COMPETITION AND PRICE ADJUSTMENT IN THE EURO AREA

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Luis J. Álvarez and Ignacio Hernando

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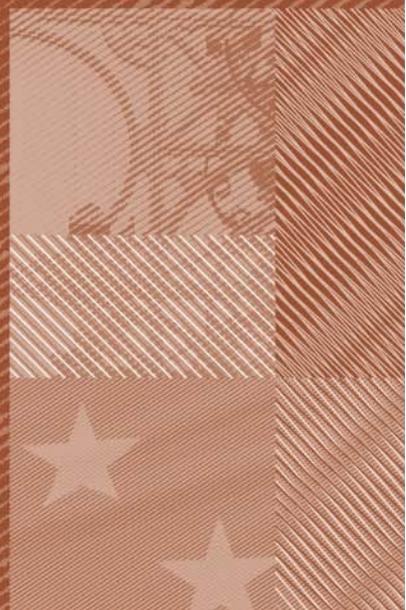
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Abstract

This paper explores the role of a number of factors in explaining the heterogeneity in the degree of price stickiness across industries, on the basis of the information provided by surveys on pricing behavior conducted in nine euro area countries. The main focus is placed on the influence of competition on the degree of price flexibility. Our results suggest that the price setting strategies of the most competitive firms give them a greater capacity to react to shocks and make, in practice, for greater flexibility in their prices. The direct influence of market competition on price flexibility is corroborated by a cross-country cross-industry econometric analysis based on the information provided by surveys. This analysis also shows that the cost structure and demand conditions help to explain the degree of price flexibility. Finally, it suggests that countries in which product market regulation is more relevant are characterized by less price flexibility.

1   Introduction

A crucial factor determining firms' pricing behavior is the degree of market competition. Since early studies on price stickiness using micro data, the relationship between market structure and pricing behavior has been a highly researched issue in industrial economics.[1] In particular, a great deal of attention has been devoted to the question of whether firms in competitive markets are more likely to change prices in response to shocks than firms enjoying significant market power [see for instance Ginsburgh and Michel (1988) and Martin (1993)]. Moreover, firms in more competitive industries, facing higher uncertainty about their future position in the market, may be more concerned with ensuring short-run returns, which leads to a higher responsiveness to current shocks [Encaoua and Geroski (1986)]. By contrast, firms facing less competition can place more emphasis on long-term returns and adopt pricing policies that smooth out expected fluctuations in costs and demand.[2] Oligopolists may prefer delays in adjusting prices in order to avoid breaking tacit pricing understandings [Stiglitz (1984)].

There are also a number of empirical papers linking price stickiness and degree of market competition. For instance, Carlton (1986) and Hall et al. (2000) find that firms in competitive markets tend to adjust prices faster than companies facing a less elastic demand. Geroski (1992) shows that price responses to both supply and demand shocks are faster in more competitive industries. Similarly, Weiss (1995) finds that cost changes are more fully transmitted into prices in industries with low concentration ratios. Overall, the empirical evidence tends to favor the existence of a positive link between price flexibility and the degree of competition [see Dixon (1983); Encaoua and Geroski (1986), and Bedrossian and Moschos (1988)], although there are also studies reporting the opposite result. For instance, Domberger (1979) finds a positive relationship between the speed of price adjustment and market concentration. He rationalizes this result by arguing that prices should react faster to costs shocks in concentrated industries, given that information is more easily gathered the higher the degree of concentration.[3]

More recently, renewed attention has been placed on the empirical relevance of the relationship between the degree of price stickiness and the intensity of market competition. For instance, the existence of a positive association between the frequency of price change and the degree of competition has been documented on the basis of individual producer prices for Spain and Belgium [see Álvarez et al. (2005) and Cornille and Dossche (2006), respectively] and for Luxembourg using consumer prices [Lünnemann and Mathä (2005)]. Furthermore, the qualitative information in the surveys on price setting behavior discussed in this book has provided an alternative source to assess the empirical significance of this relationship, which has been analyzed in several countries (see section 3 below).

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1. See Mills (1927) and Means (1936) for early contributions on the behavior of individual prices, and Silberston (1970) and Carlton (1989) for surveys of theoretical and empirical work on the relationship between pricing behavior and market structure.

2. A similar argument is considered by Eichner (1973). Industries characterized by increasing returns to scale usually lead to a small number of competitors that carry out the necessary large irreversible investments. The pricing policies of these firms are more oriented by long-run objectives than by short-run costs or demand fluctuations.

3. This argument is consistent with Stigler's (1964) model, according to which the fewer the number of firms in an industry the easier it is to monitor price cuts. Identifying price cuts with slow adjustment to cost increases, it can be argued that the fewer the number of firms, the faster the adjustment to cost shocks.

In this paper, we analyze the relationship between price flexibility and competition, focusing on euro area manufacturing and services industries. The distinguishing features of our study are the consideration of the whole euro area, the use of survey data and the inclusion of services sectors, which are generally neglected in this type of analysis. After this introduction, the structure of the remainder of this paper is the following: section 2 discusses the measurement of the degree of market competition in surveys. Section 3 explores the main features of firms pricing strategies according to their competitive environment. Section 4 shows some evidence on the relationship between competition and the degree of price flexibility. Our econometric results on the determinants of price flexibility in the euro area and presented in section 5, while section 6 concludes.

2 Measuring the degree of market competition

Measuring the degree of market competition is an extremely complex task that has received a lot of attention in the literature on industrial organization [see, for instance, Bresnahan (1989)]. In the context of the surveys on price setting discussed in this book, most national questionnaires included two questions directly related to the degree of competition faced by firms. Specifically, companies were asked to report on their market share and on the number of competitors. Unfortunately, these two measures have considerable shortcomings. First, both are highly subjective in the sense that different firms may use different criteria to define relevant markets or to identify their potential competitors. Second, in some oligopolistic markets with a small number of big companies enjoying large market shares, there is a very high degree of competition (e.g. telecommunications). Third, some industries may have a large number of competitors, but still maintain local market power (e.g. bars and restaurants).

For this reason, we infer the degree of competition faced by a firm from the importance it attaches to changes in competitors' prices in explaining its own price decreases. The rationale for this choice is that it can be expected that the more competitive is the environment faced by a firm, the more its pricing strategy is likely to be affected by the behavior of its competitors. Interestingly, the Dutch survey [Hoeberichts and Stokman (2006)], which is the only one including a direct question on the degree of perceived competition, comes in with results that support the use of this measure to proxy market competition. The importance attached by firms to changes in competitors' prices turns out to be highly correlated with the directly reported degree of perceived competition. This measure has the additional advantage that it is available for all countries. An additional measure that we use in the empirical analysis is the share of firms that set prices using a markup rule. We expect this share to be negatively related to the degree of market competition. Unfortunately, this information is not available for Austria and Luxembourg.

If we measure intense competition by considering those firms that report that competitors' prices are important or very important in determining a reduction in their own prices, it turns out that around 60% of firms in the euro area face intense competition (see Table 1). This share ranges from 54% in Spain to 71% in the Netherlands, although it has to be borne in mind that these cross-country differences are affected by differences in the sectoral coverage of national surveys.[4]

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4. For instance, the degree of perceived competition in Spain is found to be lowest in energy (31%), energy trade (38%), and bars and restaurants (44%). At the other end of the spectrum, the share of firms facing intense competitive pressures is highest in communications (69%), hotels and travel agents (66%) and food trade (65%).

TABLE 1

Degree of perceived competition[a] (percentages[b])

Country	Very low	Low	High	Very high
Austria	20.2	18.2	30.3	31.3
Belgium	17.6	21.8	30.4	30.1
France	19.5	17.3	38.4	24.9
Germany	19.0	23.4	34.0	23.6
Italy	9.8	24.6	37.0	28.5
Luxembourg	15.3	17.2	36.7	30.7
The Netherlands	4.6	24.6	48.8	22.0
Portugal	8.5	21.1	38.6	31.9
Spain	26.6	19.2	24.0	30.2
Euro Area[c]	17.1	21.5	35.2	26.2

Source: authors' calculations based on national data.

[a] Measured by the importance a firm attaches to competitors' prices when considering reducing its own prices.

[b] Rescaled figures excluding non responses.

[c] Weighted average (GDP weights).

3   Competition and firms' price setting strategies

As discussed in the introduction, the degree of market competition is an important factor in determining price setting behavior. In particular, it is reasonable to expect that firms facing a higher degree of competition will employ more flexible price determination strategies, which give them a greater ability to react to changes in market conditions.

In this section we use the results of the national surveys to analyze differences in firms' price setting policies, according to the intensity of market competition. Specifically, we focus on the differences in some aspects of pricing strategies, such as the use of markup rules versus other policies, time versus state dependence, forward looking behavior, and frequency of price reviews, in terms of the degree of competition faced by firms.

The various questionnaires address the issue of how firms set prices using slightly different formulations. Nevertheless, the results of the national surveys, with the exception of those for Austria and Luxembourg, can be compared by grouping the answers into three alternatives: "markup over costs", "price set according to competitors' prices" and "other" [see Fabiani *et al.* (2006)]. Overall, the evidence, summarized in Table 2, shows that a significant share of firms (54%) set their prices as a markup over marginal costs, suggesting that they enjoy a non-negligible degree of market power. The fraction of companies setting prices according to those of their competitors is 27%. Finally, around 19% of the companies state that they do not have autonomous price setting policies. For these firms, the final decision on the price charged is taken by a different economic agent, and this may be the public sector, the parent company, the main customers or the suppliers.

TABLE 2

Price setting policies by degree of perceived competition[a] (percentages[b])

Country	Markup	Competitors' price	Other
Belgium			
All firms	45.9	36.4	17.7
Low competition	-	-	-
High competition	-	-	-
France			
All firms	40.0	38.0	22.0
Low competition	49.8	24.4	25.9
High competition	36.0	47.6	16.4
Germany			
All firms	73.0	17.0	10.0
Low competition	78.9	9.4	11.7
High competition	69.8	22.5	7.6
Italy			
All firms	42.4	31.7	25.9
Low competition	57.6	14.5	27.9
High competition	33.6	42.6	23.7
The Netherlands			
All firms	56.4	22.3	21.3
Low competition	56.6	15.3	28.2
High competition	56.5	25.4	18.1
Portugal			
All firms	64.5	12.6	22.9
Low competition	78.7	2.9	18.4
High competition	59.9	17.6	22.4
Spain			
All firms	51.9	26.6	21.5
Low competition	61.3	11.8	27.0
High competition	44.1	40.5	15.3
Euro Area[c]			
All firms	54.3	27.1	18.7
Low competition	63.6	14.7	21.7
High competition	49.8	35.1	15.1

Source: authors' calculations based on national data.

[a] Measured by the importance a firm attaches to competitors' prices when considering reducing its own prices.

[b] Rescaled figures excluding non responses.

[c] Weighted average (GDP weights).

There are interesting differences in these figures with respect to the degree of perceived competition. In particular, we find that the fraction of firms using markup rules is higher among those operating in low competition environments: 64% as compared to 50% among firms facing intense competition. This result is qualitatively similar for all countries. In turn, only 15% of euro area firms operating in low competitive markets set prices taking into account competitors' prices, whereas 35% of them do so if they face strong competition. This pattern of results also holds for all countries.

State dependent rules may lead to more flexible prices than time dependent ones in the face of shocks; hence, we check whether pure state dependent rules are more frequent among competitive firms. The evidence in favour of this hypothesis is rather weak: the fraction of euro area firms using pure state dependent rules is 27% among firms facing intense competition and 25% for firms operating in low competition environments.

The use of forward looking strategies can also be expected to be more widespread in competitive environments. Evidence for Spain shows that price revisions among highly competitive firms do not usually involve the application of simple rules, but are the result of an optimizing process in which expectations as to how market conditions may change are, fairly frequently, taken into account. The fraction of forward looking price setters is 37% among firms operating in a competitive environment and 18% for companies facing low competition. Furthermore, the Spanish survey also shows that firms operating in competitive environments use active commercial policies to a greater extent.

There are also differences concerning the frequency of price reviews. As expected, firms operating in more competitive environments review their prices more frequently (Figure 1). For the euro area as a whole, the fraction of firms reporting that competitors' prices are unimportant (very important) and reviewing prices at least twelve times per year is 23% (34%). Conversely, the share of companies reviewing prices at most three times per year is 68% (45%) for firms reporting that competitors' prices are unimportant (very important) on their pricing decisions. This positive relationship between the frequency of price reviews and the intensity of competition is observed in all countries.

FIGURE 1

Frequency of price reviews by degree of perceived competition[a]
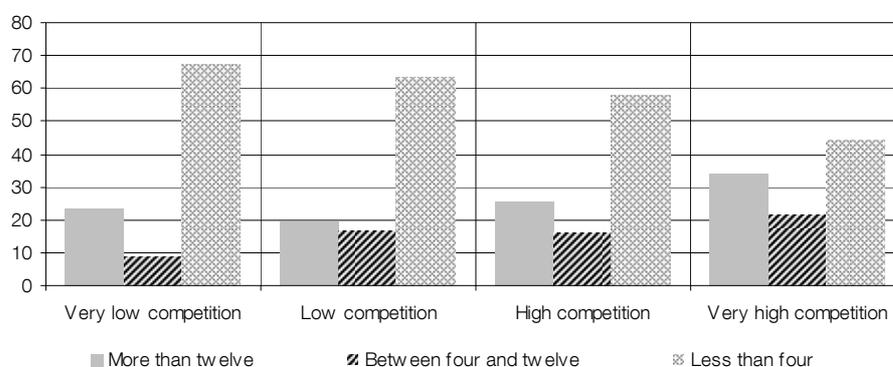
Source: authors' calculations based on national data.

[a] Measured by the importance a firm attaches to competitors' prices when considering reducing its own prices.

4   Competition and the degree of price flexibility

4.1   Descriptive statistics

A first approach to explore the relationship between competition and price stickiness consists in measuring the frequency of price adjustment for different groups of firms defined in terms of the degree of competition they face. As Figure 2 shows, firms facing stronger competitive pressures display a higher frequency of price adjustment. For the euro area as a whole, the share of companies changing prices at least four times a year is 10% (26%) for firms reporting that competitors' prices are unimportant (very important) in their pricing decisions. Conversely, the fraction of firms changing prices at most once a year is 73% (50%) for firms indicating that competitors' prices are unimportant (very important) in price setting. This pattern of results is observed in all countries with the exception of Austria.

Table 3 reports the average implicit duration as obtained from interval grouped figures for the frequency of price changes for the different countries and degrees of competition.[5] For the euro area, prices remain unchanged on average for the most competitive firms for 9 months, while in more sheltered markets prices are maintained for 14 months. As can be seen from the Table, the relationship between the degree of perceived competition and the average price duration is negative and monotonic in most countries.

FIGURE 2

Frequency of price changes by degree of perceived competition[a]
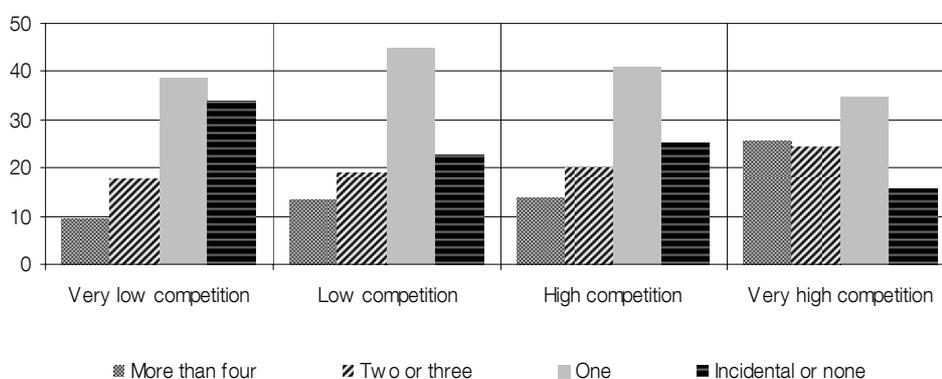
Source: authors' calculations based on national data.

[a] Measured by the importance a firm attaches to competitors' prices when considering reducing its own prices.

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5. To obtain these implicit durations, the following assumptions have been made: for firms declaring "at least four price changes per year" a duration of 1.33 months (i.e. 8 price changes per year) has been considered; for those declaring "two or three changes per year" a duration of 4.8 months (i.e. 2.5 price changes per year); for those declaring "one change per year" a duration of 12 months; and, finally, for those declaring "less than one price change per year", a duration of 24 months.

TABLE 3

Average implicit price duration (in months[a]) by degree of perceived competition

Country	Degree of perceived competition[b]			
	Very low	*Low*	*High*	*Very high*
Austria	10.0	9.4	9.9	10.5
Belgium	12.7	11.9	12.0	10.8
France	14.0	11.7	11.3	7.9
Germany	15.9	12.2	14.1	11.4
Italy	12.7	13.1	11.8	7.6
Luxembourg	10.5	9.3	9.1	6.4
The Netherlands	10.6	11.9	10.5	9.2
Portugal	13.3	13.0	12.2	11.6
Spain	13.1	11.3	11.0	9.4
Euro Area[c]	13.8	12.0	12.1	9.4

Source: authors' calculations based on national data.

[a] To obtain these implicit durations, the following assumptions have been made: for firms declaring "at least four price changes per year" it has been assumed a duration of 1.33 months (i.e., 8 price changes per year); for those declaring "two or three changes per year" a duration of 4.8 months (i.e., 2.5 price changes per year) has been considered; for those declaring "one change per year" a duration of 12 months has been considered; and, finally, for those declaring "less than one price change per year", a duration of 24 months has been assumed.

[b] Measured by the importance a firm attaches to competitors' prices when considering reducing its own prices.

[c] Weighted average (GDP weights).

4.2 Country specific results

The link between the prevailing competitive environment and the degree of price flexibility has been explored in the different country specific studies, using a variety of methodological approaches. Some studies have analyzed the influence of the degree of market competition on the reported frequency of price changes. In particular, Hoeberichts and Stokman (2006). find a positive impact from the perceived degree of competition on the frequency of price adjustment, using an ordered logit model. In a similar vein, Álvarez and Hernando (2005) report a positive effect of the intensity of competition on the frequency of price changes, in a log linear regression model. In both cases, the estimated models control for other potential determinants of price flexibility. In turn, Aucremanne and Druant (2005) in a bivariate analysis finds that flexible firms –i.e. firms with shorter average duration between two consecutive price changes– tend to experience more competition, as proxied by different indicators such as the number of competitors or the importance of competitors' prices to explain price changes.

The influence of the intensity of competition on the probability of price adjustments after shocks has been addressed for a larger number of countries using probit models. The reaction to positive and negative demand as well as costs shocks has been considered. The general conclusion that arises from these country specific studies is that the speed of response to demand shocks is significantly higher for those firms operating in more competitive environments. In this type of analysis, the dependent variable is a binary variable that is set to 1 if the firm declares that it changes its price (within a specific period or without any time constraint) after the shock and 0 otherwise. In turn, the intensity of competition is proxied by the importance attached by companies to their competitors' prices, although there are country specific differences as well.[6] Table 4 reports the sign of the estimated impact in the available country studies. Overall, results show that prices are more flexible in response to demand shocks the higher the degree of market competition. This finding holds across countries and independently of the direction of the shocks, although it is not significant for Portugal and, in the case of contractionary shocks, for Spain. These results suggest that a slow price reaction to demand contraction in a highly competitive sector may result in a substantial loss of market share. In contrast, the speed of adjustment to costs shocks does not seem to be significantly affected by the degree of competition.

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6. The precise definitions used in the different countries both for the binary dependent variable and for the proxies of competition can be found in the country specific studies.

TABLE 4

Impact of market competition on the probability of adjustment after shocks
(main results from probit analysis)[a,b]

Country	Type of shock			
	Increase in demand	Fall in demand	Increase in costs	Fall in costs
Austria	+	+	no	no
France	+	+	+	no
Italy	+	+	-	-
Portugal	no	no	no	no
Spain	+	no	no	no

Source: authors' calculations based on national data.

[a] "+" denotes that competition is positively and significantly related to the probability of a price increase/decrease in response to an increase/decrease in demand/costs; "-" denotes that competition is negatively and significantly related to the probability of a price increase/decrease in response to an increase/decrease in demand/costs; "no" denotes that competition is not significantly related to the probability of a price increase/decrease in response to an increase/decrease in demand/costs.

[b] The definition of the dependent variable in the probit analysis as well as of the competition variable may be found in the country specific studies.

5   Determinants of price flexibility in the euro area

In this section, we explore the potential role of a number of factors to explain differences in the degree of price flexibility across euro area industries. We focus on the competitive environment, the cost structure of the different industries, demand conditions and product market regulations.

5.1   Data

We have put together a database using sectoral information from national surveys. Our starting point is the consideration of all NACE 2 digit sectors, where we can broadly distinguish three groups of industries in terms of national coverage.[7] First, manufacturing, which is covered in all country surveys; second, some market services (trade, hotels and restaurants, and transport and communications), which are covered in at least two big and two small euro area countries[8]; and third, the remaining sectors. Our full sample does not include this last group of sectors, since coverage in terms of countries is too limited to be considered informative for a euro area analysis.[9]

There are specific industries in some countries in which only a limited number of firms were surveyed. To ensure that our results are not driven by these observations, we also consider restricted samples made up of those sectors in which there are at least ten surveyed firms in a given country.[10] We refer to these samples as high representativity samples.

The variables considered in our econometric models are mostly derived from the country surveys. That way the different variables refer to the same set of firms. To enhance the degree of comparability across countries, we employ the same definitions of variables as in Fabiani et al (2006). The main variables we use are the following:

Price flexibility - For the full set of countries, we have information on the number of price changes per year.[11] Specifically, for each country and industry we know the fractions of firms that change prices considering four different categories: 1) at least four price changes per year; 2) two or three price changes per year; 3) one price change per year; and 4) less than one price change. We use the fraction of firms that change prices at least four times a year as the dependent variable in the econometric analysis.

Perceived competition - One measure of competition is obtained from the importance firms attribute to competitors' prices in influencing a reduction in their own prices. Information refers to a mean score of the following categories: "1=unimportant", "2=of minor importance", "3=important" and "4=very important".

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7. Available data for the Netherlands correspond to the aggregate of manufacturing and 5 different services groupings. For Belgium, we have information on 17 aggregates that group NACE sectors.

8. These industries are covered in the Italian and Spanish surveys.

9. Specifically, we cover the NACE 2-digit sectors coded 15, 17-22, 24-36, 51-60, 64. The remaining sectors do not satisfy the two big countries and two small countries minimum coverage rule. The exclusion of the sector "Coke and refined petroleum" is due to its markedly different pricing behavior.

10. Given its special characteristics we have not applied the ten firms minimum for the sector "Office machinery and computers" (NACE 30).

11. Specifically, five national surveys (for Belgium, Spain, Luxembourg, the Netherlands and Austria) refer to the average number of price changes per year in recent years, whereas three (for Italy, France and Portugal) refer to the number of price changes in a precise year. For Germany, the figures we use refer to the number of price changes, as reported by the same firms in the IFO business survey in 2003, given that the German questionnaire did not include a question on the number of price changes.

Markup - An alternative measure of competition for all countries, except Austria and Luxembourg, can be obtained from questions on price setting. In particular, we use the percentage of firms that declare employing markup over costs rules.

Labor costs, raw materials costs and demand - All national surveys included questions about the factors that are important for changing prices upwards or downwards, including labor costs, raw material costs and demand conditions. Respondents were asked to assign scores between "1=completely unimportant" and "4=very important" to each of them. In our analysis we consider, for each factor, the sum of scores for price increases and decreases.

Product market regulation - We employ both objective and subjective measures of regulation.[12] For the former, which involve coding a variety of features of different laws and combining them into a single index, we use the estimates provided by Nicoletti et al. (1999). For the subjective measures, which involve coding responses to public opinion surveys of experts or of business people in which respondents are asked about the existence and impact of various regulations, we use the estimates by Pryor (2002). In both cases, measures refer to regulations at the national level, as information at the industry level is not available.

Sectoral dummies - We also consider dummies for groupings of manufacturing sectors (food, other consumer goods, intermediate products, and capital goods) and services sectors (trade, hotels and restaurants, and transport and communications).

5.2 Econometric methodology

In our analysis, we model the fraction of firms *(freq)* that change prices frequently. Given that fractions are bounded between 0 and 1 and linear predictors can take any real value, linear models are inappropriate in this setting and the alternative of using a log-odds ratio model also has potential problems. First, the method is not valid if the fraction takes on the values 0 or 1, as it is sometimes the case in our sample. Second, further assumptions are needed to recover the conditional expectation. To avoid these problems we use the quasi-maximum likelihood (QML) approach of Papke and Woolridge (1996), involving the estimation of a nonlinear model. Specifically, the observed frequency is expressed as a bounded nonlinear function (typically a cumulative distribution function) of explanatory variables *(x),* and a Bernoulli likelihood function is maximized. The corresponding estimator is consistent and asymptotically normal. In our estimates we use a logistic cumulative distribution function.[13] That is, we estimate

$$freq = \frac{e^{\alpha + \sum \beta_i x_i}}{1 + e^{\alpha + \sum \beta_i x_i}}$$

$freq \sim$ Bernoulli

5.3 Results

In this section first we report the results for basic specifications in which we measure the degree of market competition by the importance attached by firms to competitors' prices in explaining their own price cuts and do not include any product market regulation variable. Second, we alternatively proxy competition by the variable *markup*. Finally, we estimate specifications including product market regulation variables. Throughout we present

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12. See Nicoletti and Pryor (2006) for a comparative study of several quantitative indicators of regulation in OECD nations.
13. In our robustness analyses we have also considered a standard normal cdf and a cloglog. Results are not affected by the specific function used.

results for the full sample of manufacturing and services and also for manufacturing sectors only, since these data refer to all countries. In all cases, we check for robustness using high representativity samples, where only those industries in which at least ten firms are surveyed in a given country are considered.

The first column in Table 5 reports estimates for the complete set of manufacturing and services industries. As can be seen, price flexibility-as measured by the fraction of firms that change prices at least four times a year –is significantly and positively affected by the degree of market competition. Regarding the variables proxying the cost structure, we expect that those sectors where labor costs are highly relevant tend to contain a relatively small fraction of firms that change prices often. This is explained by the fact that wage changes typically take place once a year. On the other hand, those sectors where raw materials are highly relevant can be expected to show a high degree of price flexibility, since raw material prices change very often. In this specification, we estimate a negative coefficient on labor and a positive one on raw materials, although they are not significant. We also find a positive and significant effect of the demand variable, showing that in those sectors where demand conditions are important there is a high degree of price flexibility. Regarding country dummies, we find positive and significant coefficients for Austria, Germany and Luxembourg. This is interesting since Austria and Germany are two countries where product market regulation is low.[14] Finally, the transport and communications sector is found to be significantly less flexible than the other sectors.[15] The second column in Table 5 restricts the sample to highly representative industries. The only difference with respect to the whole sample is that cost variables are now highly significant, although the demand variable is no longer significant. Considering only manufacturing industries (column 3), competition, cost structure and demand variables are all significant, with the exception of the labor variable, which is only correctly signed. Finally, restricting the manufacturing sample to highly representative sectors, we find that competition and cost variables are highly significant, although this is no longer the case for the demand variable.

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14. No information for Luxembourg is available.
15. According to the results from country specific studies (see, for instance, Álvarez and Hernando (2005), this result is most likely driven by the high stickiness of pricing policies of transport firms.

TABLE 5

Determinants of price flexibility[a,b] (perceived competition specifications)

Explanatory variables[c]	Manufacturing and services		Manufacturing	
	Full sample	High representativity sample	Full sample	High representativity sample
Perceived competition	0.69**	0.88***	0.85**	0.91***
Labor	-0.11	-0.56***	-0.18	-0.59***
Raw materials	0.22	0.27**	0.30*	0.32**
Demand	0.35*	0.25	0.34*	0.24
Austria	2.75***	2.61***	3.06***	2.76***
Belgium	0.23	-0.1	0.54	0.13
France	0.54	-0.39	0.58	-0.4
Germany	1.52***	0.70**	1.55***	0.67**
Italy	0.53	0.45	0.56	0.37
Luxembourg[d]	1.07**	1.57***	0.99	-
The Netherlands	0.64	0.43	-	-
Spain	0.45	-0.16	0.4	-0.3
Consumer non food goods	-0.47	-0.2	-0.45	-0.19
Intermediate goods	-0.17	-0.21	-0.19	-0.22
Capital goods	-0.56	-0.38	-0.55	-0.39
Trade	0.66	0.28	-	-
Hotels and restaurants	-0.32	-0.25	-	-
Transport and communications	-1.08**	-1.18***	-	-
Constant	-6.68***	-4.38***	-7.26***	-4.53***
Number of obs.	162	133	137	113
Pseudo R squared	0.48	0.40	0.47	0.41
Log likelihood	-49.61	-39.78	-42.19	-33.83
AIC	137.22	117.56	114.39	95.65
BIC	195.89	172.47	158.19	133.84

Source: authors' calculations.

[a] Dependent variable: fraction of firms that change prices at least four times a year.

[b] p-values: *=p<.1; **=p<.05; ***=p<.01. Computed using Huber-White robust standard errors.

[c] Definition of explanatory variables: see the main text. The reference industry is Food in Portugal.

[d] The Luxembourg survey does not include any manufacturing industry in which more than ten firms were surveyed. An alternative measure of competition is obtained using the percentage of firms that employ markup rules. The main disadvantage of this measure is that it is not available for Austria and Luxembourg. Column 1 of Table 6 reports the results for the full sample. It is found that competition, costs and demand variables are all significant. This result also holds for the smaller sample of highly representative industries (column 2). Considering only manufacturing firms does not change results (column 3) and these are also robust to the use of the high representative sample (column 4).

TABLE 6

Determinants of price flexibility[a,b] (markup specification excluding product market regulation)

Explanatory variables[c]	Manufacturing and services		Manufacturing	
	Full sample	High representativity sample	Full sample	High representativity sample
Markup	-0.02***	-0.02***	-0.02***	-0.02**
Labor	-0.33*	-0.39**	-0.42**	-0.47**
Raw materials	0.37**	0.41***	0.45***	0.48***
Demand	0.32*	0.52***	0.32*	0.47***
Belgium	-0.11	-0.15	0.04	0.16
France	-0.32	-0.27	-0.47	-0.33
Germany	1.13***	1.00**	1.05**	0.86**
Italy	-0.27	-0.56	-0.33	-0.87*
The Netherlands	0.83*	0.38	-	-
Spain	-0.01	-0.12	-0.27	-0.28
Consumer non food goods	-0.83**	-0.76**	-0.75**	-0.72**
Intermediate goods	-0.47	-0.64**	-0.48	-0.63**
Capital goods	-0.85**	-0.85**	-0.81**	-0.79**
Trade	-0.19	0.26	-	-
Hotels and restaurants	-0.79*	-0.57	-	-
Transport and communications	-1.45***	-1.62***	-	-
Constant	-2.6	-3.50**	-2.41	-3.41**
Number of obs.	122	108	104	93
Pseudo R squared	0.36	0.33	0.40	0.33
Log likelihood	-31.42	-27.46	-26.43	-23.46
AIC	96.84	88.92	78.87	72.92
BIC	144.51	134.51	113.24	105.84

Source: authors' calculations.

[a] Dependent variable: fraction of firms that change prices at least four times per year.

[b] p values: *=p<.1; **=p<.05; ***=p<.01. Computed using Huber-White robust standard errors.

[c] Definition of explanatory variables: see the main text. The reference industry is Food in Portugal. Table 7 considers the addition of either objective or subjective measures of product market regulation to the specifications in Table 6. Column 1 includes the objective measure of Nicoletti et al. (1999) for the whole sample of manufacturing and services industries. It is found that competition, cost structure and demand variables are highly significant. Moreover, those countries in which product market regulation is more important display a lower degree of price flexibility. Column 2 reports results using the subjective measure by Pryor (2002) and shows that the results are robust to the change in the regulation variable. As an additional check, we consider just manufacturing sectors. The relevance of competition, cost structure and demand variables are again found, regardless of the use of an objective (column 3) or subjective (column 4) measure of product market regulation.

TABLE 7

Determinants of price flexibility[a,b] (markup specification including product market regulation)

Explanatory variables[c]	Manufacturing and services		Manufacturing	
	Objective regulation[d]	Subjective regulation[e]	Objective regulation[d]	Subjective regulation[e]
Markup	-0.02**	-0.02***	-0.02**	-0.02***
Labor	-0.45***	-0.37***	-0.51***	-0.37***
Raw materials	0.40***	0.41***	0.48**	0.43**
Demand	0.32**	0.33**	0.32*	0.35**
Product markets regulation	-2.51***	-2.45***	-2.48***	-2.79***
Consumer non food goods	-0.75**	-0.81**	-0.72**	-0.81**
Intermediate goods	-0.45	-0.48*	-0.46*	-0.51*
Capital goods	-0.76**	-0.82**	-0.73**	-0.85**
Trade	-0.17	-0.34	-	-
Hotels and restaurants	-0.79*	-1.14***	-	-
Transport and communications	-1.39***	-1.52***	-	-
Constant	-0.49	-1.03	-0.64	-0.85
Number of obs.	122	122	104	104
Pseudo R squared	0.30	0.34	0.31	0.35
Log likelihood	-31.96	-31.64	-27.06	-26.73
AIC	87.92	87.28	72.11	71.45
BIC	121.57	120.93	95.91	95.25

Source: authors' calculations.

[a] Dependent variable: fraction of firms that change prices at least four times a year.

[b] p values: *=p<.1; **=p<.05; ***=p<.01. Computed using Huber-White robust standard errors.

[c] Definition of explanatory variables: see the main text. The reference industry is Food in Portugal.

[d] Objective product market regulation variable. Source: Nicoletti et al. (1999).

[e] Subjective product market regulation variable. Source: Pryor (2002).

6   Conclusions

Recent empirical studies on price setting behavior using micro data have shown a marked heterogeneity in the degree of price stickiness across industries. In this paper, we have explored the role of a number of factors in explaining this heterogeneity, on the basis of the information provided by surveys on pricing behavior conducted in nine euro area countries. The main focus has been placed on the influence of the intensity of competition on the degree of price flexibility. Our results suggest that the pricing policies of firms operating in more competitive environments show greater flexibility in certain aspects. These firms carry out price revisions and changes substantially more often and tend to use markup rules to a lesser extent. Overall, the price setting strategies of the most competitive firms give them a greater capacity to react to shocks and make, in practice, for greater flexibility in their prices.

The direct influence of market competition on price flexibility is corroborated by a cross-country cross-industry econometric analysis based on the information provided by the surveys. This analysis also shows that the cost structure and demand conditions help to explain the degree of price flexibility. Finally, it suggests that countries in which product market regulation is more relevant are characterized by less price flexibility. Overall, these results are in line with the micro quantitative evidence on the determinants of the frequency of consumer and producer price changes [Sabbatini *et al.* (2006)].

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