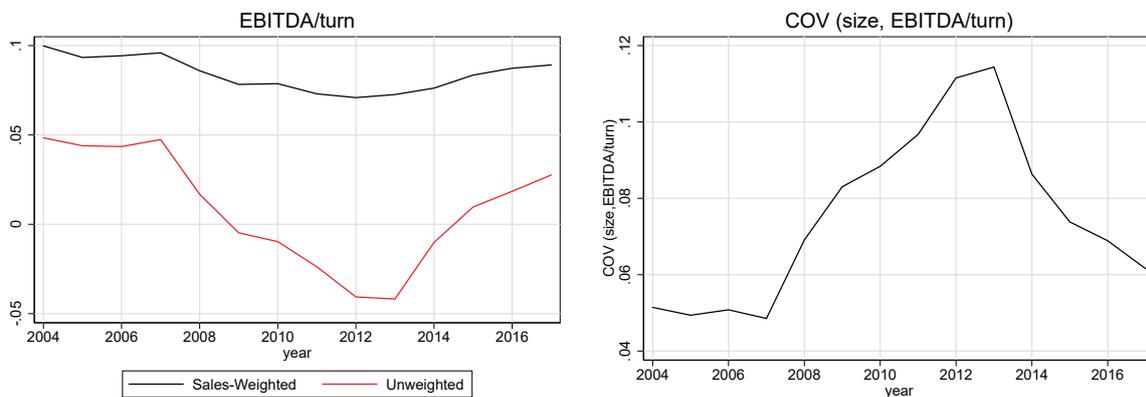


Figure 6: Left: [Red] *Unweighted EBITDA share*; [Black] *Sales-weighted EBITDA share*. Right: Covariance term between relative firm size and relative EBITDA share.

In Supplies there is an increase in the weighted average profit rate from 20% in 2007 to more than 25% in 2017. Profit rates experienced a notable recovery in some sectors such as Transportation, Accommodation and Real Estate. On the other hand, profit rates in IT and Construction continued to decline even after the recession was over.

3.3 Structure of Costs

In order to understand the previous findings regarding markups and profit rates, this section explores the evolution of different types of cost at the firm level. We emphasize that distinguishing between variable and fixed costs is key to understand the cyclical behavior of markups and profit rates seen in the previous sections. Variable costs are composed of materials and a small fraction of labour costs including those workers holding temporary contracts, whereas fixed costs include other operating expenses and the bulk of labour costs. To understand the connection between different types of costs, markups and profit rates, it becomes useful to recall the following basic accounting identity:

$$\frac{\pi_{it}}{S_{it}} = 1 - \frac{1}{\mu_{it}} \frac{AC_{it}}{MC_{it}}$$

which shows that profit rates at the firm level are proportional to markups and inversely related to the ratio between average costs (AC) and marginal costs (MC). Recall that the markup is inversely related to the variable input (here, material) share. Therefore, higher fixed costs (such as utilities and labour expenses) lead to higher average costs relative to marginal costs. Hence, firms can increase profit margins by raising markups or by increasing efficiency through lower average costs.

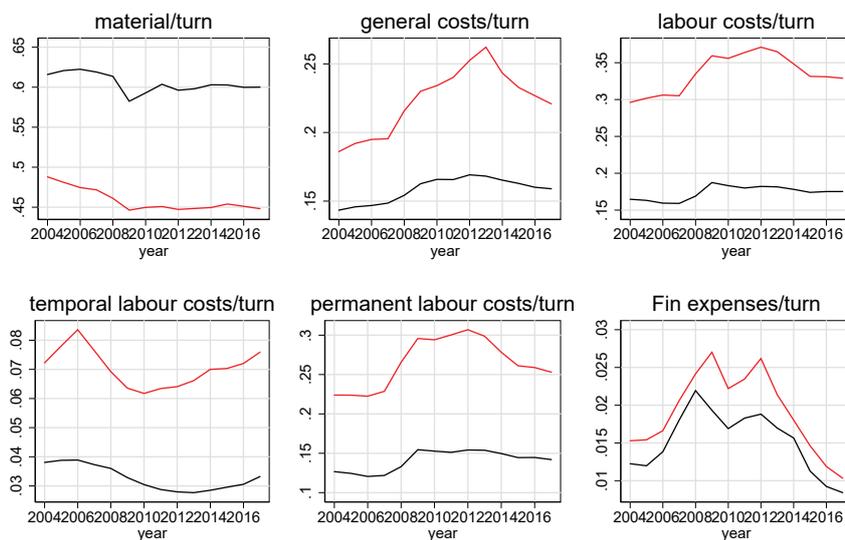


Figure 7: Structure of costs. [Red] *Unweighted input share*; [Black] *Sales-weighted input share*. *fin expenses* includes financial expenses including interest payments, depreciation, and amortization.

As seen in Figure 7, there exist sizable differences in Spain in the cost structure of firms by size, especially regarding the contribution of materials and labour expenses. In particular, the weighted average material share represents around 60% of sales, whereas this ratio is close to 45% for the unweighted average. This means that large firms spend more than small ones in materials relative to their sales, partly explaining their lower markups. On the contrary, there are no such differences in other operating expenses (second panel on the top row), this being the balance-sheet item that, together with materials, adds up to overall expenditures in intermediate goods of the firm. Indeed, the weighted ratio is close to 15%, with the unweighted average fluctuating between 20 and 25%.

Regarding labour expenses, the weighted average is close to 30% whereas the unweighted average is close to 15%. This means that, relative to their sales, small firms spend more in terms of labour than large firms, and this difference counterbalances the relatively higher material share faced by small firms. One important question is whether this labour input should be considered a fixed or a variable input. Our dataset allows us to decompose labour costs between workers with different types of contract. This is important in Spain because open-ended contracts enjoy a higher level of legal protection from the side of the worker. Hence we consider these as relatively fixed compared to labour in fixed-term positions. For all firms, most of the labour cost is related to workers with open-ended contracts. The weighted average cost related to fixed-term contracts account for around 4% of revenues, whereas the unweighted average accounts for 8%. Hence, most of the differences among firms here stem from those labour expenses associated with the share of labour that has higher adjustment costs. Interestingly, as a fraction of total labour costs, those costs related to permanent workers are slightly higher for larger firms, meaning that conditional on their

lower labour costs, large firms have a higher fraction of employees with open-ended contracts. Finally, financial expenses (including interest payments, depreciation and amortization) account for between 1.5% and 2.5% of total revenue, regardless of the size of the firm.

Adding up materials and temporary employees as variable inputs, large firms have a higher share of variable inputs with respect to small firms. All in all, small firms operate with higher fixed costs than large firms (in both general operating expenses and especially in terms of labour costs). These firms may thus compensate their disadvantage by setting higher markups, which rationalizes the negative covariance between firm size and markups, the positive covariance in profit rates, and the evolution of both markups and profit rates over time. As this compensation is only partial, profit rates of large firms are still higher than those of small firms.

During the pre-crisis expansionary period (between 2004 and 2007), all ratios for both the weighted and the unweighted averages remain constant. The only exceptions are the unweighted average of the material share, which decreases 2ppt during these years, unlike its weighted average counterpart. Financial expenses also increased regardless the size of the firm, though slightly less than 1ppt in 2007 following the subprime crisis.

Between 2007 and 2013, the crisis period, there was a decrease in the material share, which was somewhat lower for the weighted average (2ppt) than for the unweighted average (3ppt). In the first two years of the crisis, all firms decreased their material shares between 3ppt and 4ppt. However, later on, the weighted average recovered some 2ppt, while the unweighted average remained constant. Regarding other general expenses, all firms increased its share of sales during the crisis, but this rise was much higher for smaller firms. The weighted average ratio of general expenses relative to sales increased about 2ppt, whereas it increased some 6ppt for the unweighted average.

Similar behavior is observed for labour costs. The crisis years saw an increase in labour costs for all firms, but the increase was again higher for smaller firms. In this case, the timing also shows some differences between large and small firms. Large firms initiated a process of decreasing labour costs in 2009, whereas small firms delayed this process to 2013. Most of the rise in labour costs is due to the increase in the open-ended component. After 2010, large firms initiated a reduction of the permanent component that was not matched by smaller firms until 2013. On the contrary, the share of costs that can be attributed to temporary workers decreased relative to output slightly more for small firms relative to what was observed for large firms between 2007 and 2010. Finally, financial expenses increased slightly between 2007 and 2009, initiating a process of continuous

reduction that accelerated between 2011 and 2012. After 2013, during the recovery years, both the weighted and the unweighted average ratio of materials and temporary labour costs to turnover recovered slightly, more so for the latter. On the other hand, general expenses decreased and so did the labour share. Financial expenses over sales fell more than 1ppt for all firms. Similar patterns were shared in qualitative terms by all sectors.

Summing up, it appears as though small firms experienced problems containing the sharp rise in labour costs and in general expenses relative to large firms during the first few years of the crisis. This is consistent with evidence provided by Bertola *et al.* (2010), which argues for the difficulties of small firms to use internal flexibility measures to reduce costs. In this context, small firms were forced to increase markups in order to alleviate the fall in profits following the reduction in sales. To provide a more formal check of the aforementioned patterns, we run the following regression:

$$\ln \left(\frac{\mu_{is,t}}{\mu_{is,t_0}} \right) = \beta_0 + \beta_1 \Delta \alpha_{is,t_0}^t + \beta_2 FinStress_{is,t_0} + \lambda_j + \varepsilon_{ist}$$

In this equation, the dependent variable is the log difference in the firm-level markups of firm i from sector s between years t_0 and t , $\Delta \alpha_{is,t_0}^t$ is the log change in the share of total sales of the firm represented by fixed inputs (including financial expenses, labour costs and other general expenses), and $FinStress_{is,t_0}$ is a dummy variable indicating if the firm is under financial distress (identified as a point in time in which financial expenses are greater than profits). We explore three sub-periods: pre-crisis (2004-2007), crisis (2007-2013), and recovery (2013-2016). To capture time-invariant industry-specific characteristics that are common across firms, we control for industry fixed effects, λ_j .

	(1)	(2)	(3)
	2004-2007	2007-2013	2013-2016
$\Delta \alpha_{is,t_0}^t$	0.6298*** (0.0276)	0.6033*** (0.0242)	0.5793*** (0.0225)
$FinStress_{ist}$	0.0326*** (0.0076)	0.0434*** (0.0088)	0.0015*** (0.0054)
R^2	0.23	0.24	0.20
# Obs.	173147	149076	237179

Table 1: Relationship between markup, average costs and financial stress. All standard errors (in parentheses) clustered by 4-digit industry. Significance: * = 10%, ** = 5%, *** = 1%.

Table 1 shows the results. We find a statistically significant relationship between the change in the markup and the change in the share of fixed inputs at the firm level for all three sub-periods of analysis: those firms who increased the share of fixed inputs over sales the most saw, on average, an

increase in their markups. Moreover, markup changes are also positively correlated with financial stress, consistent with the idea that those firms that are most financially constrained also increased their markups in order to reduce the effects of increased costs onto their profits.

3.4 Consequences for Market Shares and Firm Exit

In the previous section we have shown how different firms within a particular market (defined as the 4-digit industry) set different markups during the recession. If we were to understand markups as reflecting market power, those firms that were setting higher markups between 2007 and 2013 should have lost market share in their sector. To test this explanation, Figure 8 plots the sales share of the 10 largest firms within a 4-digit industry, averaged across all industries. The evidence clearly reflects a sharp rise in concentration between 2007 and 2013, followed by a period of decreasing concentration during the recovery. Figure B.4 (in the Appendix) shows that this pattern occurred across most branches of activity.

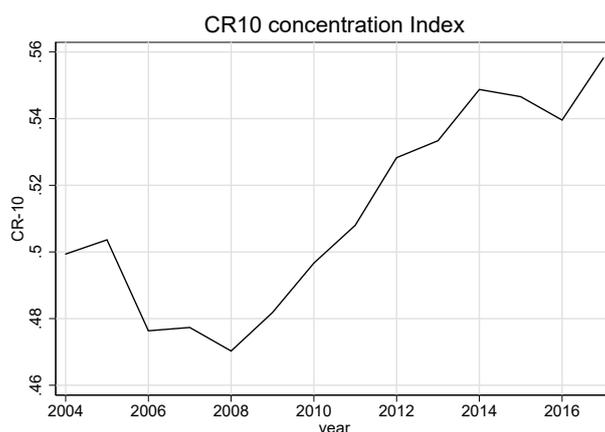


Figure 8: Evolution of the average concentration ratio of 10 largest firms within each 4-digit sector over time.

This result might justify the different pattern of growth observed in Spain (and in other Southern European countries) during the previous expansionary period (1995-2007). As documented in García-Santana *et al.* (2019) and Gopinath *et al.* (2017), misallocation of resources increased during the expansionary period and unproductive firms were gaining share. Our results would relate that particular increase in the share of unproductive firms with the relative decrease of markups of small firms in a period of economic expansion, and hence overall decrease of average costs. As an alternative strategy, firms might have decided to exit the market. Figure 9 plots the entry and exit rates in the Spanish economy during this period. There is an increase in exit rates in 2009 from

slightly above 4% to 8%. During the remainder of the crisis and the recovery periods, exit rates have been steadily declining at a low pace.

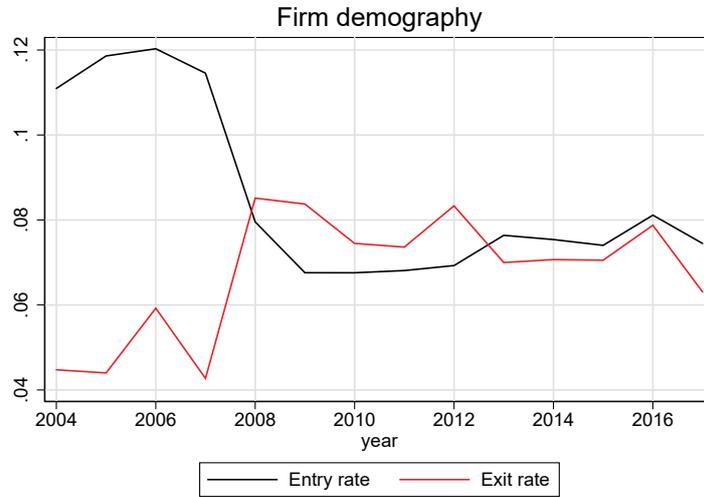


Figure 9: Evolution of entry and exit rates

To analyze the contribution of exits to markups compared to the importance of the reallocation of resources among heterogeneous firms, we may decompose the change in markups $\Delta M_t \equiv M_t - M_{t-1}$ as follows:

$$\begin{aligned}
 \Delta M_t = & \underbrace{\sum_i \omega_{i,t-1} \Delta \mu_{it}}_{\text{within}} + \underbrace{\sum_i \left(\mu_{i,t-1} \Delta \omega_{i,t} + \Delta \mu_{i,t} \Delta \omega_{i,t} \right)}_{\text{reallocation}} \\
 & + \underbrace{\sum_{i \in \mathcal{E}_t} \omega_{it} (\mu_{it} - M_{t-1})}_{\text{Entry}} - \underbrace{\sum_{i \in \mathcal{X}_t} \omega_{i,t-1} (\mu_{i,t-1} - M_{t-1})}_{\text{Exit}}
 \end{aligned}$$

where \mathcal{E}_t is the set of firms active in t and inactive in $t - 1$ (i.e. entering firms), and \mathcal{X}_t is the set of firms active in $t - 1$ and inactive in t (i.e. exiting firms). This equation decomposes the evolution of markups into the contribution of new entrants, firms that exit the market and incumbents. At the same time, this latter component is split between the change in markups of incumbents keeping constant their initial weight in the sales distribution (within effect) and the change in markups attributed to changes of those shares (between, or reallocation, effect). Figure 10 shows the minor contribution of business demography to the evolution of markups during the period 2004-2017 compared to the between and within components. Entry rates contribute positively to

the increase in markups during this period despite the recent low entry rates, but in magnitude this contribution is negligible. On the other hand, exit rates have a nil effect on markups. As it was argued in Section 3.1, during the Great Recession the increase in the average markup was led by the rise of markups of small unproductive firms, despite the fact that they were losing weight in the sales distribution.

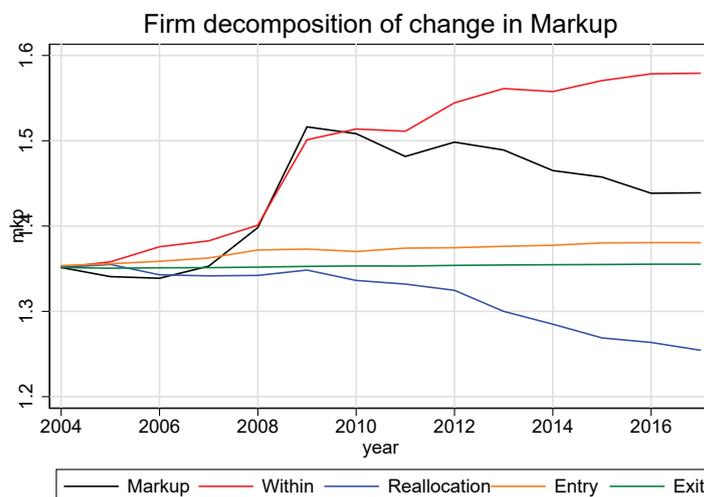


Figure 10: Decomposition of the change in markups in within, between, entry and exit components.

4 Conclusion

Using firm-level data for Spain from a representative sample of all firms and all input types, this paper documents that markups are higher and increased during the Great Recession for small firms compared to their larger competitors in the same sector. By studying the structure of costs of those firms, we conclude that this is the case because the labour share and overhead costs over sales are much higher for small firms than for larger firms in Spain. Hence, these firms set higher markups to compensate for higher average costs and increased them during and in the aftermath of the crisis because of their inability to gain efficiency by other means. The increase of relative markups by small firms came at a cost of losing market share, with a reallocation of resources to more productive firms that were able to gain in efficiency terms setting lower markups. In this respect, large firms may have been able to reduce costs via the renegotiation of contracts with their suppliers, or by making more flexible arrangements with their workers.

Through the lens of our analysis, the different results found for the United States by DeLoecker *et al.* (2020) and Gutiérrez and Philippon (2017a), among others, may be rationalized by Southern

European firms being smaller on average and operating in more frictional labour markets. Those characteristics might make Southern European firms less prone to increases in efficiency terms after a recessionary shock. On the other hand, those characteristics might have made it harder for those firms to benefit from technological progress and globalization, as it may have happened with the American superstars.

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APPENDIX

A Different markups specifications

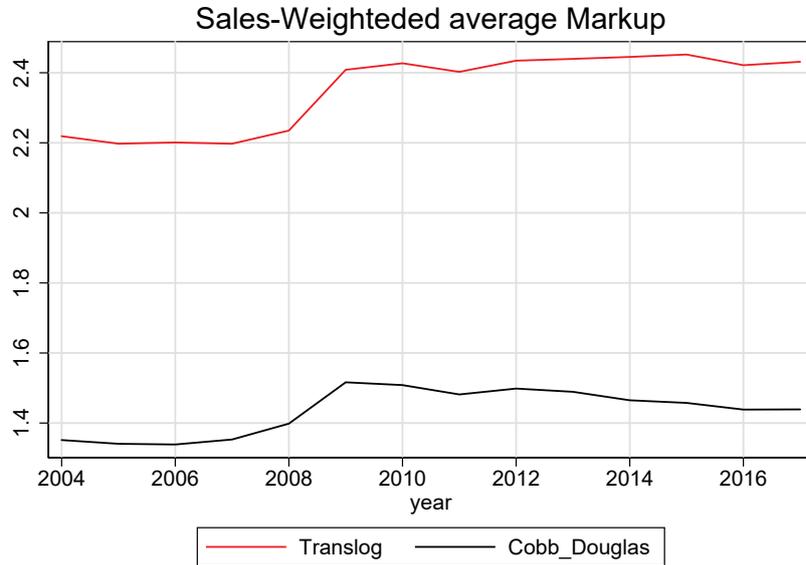


Figure A.1: Sales-weighted markup under different production function specifications. The translog production function is: $q_{it} = \beta_l l_{it} + \beta_m m_{it} + \beta_k k_{it} + \beta_{ll} l_{it}^2 + \beta_{mm} m_{it}^2 + \beta_{kk} k_{it}^2 + \beta_{lm} l_{it} m_{it} + \beta_{lk} l_{it} k_{it} + \beta_{mk} m_{it} k_{it} + \omega_{it} + \epsilon_{it}$.

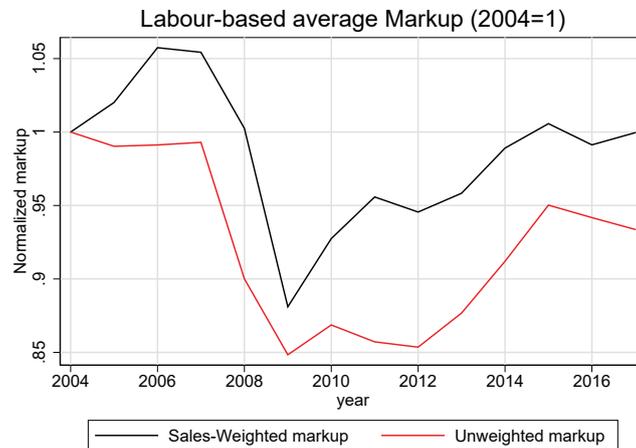


Figure A.2: Sales-weighted markup relative to labour input. Legend: [Red] Unweighted markup ($\bar{\mu}_t$); [Black] Sales-weighted markup (M_t)

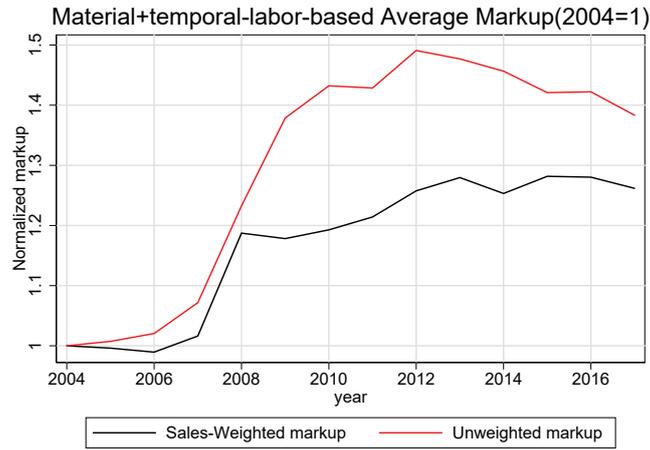


Figure A.3: Sales-weighted markup relative to material and temporary labour inputs. *Legend:* [Red] Unweighted markup ($\bar{\mu}_t$); [Black] Sales-weighted markup (M_t)

B Additional Figures

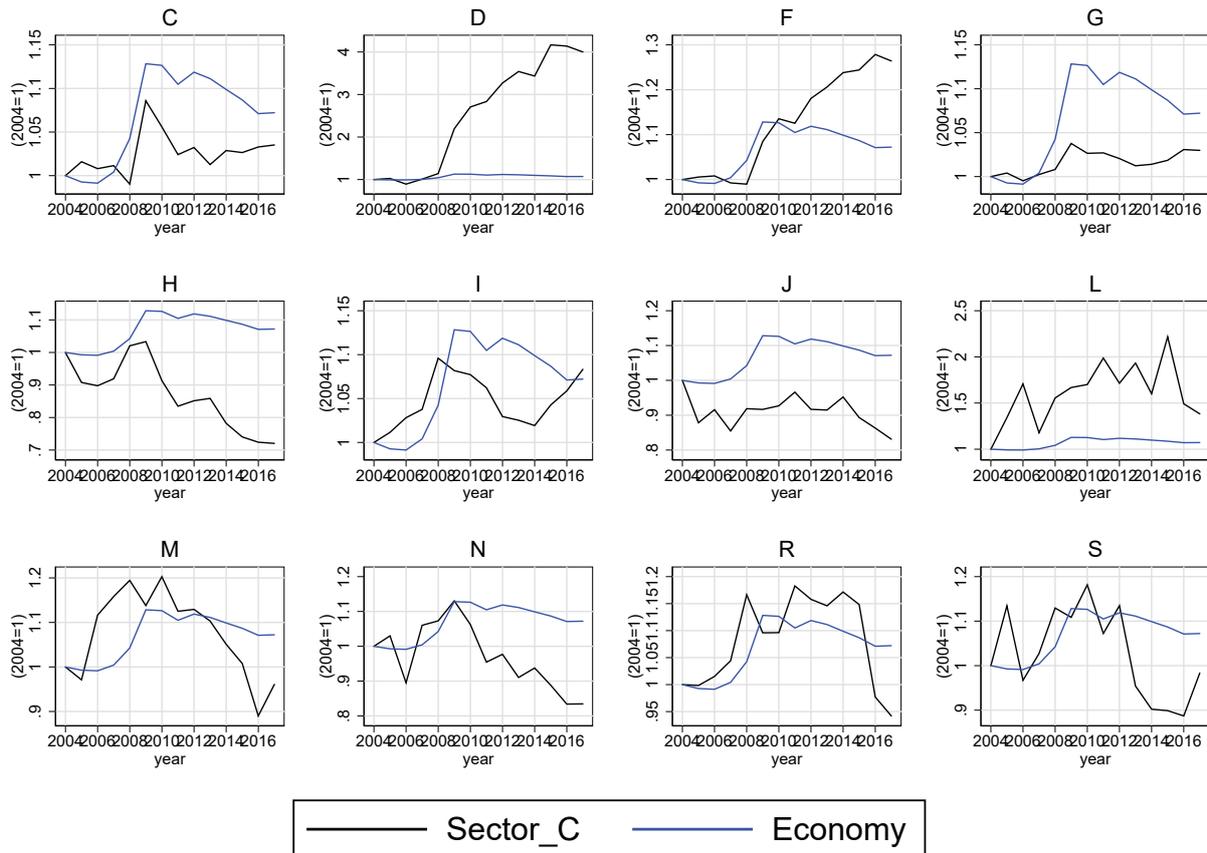


Figure B.1: Sales-weighted average markup (2004=1), by sector: C “Manufacturing” D “Supplies” F “Construction” G “Retail Trade” H “Transportation” I “Accommodation” J “IT” L “Real Estate” M “Technical and Professional Activities” N “Administrative Activities” R “Recreational Act.” S “Other Services”

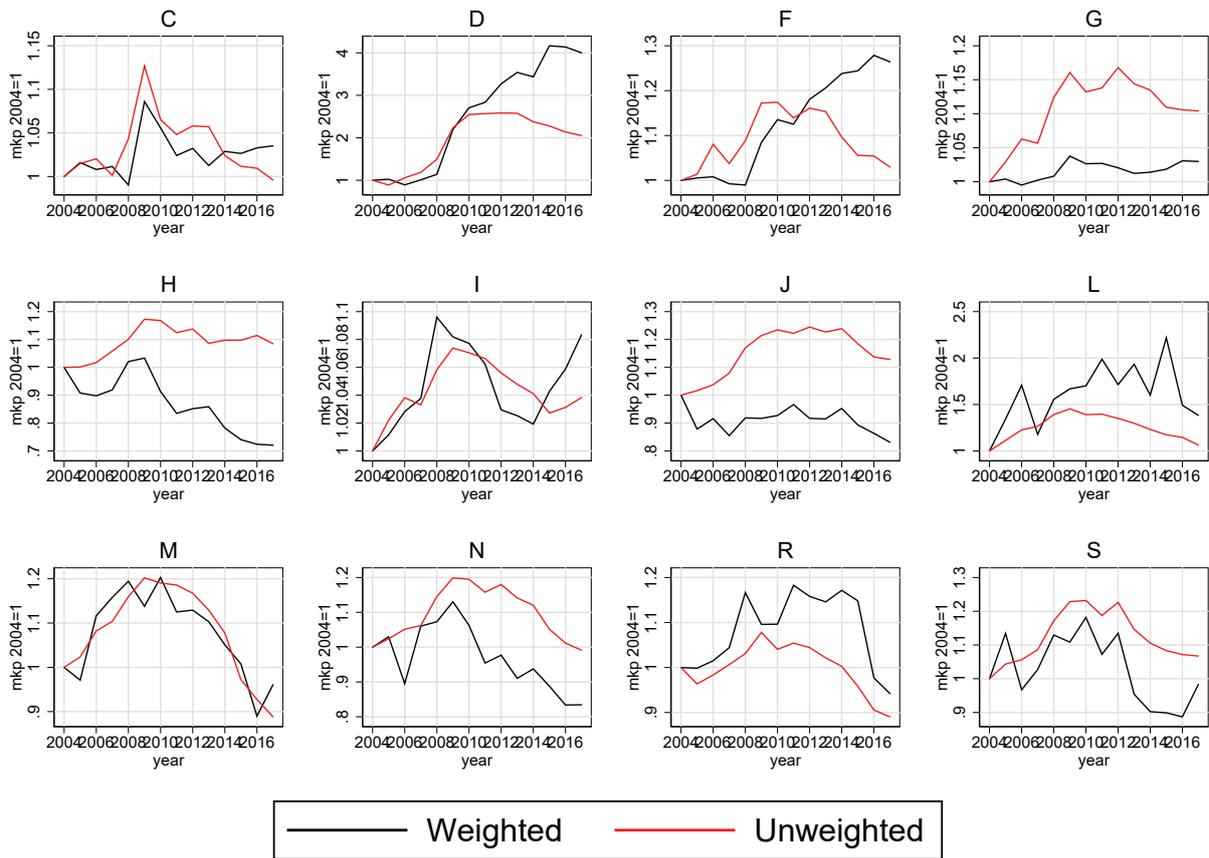


Figure B.2: Sales-weighted and unweighted markup (2004=1), by sector: C “Manufacturing” D “Supplies” F “Construction” G “Retail Trade” H “Transportation” I “Accommodation” J “IT” L “Real Estate” M “Technical and Professional Activities” N “Administrative Activities” R “Recreational Act.” S “Other Services”

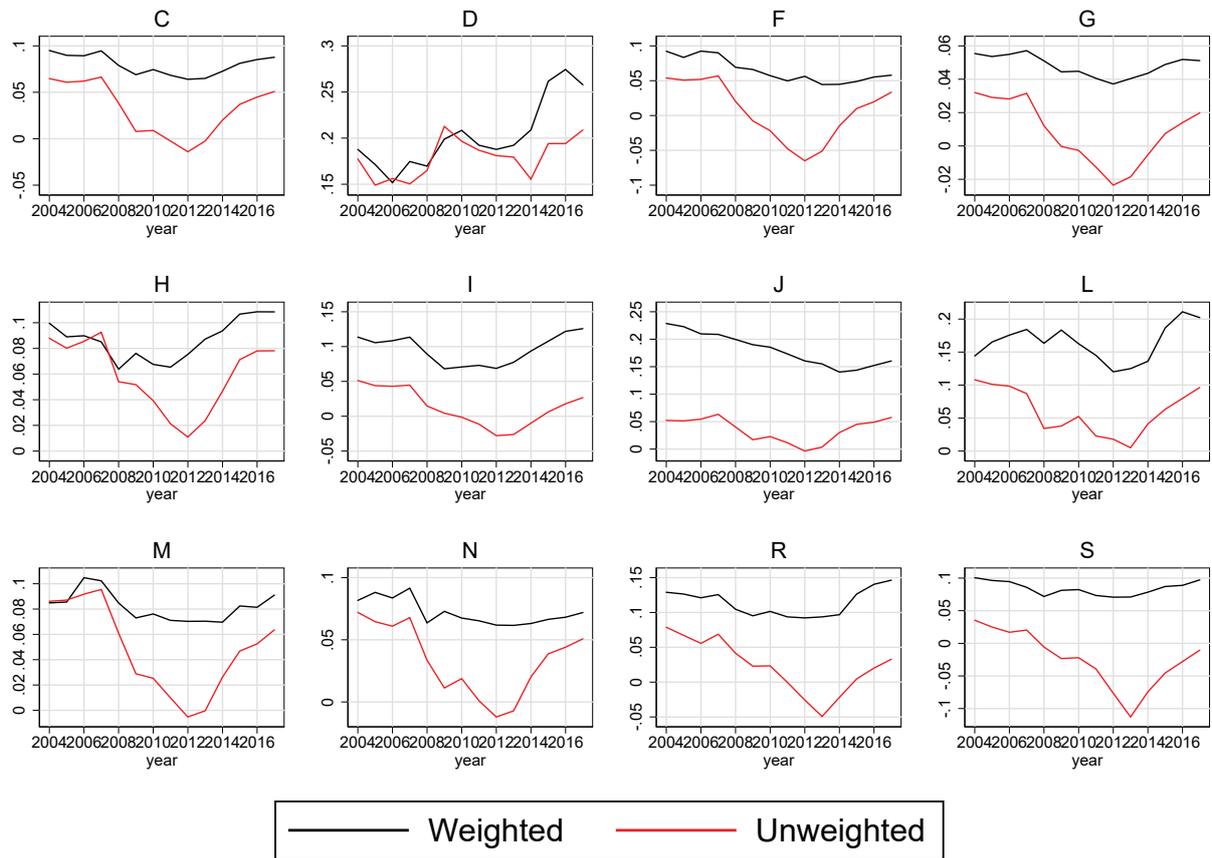


Figure B.3: Weighted and unweighted EBITDA share (2004=1), by sector: C “Manufacturing”
D “Supplies” F “Construction” G “Retail Trade” H “Transportation” I “Accommodation” J
“IT” L “Real Estate” M “Technical and Professional Activities” N “Administrative Activities”
R “Recreational Act.” S “Other Services”

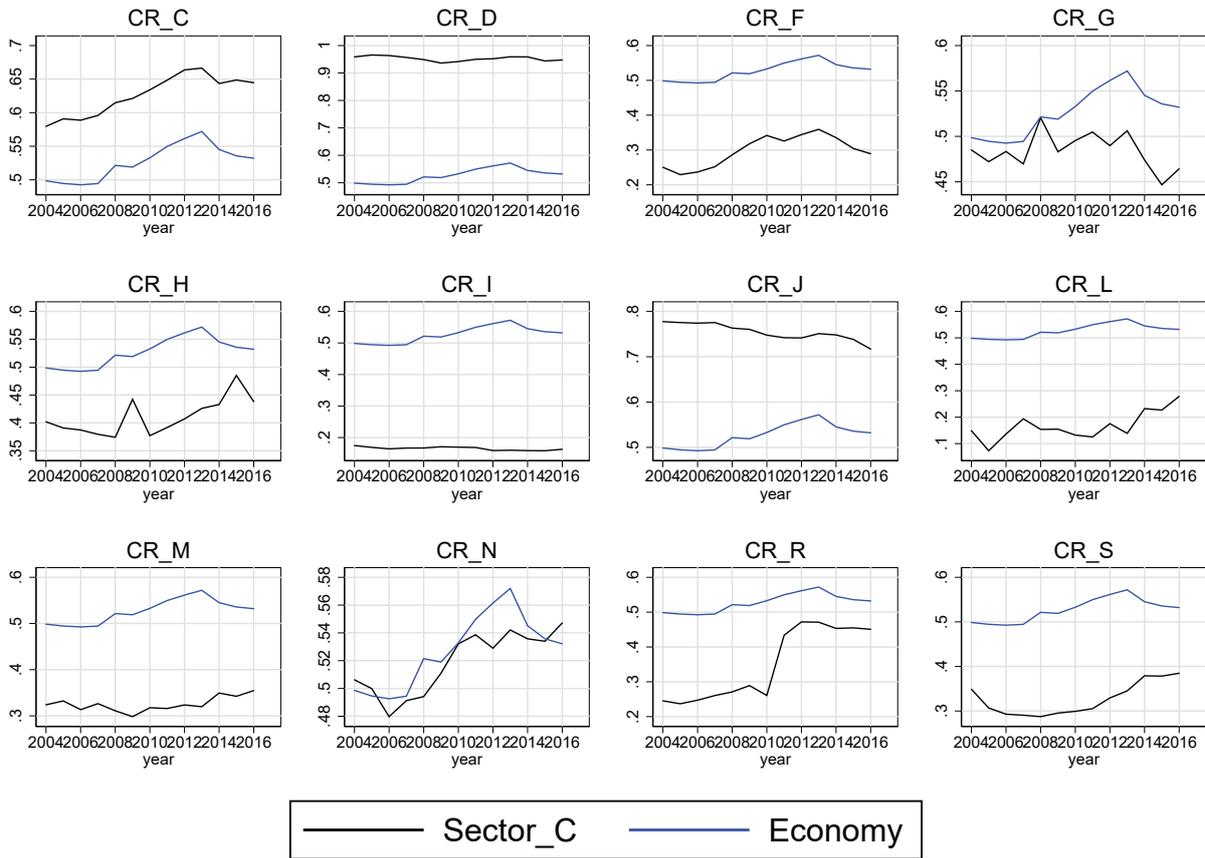


Figure B.4: Concentration ratios of 10 largest firms, by sector (2004 = 1): C “Manufacturing”
D “Supplies” F “Construction” G “Retail Trade” H “Transportation” I “Accommodation” J
“IT” L “Real Estate” M “Technical and Professional Activities” N “Administrative Activities”
R “Recreational Act.” S “Other Services”

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