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2014

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Documentos de Trabajo
N.º 1407

BANCO DE ESPAÑA
Eurosistema

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(*) We wish to thank Paloma López-García for her help in the initial stages of this research project. The paper has benefited from useful comments from Óscar Arce, Pablo Hernández de Cos, an anonymous referee and seminar participants at the Banco de España. The opinions and analyses in this paper are the responsibility of the authors and, therefore, do not necessarily coincide with those of the Banco de España or the Eurosystem. Please address comments to jmontero@bde.es or to aurtasun@bde.es.

Documentos de Trabajo. N.º 1407
2014

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ISSN: 1579-8666 (on line)

Abstract

This paper explores the dynamics of price-cost mark-ups using firm-level data, paying particular attention to the crisis period 2008-2011. To this end, we apply the econometric framework developed by Klette (1999) to a comprehensive sample of Spanish non-financial corporations in order to estimate price-cost mark-ups for the period 1995-2011 at the aggregate and sectoral levels. The results reveal a widespread pattern of increasing price-cost mark-ups since 2008, both by industry and firm size. Moreover, with the aim of interpreting the pattern identified in our findings, we also relate the changes in our industry-level estimates of price-cost margins between 2007 and 2011 to some relevant industry characteristics suggested by the literature, with an emphasis on the extent of market power and of financial pressure. We find a positive and statistically significant association between the growth rate of estimated mark-ups and both our direct measure of market power and our proxy of financial pressure.

Keywords: mark-ups, returns to scale, production function, market power, financial pressure, GMM estimator, rolling regression.

JEL Classification: C23, C26, D24, E31, L11, L16.

Resumen

Este documento analiza la evolución dinámica de los márgenes precio-coste utilizando microdatos de empresas y prestando una atención particular al período de crisis (2008-2011). Con este fin, se emplea el modelo econométrico desarrollado por Klette (1999) para estimar los márgenes precio-coste marginal a partir de una muestra muy amplia y representativa de sociedades no financieras españolas para el período 1995-2011, tanto a nivel agregado como por ramas de actividad y por tamaños de empresa. Los resultados de las estimaciones revelan un patrón creciente de los márgenes precio-coste bastante generalizado a partir de 2008, tanto por sector como por tamaño de empresa, tras una etapa previa de relativa estabilidad. Además, con el objetivo de interpretar dicho patrón creciente, se han estimado unas regresiones sencillas, que relacionan el cambio entre 2007 y 2011 en los márgenes empresariales en el ámbito del sector a dos dígitos con algunos determinantes sugeridos por la bibliografía económica, con un énfasis especial en los derivados del poder de mercado y de las tensiones financieras. Los resultados de este ejercicio de estimación muestran que existe una relación positiva y estadísticamente significativa entre la tasa de variación de los márgenes estimados y las medidas que aproximan el poder de mercado y el grado de presión financiera en cada rama de actividad.

Palabras clave: márgenes precio-coste, rendimientos a escala, función de producción, poder de mercado, presión financiera, estimador GMM, *rolling regression.*

Códigos JEL: C23, C26, D24, E31, L11, L16.

1 Introduction

The study of the behavior of price-cost margins is central in industrial organization and in competition economics, but also, in no less amount, in macroeconomics, as it plays a key role in a number of theoretical models that are at the heart of modern macroeconomics. How markups move, in response to what, and why, is crucial to understand how different shocks are transmitted through the pricing mechanism – or in other words, through the dynamics of inflation –. Even though it is a challenging task trying to measure and explain the evolution of an aggregate markup – whether at an industry- or country-level –, this paper tries to contribute to this understanding by applying a well known microeconomic structural framework (Hall's approach) to the recent Spanish experience.

Besides estimating price-cost margins, in this paper we will study the behavior of this variable through the lens of the adjustment process followed by the Spanish economy. After a decade of strong economic growth and capital inflows, Spain accumulated large and closely interconnected external and internal imbalances, in particular, very high domestic and external debt levels. The adjustment process to these imbalances is on-going but not completed yet, and it mainly requires that Spain moves towards persistent current account surpluses to reduce its stock of net external liabilities. Currently most of the shift of resources towards the tradable sector is being facilitated by improvements in cost competitiveness driven by adjustments in unit labor costs (ULC), while price-cost margins seem to be lagging behind, as approximated, for instance, by the profit share of non-financial corporations –defined as the ratio of gross operating surplus over gross value added–. Figure 1.1, which displays this variable calculated with data from National Accounts, reveals that the profit share increased notably since 2008, despite the deep economic crisis in Spain. Although this evidence is suggestive, it has to be recalled that this proxy is subject to several caveats.

Hence, in order to study the behavior of price-cost markups this paper descends to the level where they are determined, i.e. the firm level, and follows the econometric framework laid out in Klette (1999) – who draws from Hall (1988, 1990) – for the estimation of price-cost markups using a panel of firm-level data. One of our contributions is to estimate the econometric model on a comprehensive panel of firms' accounting information covering most of the non-financial corporate sector over the period 1995-2011 from the Central Balance Sheet Data Office of the Banco de España.[1] This data set allows us an extensive analysis of the dynamic behavior of price markups across several dimensions, notably, industry and size. An additional novelty is to employ rolling regression techniques in order to attain temporal variability in estimated markups. Our estimates reveal a common pattern in the performance of Spanish firms' price-cost markups across industries and size categories – with some subtle differences to be discussed below – consisting of a significant increase of estimated markups since 2007, after a rather stable period oscillating around 1.20. This fact suggests that there must be some common factors explaining this behavior of markups, in particular during the recent crisis period.

In order to examine likely explanations of the estimated dynamic performance of price-cost margins during the period 2008-2011, we use a simple regression framework. In

1. Most papers using similar conceptual frameworks only focus on manufacturing firms, such as Klette (1999), De Locker and Warzynski (2012) or Cassiman and Vanormelingen (2013) for the case of Spain. See Siotis (2003), in the case of Spain, for an exception.

this empirical exercise, we regress the (log) change in estimated markups for each industry between 2007 and 2011 against a set of (industry-level) explanatory variables that account for some of the main determinants identified in the literature. Among these driving factors, we pay special attention to two of them that we believe are particularly suited to the Spanish case. The first one is related to the high degree of financial pressure faced by Spanish firms, in terms of both high levels of corporate leverage and tight financing conditions. In these circumstances, as already advanced, *inter alia*, by Chevalier and Scharfstein (1996) and Gilchrist *et al.* (2013), firms may be driven to set relatively high margins, even in the face of weak demand, in order to be able to meet their ongoing financial commitments, as well as to build buffers of internal funds to finance investment projects. Our paper thus makes another contribution to the existing empirical literature examining the role of financial frictions on the cyclicality of markups.

The second one is connected with the fact that some industries in the Spanish economy are frequently characterized by a relatively low degree of product market competition. Further, the current economic meltdown has brought about a large increase in the pace of business destruction, along with a notable sluggishness in business formation –see below–. This has resulted in a significant reduction in the number of competitors, which may have enhanced surviving firms' market power. In this context, these firms would be able to charge larger markups despite being faced with a declining demand.

As it turns out, we find compelling evidence in favor of both hypotheses. Firstly, it is estimated a fairly robust positive and statistically significant association between our direct measure of market power (the level of markups in 2007) and the growth rate of estimated markups between 2007 and 2011. As regards the other variable of interest, we also find a quite strong positive, and statistically significant, relationship between our preferred measure of financial pressure – the debt ratio – and the growth rate of markups.

The rest of the document is organized as follows. Section 2 spells out the empirical approach, which is based on Klette (1999). Section 3 presents the main characteristics of the database and the variables used. Next, in Section 4 we provide the estimates for the price-cost markups. In Section 5 we relate the estimated markups to a few industry characteristics in order to explain their increase in the crisis period. Finally, Section 6 gives some concluding remarks.

2 Empirical Strategy

We introduce an empirical model to obtain firm-level markups relying on standard cost minimization conditions for variable inputs free of adjustment costs in a Neoclassical setting. This is, essentially, the approach developed by Robert Hall in successive papers (1986, 88, 90), and which is the basis for many papers trying to estimate price-cost markups relying on microdata from accounting information. One of those papers is Klette (1999), which we will follow because it presents several advantages over the standard Hall's approach – as it will be discussed below –.

At a firm level, the appropriate model of production relates gross output (Y) to primary inputs of capital (K) and labour (L), as well as purchased intermediate inputs (M). We assume that all firms can use the following Neoclassical production function:

$$Y_{it} = T_{it} F_t(K_{it}, L_{it}, M_{it}) \tag{1}$$

where t denotes time and i is the firm's subscript. The stock of capital may be a dynamic input of production, while T_{it} represents a firm-specific productivity factor and the function $F_t(\cdot)$ can change freely between years. In other words, the model does not impose restrictions on the form of technical progress, which can be factor augmenting. We further assume that the function $F_t(\cdot)$ is homogeneous of degree γ in all inputs. Klette (1999) proposes to derive a log-linear approximation of equation (1) around a point of reference by using a generalized mean value theorem, instead of a Taylor approximation. This point of reference can be thought of as the representative's firm level of output and inputs for each year and sector of activity.[2] Then, it can be derived the following expression:

$$\hat{y}_{it} = \bar{\varepsilon}_{yk,it}\hat{k}_{it} + \bar{\varepsilon}_{yl,it}\hat{l}_{it} + \bar{\varepsilon}_{ym,it}\hat{m}_{it} + \hat{t}_{it} \tag{2}$$

where lower case letters with a hat represent the log-deviation from the reference point of the corresponding upper case variable (e.g. $\hat{y}_{it} = \ln\left(\frac{Y_{it}}{Y_{0t}}\right)$); and $\bar{\varepsilon}_{yj}$ represents the output elasticity of factor J ($J = K, L, M$) evaluated at an internal point between J_{it} and the reference point J_{0t}.

Several comments are required as regards the benefits of this particular theoretical framework. Firstly, in the empirical specification the reference point usually chosen is the median firm within the industry in each year, either for the output or for the inputs. This choice has several advantages, such as for instance allowing for unrestricted technical change by changing the reference point year by year. But the main advantage of this approach is that it can be avoided the difficulty of obtaining appropriate deflators, as the standard source of data is firms' accounting information in nominal values, but such deflators are usually available at the industry level, which are frequently contaminated by noise and do not reflect the large heterogeneity across firms within a sector. This way we avoid introducing an additional estimation bias derived from using industry-level deflators,[3] as we will be assuming that the

2. See Klette (1999) for all the details.

3. As Klette and Griliches (1996) show, the use of industry-wide deflators results in estimated parameters in a production function setting that are mixtures of supply- and demand-side coefficients, and thus are biased. In particular, they show that within a fairly conventional demand-side modeling, the elasticity of scale tends to be downward biased (below one), which, given expression (8) below, would be transmitted to the estimated markup.

markups in equation (7) are constant across firms in the same sector of activity (see below). The error term in this equation will thus capture differences in the markup and scale parameters across firms [see Klette (1999)], which will motivate, along with the endogeneity of productivity, the use of instrumental variables estimation methods.

Secondly, equation (2) is a relationship in terms of cross-sectional differences in output and inputs between firms, and such differences can be of a magnitude of several hundred percent in many industries. Under these circumstances, a Taylor approximation might be problematic, but the mean value theorem provides an approximation more robust and suitable for samples with any magnitude of cross sectional differences.[4]

As we allow the stock of capital to be a quasi-fixed input of production, we make use of the Euler's Theorem for homogeneous functions to replace the output elasticity of capital in expression (2), since it ensures that there is a close relationship between the degree of returns to scale and the output elasticities of productive inputs:

$$\bar{\gamma} = \bar{\varepsilon}_{y,k} + \bar{\varepsilon}_{y,l} + \bar{\varepsilon}_{y,m} \tag{3}$$

We now assume that all producers active in a market are cost minimizing and, further, that they are price-takers in input markets.[5] Then, it can be shown that the following first-order condition holds for any variable input –free of adjustment costs–:

$$w_{j,t} = MC_t \cdot F_{t,j}(t) \tag{4}$$

where $w_{j,t}$ denotes the price for input j at time t, MC_t the marginal cost and $F_{t,j}(t)$ is the partial derivative with respect to input *j* at time t. It is important to remark that expression (4) holds for all variable factors of production and that we assume that the stock of capital (K) is a quasi-fixed input of production.

A final step to obtain an equation for the price-cost markup (μ_t) is to define it as the ratio between the price of output (P_t) and the marginal cost of production:

$$\mu_t \equiv \frac{P_t}{MC_t} \tag{5}$$

It has to be noticed that this definition of the markup is consistent with many price setting models, both static and dynamic, and does not depend on any particular form of price competition among firms. It is important to realize, however, that equation (5) allows us to identify the markup from the difference between price and marginal cost, but this does not mean anything in terms of equilibrium. In equilibrium, markups will be determined depending on the specific model of competition and strategic interaction between firms.

Hence, by combining equations (4) and (5), and with a bit of algebra, we can derive the following relation:

$$\mu_t = \frac{\bar{\varepsilon}_{j,t}}{\bar{s}_{j,t}} \tag{6}$$

4. See Klette (1999) for a deeper discussion of this point.

5. The subsequent derivation would also be consistent with a right-to-manage bargaining framework, as shown by Dobbelaere and Mairesse (2011).

where $\bar{s}_{j,t}$ measures the share of input *j*'s expenditure on total revenues (e.g. w_jJ/P_yY for j = L, M in this case). This expression is crucial to the identification of the markup and, along with equation (2), forms the basis for the estimation of markups in many approaches. In particular, the combination of both equations results in an empirical specification that allows one to obtain average estimates of both the markups of price over marginal cost and the elasticity of scale and which is quite standard in the literature:

$$\hat{y}_{it} = \mu_{it} \cdot \left(\bar{s}_{yl,it}(\hat{l}_{it} - \hat{k}_{it}) + \bar{s}_{ym,it}(\hat{m}_{it} - \hat{k}_{it})\right) + \gamma_{it} \cdot \hat{k}_{it} + \hat{t}_{it} \quad (7)$$

Basically, this relationship, together with some stochastic assumptions to be presented below, provides the empirical specification to be estimated. Thus far, the set of assumptions imposed on technology and firms' behavior has been minimal and fairly general. This model is consistent with non-constant returns to scale –one of the main criticisms received by the early Hall's papers– and with the presence of market power, and would be consistent with a fair amount of game theoretic pricing decisions. It also allows for the possibility of quasi-fixed factors of production (capital, in our case).

However, as stressed by Crépon *et al.* (2005) and Dobbelaere and Mairesse (2011), many papers find it difficult to identify and estimate both the elasticity of scale and the markup within this framework. To see why this is the case, notice that under cost minimization and appealing to Euler's Theorem for homogenous functions, the degree of returns to scale (γ) equals the ratio of average to marginal cost. Simple algebra shows that there is a tight link between the markup of price over marginal cost, the average profit ratio (*P/AC*) and returns to scale:

$$\gamma = \frac{AC}{MC} = \left(\frac{P}{MC}\right) \cdot \left(\frac{AC}{P}\right) = \mu \cdot (1 - s_\pi) \quad (8)$$

where s_π is the share of pure economic profits, i.e., profits attained in excess of the remuneration of productive inputs.[6] This expression will allow us to obtain an estimation of the share of pure profits, once we have estimated the elasticity of scale and the markup. Equation (8) also tells us that the source of profits lies in either imperfect competition or decreasing returns to scale.

The problem of jointly estimating both parameters is worsened when we try to obtain time-varying estimates, because of the smaller sample used for each regression. Thus, in order to avoid being too demanding of the dataset and of the empirical framework that we use, we prefer to fix the elasticity of scale to some predetermined value and then check the robustness of our results to such choice. To that end, we will choose the degree of returns to scale so as to be consistent with the long-run properties of our conceptual framework. In the long run, when pure profits should be close to zero with free entry, the markup should be close in value to the scale parameter. Given that diminishing returns would imply that firms consistently price output below marginal cost, which makes no economic sense, this entails that firm-level returns must be either constant or increasing in the long run. We will assume slightly increasing returns to scale (i.e. γ=1.1), in accordance with the aggregate evidence

6. This can be seen by defining total costs as *c(w,y)* and pure profits as *π=py-c(w,y)*. Then, it follows that $s_\pi = \frac{\pi}{py} = 1 - \frac{c(w,y)}{py} = 1 - \frac{AC}{p}$

presented in Appendix A, but the robustness of our results to this assumption will be checked, as we explain below.

An additional step to close the econometric model is to make the appropriate assumptions for the term $\hat{t}_{it}$ in equation (7), which represents the firm's productivity relative to the reference firm. As productivity differences tend to be highly persistent over time[7], it makes sense to assume the following error structure:

$$\hat{t}_{it} = t_i + u_{it} \tag{9}$$

where t_i is treated as a fixed effect, and thus is allowed to be freely correlated with all the variables in equation (7), while u_{it} is a random error term representing transitory and idiosyncratic differences in productivity with the usual properties.

And finally, we will assume that the markups in equation (7) are constant across firms in the same sector of activity and, as we mentioned above, an elasticity of scale of 1.1 for all firms. Therefore, as we already pointed out, the error term will have a component measuring the differences between the firm-specific parameter and the common one.

In this setting, it is obvious that equation (7) cannot be estimated with OLS methods because of a problem of endogeneity between productivity shocks and input demand and because of the homogeneity imposed on the markup parameter. Given the difficulty in finding good "external" instrumental variables in a context of a firm-level production function, a natural estimator to use is the GMM estimator. Thus, we choose the GMM difference estimator (Arellano and Bond, 1991), in which first differences of the variables are taken to eliminate the time-invariant effects and then appropriate lagged levels of the regressors are used as "internal" instruments for their first-differences. In particular, we assume that all productive factors are predetermined with respect to idiosyncratic productivity shocks (u_{it}) so that instruments lagged t-2 and earlier are assumed (and tested) to be valid for the equation in first differences.[8] Finally, note that the predeterminedness assumption made for estimation implies that current shocks to firm's productivity (u_{it}) do have an effect on future input demand, which seems sensible at the frequency of yearly data considered here.

Lastly, some additional comments are needed in order to understand the type of estimation exercises that we are going to undertake in this paper. Because it is more important for us to have an idea of the dynamics of estimated markups than their precise point estimates, we have decided to present most of our results in terms of rolling regressions, whereby the equation (7) will be estimated using rolling windows of 4 years.[9]

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7. See the recent survey by Syverson (2011). There can be several explanations for this: firms may differ in the quality of its management, quality of labour, capital vintage, innovativeness, etc.

8. Of course, fixed effects t_i is not the only reason why productivity shocks can be correlated with lagged factor input variables. Another reason is the presence of serial correlation in u_{it}. This can be easily tested in the GMM framework.

9. For each new estimation subsample, a new year (t+1) of observations is included, and the first period (t-3) is removed, and therefore we can assign most of the difference in parameter estimates across windows to the new year included, as it accounts for roughly 25% of total observations. However, the lags (t-2, t-3, etc) of regressors that we use as instrumental variables can overrun the 4-year subsample period.

3 Data

We use a sample of non-financial firms covering almost all (two-digit) industries for the period 1995-2011 (see Table 3.1 for a list of sectors). The sample is based on firm-level information from the Central Balance Sheet Data Office (CBSO) of the Banco de España. These data are collected from two sources: first, a CBSO's own database elaborated from a yearly survey and balance-sheet information of firms collaborating on voluntary grounds[10] – which shall be called CBA –; and second, data from financial statements deposited yearly in official Firm Registries by all active companies – which we will label CBB –.[11]

One of the advantages of combining both databases is that we achieve a selection of firms reasonably representative of the population, as can be seen in Table 3.2, where we compare the shares of firms by both sector of activity and firm size. A second advantage is that we attain a sample with a very good coverage rate, potentially of over 50% of nonfinancial corporations' value added.[12]

Although the quality of the data is reasonably good as it passes numerous filters, we were very careful with outliers and/or incoherencies. In our study only operating firms with at least 1 employee throughout the year have been included,[13] and those which existed for less than 3 consecutive years were eliminated. We dropped all observations that did not report the required variables, as well as those with strange values, such as negative figures of employment, capital stock, sales or assets, or extreme ones.[14] After cleaning the data, we were left with an unbalanced panel of firms covering the period 1995-2011,[15] with information for a median (mean) of 7 (7.3) years of 347,317 firms (2,034,200 observations in total). The basic characteristics of this sample of firms are displayed in Table 3.3.

Output and inputs are measured relative to the median values for the industry to which the firm belongs. The industry median values are estimated separately for each year, which is required to allow the technology to change freely over time, as we mentioned above. As we also mentioned in Section 2, this method has the additional benefit of eliminating the need for deflating nominal variables.

The output variable is measured in gross terms, i.e. inclusive of intermediate consumption, while we take into account the presence of 3 productive inputs: capital, intermediate inputs and labour. Labour refers to the average number of employees in each

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10. The reporting firms fill in a questionnaire with detailed accounting information, as well as some other additional information on employment, breakdown of the workforce in terms of skills, type of contracts, spending on training or R&D expenditures. For a complete description of both CBA and CBB databases refer to the CBSO's Annual Report: http://www.bde.es/bde/en/secciones/informes/Publicaciones_an/Central_de_Balan/anoactual/ .

11. CBA+CBB data consists mainly of individual entrepreneurs, public corporations and limited liability companies. Self-employed workers are excluded.

12. In 2010, the last complete year available, the coverage rate was 52% of gross value added.

13. We thus remove so-called individual entrepreneurs.

14. We removed observations with extreme value added per unit of labour or extreme capital per unit of labour. Outliers were defined as deviations from the interquartile range exceeding 3 in absolute value for each year and each two-digit industry. We also dropped firms with excessive changes of employment, defined as those outside the percentiles p1 and p99, for each year and two-digit industry.

15. The coverage of 2011 is only partial with about 120,000 observations compared with about 172,000 observations on average for the period 2001-2010.

firm for each year, and materials refer to intermediate consumption. The capital stock is measured by the net book value of fixed assets, as reported in the firm's balance sheet.[16]

The theoretical framework presented in Section 2 includes the share of factor costs over the value of gross output ($\bar{\varepsilon}_{yj}$), evaluated at some internal point between the reference point (the industry-year median value) and the observed level of operation for the firm in question. We follow Klette (1999) and approximate these shares by taking the average value of the share for the observed firm and the year-industry median share.[17]

16. We are aware of the problems that this generates, because they are valued at historical prices, but this is the only proxy we have at our disposal. Moreover, it has the advantage of being based on direct information provided by the firm, in contrast with the approaches that use the perpetual inventory method, which rely on strong assumptions on estimates of industry-specific depreciation rates and user costs of capital.

17. This would be an exact approximation for a translog technology.

4 Estimates of markups

As we explain in Section 2, we will present the results from estimating equation (7) once we have fixed the elasticity of scale to 1.1. We have also repeated all the estimation exercises to be presented here using other values for the elasticity of scale, such as 0.8, 0.9, 1.0 and 1.2. We found that the results were unaltered in terms of the shape of the estimated markup over time. The only difference was with respect to its magnitude, with the following relationship: the larger the scale elasticity, the larger the estimated markup (see Appendix B).

Figure 4.1 shows rolling regression estimates of the average markup of price over marginal costs for the sample of all firms pooled together. As it can be seen, the estimated markup remained broadly stable around 1.2 until 2007, when it rises steadily towards 1.3 by 2011. This result would be consistent with the aggregate evidence shown in Section 1, where the profit share rose markedly since 2008. As we explain above, there is a close relationship between the markup, the elasticity of scale and the share of “pure” profits –see equation (8)–. We exploit this relationship in order to estimate the profit share implicit behind the estimated markup, which we plot in Figure 4.2.[18] The implicit share of aggregate economic profits is more volatile than the underlying markup and, moreover, it jumped more markedly, from about 6% of total revenue to about 15%.[19] Thus, it seems that, overall, Spanish businesses seem to be trying to improve their financial situation in the period 2008-2011. We will study below why this might be the case.

Next, we show in Figure 4.3 estimation results by size strata. Irrespective of their sector of activity, firms are pooled into the following groups by the average number of employees: 1-5; 6-9; 10-19; 20-49; 50-99; 100-249; 250-499; and over 500. The results show that, indeed, we can split firms into 3 groups because their estimated markups display a similar behavior within those groups. To be more specific, we can group firms for 1-19 employees – which we will label as “small firms”, see panels A-C in Figure 4.3 –, for 20-249 employees – or “medium-sized firms”, see panels D-F in Figure 4.3 –, and for over 250 employees – labeled as “large firms”, see panels G-H in Figure 4.3 –. This way, it is interesting to notice that initially all estimated markups tended to increase after 2007, but while markups for medium-sized firms continued rising, those for smaller and larger firms tended to fall back towards pre-crisis levels by 2011. In other words, the aggregate behavior detected in Figure 4.1 would be mainly driven by the estimated markups for firms between 20 and 250 employees.

Subsequently, we take into account the sectoral dimension. Since presenting and commenting results for all 57 industries considered would be a cumbersome process, we have pooled all firms by main aggregate sector of activity instead, i.e. primary sector, manufacturing industries, public utilities sector, construction, and market and non-market services (see left column, Table 3.1). Estimated markups at a 2-digit level (57 industries) will

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18. The standard deviation of the estimated profit share is computed using the Delta Method applied to equation (8).

19. This range is not unusual in this type of estimation exercises. For instance, if we compute the implied profit share in Klette’s Table II estimates, we would find a range between 4.7% and 13.5%. This is a good test of consistency between theory and practice which not all papers pass. The existence of large pure economic profits would not be consistent with a competitive market with free entry in the long run.

be used, however, in Section 5 below, when we try to ascertain the determinants of the increase in estimated markups after 2007.[20]

Results for the 6 main aggregate sectors of activity are reported in Figure 4.4, where one can see that, first of all, the dynamic behavior of estimated markups is quite similar across industries, except in the sector of utilities (see panel C in Figure 4.4).[21] Their performance is rather stable until 2007 – with the notable exception of the primary sector,[22] which is more volatile, see panel A –, and then there is a significant increase with a varying intensity across sectors. Besides, it is quite notable the degree of synchronization achieved by markups in the three main sectors of activity – market services, manufacturing and construction –, although the rise in price-cost margins since 2007 is lower in the construction sector (see panel D in Figure 4.4). Regarding the sector of utilities, the estimated markups remained relatively stable around 1.3 until 2007, and then they fell towards 1.1 by 2011.

As an additional remark, it has to be noticed that our estimated markups of price over marginal costs are in line with results in previous studies using firm-level data. For instance, for the case of Spain, and without the aim of being exhaustive, Cassiman and Vanormelingen (2013) find average markups of 1.32 (median margins of 1.20) for a sample of manufacturing firms during the period 1990-2008.[23] Fariñas and Huergo (2003) using the same database ("*Encuesta sobre Estrategias Empresariales*"), but a different time period (1990-1998) and methodology, estimates price-cost margins (adjusted for the business cycle) for manufacturing firms of between 1.03 and 1.18. Siotis (2003), on the contrary, employs the CBA database for the period 1983-1996, which is a sample with wider industry coverage – encompassing also the services sector –, although biased towards larger businesses. He estimates two(and three)-digit sectoral Lerner indexes ranging from 0.132 to 0.850, which correspond to price-cost markups in the range 1.15-6.67. This wide range is probably motivated by the small number of observations existing for some of the industries considered.

As regards the evidence for other countries, De Loecker and Warzynski (2012) report the median markup to be around 1.20-1.30 for Slovenian manufacturing firms, while Klette (1999) estimates small markups for a sample of Norwegian manufacturing firms, between 0.65 and 1.09. Dobbelaere and Mairesse (2011) use a panel of French manufacturing firms over the period 1978-2001 and estimate a bunch of price-cost markups that fall between 0.90 and 1.60.

Further, the numerous regressions estimated have been tested by means of the two more common specification tests used in the GMM setting, namely, the Hansen-Sargan test of overidentification and the AR(2) tests for first-differenced residuals, as suggested by Arellano and Bond (1991). In order to assess the results from these tests, it has to be taken into account how we decided our strategy for choosing the instrument set. Since we had to

20. In Appendix C we show estimated average markups for the 57 industries under study in two moments of time: 2001-2007 and 2008-2011. It can be observed that most 2-digit industries increased their price-cost margins in the latter period vis-à-vis the former one.

21. The utilities sector contains companies such as electric, gas and water firms and integrated providers, i.e. heavily regulated industries.

22. The primary sector of the economy extracts or harvests products from the earth, including the production of raw materials and basic foods. Activities associated with this sector include agriculture (both subsistence and commercial), mining, forestry, farming, grazing, hunting and gathering, fishing, and quarrying.

23. Indeed, these markups cannot be directly compared with ours because they are estimated using value added instead of gross output. Assuming a share of materials similar to the median share in our sample (around 0.60), their average markup would be 1.11 (median markup of 1.07).

estimate a considerable amount of regressions,[24] we faced a trade-off between simplicity and precision when choosing the appropriate set of instrumental variables. Because we are more interested in the dynamic behavior of price-cost markups than in their specific point estimate, we opted for the former.

Hence, we chose a common set of instruments across specifications. We restricted the instrument set to 3 variables: the stock of capital ($\hat{k}_{it}$), employment ($\hat{l}_{it}$) and intermediate inputs ($\hat{m}_{it}$). As we explain in Section 2.2, we assume – and test – that these variables are predetermined. As regards the number of lags to be used as instruments, we follow the literature and choose a low number (3 lags) in order to avoid overfitting and problems of weak instruments.

Figure 4.5 shows a scatter plot where each dot represents the p-values from the specification tests mentioned above for the 57 industry-specific estimation results for three different sample periods (1995-2000, 2001-2007 and 2008-2011). The vertical axis contains the p-value for the Hansen-Sargan test of overidentification, while the horizontal axis represents the p-value for the AR(2) tests for first-differenced residuals. The dashed lines are depicted at the 5% level. Given the homogeneity imposed in the set of instruments, the results can be regarded as quite reasonable. Most parameters tend to be in the upper-right quadrant, while few of them tend to fall in the lower-left quadrant.

Thus far, we have done a sort of descriptive exercise, trying to measure the markup of price over marginal cost. All in all, our estimation results show that, after a relatively stable period, there is a widespread pattern of increasing price-cost markups across industries and size categories – with some subtle differences – since 2007. This empirical regularity suggests that there must be some common factors explaining a good chunk of this behavior of markups during the recent crisis period. In the following section, we will provide some clues as regards why the estimated markups have risen so much in the latter period of the sample, paying special attention to common drivers.

24. Note, for instance, that we have estimated equation (11) for 57 panels of firms split by 2-digit industries; or for 8 panels of firms by size strata. Moreover, since we use rolling regression techniques, we have the additional time dimension that implies 13 point estimates (from 1999 through 2011).

5 Interpreting the increase in estimated markups since 2007

The notable increase in price-cost margins since 2007 that we have estimated in the previous section might seem somehow counterintuitive for an economy undergoing a deep economic crisis, such as the Spanish one. However, although the literature has not reached a consensus in this regard yet, there are many papers, both theoretical and empirical, that argue that markups are countercyclical indeed, in particular for the US economy. In the case of Spain, Estrada and López-Salido (2005) use industry-level data for the period 1980-2002 to provide empirical evidence that aggregate markups are procyclical, as the procyclicality in manufacturing industries tends to dominate the countercyclical behavior in market services. Fariñas and Huergo (2003) also confirm the procyclical behavior of markups in manufacturing using firm-level data for 1990-1998.

On the contrary, our paper provides strong evidence that, at least for the most recent downturn, price-cost margins behaved countercyclically. There may be several reasons for such behavior,[25] but for the purpose of our paper, we would like to highlight two of them. The first one is related to the high degree of financial pressure faced by Spanish firms, in terms of both high levels of corporate leverage and tight financing conditions. In these circumstances, firms may be driven to set relatively high margins, even in the face of weak demand, in order to be able to meet their ongoing financial commitments, as well as to build buffers of internal funds to finance investment projects and to protect against eventual funding shocks. One way to illustrate this point is to have a look at Figure 5.1, where we plot the change in estimated markups by industry between 2007 and 2011 against the average debt ratio in 2007 by industry – see below for more details –. In this Figure we can see that industries with higher debt ratios tended to experience larger increases in their markups.

Indeed, this type of hypothesis had already been advanced, *inter alia*, by Chevalier and Scharfstein (1996) for the US case. They build, and test, a theoretical model of markets with consumer switching costs – customer market model – and capital-market imperfections. In such a model, during a recession, when firms have lower cash flows and greater difficulty raising external funds, firms will try to boost current profits to meet their liabilities and finance investment. They may do so by increasing prices and forgoing attempts to build market share. Since the firm may default, it has less incentive to build market share, because it may not reap the benefits of such "investment" in the future. They provide empirical evidence in support of this theory using pricing data from the supermarket industry in the early 1990s, a period in which there was both a recession and the aftermath from the boom in leveraged buyouts of the 1980s.

A more recent contribution in this same spirit is that of Gilchrist *et al.* (2013), who investigate the effect of financial conditions on the price-setting behavior of US firms during the 2008-2009 financial crisis. They find strong evidence that at the peak of the crisis firms with relatively weak balance sheets increased prices, while firms with strong balance sheets lowered them. Moreover, they explore the implications of financial distortions on price-setting within the context of a New Keynesian framework that allows for customer markets and financial frictions. They find that their model implies a substantial attenuation of price

25. See the classical reference Rotemberg and Woodford (1999) for a comprehensive analysis.

dynamics relative to the baseline model without financial distortions in response to contractionary demand shocks.

The second main hypothesis is connected with the competitive setting in which firms have to operate. To begin with, there is a certain degree of consensus that the Spanish economy is characterized by a relatively lower level of product market competition in some industries than in peer developed economies. This feature has not been substantially altered during the crisis period, given that it depends on institutional and regulatory factors that evolve slowly over time.[26] Moreover, the current economic meltdown has entailed a large increase in the pace of business destruction, along with a notable sluggishness in business formation (see Figure 5.2). This has resulted in a significant reduction in the number of competitors across most industries, which may have enhanced surviving firms' market power, as highlighted by the Industrial Organization literature (e.g. Campbell and Hopenhayn, 2005). In this context, one would expect a relatively high degree of persistence in the low level of product-market competition in the Spanish economy in the most recent period. In such a setting, firms would be able to charge larger markups despite being faced with a declining demand.[27]

In view of the above discussion, in this section we investigate how the estimated markups from Section 4 correlate with some sector-specific variables in the most recent period, characterized by a deep economic crisis. These variables are chosen so that we can control for the typical factors affecting the evolution of price-cost margins considered by the literature (see, e.g., Dobbelaere and Mairesse, 2011, or Cassiman and Vanormelingen, 2013, for some recent contributions), such as size, capital intensity or R&D intensity, as well as the two main issues we believe lie behind that evolution, namely the (increased) presence of financial pressure and market power.

To this end, we will retrieve the estimated markups for the 57 two-digit industries that we consider and we will correlate them with a set of regressors ($X_{i,2007}$) calculated for the average[28] 2007 firm in each industry in our sample.[29] More specifically, we will estimate the following regression:

$$\Delta\hat{\mu}_{i,2011/2007} = \gamma_0 + \gamma_1{}' X_{i,2007} + \varepsilon_i \tag{10}$$

by Weighted OLS – where the weight is defined as the share of each industry in total gross value added – and where $i=1,\dots,57$ represents each industry. The dependent variable is the (log) change between average (estimated) markups for the period 2001-2007 and for the period 2008-2011 for each of the 57 sectors. The first relevant regressor is the proxy for financial constraints. We build several measures of financial pressure, based on both stocks and flows of financial liabilities, and both of them are typical of the literature on financial frictions. Thus, the first measure is built as the average debt ratio for each industry, which is defined as total

26. See *The Global Competitiveness Report 2013-2014* for an international comparison in which Spain comes out poorly in terms of product market competition. Besides, the different competition-related indicators available do not show a relevant improvement in the most recent period, even though some relevant product market reforms have been approved.

27. See Etro and Colciago (2012) for a theoretical model developing this sort of behavior, who also find some empirical support for the US case.

28. Estimation results are robust to the use of the median, instead of the mean. Indeed, the degree of statistical significance increases with the median.

29. Although we do not attempt at making a strict causal interpretation of this regression exercise, it should be noted that this specification helps minimize the problem of endogeneity, as all regressors would be determined prior to the crisis period.

liabilities adjusted for short-term assets – i.e., short-term financial assets plus cash and other liquid assets – over total assets. The second measure is the total debt burden ratio, defined as the ratio between financial expenditures plus total short-term liabilities over cash flows. This last item is calculated as the sum of gross operating surplus and financial income.

Further, we also try to account for the degree of product market competition across industries, as we discussed above. To this end, we rely on the (log of) our estimated markups for 2001-2007 as a direct measure of market power: the larger the estimated markup, the larger the (inherent) market power, so we might expect a positive correlation between our proxy of market power and the change in markups. Unfortunately, we would have liked to include some variable accounting for the impact of business dynamics on market competition during 2008-2011 as well, such as the net business entry rate, but it would be subject to a severe problem of endogeneity, difficult to tackle in our setting.[30] This notwithstanding, to the extent that, as we argue above, market power presents a high degree of persistence, due to both institutional and business dynamics factors, our proxy would also be capturing part of those dynamic effects. Indeed, the argument of high persistence is underpinned by the results of Cassiman and Vanormelingen (2013). They test a dynamic specification for price-cost margins in which the lagged markup is statistically significant, with values in the range of 0.3-0.4. Moreover, they compute a 5-year transition matrix between different quintiles of the distribution of estimated markups and find that they display a substantial amount of persistence.

As regards the rest of regressors in $X_{i,2007}$, we also include a measure of concentration, which is a traditional proxy for market structure and, indirectly, market power. Specifically, we compute the in-sample Herfindahl-Hirschman (HH) index of concentration, which is the sum of the squared market shares in sales. We thus follow Geroski (1990) who argues that the degree of rivalry in a market is difficult to determine with any precision, and probably cannot be completely captured by just one variable. He therefore suggests using several measures of rivalry, so that one can capture different aspects of market power in an industry.[31]

We include also a set of additional control variables that should allow us to better capture the partial correlations we are interested in. We take account of a proxy for average firm size, which we measure by the log of the stock of capital in 2007 – defined as before, i.e. net book value of fixed assets –. The effect of capital requirements on markups during a (deep) recession may be twofold (see e.g. Odagiri and Yamashita, 1987). On the one hand, because it works as a barrier to entry, it reinforces concentration and, thus, market power, so is likely to increase markups. On the other hand, it may deter exit rather than entry in a recession, because the stock of capital usually constitutes a sunk cost, in which case in an industry with larger capital requirements markups may decrease so as to maintain a higher rate of capacity utilization.

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30. We have run some regressions in which we included the net entry rate for the year 2007, both alone and interacted with the estimated markup for 2007, as a way of accounting for the impact of business dynamics on market competition. Results, available upon request, show that the coefficient for net entry tends to be negative and, in some specifications, statistically significant. This means that in those industries with higher net entry of new businesses before the crisis, there was a lower increase in estimated markups during 2008-2011.

31. For instance, he uses 6 measures of rivalry: the extent of market penetration by entrants, the market share of imports, the relative number of small firms (<99 employees), the 5-firm concentration index, the change in concentration and the market share of exiting firms.

We account for the degree of an industry's innovativeness, or alternatively R&D intensity, with the ratio of the book value of intangible assets to total assets, which is expected to increase market power in a given sector and, thus, price-cost margins, through either product differentiation or better productive efficiency (see Cassiman and Vanormelingen, 2013). As suggested by Sutton (1998), a large R&D intensity may also be the reflection of an endogenous reaction of firms to potential entry, thus creating a barrier to entry.

Table 5.1 shows the results from estimating equation (10) by WLS. As it can be seen, we find a fairly robust positive and statistically significant association between our preferred measure of financial pressure – the debt ratio – and the growth rate of markups.[32] A similar result (not reported) is obtained when our "flow" variable, the total debt burden ratio, is used instead of the debt ratio, except for a certain loss of statistical significance.[33] This result would provide support for the thesis that the financial difficulties experienced by Spanish firms may be behind the estimated increase in price-cost markups during the current economic crisis. As regards the other variable of interest, we also find a quite strong positive, and statistically significant, relationship between our direct measure of market power (the level of markups in 2007) and the growth rate of estimated markups. In other words, the increase in price-cost margins have tended to be larger the higher the industry's market power. Moreover, the coefficient linked to the concentration index turns out to be negative, but not significant,[34] which would point to the fact that the degree of concentration does not seem to be problematic in terms of degree of competition.

As regards the other variables, the only one which is consistently significant is the industry's average stock of capital, with a negative sign, which would lend support to the barrier-to-exit interpretation that in industries with higher capital needs markups tend to be lower in order to preserve a higher rate of capacity utilization.[35] In other words, the difficulties in putting fixed tangible assets into liquidation could be having a discouraging effect on business exit rates, thus entailing a relatively large number of competitors, which would put downward pressure on markups of surviving businesses.

Finally, in columns [6] and [7] we check the robustness of our results to the composition of our sample in terms of industries included. First, we remove the observations from non-market industries, such as social services, health, education or sports, where pricing decisions may not be driven by market forces. This results in a certain increase in statistical significance. However, when we drop the observations from two outliers,[36] namely, "coke and refined petroleum products" and "electricity, gas and water", we lose some statistical significance.

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32. Similar results are obtained when we use the total debt ratio, instead of our measure corrected for short-term assets.

33. Interestingly enough, when we include both variables at the same time in regression (13), the total debt burden loses statistical significance, while the debt ratio remains highly significant.

34. We obtain similar results when we replace the HH index with the four-firm concentration ratio (CR4), another typical measure in the literature.

35. We could interpret the negative coefficient for the stock of intangible assets in a similar vein, as it might be working also as a barrier to exit.

36. These are extreme observations in the sense that, as it can be observed in Figure 5.1, their change in estimated markups between 2007 and 2011 is highly negative compared with the rest.

6 Conclusions

This paper has presented the results from estimating price-cost markups following a standard econometric framework used in the literature. The econometric model has been estimated on a comprehensive panel of firms' accounting data covering most of the non-financial corporate sector over the period 1995-2011. This data set has allowed us an extensive analysis of the dynamic behavior of price-cost margins across several dimensions, namely, industry and size. Our estimation results reveal a common pattern across industry and size categories characterized by a significant increase of estimated markups since 2007, after a rather stable period oscillating around 1.10-1.20. This fact suggests that there must have been some common factors explaining this behavior of markups, in particular during the recent crisis period.

In the second part of the paper, we have examined some likely explanatory factors underlying the estimated dynamic performance of price-cost markups in the most recent period. To this end, we have employed a simple empirical framework whereupon we have regressed the change in estimated markups for each industry between 2007 and 2011 against a set of relevant regressors identified in the literature. We are particularly interested in the Spanish experience, which motivates us to study two hypotheses behind such countercyclical behavior of estimated markups. The first one is related to the high degree of financial pressure faced by Spanish firms, in terms of both high levels of corporate leverage and tight financing conditions. In these circumstances, as recently stressed by Gilchrist *et al.* (2013) for the US case, firms may be driven to set relatively high margins, even in the face of weak demand, in order to be able to meet their ongoing financial commitments.

The second one is connected with the fact that the Spanish economy is characterized by a lower level of product market competition across industries than in peer developed economies. We have argued that this is a persistent feature that may have worsened during the current economic meltdown, which has brought about a large increase in the pace of net business destruction – thus enhancing surviving firms' market power –. We found compelling evidence in favor of both hypotheses. There is a positive and statistically significant association between our preferred measure of financial pressure – the debt ratio– and the growth rate of estimated markups between 2007 and 2011. We also found a quite strong positive, and statistically significant, relationship between our direct measure of market power (the level of markups in 2007) and the growth rate of markups.

Although these results must be interpreted with due caution, some interesting policy implications can be drawn. As we have mentioned in the introduction, the current adjustment in the external competitiveness of the Spanish economy is relying mostly on labor shedding and wage moderation. On the contrary, as we have shown in this paper, the estimated price-cost margins would be lagging behind that adjustment. As argued, *inter alia*, by Blanchard and Giavazzi (2003), from a political economy point of view, it is difficult to sustain this unbalanced adjustment process for a long time, unless it is accompanied by deep reforms in goods markets. Product market deregulation should curtail firms' market power, thus reducing price-cost markups and, hence, improving households' disposable income.

The Spanish economy has been involved in an ongoing process of deregulation and structural reform for some time, the results of which will take time to materialize. Indeed, as our results show, the increase in price-cost margins has been larger in industries where market power was larger. Therefore, it is necessary to keep the reform impetus to strengthen competition in product markets, so that the evolution of price-cost markups is more consistent with the absorption of macroeconomic imbalances and enhanced social welfare.

This notwithstanding, these conclusions must be qualified by the complex relationship existing between firms' markups and their financial health. To the extent that the financial difficulties are a widespread phenomenon, a significant fall in price-cost margins could have such a strong impact on firms' balance sheets that it could affect their possibilities of survival, as well as their investment and employment decisions. This situation would call for complementary measures in the financial side, as for instance, debt relief programs or improvements in the efficiency of bankruptcy system. The evidence presented in this paper suggests that any attempt to understand price-cost margins in the aggregate must account for firms' differential access to capital markets across time. The interaction between a firm's balance sheet position and its pricing decision is an interesting avenue for future research.

7 References

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8 Tables and Figures

Table 3.1. List of industries considered in the CBSO's sample

CBSO's Industry Clasification

Sector	(CBSO's code)	Industry
Primary Sector	1	Crop and animal production,hunting and related service activities
	2	Forestry and logging
	3	Fishing and aquaculture
	4	Mining and quarrying
Manufacturing industries	5	Manufacture of food products, beverages and tobacco
	6	Manufacture of textiles, wearing apparel and leather and related products
	7	Manufacture of wood and products of wood and cork;except furniture;manufacture of articles of straw and plaiting materials
	8	Manufacture of paper and paper products
	9	Printing and reproduction of recorded media
	10	Manufacture of coke and refined petroleum products
	11	Manufacture of chemicals and chemical products
	12	Manufacture of basic pharmaceutical products and pharmaceutical preparations
	13	Manufacture of rubber and plastic products
	14	Manufacture of other non-metallic mineral products
	15	Manufacture of basic metals
	16	Manufacture of fabricated metal products,except machinery and equipment
	17	Manufacture of computer,electronic and optical products
	18	Manufacture of electrical equipment
	19	Manufacture of machinery and equipment n.e.c.
	20	Manufacture of motor vehicles,trailers and semi-trailers
	21	Manufacture of other transport equipment
	22	Manufacture of furniture and other manufacturing
	23	Repair and installation of machinery and equipment
Utilities Sector	24	Electricity,gas,steam and air conditioning supply
	25	Water collection, treatment and supply
	26	Sewerage, Waste collection, treatment and other waste management services
	27	Construction
Market Services industries	28	Trade and repair of motor vehicles and motorcycles
	29	Wholesale trade, except motor vehicles and motorcycles
	30	Retail trade, except motor vehicles and motorcycles
	31	Land transport and transport via pipelines
	32	Water transport
	33	Air transport
	34	Warehousing and support activities for transportation
	35	Postal and courier activities
	36	Accommodation and food service activities
	37	Publishing activities
	38	Motion picture, video and television programme production, sound recording and music publishing activities; Programming and broadcasting activities
	39	Telecommunications
	40	Computer programming, consultancy and related activities; Information service activities
	42	Real estate activities
	43	Legal and accounting activities; Activities of head offices; management consultancy activities
	44	Architectural and engineering activities;technical testing and analysis
	45	Scientific research and development
	46	Advertising and market research
	47	Other professional, scientific and technical activities; Veterinary activities
	48	Rental and leasing activities
	49	Employment activities
	50	Travel agency, tour operator and other reservation service and related activities
	51	Security and investigation activities; Services to buildings and landscape activities; Office administrative, office support and other business support activities
Non-Market Services industries	52	Education
	53	Human health activities
	54	Social work activities
	55	Creative, arts and entertainment activities; Libraries, archives, museums and other cultural activities; Gambling and betting activities
	56	Sports activities and amusement and recreation activities
	57	Repair of computers and personal and household goods
	58	Other personal service activities

Note: Sector 41 "Activities of holding corporations, without administrative or management purpose" is missing because all firms in the sample belonging to this industry are dropped.

Table 3.2. Sample composition by size and industry

Sample composition by industry and firm size: CBA+CBB vs Population (DIRCE)
Average Employment Shares for 1999-2008.

Firm size:	<10 employees		10-19 employees		20-49 employees	
Industry:	DIRCE	CBA+CBB	DIRCE	CBA+CBB	DIRCE	CBA+CBB
PRIMARY SECTOR	0.677	0.766	0.162	0.132	0.116	0.078
MANUFACTURING	0.714	0.582	0.137	0.212	0.101	0.154
UTILITIES SECTOR	0.877	0.664	0.047	0.131	0.032	0.093
CONSTRUCTION	0.812	0.714	0.106	0.170	0.061	0.094
MARKET SERVICES	0.903	0.796	0.055	0.121	0.028	0.062
NON-MARKET SERVICES	0.840	0.782	0.077	0.117	0.051	0.075

Firm size:	50-99 employees		100-199 employees		>200 employees	
Industry:	DIRCE	CBA+CBB	DIRCE	CBA+CBB	DIRCE	CBA+CBB
PRIMARY SECTOR	0.026	0.016	0.012	0.006	0.006	0.003
MANUFACTURING	0.026	0.029	0.012	0.013	0.010	0.010
UTILITIES SECTOR	0.014	0.036	0.011	0.028	0.019	0.049
CONSTRUCTION	0.014	0.016	0.005	0.005	0.003	0.002
MARKET SERVICES	0.007	0.012	0.004	0.005	0.003	0.003
NON-MARKET SERVICES	0.018	0.018	0.009	0.006	0.006	0.002

Source: Directorio Central de Empresas (INE); Authors' calculations.

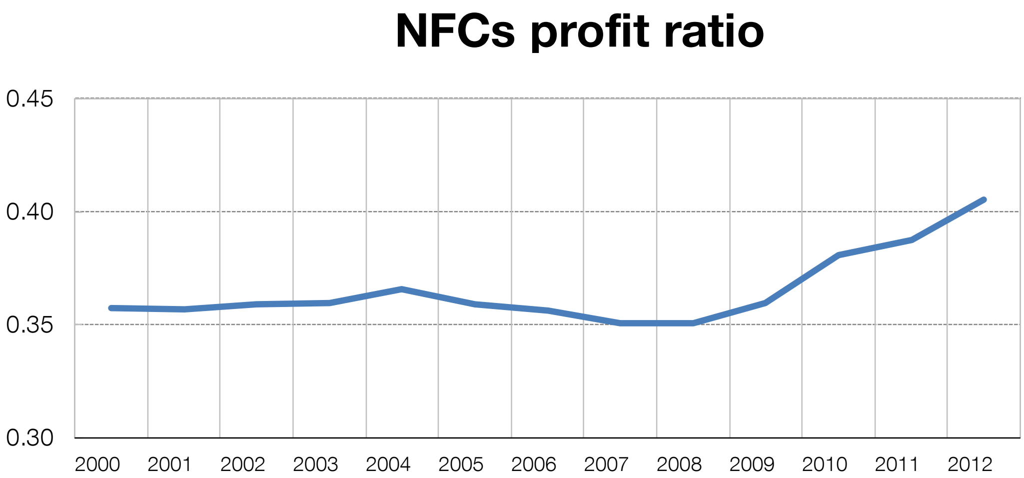
Table 3.3. Summary statistics for the estimation sample. All firms.

Main summary statistics. 1995-2011.

Variable	Mean	Std. Dev.	Min	Max	Q1	Q2	Q3
(thousands €)							
Y	2754.08	71222.18	0.61	2.07E+07	192.54	445.09	1119.48
L	19.67	330.78	0.01	67183	3	5.85	12
K	734.79	33925.01	0.05	1.24E+07	22.62	68.73	216.21
M	1994.28	60926.12	0	2.01E+07	98.68	263.37	737.56
(Growth rate)							
dY	0.012	0.269	-4.086	4.063	-0.100	0.024	0.141
dL	-0.001	0.291	-4.545	3.754	-0.074	0	0.082
dK	0.026	0.454	-4.880	6.834	-0.171	-0.044	0.101
dM	0.011	0.354	-8.599	9.009	-0.1318	0.021	0.167
(thousands €/employee)							
Y/L	107.142	99.646	4.113	10897.86	48.091	75.994	129.225
K/L	39.507	159.333	0.034	4223.18	4.670	11.796	28.934
(Ratio)							
Lshare	0.309	0.179	0.007	1.625	0.168	0.280	0.415
Mshare	0.612	0.199	0	1	0.481	0.634	0.769

#Observations: 2034200 (except for growth rates: 1569678)

Figure 1.1. Profit share of non-financial corporations



Source: National Accounts (INE).

Figure 4.1. Estimates of the price-cost markup. ALL FIRMS.

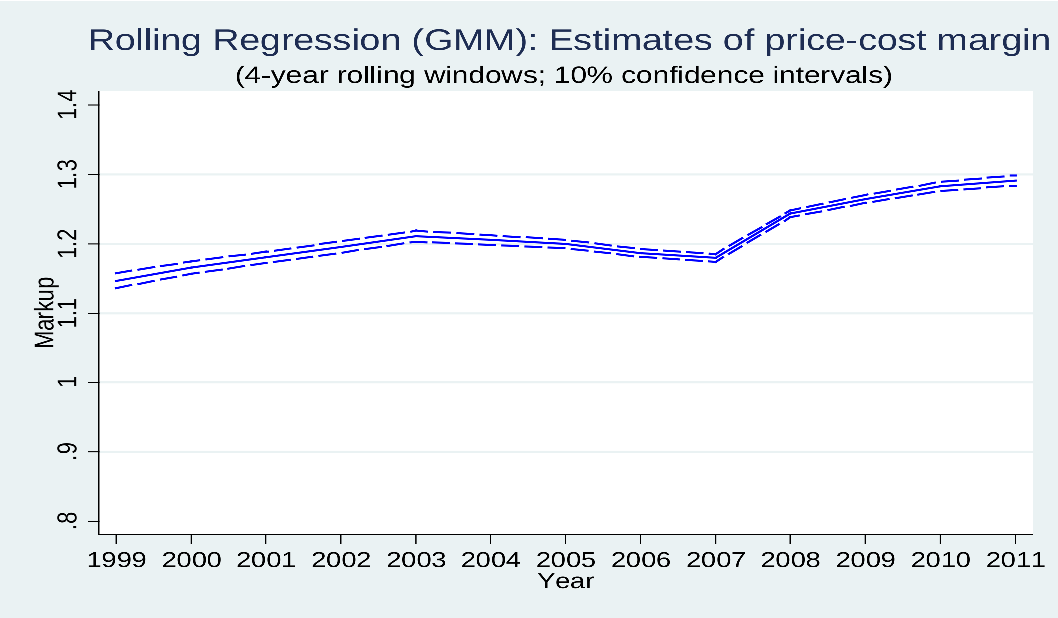


Figure 4.2. Implicit estimates of the rate of pure profits. ALL FIRMS.

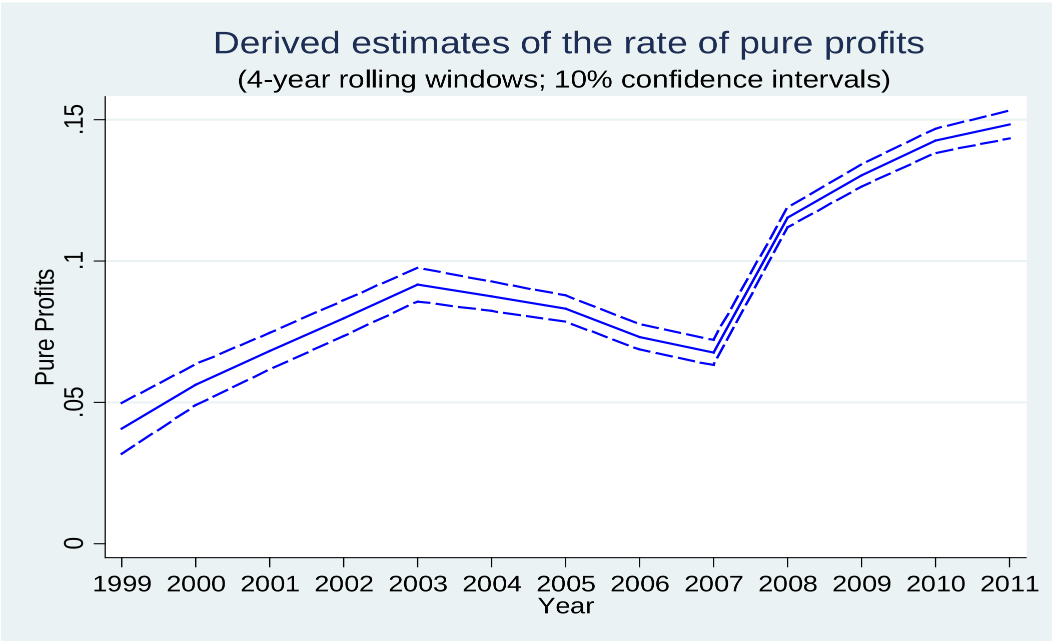
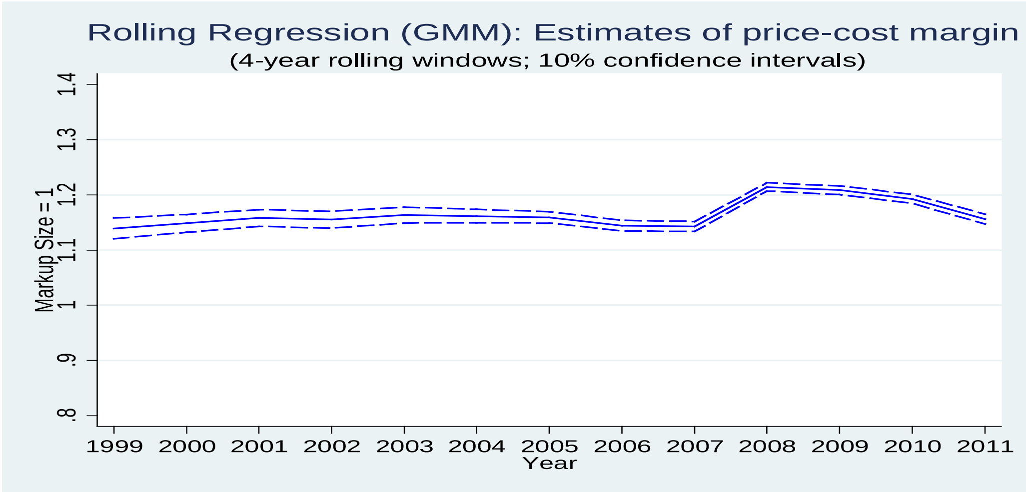
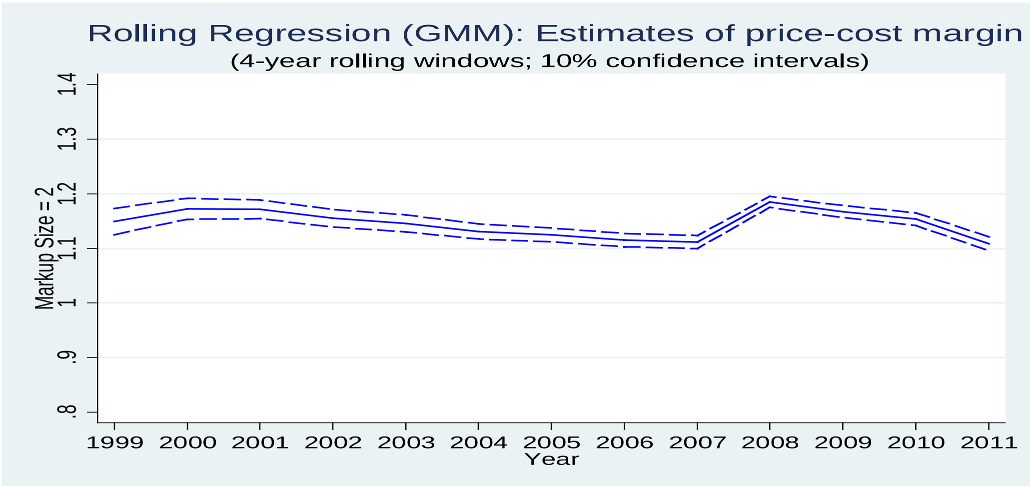


Figure 4.3. Estimates of the price-cost markup by SIZE STRATA.

(Panel A: 1-5 employees)



(Panel B: 6-9 employees)



(Panel C: 10-19 employees)

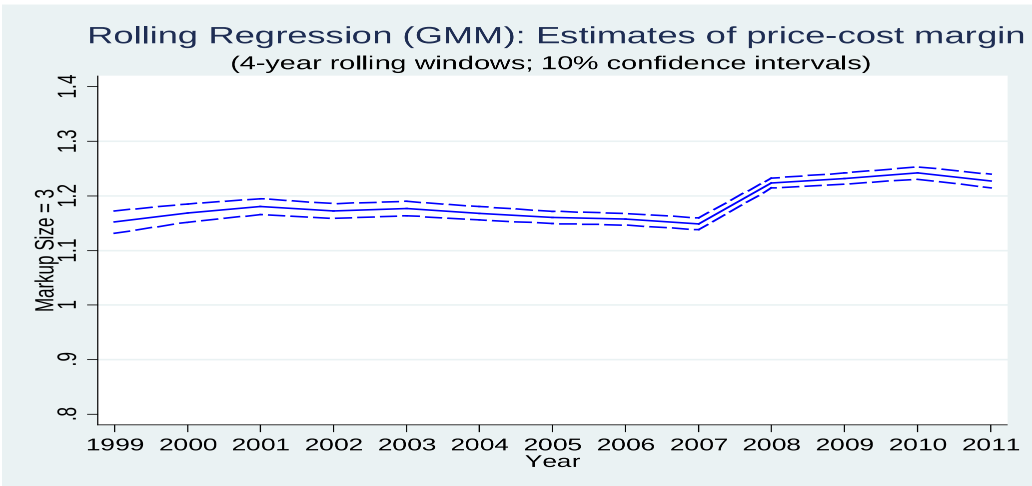
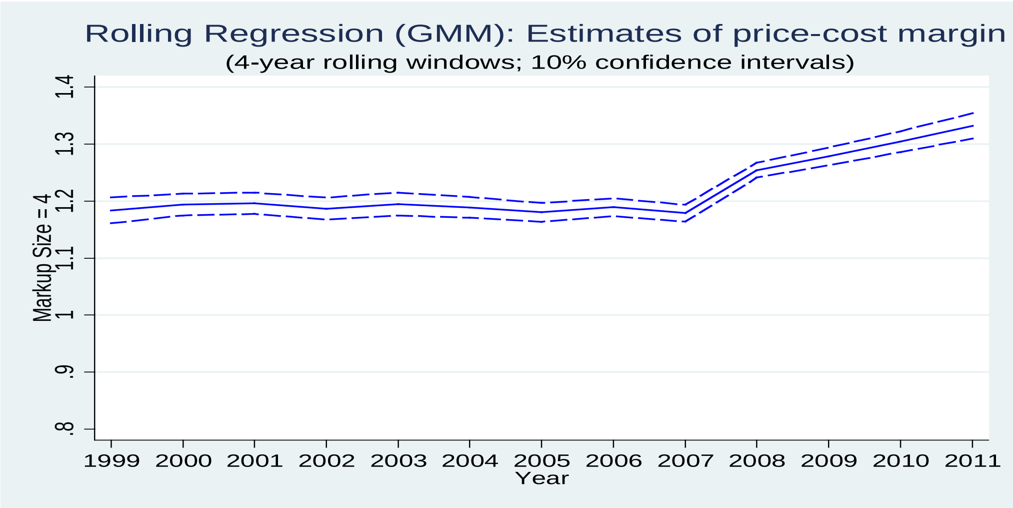
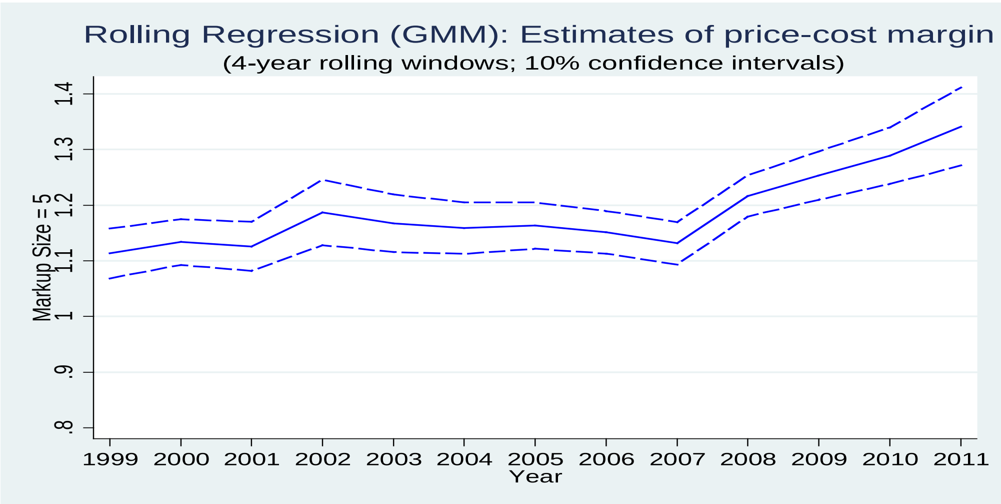


Figure 4.3. Continued.

(Panel D: 20-49 employees)



(Panel E: 50-99 employees)



(Panel F: 100-249 employees)

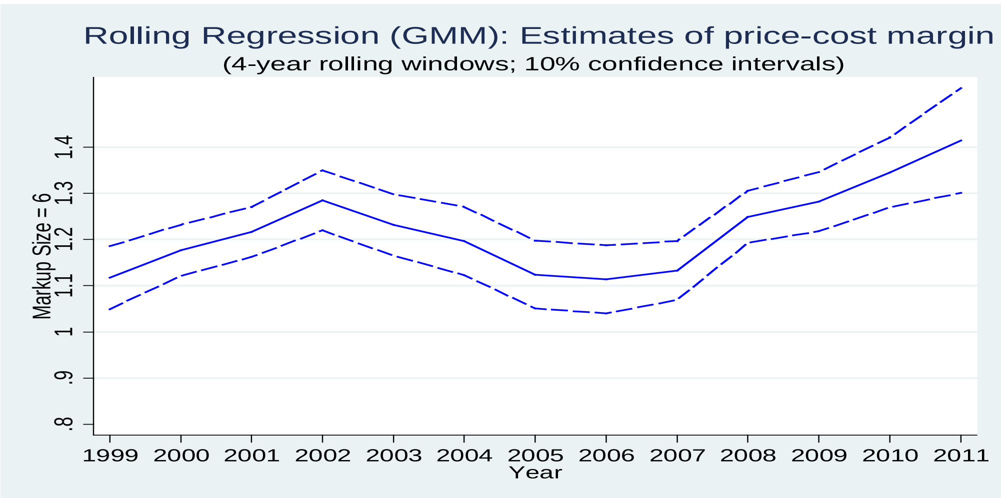
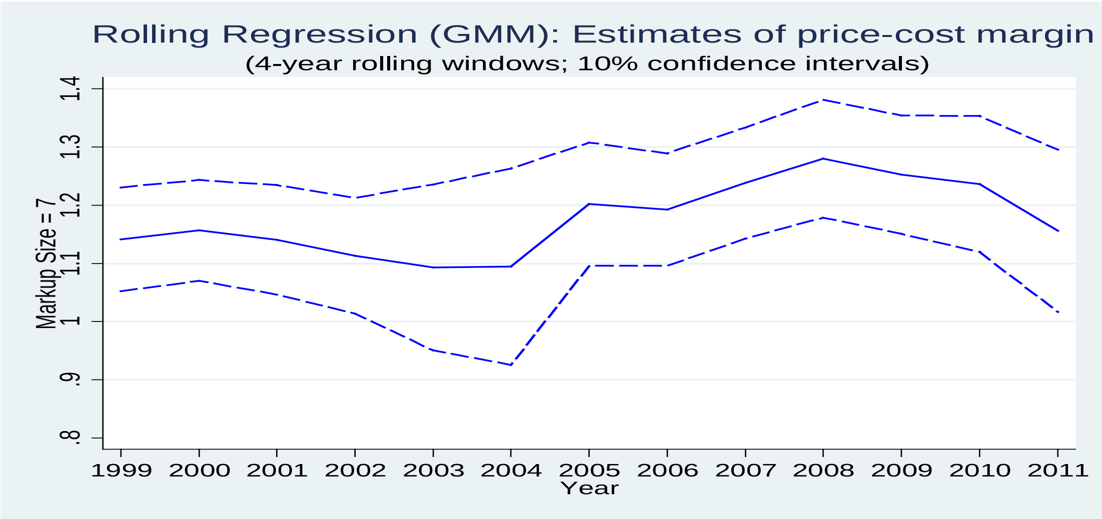


Figure 4.3. Continued.

(Panel G: 250-499 employees)



(Panel H: 500+ employees)

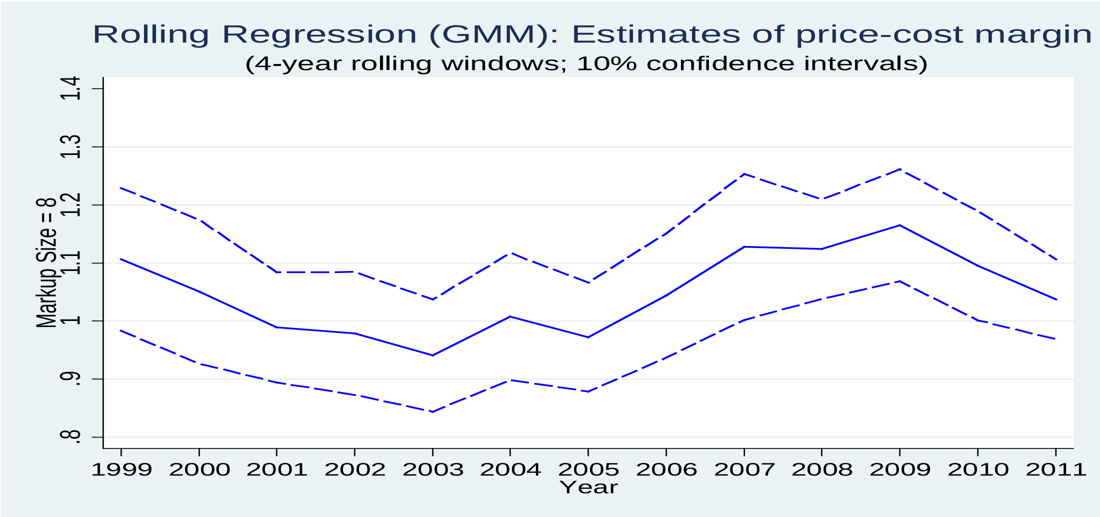
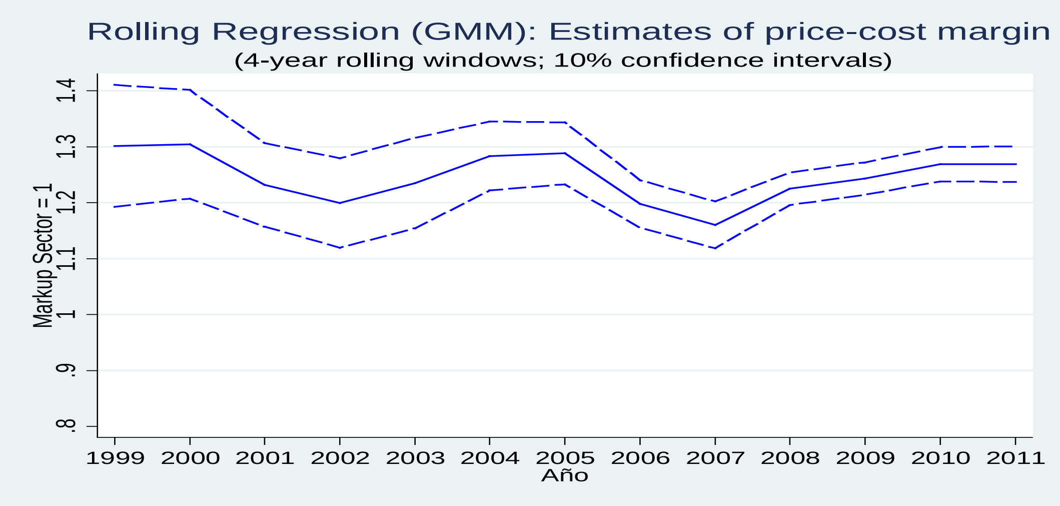
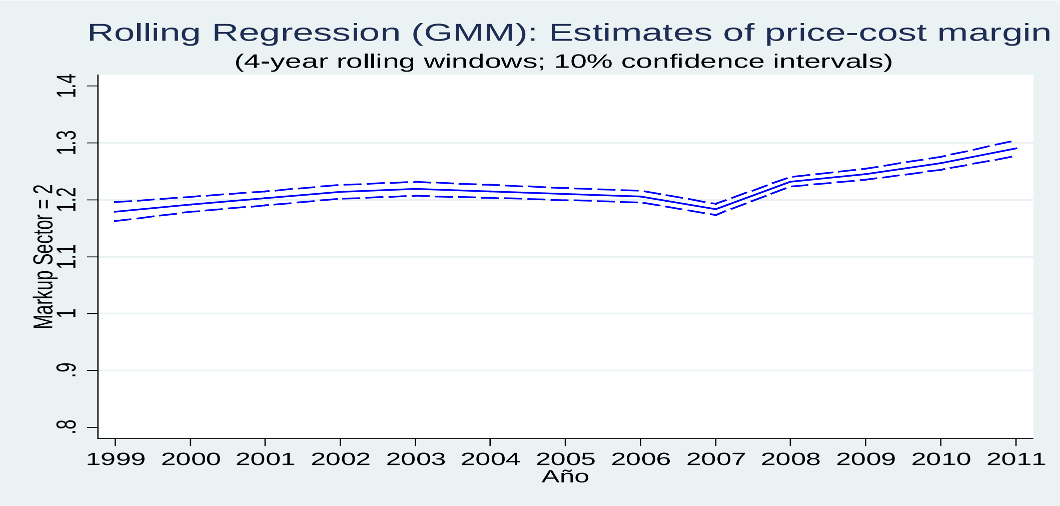


Figure 4.4. Estimates of the price-cost markup by AGGREGATE INDUSTRY.

(Panel A: Primary industries)



(Panel B: Manufacturing industries)



(Panel C: Utilities industries)

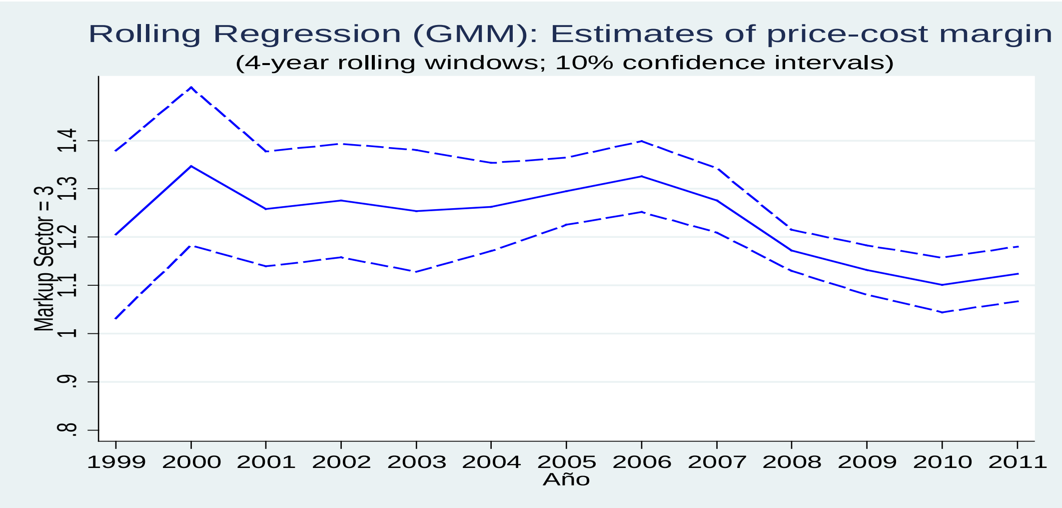
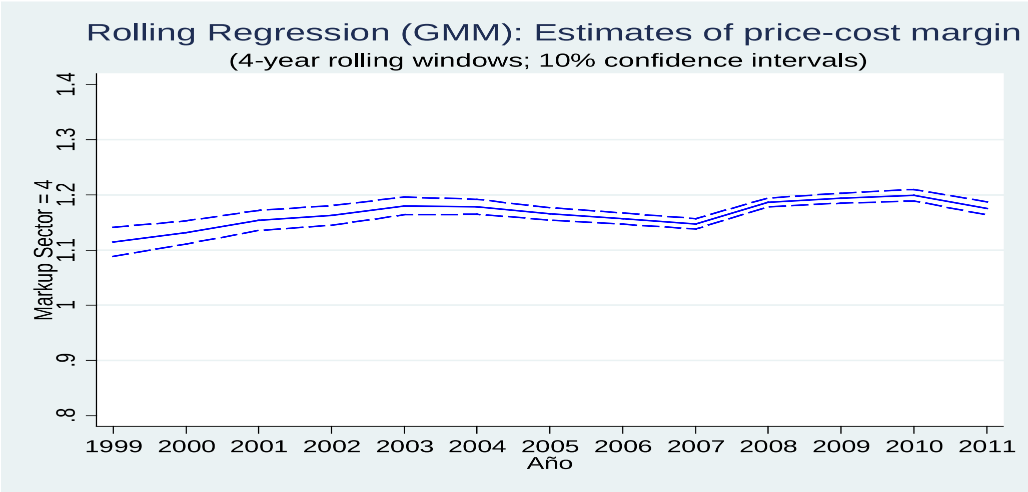
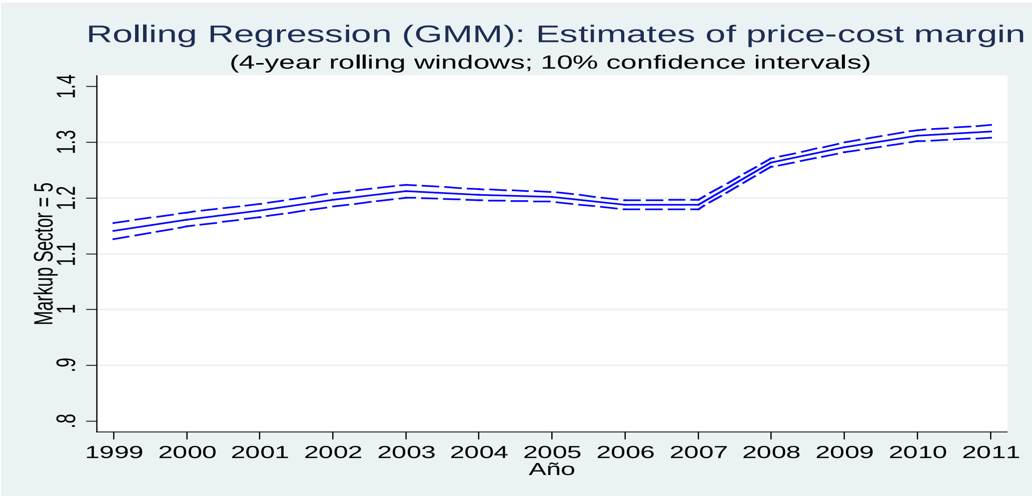


Figure 4.4. Continued.

(Panel D: Construction sector)



(Panel E: Market-Services industries)



(Panel F: Non-Market Services industries)

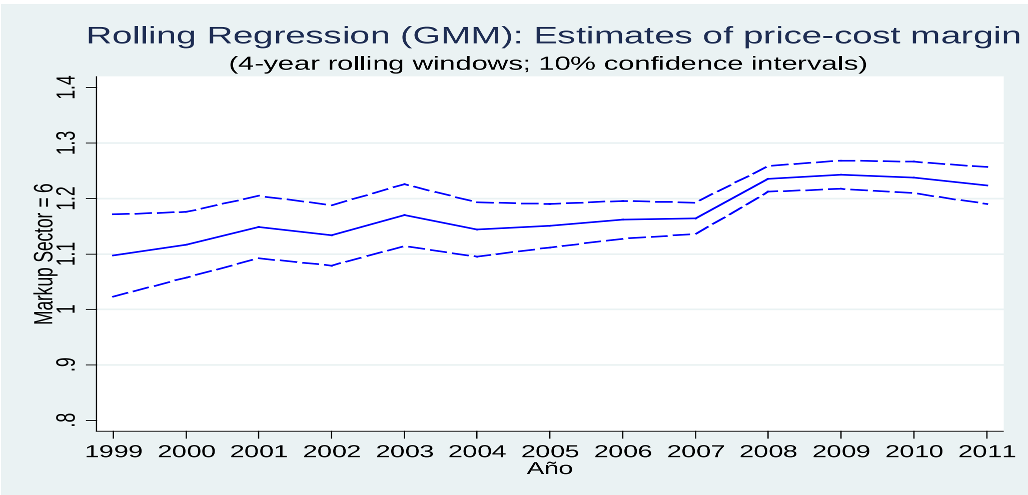
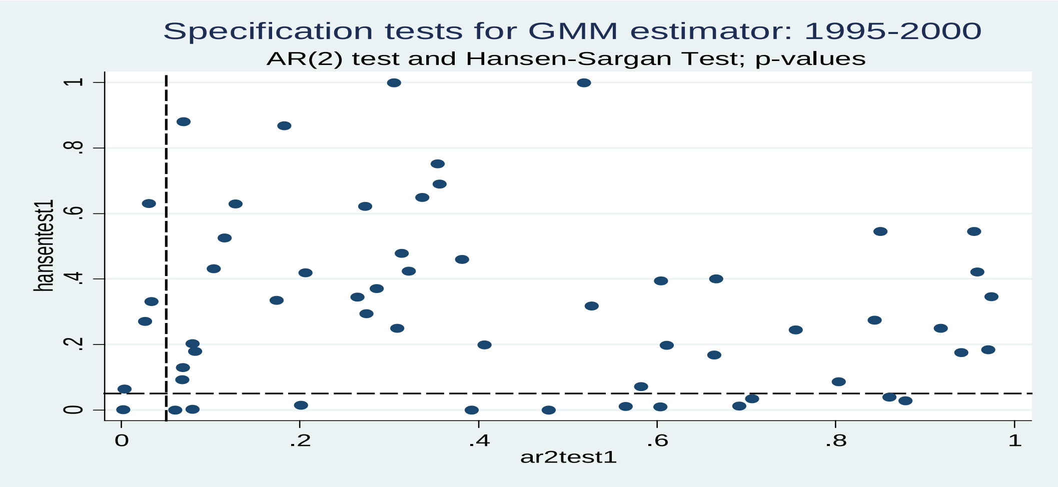
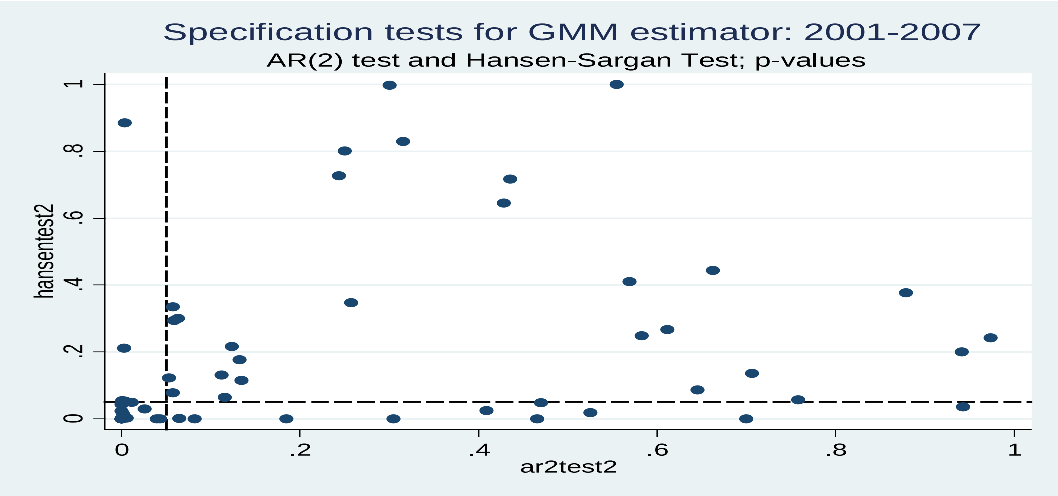


Figure 4.5. Specification tests.

(Panel A: 57 industries; 1995-2000)



(Panel B: 57 industries; 2001-2007)



(Panel C: 57 industries; 2008-2011)

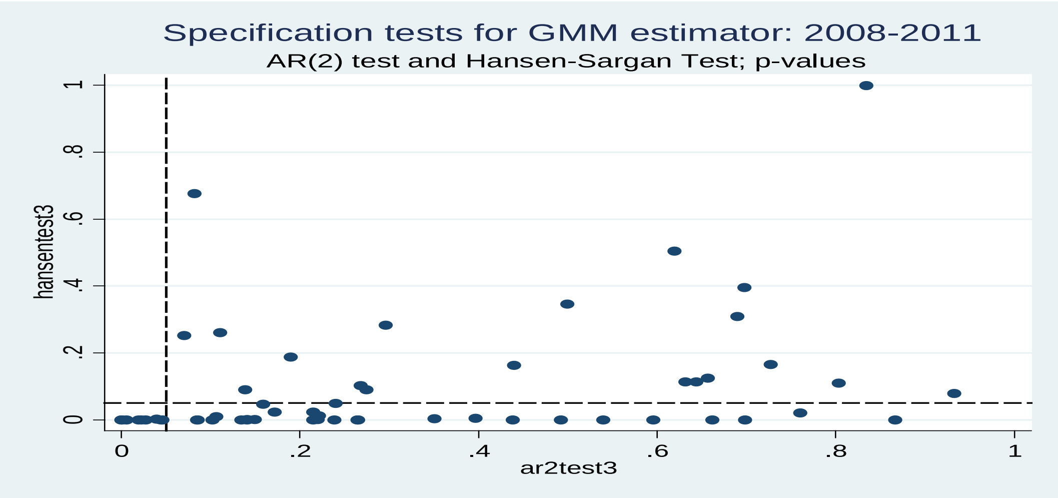


Figure 5.1. Change in industry's markups between 2007 and 2011 against the (average) debt ratio in 2007.

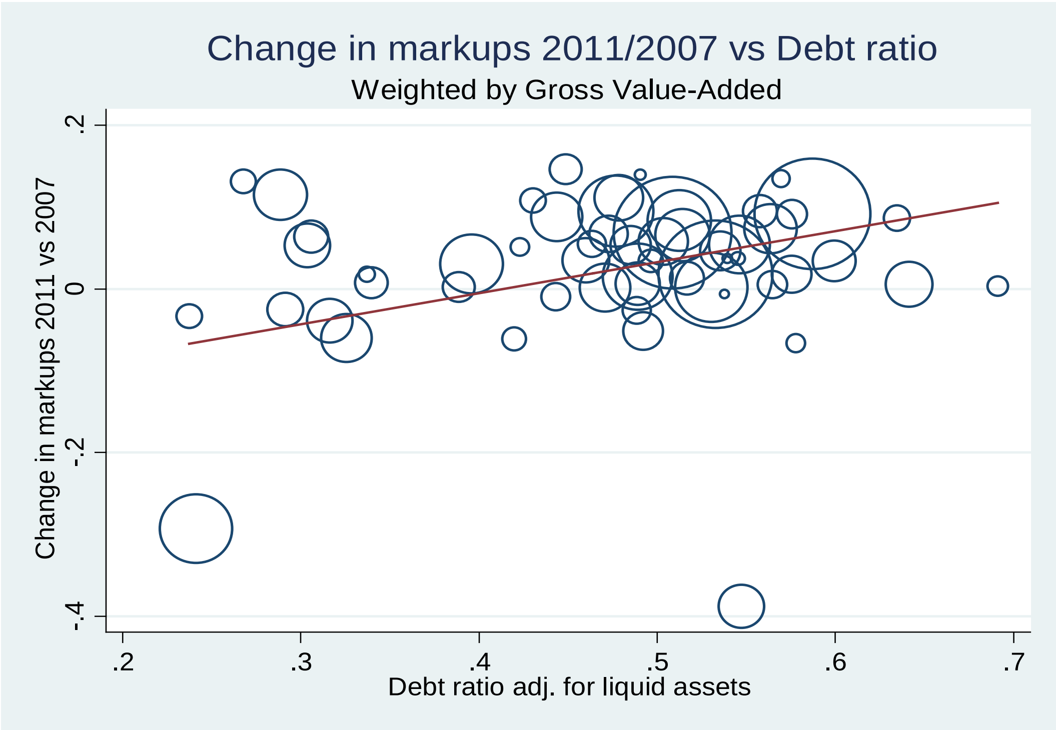
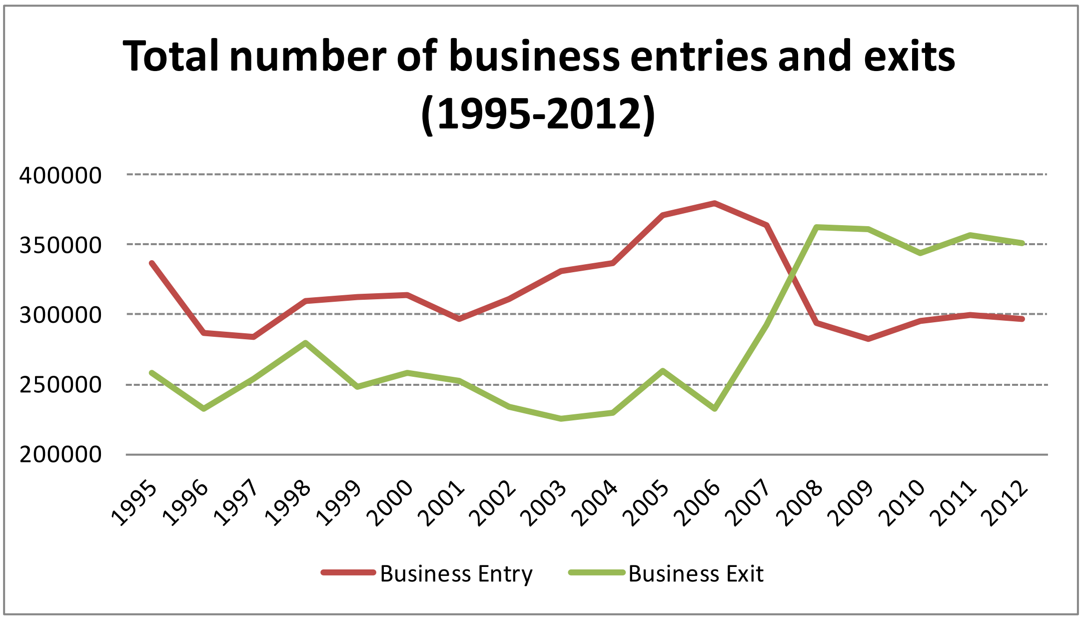


Figure 5.2. Business creation and destruction in Spain.(*)



(*) Note: It includes data for public corporations, limited liability corporations and individual entrepreneurs.

Source: Directorio Central de Empresas (INE)

Table 5.1. Regression results for the determinants of the growth rate of estimated markups between 2007 and 2011.

Estimation results for equation (X). Weighted-OLS.

Dependent variable: Change in markups between 2011 and 2007.

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Log($\mu_{i,2007}$)	-0.007	0.738 *	0.323	0.557 **	0.690 **	0.902 ***	0.540 **
	(0.525)	(0.442)	(0.319)	(0.254)	(0.282)	(0.290)	(0.224)
Debt ratio		0.564 **	0.475 **	0.464 ***	0.501 ***	0.579 ***	0.256 **
		(0.275)	(0.210)	(0.171)	(0.172)	(0.174)	(0.102)
HH index			-0.340 *	-0.118	-0.116	-0.095	-0.053
			(0.178)	(0.102)	(0.097)	(0.096)	(0.051)
Log($K_{i,2007}$)				-0.036 ***	-0.039 ***	-0.040 ***	-0.014 *
				(0.009)	(0.009)	(0.009)	(0.007)
Intangible assets					-0.281	-0.358 *	-0.318 **
					(0.193)	(0.185)	(0.142)
Constant	0.028	-0.364	-0.233 *	-0.109	-0.110	-0.171 *	-0.071
	(0.082)	(0.184)	(0.122)	(0.093)	(0.092)	(0.190)	(0.072)
Observations	57	57	57	57	57	46	44
R-squared	0.000	0.220	0.351	0.590	0.599	0.646	0.258

Significance: * 10%; ** 5%; *** 1%. Weights: Share in gross value added.
All explanatory variables are dated 2007.
Column [6]: Excludes observations from Non-Market activities, as well as the Primary Sector.
Column [7]: As in column [6], and it also excludes observations from "Coke and refined petroleum products" and "Electricity, gas and water".

APPENDIX A. Estimating the degree of returns to scale for the Spanish economy

In order to attach a reasonable value to the elasticity of scale, we will follow the approach suggested by Susanto Basu and co-authors,[37] which essentially is a variant of Hall's approach, to estimate the degree of returns to scale. Thus, we start from the same conceptual framework as in Section 2.1. It can be shown that by combining equations (4), (6) and (8) one can find the following relationship between price-cost markups (μ) and returns to scale (γ) for productive input j = K, L, M:

$$\mu \cdot s_{j,t} = \gamma \cdot c_{j,t} \tag{A1}$$

where $c_{j,t}$ is defined as the share of costs for input j in total cost, and the rest of variables have been defined previously.[38] Replacing this expression into equation (7), one obtains the relation that will serve as the basis for estimating the degree of returns to scale:

$$\Delta y_t = \gamma \cdot \left(c_{L,t}\Delta l_t + c_{k,t}\Delta k_t + c_{M,t}\Delta m_t\right) + \Delta t_t = \gamma \cdot \Delta x_t + \Delta t_t \tag{A2}$$

We follow then the standard practice of applying firm-level theory to relatively aggregated data and use a panel of industries defined at approximately the two-digit level of the National Accounts classification in order to estimate equation (A2). To be more specific, we use a balanced panel for 34 industries that together constitute the sector of non-financial corporations for 1995-2010 and which basically correspond with the industries considered in Section 3.

We assemble a database with National Accounts data on output and input (log) growth rates for each industry. Output is defined as real gross output; while employment is measured in thousands of employees in full-time equivalent units. The user cost of capital is estimated as the real interest rate charged by financial institutions to firms[39] plus the depreciation rate. We also use information from the data-set elaborated by Fundación BBVA, which includes capital in nominal and real terms.

As regards the method of estimation, we face a similar problem as in Section 2.1, namely, the endogeneity of technology shocks and inputs choice, so we present regression results for both the pooled OLS and the GMM estimators. In the latter case, and in order to avoid overfitting and weak instruments, we restrict the instrument set to only one lag of the regressor –the weighted average of input growth, Δx_t –.

Moreover, as argued among others by Basu and Fernald (2001), it is important to account for variable utilization of both capital and labor services. Otherwise, growth rates of the observed capital stock and labor do not capture the full service flows from those inputs and the regression suffers from measurement error, which would bias the estimated elasticities.[40] Hence, we draw from Basu and Fernald (2001) when we attempt to control for variable service flow from inputs. They show that changes in hours per worker provide an index of unobserved changes in the intensity of work. This suggests a regression such as (14) expanded with an additional regressor, namely, Δh_t the growth rate of hours per worker.[41]

37. See, *inter alia*, Basu and Fernald (1997).

38. This condition holds in the long run, when all productive factors are variable.

39. We assume that the real interest rate is the same across branches.

40. The resulting estimate of γ would not be consistent unless the cost-weighted sum of the growth rates of the observed inputs (K and L) is identically zero or uncorrelated with the instruments. Neither condition is plausible.

41. Earlier work by Abbott *et al.* (1998) also runs this type of regression to control for variable utilization.

Besides, they also show the conditions under which this type of regression corrects for variable capital utilization as well as work effort.

Table A.1 reports our estimates from equation (A2), and its extension with hours per worker –columns [2] and [4]–, while Figure A.1 shows rolling regression estimates of the elasticity of scale in order to check its stability through time. The first row in Table A.1 shows the estimates of the elasticity of scale. All coefficients are statistically significant and very close to each other, between 1.10 and 1.16, irrespective of the estimation method or the use of the proxy for variable factor utilization. All estimates, besides, reject the hypothesis of constant returns to scale (see last row in Table A.1), except for that in column [4] –although by a small margin–. Thus, it seems that the production function of Spanish non-financial corporations shows evidence of (small) increasing returns to scale on aggregate.

Additionally, the rolling regression results reported in Figure A.1 display a reasonable degree of stability in the estimated elasticity of scale. This parameter oscillates around 1.10 in OLS estimates and around 1.2 in GMM ones. Consistent with this evidence, we choose an elasticity of 1.1 as our reference for the estimation of markups in Section 4.

Table A.1. Estimation results for the elasticity of scale.

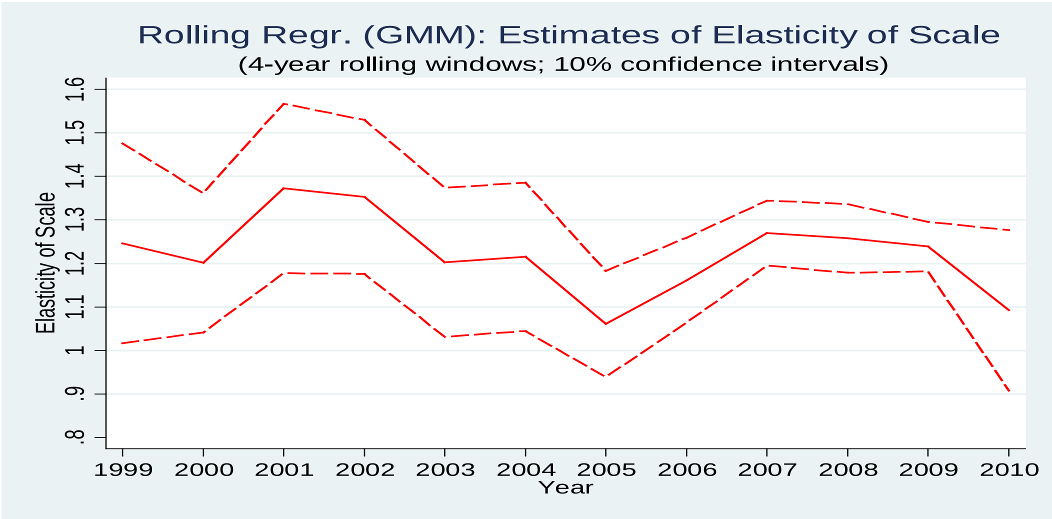
Aggregate estimates of the elasticity of scale

Dependent variable: gross output growth	OLS		GMM	
	[1]	[2]	[3]	[4]
Returns to scale (γ)	1.156 ***	1.154 ***	1.131 ***	1.100 ***
	(0.020)	(0.020)	(0.063)	(0.066)
Hours worked		0.399 **		1.016 ***
		(0.151)		(0.370)
Observations	510	340	476	306
R-squared	0.975	0.976		
Hansen-Sargan test (p-value)			0.797	0.768
AR(2) test for residuals (p-value)			0.123	0.115
F-test for CRS: $\gamma = 1$ (p-value)	0.000	0.000	0.039	0.134

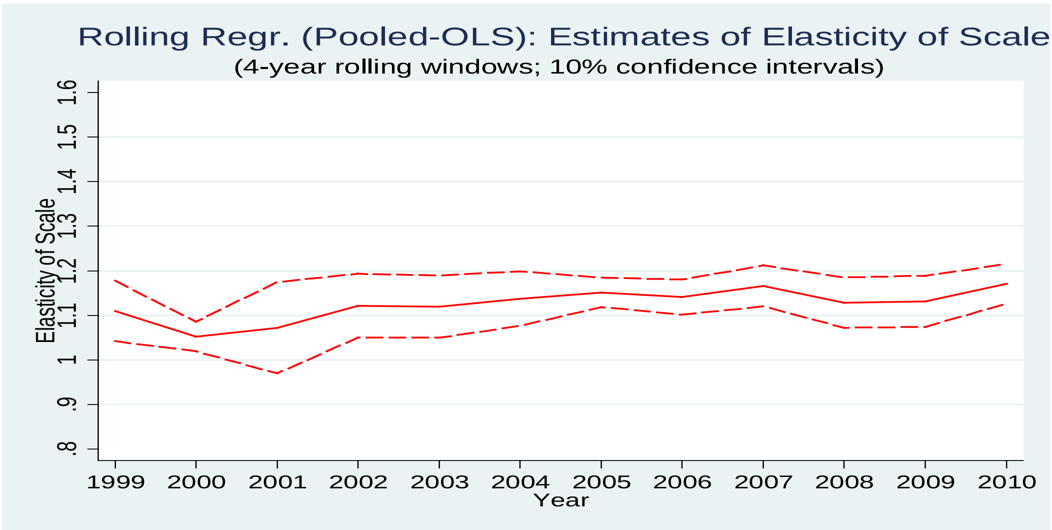
Note: Sample period is 1996-2010. Estimates of eq. (14). All regressions include time dummies.
All regressions are weighted by the share of each industry on total gross output.
Instruments are the second lag of Δx and of Δhours.

Figure A.1. Rolling estimates of the elasticity of scale.

Panel A.

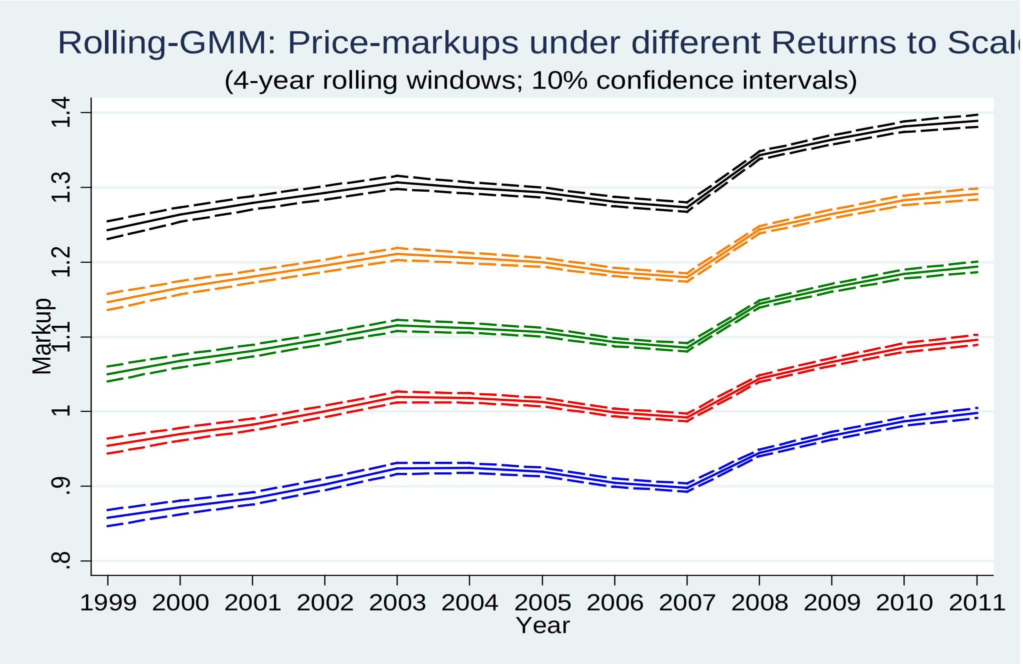


Panel B.



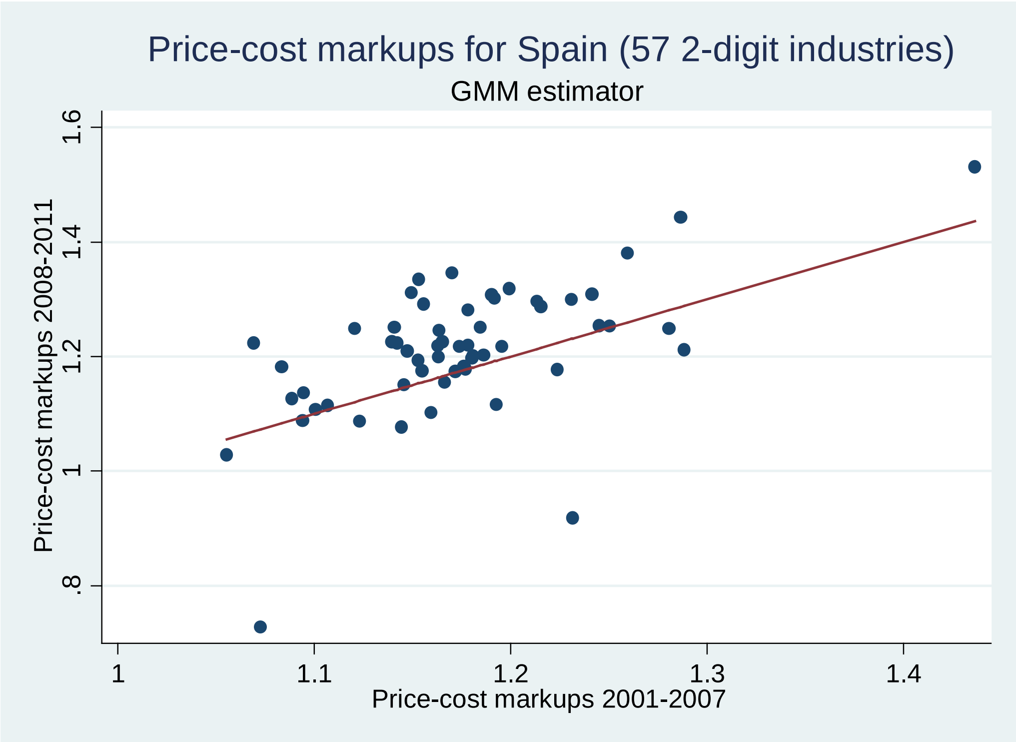
APPENDIX B. Estimates of the price-cost markup. ALL FIRMS.

DIFFERENT ELASTICITIES OF SCALE.



Note: Blue line: elasticity of scale = 0.8; Red line: elasticity of scale = 0.9; Green line: elasticity of scale = 1.0; Orange line: elasticity of scale = 1.1; Black line: elasticity of scale = 1.2.

APPENDIX C. ESTIMATES FOR 2001-2007 VS 2008-2011. 57 (2-DIGIT) INDUSTRIES.



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