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The Price Setting Behaviour of Portuguese Firms Evidence from Survey Data*

Fernando Martins†

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Abstract

This paper analyses the results of a survey conducted by the Banco de Portugal between May and September 2004 on a sample of 1370 Portuguese firms with the main purpose of investigating their price setting behaviour. The evidence points to the presence of a considerable degree of price stickiness: most firms do not review or change their prices more than once a year; time lags in price reactions to cost and demand shocks were found to be significant; and slightly more than half of the firms follow time-dependent price reviewing, though only one-third stick to this practice after the occurrence of specific shocks. The degree of price stickiness seems to be higher in services than in manufacturing. The presence of implicit contracts between firms and their customers under which the former pledge to stabilise their prices as a way to increase customers' loyalty is apparently the main reason that prevents firms from changing their prices more promptly. Other relevant sources of price stickiness were also found: coordination problems arising from the preference of firms not to change their prices unless their competitors do so, the constraint imposed by a high proportion of fixed costs, marginal costs that vary little when costs are an important determinant in firms' pricing decisions or the presence of formal contracts that are costly to renegotiate. In contrast, alternative explanations such as the existence of menu costs, the preference of firms to quote their prices according to certain thresholds and the costs of collecting the relevant information for pricing decisions were not considered very important.

Keywords: Inflation persistence, price-setting behaviour and survey data.
JEL Codes: E31, D40, L11.

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Non-technical summary

In this paper, price stickiness in Portugal is investigated on the basis of qualitative data coming from a survey conducted by the Banco de Portugal between May and September 2004. The sample covered 1370 Portuguese firms, mostly from manufacturing. Firms were asked about a number of features of their pricing behaviour such as the frequencies of price reviews and price changes, the speed and magnitude of price adjustments as well as the reasons that lead them to change their prices infrequently. The methodology is similar to that proposed by Blinder *et al.* (1998), who were the first to implement the large-scale interview method to test different theories of price stickiness. One main advantage of using survey analysis lies in the possibility of asking firms directly about a number of aspects of their pricing behaviour such as the motivations underlying the asymmetries observed in price changes or the reasons why they decide to adjust prices infrequently. This cannot be carried out on the basis of quantitative data coming from individual price indices. However, one major drawback is the need to assume that firms' responses describe what they actually do in practice.

In order to assess the degree of price stickiness, five indicators were used: the share of firms following time-dependent pricing rules *vis-à-vis* the share of firms following state-dependent pricing rules; the frequency of price reviews; the frequency of price changes; the share of firms that take into account expectations about future economic developments when reviewing their prices; and the speed of price response following cost or demand shocks. The results point to the presence of a considerable degree of price stickiness: most firms do not review or change their prices more than once a year; time lags in price adjustments were found to be significant; slightly more than half of the firms follow time-dependent price reviewing, though only one-third stick to this practice after the occurrence of specific shocks; and, finally, more than half of the firms build their price decisions taking into account only historical data.

Results also show that the degree of price stickiness seems to be higher in services than in manufacturing (all the five indicators point in the same direction). This a stylised fact also identified for the euro as a whole [see Fabiani *et al.* (2005)]. However, given that the services sector has typically a larger labour input share, the higher price persistence identified in this sector can be justified by a higher degree of nominal wage rigidity.

Another important finding is that prices seem to go down more frequently than what is normally assumed: slightly more than 30 percent of price changes are price decreases. This result is in line with the evidence from the quantitative data, both for Portugal and for the euro area as a whole [see, respectively, Dias *et al.* (2004) and Dhyne *et al.* (2005)] .

Finally, the presence of implicit contracts between firms and their customers, under which the former pledge to stabilise their prices as a way to increase their customers' loyalty, is apparently the main reason for the persistence observed in prices. Coordination problems arising from the preference of firms not to change their prices unless their competitors do so, the constraint imposed by a high proportion of fixed costs, marginal costs that vary little when costs are an important determinant in firms' pricing decisions or the presence of formal contracts that are costly to renegotiate were also found to be relevant sources of price stickiness. In contrast, alternative explanations such as the existence of menu costs, the preference of firms to quote their prices according to certain thresholds and the costs of collecting the relevant information for pricing decisions were not considered very important.

1 Introduction

In economic literature it is widely accepted that the way monetary policy is conducted can influence the level of economic activity. The central assumption to obtain not only nominal but also real effects from monetary policy is that prices are not fully flexible, remaining fixed for at least very short periods. The impact of interest rate changes on inflation and output is thus affected by the degree of price stickiness. In this context, a deeper understanding of the extent and reasons for the sluggish adjustment of nominal prices is critical for the design of monetary policy. This has motivated a renewed interest in this field of research.

In this paper, price stickiness in Portugal is investigated on the basis of qualitative data coming from a survey conducted by the Banco de Portugal between May and September 2004. The sample covered 1370 Portuguese firms, mostly from manufacturing. Firms were asked about a number of features of their pricing behaviour such as the frequencies of price reviews and price changes, the speed and magnitude of price adjustments as well as the reasons that led them to change their prices infrequently. The methodology is similar to that proposed by Blinder *et al.* (1998), who were the first to implement the large-scale interview method to test different theories of price stickiness. Hall *et al.* (2000) for the UK and Apel *et al.* (2001) for Sweden followed similar approaches. More recently, in the context of the Eurosystem's Inflation Persistence Network, a number of national studies using identical methodology were undertaken for several euro area countries. This is the case of Fabiani *et al.* (2004) for Italy, Loupias and Ricart (2004) for France, Kwapil *et al.* (2005) for Austria, Aucremanne and Druant (2005) for Belgium, Hoeberichts and Stokman (2004) for the Netherlands, Alvarez and Hernando (2005) for Spain, Lünnemann and Mathä (2005) for Luxembourg and Stahl (2005) for Germany. No similar study has ever been done for Portugal.

One important advantage of using survey analysis lies in the possibility of asking firms directly about a number of aspects of their pricing behaviour such as the motivations underlying the asymmetries observed in price changes or the reasons why they decide not to adjust their prices immediately after a significant change in their costs or demand. This cannot be carried out on the basis of quan-

titative data coming from individual price indices. Another important strength of survey analysis is the chance to split the process of price determination into its two main components (the "price reviewing stage" and the "price changing stage") and study them separately, something that it is also impossible with quantitative data where only the final outcome of this process is available. Survey data also provide a useful mechanism to crosscheck the evidence stemming from the analysis of micro price data. However, in the context of survey analysis, there is the risk that firms' responses may not describe what they actually do in practice. Besides that, responses may be sensitive to various factors, such as the wording of questions and the economic environment in which they are answered[1]. Finally, surveys are in most cases expensive and very time-consuming, which makes them quite difficult to conduct on a regular basis. This lack of a time dimension eliminates any chance of investigating how different variables evolve over time.

The paper is structured as follows. Section 2 discusses the methodological issues involving the sample selection and the survey design. Section 3 describes some of the characteristics of the market where firms operate that are important for their pricing decisions, with special emphasis on the degree of competition and customer relationships. Section 4 presents some general information regarding the price-setting behaviour of Portuguese firms, in particular the presence of some form of price discrimination both in Portugal and in foreign markets. In section 5, a number of indicators of price stickiness are analysed including the frequency of price reviews and price changes, the speed of price changes or the fraction of firms following time-dependent and state-dependent pricing rules. The main theories of price stickiness put forward in the literature are examined in section 6. The reaction of prices to demand and cost shocks is investigated in section 7, which also presents an empirical model with the main purpose of explaining possible asymmetries identified in price adjustments. Finally, section 8 presents some concluding remarks.

[1]For instance, in 2003, the reference year in the survey, Portugal went into recession. Real GDP declined by 1.3 percent, reflecting a rather negative contribution of domestic demand. Gross Fixed Capital Formation went down by 9.6 percent while private consumption declined by 0.7 percent. The levels of both consumer and business confidence reached historically low levels. This unfavourable economic environment could have had some influence on firms' answers to the survey.

2 Methodological issues

2.1 Sample design

The survey was conducted by the Banco de Portugal between May and September 2004 on the basis of a sample covering Manufacturing (NACE – classification of economic activities – 15 to 37, excluding 30); Energy (NACE 40 and 41); Transport, Storage and Communication (NACE 60 to 64); Education (NACE 80); and Healthcare excluding social work (NACE 85, excluding 853). This implied that a total of 31 two-digit sectors were covered. Some sectors such as construction or retailing were not included, mostly because of the difficulty in identifying a main product. A total of 2491 firms were contacted to participate[2]. The Banco de Portugal Central Balance-Sheet Database (*Central de Balanços*, CB) was the primary source for company selection[3].

Given the dominance of smaller firms in Portugal, a purely random selection would run the risk of an overrepresentation of these firms. To overcome this problem, it was decided to select firms using stratified random sampling. The whole population of firms for the above-mentioned sectors was firstly split into two groups according to the number of employees: one group containing firms with 20 or more employees but less than 50 (the small firms), and another group including firms with 50 or more employees (the large firms). It was decided that 40 percent of firms would be drawn from the first group while the remaining 60 percent would be drawn from the second. A crosstabulation of these two groups with the selected sector breakdown gave rise to 62 mutually exclusive strata. The selection of firms in each stratum was then made by stages. The relative frequency of each stratum in the Ministry of Employment Personnel Database (*Quadros de Pessoal*, QP)[4] – the best proxy for

[2]The total number of firms sampled was 2500 but the survey was only sent to 2491, because the remaining firms had either merged or ceased to exist. In addition, firms that participated in the pilot survey were not included in the final sample because the questionnaire they received was considerably different from the final version.

[3]The Central Balance-Sheet Database was created in 1987 and it is based on an annual survey conducted by the Banco de Portugal. It gathers an important body of economic and financial information on those firms which are willing to co-operate with this Office. The data are collected through the completion of an annual questionnaire submitted to firms.

[4]The Personnel Database was created in 1982 and it is based on an annual survey conducted by the Portuguese Ministry of Employment. It is the most complete survey made of Portuguese firms and covers all premises with wage earners. Answering this survey is mandatory. The survey collects detailed information on both wages and the characteristics of each individual employee (regular wages, subsidies, hours worked, date of admission, age, gender, schooling, qualification level,...) as well as basic information about the premises and about the firm (size, ownership, location, ...). By law, this information is sent to the Statistics Department of the Ministry of Employment, it is copied

the population of Portuguese firms – was used as a benchmark to determine the number of firms to be drawn from the CB 2002. After doing this, firms were drawn randomly from each stratum. For those strata where the number of available firms in the CB 2002 was less than the benchmark, the CB 2001, the CB 2000 and finally the QP 2000 databases were used successively until the sample was fully completed. At the end, the sample included 2099 firms from Manufacturing, 10 from Energy and 382 from Services. These firms accounted for about 17 percent of total employment in Portugal.

2.2 Survey design and implementation

The survey was organised in six sections containing a total of 31 questions (an English version of the survey is annexed to the paper). For the sake of comparability, a large share of these questions was taken from other similar surveys. The opportunity was also used to ask firms about other aspects of their price-setting behaviour. This was the case of questions on the evidence of price discrimination in foreign markets or on the evidence of wage-adjustment synchronisation. An attempt was made to phrase the questions as much as possible in non-technical language that can be understood by a non-economist. Section 1 collected some general information about the characteristics of the market where firms operate such as their main market, destination of sales, degree of competition and the kind of relationship they have with customers. In section 2, firms were asked about their general price-setting behaviour, in particular whether they were mostly price-makers or price-takers, the frequency of their price reviews and price changes, the information they use for setting prices or whether they follow mostly time-dependent or state-dependent pricing rules. Section 3 investigated the possible presence of asymmetries in price adjustments, both in terms of the nature of shocks and speed of reaction. The main theories of price stickiness were outlined in section 4. Section 5, which was answered only by those firms where exports accounted for a non-negligible share of sales, analysed the extent to which pricing behaviour was dependent on the market where firms operate. Finally, section 6 asked firms about the frequency of their wage changes in a small-scale attempt to

to the employers' association, and is made available to every worker in a public space of the company's premises. This last requirement facilitates the work of the Ministry of Employment, which monitors compliance of companies with the law (e.g. illegal work).

bring together information on price setting with information on wage setting.

After the sample had been selected and a first draft of the survey had been designed, a small-scale pilot survey was carried out on a sample of 20 firms at the end of May. This provided a very useful mechanism for an *ex-ante* assessment of firms' reaction to the survey. Following the analysis of responses and after contacting some of the surveyed firms by phone, a number of questions were either reformulated or even eliminated in order to make the survey shorter and simpler[5]. The pilot survey was also very helpful in terms of choosing the best way to contact firms.

In July 2004, a revised version of the survey was sent by traditional mail for the whole sample of firms. It was accompanied by a cover letter signed by both the Director and the Deputy Director of the Research Department making clear *inter alia* that the survey was supposed to be answered by someone well informed about the firm's price setting (senior managers in most cases). Firms were allowed to answer within fifteen working days either by traditional mail or through a specially created website[6]. A reminder was sent to those firms that had not responded by mid-August. At the end, 1370 valid questionnaires were received[7]. A response rate of 55 percent was rather pleasant given that for most firms it was the first time they were facing such kind of survey and some of the questions were not particularly easy to answer.

2.3 Weighting procedure

In order to draw inferences for the whole population of Portuguese firms and not only to make statements about the sample behaviour, it was necessary to correct for possible biases in the response structure. For instance, in our response structure larger firms were over-represented. So, to estimate the means or the proportions for the population as a whole, in each stratum the calculated means and proportions had to be adjusted. In addition, given that pricing decisions of larger firms are presumably more important for the economy than those of smaller firms, weights were also adjusted

[5] Expressions like "marginal costs" or "firms with a lower elasticity of demand" were replaced by less technical terms such as "changes in costs" or "firms that are less sensitive to changes in prices".

[6] A help desk was created to support firms, either by phone, fax or email.

[7] The number of firms that sent their questionnaires was a slightly higher but some questionnaires had to be eliminated because of inconsistencies. For instance, 87 firms answered in question 6 that they had no competitors in their main market, but 3 of them claimed in question 16 that their price was set by their main competitor.

by a measure that accounted for differences in the size of firms. The number of employees was the selected measure. The weighting procedure followed closely that proposed in Kwapil *et al.* (2005) for Austria (Table A1 in the Annex shows the details of this procedure)[8]. It should be kept in mind that this adjustment did not intend to reflect in the weighted structure the total share of manufacturing and services in the economy. For instance, if those services that were selected accounted for about 15 percent of total firms in the restricted population of firms under consideration, they will keep basically the same share in the (weighted) response structure. This explains why the findings for the total sample and for manufacturing (which accounts for about 85 percent of the total sample of firms) do not differ by much. Finally, results for services should be read with care as they reflect price-setting behaviour for those services that were selected, and these represent only a fraction of total services in the economy.

3 Main market characteristics

Firms' price-setting behaviour is affected by the characteristics of the market where they operate. Among those characteristics is the location of their main market (domestic or foreign), the degree of competition they face and the kind of relationship they have with their customers. In this section, these characteristics are analysed.

3.1 Main product and main market

To minimise the potential problem of firms considering different products and price strategies in their answers, the survey focused on their main product, either a good or a service, referred to as the product with the highest turnover in 2003 [9]. This could have been a very restrictive limitation to the survey if their main product was not representative of their total turnover. Fortunately, this was not the case. Indeed, the main product accounted on average for slightly more than 80 percent

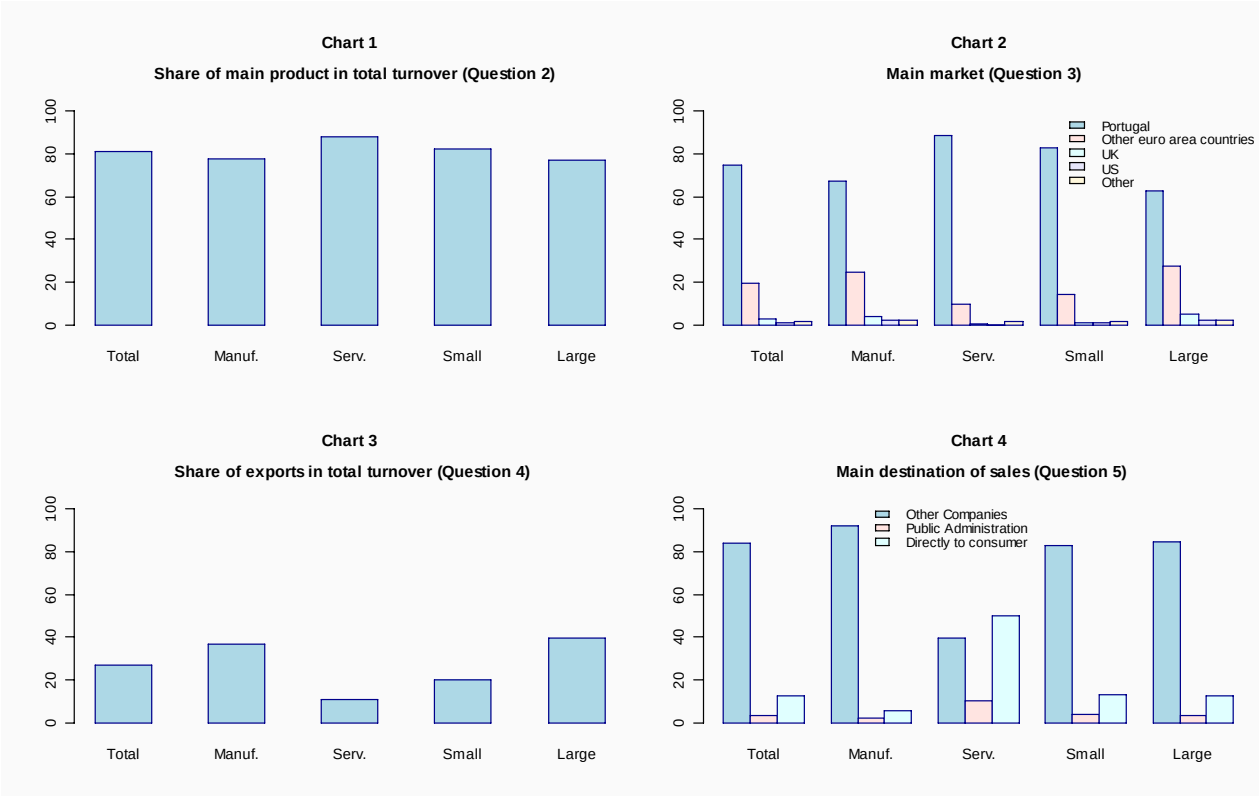
[8] I would like to thank Claudia Kwapil and Josef Baumgartner from the Oesterreichische Nationalbank for sharing their weighting procedure.

[9] The focus on a particular year is in line with Apel *et al* (2001) for Sweden, Fabiani *et al* (2004) for Italy and Fougier *et al* (2004) for France but contrasts with Aucremanne and Druant (2005) for Belgium, where no reference is made to a particular year.

of total turnover (Chart 1). This high percentage was broadly expected since our sample excluded a number of sectors where a main product was particularly difficult to identify. Analysing results by sector and firm size, figures are higher in services (88 percent) than in manufacturing (78 percent) and for smaller firms (82 percent) than for larger ones (77 percent).

Regarding firms' main market, about three-quarters sell their product mostly to the domestic market (Chart 2). The location of firms' main market is important because price-setting strategies might be different in domestic and foreign markets. As expected, this share is higher in services and for smaller firms. The higher degree of openness found in manufacturing and among larger firms is consistent with the results obtained when exporting firms were asked about the percentage of their turnover that was due to exports (Chart 3). As expected, this percentage is higher in manufacturing (36 percent) than in services (11 percent) and also among larger firms (40 percent *vis-à-vis* 20 percent for smaller firms).

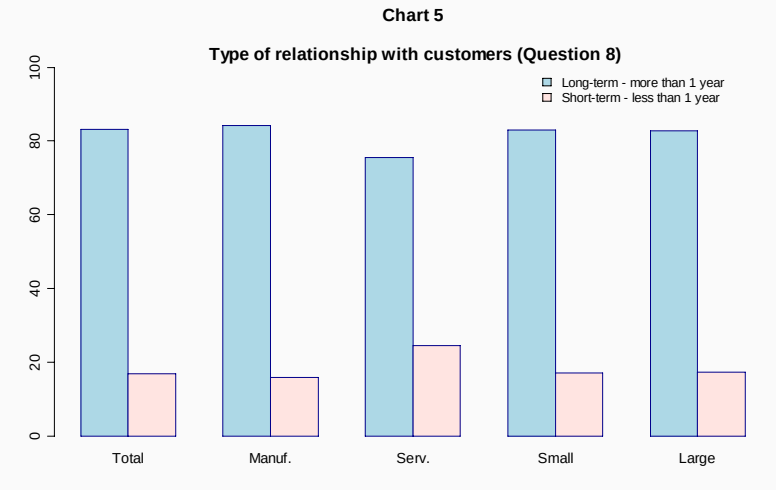
Reflecting the larger share of manufacturing in our sample, most firms (84 percent) sell their main product to other firms, while only 13 percent sell it directly to consumers (Chart 4). This suggests that the type of price-setting behaviour under analysis refers predominantly to producer prices.

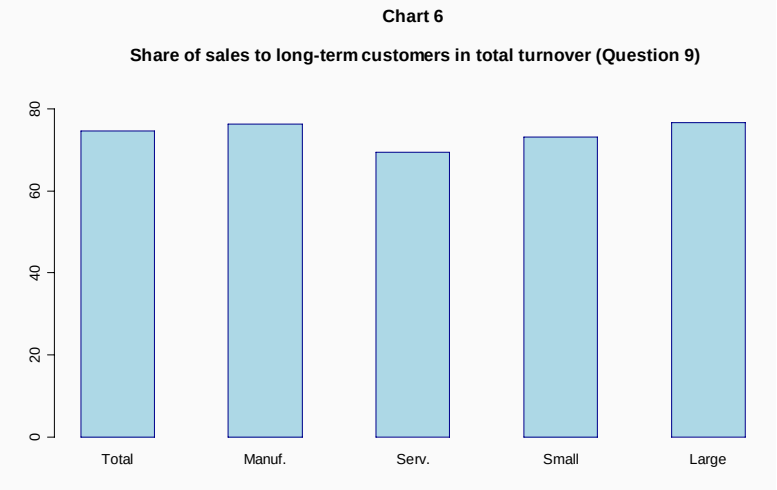


3.2 Relationship with customers

The kind of relationship that firms have with their customers, i.e. whether it is long-standing or only occasional, can have a bearing on their price strategies. Hall *et al.* (1997) show that firms with longer-standing relationships with customers tend to review prices less frequently. The reasoning behind this behaviour might be that the presence of a significant number of longer-term customers could act as a kind of implicit contract leading firms to stabilize their prices. Results reveal that 83 percent of firms have a long-term relationship with their customers (Chart 5)[10]. This share is higher in manufacturing (84 percent) than in services (75 percent). Firms also reported that their sales to longer-term customers represented the bulk of their total sales (75 percent). This share is slightly higher is manufacturing and for larger firms (Chart 6).

[10] For firms that sell their main product mostly to consumers this share is significantly lower (65 percent).

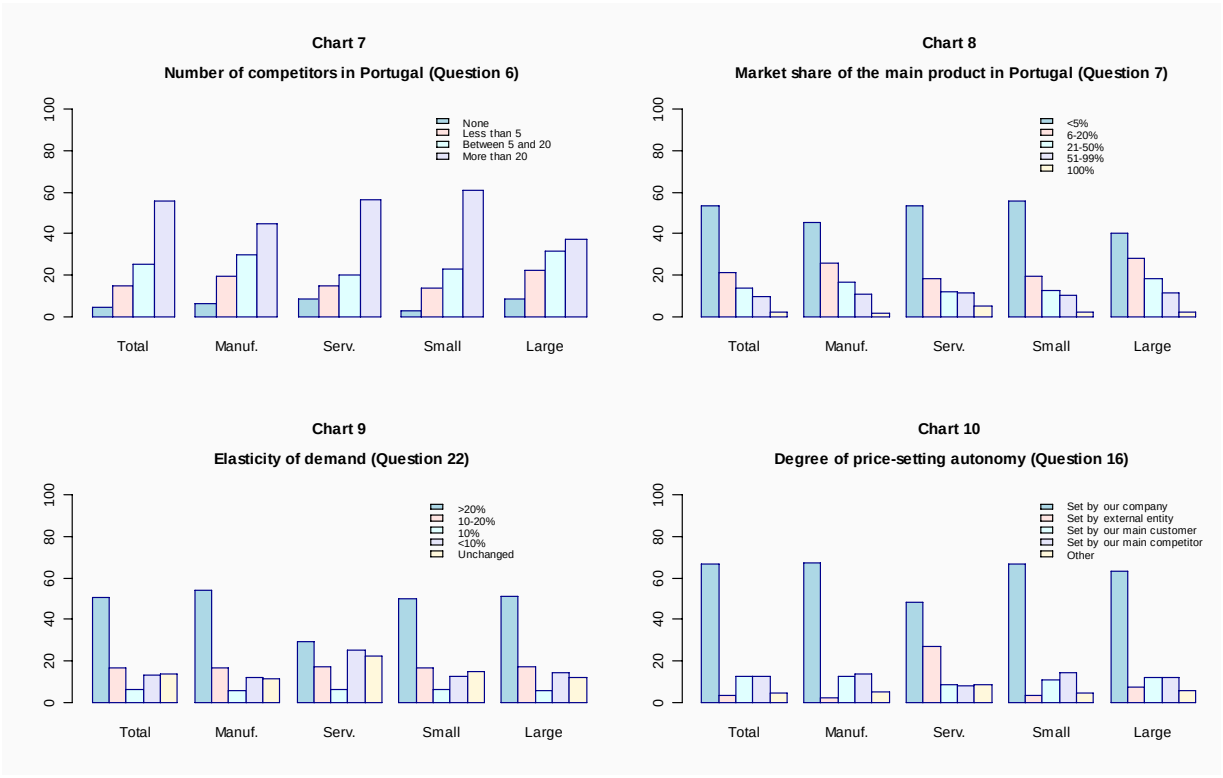




3.3 Degree of competition

The degree of competition that firms face is another important variable affecting price-setting decisions. In a market with perfect competition, prices are equal to marginal costs and mark-ups and price rigidities do not exist. Price stickiness is thus only possible if there is some departure from perfect competition, i.e. if firms have some degree of autonomy in their price setting. In

principle, one would expect that the lower the degree of competition, i.e. as firms get closer to pure monopolistic conditions, the higher is the room for not adjusting prices instantaneously when marginal costs change. The survey contains a number of questions that try to capture the degree of competition faced by firms. For instance, in questions 6 and 7 firms were asked about the number of competitors they have in the Portuguese market and about their market share. Even though the coverage of our sample has a bias towards larger firms, in general firms seem to have a limited market power: 56 percent of firms have more than 20 competitors in their main market and 53 percent have a market share of less than 5 percent (Charts 7 and 8). As expected, the degree of competition is somewhat weaker for larger firms irrespective of which of the two proxies is used.



This finding was congruent with the evidence coming from the question on the elasticity of demand. When firms were asked about what would happen to the quantities they sold if they

decided to increase the price of their main product by 10 percent, 67 percent responded that the quantities would fall by more than 10 percent (Chart 9). Even though the results show that most firms seem to operate in a highly competitive environment, about two-thirds of them still have some autonomy over their price (Chart 10). As explained above, this is a key condition for the presence of some degree of price persistence.

4 Background information on price setting

4.1 The importance of price as a strategic variable

Before a more in-depth analysis of the main features of price-setting behaviour, it may be useful to have some idea about the importance of price as a strategic variable for firms. According to the results, firms consider price as the second most important factor for their competitiveness (Table 1). Quality emerged as the highest-ranked factor, a feature that is immutable across the different sectors and the size of firms. All the six factors of competitiveness that were considered in the survey received high mean scores, which suggests that firms have a number of non-price variables they can manage in order to create some market power.

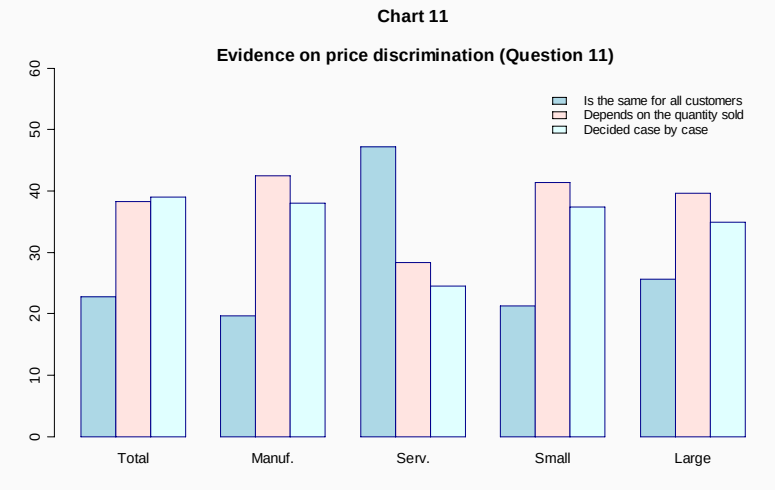
Table 1 - Most important factors for the competitiveness of the main product (Question 10)

Question	Factor	Total:		Memo:			
		Mean score	P-value	Manufact.	Services	Small firms	Large firms
10.2	Quality	3.73	0.00	3.73	3.70	3.70	3.75
10.1	Price	3.51	0.00	3.56	3.24	3.52	3.51
10.5	Long-term relationship	3.39	0.66	3.39	3.39	3.43	3.37
10.4	Delivery period	3.38	0.00	3.43	2.95	3.37	3.38
10.3	Product differentiation	3.03	0.00	3.03	3.01	3.02	3.03
10.6	After-sales service	2.92	-	2.95	2.67	2.85	2.96

Note: Firms were asked to indicate the importance of each option in a scale ranging from 1 ("not important") to 4 ("very important"). The p-values were computed for testing the hypothesis that the mean score of a given factor is significantly different from that ranked just below. Manufacturing includes Energy.

4.2 Price discrimination

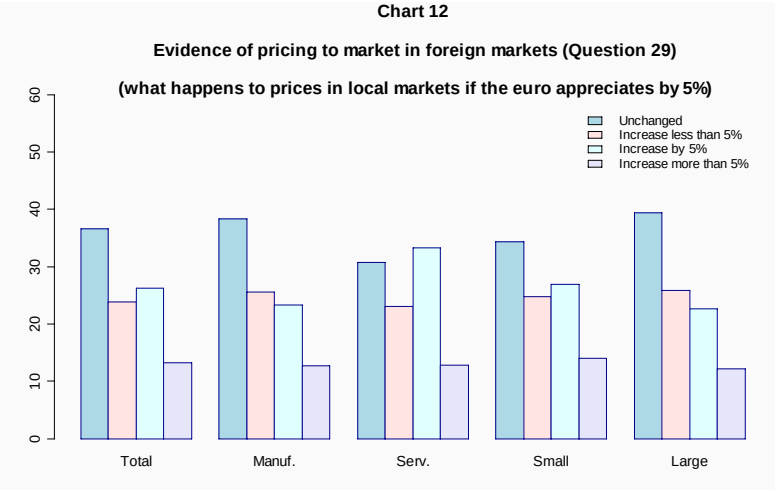
Another important characteristic of firms' price-setting behaviour is the possible presence of some form of price discrimination. To investigate this, firms were asked if the price of their main product was the same for all customers or if they discriminated their price either according to the quantity sold or on a case-by-case basis. Evidence does not support the presence of uniform price setting: only 23 percent of firms charge the same price for all their customers (Chart 11). The remaining firms discriminate their prices either according to the quantity they sell (38 percent) or on a case-by-case basis (39 percent)[11]. However, results differ substantially between manufacturing and services. In manufacturing, only 20 percent of firms charge the same price for all their customers whereas in services the proportion of firms charging the same price is 47 percent. Smaller firms seem to differentiate their prices more than larger ones.



The survey also tried to investigate for the possible presence of price discrimination not only across the customer base but also across markets. Those firms that export to non-euro area countries were

[11] In principle, it is in firms' own interest to discriminate their prices as much as they can in order to extract a higher share of their customers' surplus.

asked about the impact on the local price of their product in some reference market if the euro appreciated by 5% *vis-à-vis* the currency of that country. For about 60% of the firms, the price would either remain unchanged or increase by less than 5%, suggesting that exporting firms apply some form of pricing to market (Chart 12). The survey also included a question on the importance of a number of factors in explaining the differences in prices across markets. Transportation costs and market rules seem to be the most relevant factors underlying firms' pricing-to-market behaviour (Table 2). These are followed by cyclical fluctuations in country demand and market structural conditions such as tastes or standards of living. Perhaps surprisingly, exchange rate movements have a modest ranking while the country's tax system emerges as the least important factor in explaining differences in prices[12]. These results are broadly in line with the findings reported by Fabiani *et al.* (2005) for the euro area as a whole.



[12] Aucremmanne and Druant (2005) found that the tax system is more relevant for consumer-oriented firms, presumably because they are more sensitive to changes in indirect taxation.

Table 2 - Most important factors for discriminating prices in foreign markets (Question 28)

Question	Factor	Total:		Memo:			
		Mean rank	P-value	Manufact.	Services	Small firms	Large firms
28.6	Transportation costs	3.0	0.00	3.0	2.8	3.0	3.0
28.5	Market rules	2.8	0.02	2.8	2.9	2.8	2.8
28.4	Fluctuations in country demand	2.7	0.00	2.7	2.8	2.8	2.7
28.3	Structural market conditions	2.5	0.08	2.6	2.1	2.5	2.5
28.1	Exchange rate changes	2.4	0.00	2.5	2.0	2.3	2.5
28.2	Country tax system	2.1	-	2.1	2.1	2.1	2.2

Note: Firms were asked to indicate the importance of each option in a scale ranging from 1 ("not important") to 4 ("very important"). The p-values were computed for testing the hypothesis that the mean rank of a given factor is significantly different from that ranked just below. Manufacturing includes Energy.

5 Measuring price stickiness

In this section, five indicators are used in order to assess the degree of price stickiness: the share of firms following time-dependent pricing rules *vis-à-vis* the share of firms following state-dependent pricing rules; the frequency of price reviews; the frequency of price changes; the share of firms that take into account expectations about future economic developments when reviewing their prices; and the speed of price response following cost or demand shocks.

5.1 Price reviewing rules: time-dependent and state-dependent pricing rules

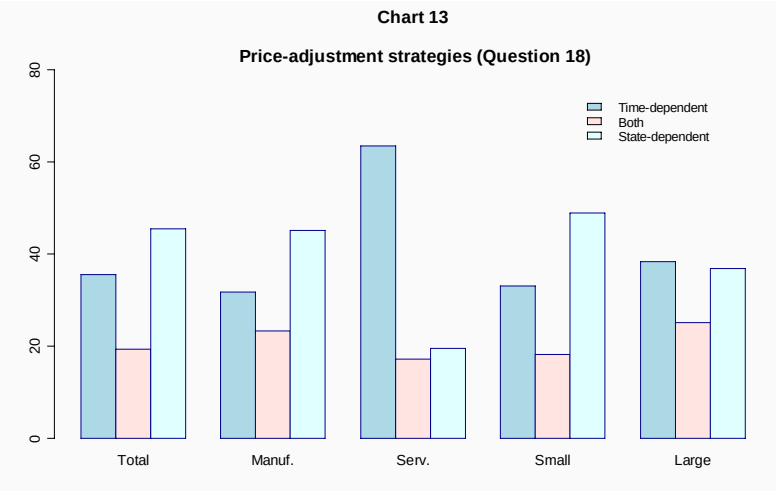
In the literature there are traditionally two approaches for modelling price setting behaviour: time-dependent rules and state-dependent rules. Under the former, prices are reviewed at discrete time intervals. Those intervals may be fixed as in Taylor (1980) or stochastic as in Calvo (1983), but the main point is that firms review their prices periodically and independently of the economic conditions[13]. As opposed to time-dependent rules, in state-dependent rules the timing of price reviews is endogenous, which means that firms decide to review their prices only when there is a sufficiently large shift in market conditions.

[13] In Taylor's framework, originally proposed for wage adjustment, it is assumed that for every N period a constant fraction of firms 1/N adjust their prices. In Calvo's model, every firm resets its price with probability $1-\theta$, irrespective of the time elapsed since the last price adjustment. As a result, the price is expected to remain fixed for $1/1-\theta$ periods.

Even though both theories imply the presence of a certain degree of price stickiness, presumably more in time-dependent rules, they have different policy implications. Under time-dependent rules, prices are reviewed at discrete time intervals whose length usually depends on the inflation rate: when inflation is high, firms' relative prices are falling quickly and, in order to avoid a fall in profits, they tend to review prices more frequently (i.e. prices become less sticky). In this context and other things being equal, a monetary shock in a high inflation environment is likely to have a smaller and a less persistent impact on economic activity. Under state-dependent rules the level of inflation is downgraded in terms of importance and what matters the most is the nature and size of shocks affecting market conditions.

To test the relative importance of both rules, firms were asked whether their prices were generally reviewed at a well-defined frequency or in response to market conditions (Question 18)[14]. The survey also included a "hybrid option" in order to consider those situations where firms review their prices at a specific frequency as a rule, for instance at the end of every year, but they also conduct additional reviews in response to particular events. Results show that under normal circumstances 55 percent of firms follow time-dependent rules. However, in the event of specific shocks, 19 percent of firms change to state-dependent price reviewing (Chart 13). This is in line with the results reported by Fabiani *et al.* (2005), who found that in the euro area the percentage of firms following pure time-dependent rules is 34 percent. Results also point to the presence of important differences across sectors: in services, time-dependent rules have a clear dominance as opposed to manufacturing where the bulk of firms follow state-dependent rules.

[14] While price reviews can be made at regular time intervals this is not typically the case for price changes. In principle, a price change comes after a price review but prices do not necessarily change every time a price review takes place. For this reason, it makes more sense to formulate this question in terms of price reviews than in terms of price changes.



5.2 The role of information: backward-looking and forward-looking price-setting behaviour

One unsettled issue in macroeconomic theory is whether inflation should be modelled primarily as a backward-looking variable, as in the so-called traditional expectations-augmented Philips Curve, or as a forward-looking variable, as in New Keynesian Philips Curve (NKPC). Under the traditional formulation of the Philips Curve, inflation is related to its own lagged values as well as to some cyclical measure. In contrast, the NKPC paradigm puts the emphasis on the forward-looking nature of inflation. The main point of this debate lies in the short run behaviour of inflation and its implications for monetary policy [see, for instance, Galí *et al.* (2001)]. In NKPC models, it is possible for a monetary authority to reduce inflation without any cost in terms of employment and output as long as inflation expectations evolve in line with inflation itself[15]. In addition, at the empirical level, even though the NKPC is generally considered as more appealing, given its forward-looking nature, the traditional formulation does a better job in portraying the evidence coming from the data. Galí and Gertler (1999) argue that the difficulty of the NKPC to fit the data results from the use of detrended GDP or other similar measures to proxy the output gap. To overcome this problem, they propose the use of the real marginal cost. This choice seems to be supported by the

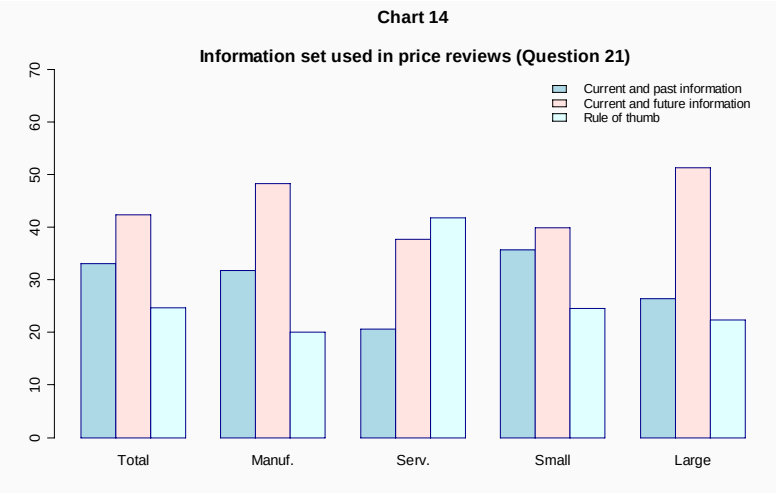
[15] See, for instance, Roberts (1997).

empirical results both for the US and the euro area [see Galí *et al.* (2001)]. The unsettled nature of this issue has led some authors to prefer hybrid versions of the Philips Curve that also include backward-looking or rule-of-thumb terms [see, for instance, Fuhrer (1997) or Smets (2003)].

In the context of survey analysis, one can try to test which of the two paradigms gives a better description of the way firms usually formulate their pricing decisions by asking them directly about the information set they take into account when reviewing their prices, since this could provide an important indication of price stickiness. Indeed, departures from fully optimising behaviour, as a result for instance of the use of a rule-of-thumb price-setting mechanism, could be an additional reason for the persistence observed in the reaction of prices to shocks. According to the evidence collected, an important share of firms (42 percent) review their prices taking into account a wide range information, including expectations about future economic developments (Chart 14). However, a large fraction of firms build price decisions without looking at economic projections, whereas about one-quarter of them simply adopt a rule-of-thumb approach based for instance on the overall consumer price index or on wage growth. Results also indicate that larger firms are more forward-looking. Overall, this evidence supports the recent preference for the use of hybrid versions of the NKPC.

Chart 14

Information set used in price reviews (Question 21)



5.3 The frequency of price reviews and the frequency of price changes

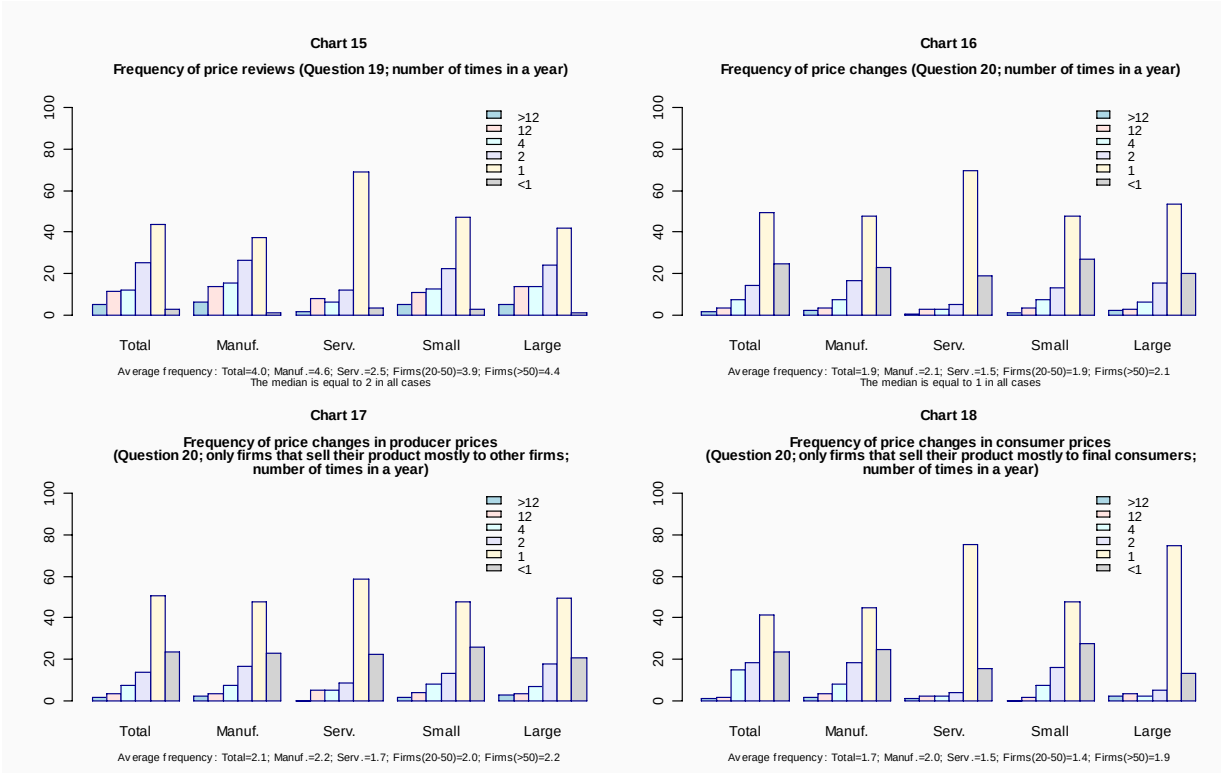
Another indication of the degree of price stickiness could be obtained through the analysis of the frequencies of price reviews and price changes. As mentioned before, information on the frequency of price reviews can only be taken in the context of survey analysis. Regarding the frequency of price changes, the recent availability of large-scale datasets for consumer and producer price indices has contributed to improve the analysis of the frequency of price changes and the measurement of the duration of price spells [see Dias *et al.* (2004) for the analysis of the Portuguese CPI and PPI micro datasets]. However, even in the case of the analysis of the frequency of price changes survey results are still useful as a way of crosschecking the evidence obtained from the quantitative datasets.

In the survey, those firms that follow time-dependent rules, either strictly or only when there are no large shifts in market conditions, were firstly asked to mention the normal frequency of their price reviews (Question 19). If the costs incurred by firms to collect the relevant information for pricing decisions were negligible, it would be expected that firms review their prices quite regularly. However, results show that only a small fraction of firms (5.1 percent) review their prices more than once a month. This indicates that price reviews are probably not costless. For instance, firms may fear that the possible gains resulting from reviewing prices for instance every day or every week might not be large enough when compared to the costs they have to bear to update almost on a continuous basis the background information for pricing decisions[16]. Indeed, the size of these costs seems to be such that 47 percent of firms adopting time-dependent rules review their prices no more than once a year (Chart 15). Comparing results across sectors, the evidence shows that price reviews are more frequent in manufacturing than in services. All in all, the majority of firms, most notably in services, review their prices only once a year.

Having analysed the frequency of price reviews, the next step was to ask firms how often they actually changed their prices (Question 20). Comparing results for firms that responded both to the question on price reviews and the question on price changes, the evidence shows that, as expected,

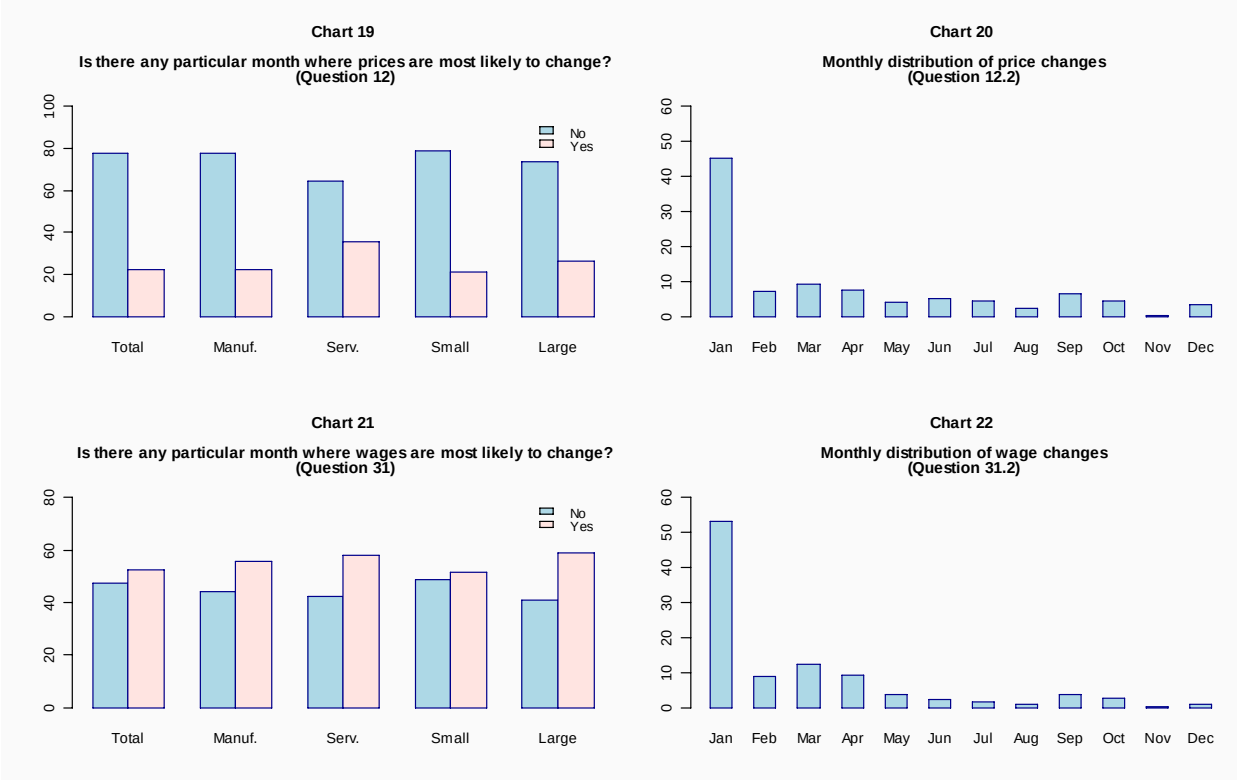
[16] One alternative explanation for the low frequency of price reviews found in data could be attributed to the fact that some firms may consider that it may not make sense for them to review their prices more often simply because the frequency of arrival of new relevant information is also low.

price changes are less frequent than price reviews: about three quarters of firms change their prices no more than once a year (Chart 16). These results are in line with the findings of Fabiani *et al.* (2005) for the euro area and Blinder *et al.* (1998) for the US. As in price reviews, the evidence coming from the analysis of the frequency of price changes suggests that prices in services are stickier. In addition, firms that sell their product mostly to other firms - our best proxy for the behaviour of producer prices - seem to change their prices more frequently than those that sell their product mostly to final consumers (Charts 17 and 18).



Although about half of the firms change their price just once in a year, they do not seem to have a particular month when they do so (Chart 19). Indeed, only 22 percent of firms answered that they change their price in a specific month of the year, which is January in most of these cases (Chart

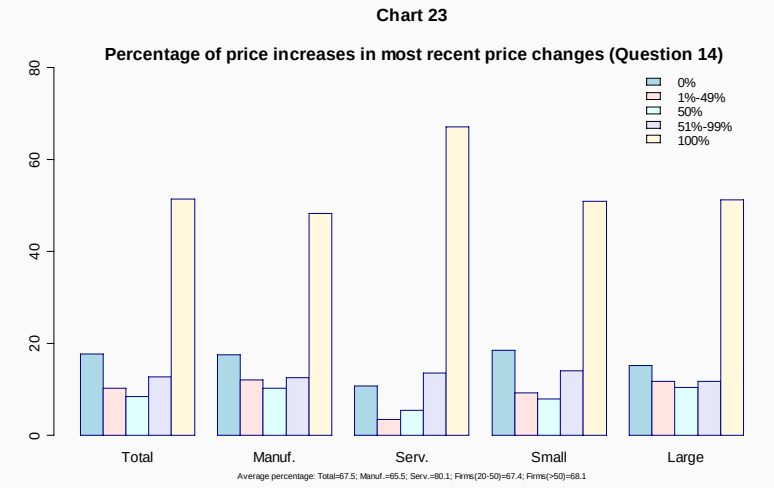
20). This contrasts with results on wage adjustments where the degree of synchronization seems to be much higher. The fraction of firms that change their wages in a particular month of the year is much higher (about 56 percent, Chart 21), with more than one-half of them doing so in January (Chart 22).



5.4 The direction and magnitude of price changes

One important objective of this study was to investigate to what extent the evidence stemming from the quantitative data was supported (or not) by the qualitative data coming from the survey. Dias *et al.* (2004) pioneered the study of price setting behaviour in Portugal using the micro-datasets underlying the consumer and producer price indices. In their paper and taking the period from 1992 to 2001 as a reference, they conclude *inter alia* that price decreases account for around 40 percent

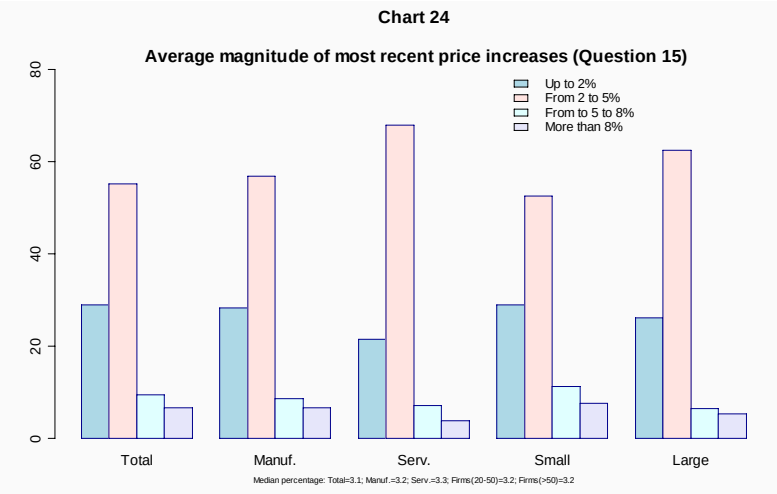
of total price changes and that the magnitude of price increases is broadly similar to that of price decreases. These two findings are common to both consumer and price indices. Their results also show that consumer prices seem to change more frequently than producer prices, something that is valid both for price increases and price decreases. Survey evidence confirms that price decreases are in fact more common than it is usually admitted: on average, slightly more than 30 percent of total price changes are price reductions (Chart 23), smaller share than the one reported in Dias *et al.* but in line, for instance, with the result obtained by Loupias and Ricart (2004) for France[17]. Downward price rigidity is apparently higher in services: only one price change out of five is a price reduction. However, given that the services sector has typically a larger labour input share, its higher downward price rigidity can be justified by downward nominal wage rigidity.

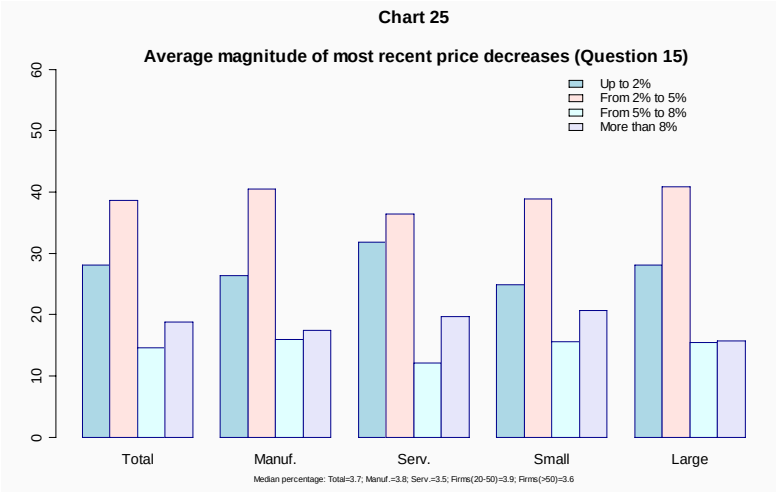


Survey results also revealed that the magnitude of price decreases is on average one percentage point higher than that of price increases (4.5 percent against 3.5 percent, respectively). Differences across sectors are not significant but smaller firms seem to be more aggressive in terms of the magnitudes of their price changes (Charts 24 and 25). In this context, the positive inflation witnessed

[17] These results should be read with some prudence. The analysis in Dias *et al* was conducted on the basis of monthly data covering the period 1992-2001, while in this survey firms were asked about their last price changes.

at the aggregate level is apparently the result of a higher frequency of price increases and not of differences in magnitude between price increases and price decreases.





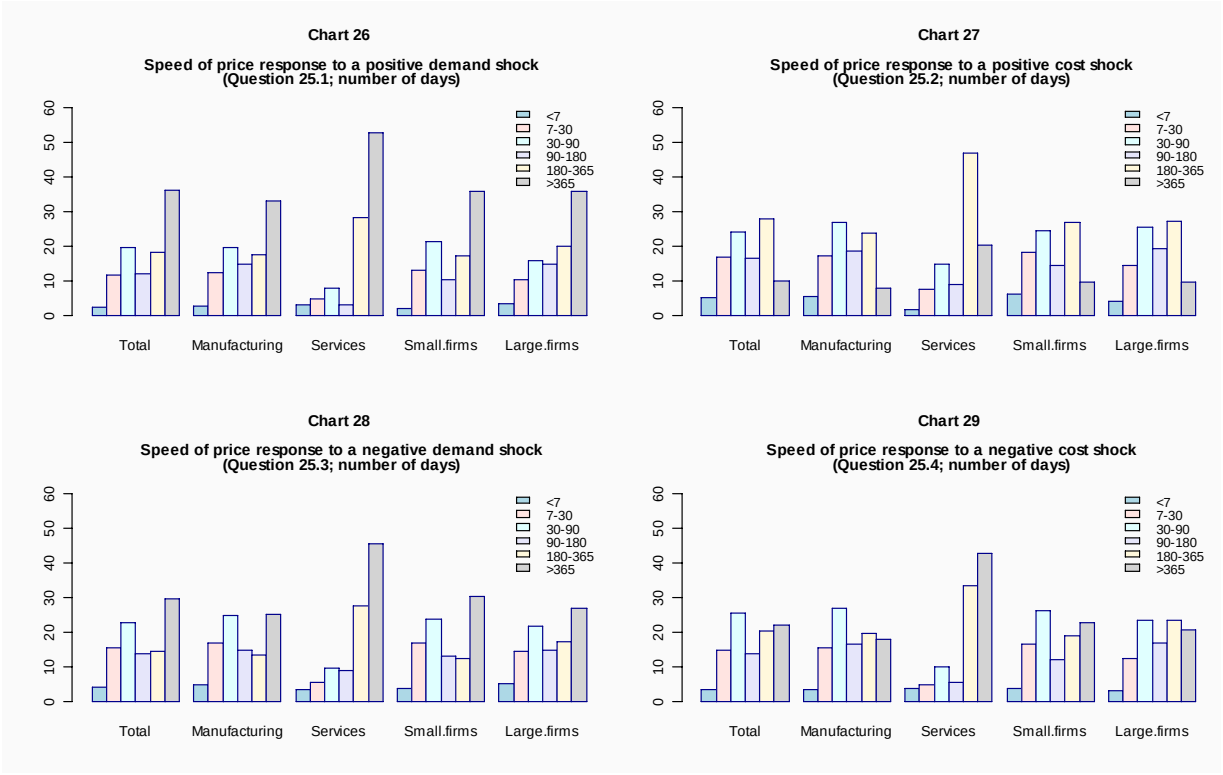
5.5 The speed of price changes

The analysis of the frequencies of price changes provides an important indication of the degree of price stickiness. However, as Blinder *et al.* (1998) pointed out, this may not be sufficient to conclude on the presence of price stickiness: infrequent price changes may be the result of infrequent cost and demand shocks. Against this background, firms were asked to report the time that elapses on average between a significant demand or cost shock and the corresponding price change. Respondents had 6 options available: 1 - less than one week; 2 - from one week to one month; 3 - from 1 month to 3 months; 4 - from 3 to 6 months; 5 - from 6 months to 1 year; 6 - the price remain unchanged. Regarding the latter option, it should be interpreted as referring to the short-run rigidity in response to a shock firms consider as permanent. If for instance firms interpret a "significant rise in costs" as a permanent rise in costs then any answer that does not include a change in prices will make no sense. Thus, option 6 indicates the proportion of firms that maintain their prices in the first year after the occurrence of a given shock.

Table 3 reports the percentage of firms that maintain their prices in the first year after a shock. There is no evidence that prices move faster upwards than downwards. However, firms seem to respond faster to cost shocks, in particular when they are positive, than to demand shocks. Only 10 percent of firms maintain their prices unchanged in the first year after a positive cost shock, while the fraction of firms holding their prices constant in response to a positive demand shock is 36 percent. Moreover, the speed of price adjustment seems to be considerably higher in manufacturing than in services. Charts 26 to 29 corroborate these facts by showing the speed of price responses to different types of shocks. The percentage of firms that do not adjust their prices during the first six months after a shock lies between 38 percent for positive cost shocks, and 55 percent for positive demand shocks. In services, these figures are significantly higher (67 and 81 percent, respectively).

Table 3 - Percentage of firms that do not change their prices in the first year after a shock (Question 25)

	Total	Manufacturing	Services	Small firms	Large firms
Positive demand shock	35.8	33.0	52.9	35.8	35.8
Positive cost shock	9.7	8.0	20.2	9.7	9.7
Negative demand shock	28.1	25.2	45.5	30.3	26.7
Negative cost shock	21.5	18.0	42.6	22.8	20.6



6 The main theories of price stickiness

The process of adjusting prices is normally divided into two stages: the "price reviewing stage" and the "price changing stage". In the first, firms estimate an "optimal" price using all the information they consider as relevant. Having done this, they are then able to check whether the deviation of their current price from that optimal price is significant enough to warrant a price change. Sources

of price stickiness may be present at both stages. Results from the last section suggested that firms review their prices at discrete intervals and not continuously, which points to the presence of some kind of stickiness at this first stage. Once the price review has been made, firms decide whether they want to change their price or not. Results also showed that price changes are more frequent than price reviews. This could happen either because the evidence coming from the price review does not support the need for a price change or because once firms decide to incur the informational costs of reviewing their prices, they recognise that there are extra costs associated with a price change that could possible outweigh their benefits. In this section, the possible origin of these costs is analysed. This is done by asking firms the following question: "Firms sometimes decide to postpone price changes or to change their price only slightly. This is generally due to various factors. Some of them are listed below. Please indicate their importance in your company." The list contained 12 theories of price stickiness, all explained in a language that could be broadly understandable[18]. Respondents were asked to indicate their degree of agreement with the chain of reasoning underlying each option in a scale ranging from 1 ("unimportant") to 4 ("very important"). The theories were not mutually exclusive: firms could, and they did it in many cases, consider several of them as very important. Table 4 ranks the theories by mean scores. In addition, it also shows the p-value corresponding to the test of the hypothesis that each theory's mean score is significantly different from the theory ranked just below. Results of this test show that only in three cases are the differences in rankings not statistically different at the 10 percent level.

[18] A detailed description of these theories can be found in Blinder *et al* (1998) or Fabiani *et al* (2005).

Table 4 - Theories of price stickiness (Question 26)

Question	Theory	Total:		Memo:			
		Mean score	P-value	Manufact.	Services	Small firms	Large firms
26.7	Implicit contracts	3.14	0.00	3.17	3.01	3.17	3.12
26.1	Co-ordination failure	2.84	0.36	2.87	2.69	2.81	2.86
26.9	High fixed costs	2.80	0.00	2.81	2.79	2.85	2.78
26.11	Constant marginal costs	2.70	0.09	2.70	2.67	2.82	2.62
26.4	Explicit contracts	2.63	0.54	2.60	2.81	2.55	2.68
26.12	Procyclical elasticity of demand	2.61	0.00	2.63	2.49	2.79	2.49
26.2	Temporary shock	2.46	0.63	2.49	2.15	2.46	2.44
26.3	Time lags in price adjustments	2.45	0.00	2.46	2.47	2.41	2.49
26.10	Judging quality by price	2.28	0.00	2.30	2.16	2.35	2.23
26.6	Menu costs	1.89	0.00	1.89	1.90	1.90	1.89
26.5	Pricing thresholds	1.78	0.05	1.76	1.92	1.77	1.79
26.8	Costly information	1.70	-	1.71	1.66	1.74	1.68

Note: Firms were asked to indicate the importance of each option in a scale ranging from 1 ("not important") to 4 ("very important"). The p-values were computed for testing the hypothesis that the mean score of a given theory is significantly different from that ranked just below. Manufacturing includes Energy.

Results suggest that the "implicit contracts" theory is the most important explanation for infrequent price adjustments. This theory was formulated as "the preference of customers for stable prices (a reason why) changing prices frequently could threaten customer relations". It is in firms' own interest to establish a long-run relationship with their customers in order to make their sales more predictable. To do so, they try to capture the loyalty of their customers by changing their prices infrequently. This "implicit contract" is also favourable to customers because more stable prices minimise search costs (e.g. saving shopping time)[19]. The mean rank attached to this theory is surprisingly high given the traditional magnitude of mean scores in similar studies, which on a comparable scale do not normally exceed 3. The "coordination failure" and the "high fixed costs" theories are the next two theories in the ranking, with similar (non-statistically different) mean scores. The first theory refers to the fact that it may not be in a firm's interest to change its price if their main competitors do not change their prices as well, while the second refers to the constraint

[19] This result is consistent with the fact reported in section 3 that most of the firms have a long-term relationship with their customers and it may also justify why they are more likely to increase their prices in response to cost shocks than to demand shocks, as they try not to threaten customer relationships.

that the presence of high fixed costs puts on a firm's decision to change its price.

"Constant marginal costs", "explicit contracts" and "procyclical elasticity of demand" complete the group of theories that exceed the neutral score of 2.5. If costs are an important determinant in firms' pricing decisions and if marginal costs do not change by much, there is no reason to change prices frequently. This is the reasoning behind the theory of constant marginal costs. The existence of explicit (written) contracts implies that prices can only change when the contracts are renegotiated. Finally, if firms' elasticity of demand is procyclical (i.e. their mark-up is countercyclical) their demand curve becomes less elastic as it shifts down, which means that when demand decreases firms lose firstly their "less loyal" customers and retain those that are less sensitive to price, implying that the price can be kept basically unchanged.

Below the top group of theories, there is a group with mean scores between 2 and 2.5 that may be considered as having limited relevance for explaining the inertia observed in prices. There are three theories in this group: "time lag in price adjustments", "temporary shocks" and "judging quality by price". Under the first, firms recognise that there are lags in price adjustments, coming for instance from bureaucratic delays in the decision to change prices, while the second refers to the fact that firms may decide not to change their price in response to a shock if they see it as temporary. Finally, some firms may feel reluctant to reduce their price for fear that their customers will think that the quality of their product has also declined. This "quality signal" might be relevant in some market segments such as luxury goods.

The last three theories in the ranking ("menu costs", "pricing threshold" and "costly information") do not seem to be good explanations for price stickiness. The theory of menu costs, which is cited frequently in textbooks, obtained a relatively modest mean score. Apparently, physical menu costs, i.e. the amount of resources needed to implement a price change, are not so important in deterring firms from adjusting their prices more frequently. Some firms may want to quote their prices according to certain thresholds (for example, pricing at 4.99 euros instead of 5 euros) if they believe that increasing their prices above these thresholds will lead to a disproportionate fall in demand. This "pricing threshold" theory implies that demand curve is not continuous and firms may delay a

price adjustment until new events justify a change to the next price threshold. Finally, the theory labelled as "costly information" focuses on the costs of collecting the relevant information to decide whether the current price is right or not. These costs typically occur in the price reviewing stage. The costly information theory received the worst score in the contest of theories, which seems to suggest that the main sources of price stickiness are not in the first but in the second stage of price setting.

When analysing the different theories of price persistence, an important distinction should be made between those referring predominantly to nominal rigidity and those referring to real rigidity. Nominal rigidity relates to the costs that firms have to bear to adjust their nominal prices (relabelling, new price lists, different contract conditions, ...). "Menu costs", "Explicit contracts", "Time lags in price adjustment" or "Pricing thresholds" are theories of nominal rigidity. However, a considerable number of explanations set forth in the literature are related to real rigidity. They attempt to explain why firms have a low incentive to change their relative prices even when the costs of adjusting their nominal prices are small. This low incentive is related to the sensitivity of firms' profits to shocks: the less sensitive their profits are to shocks the less likely it is that they will change prices. This means that nominal rigidity is an increasing function of real rigidity. Ball and Romer (1990) show that real rigidities play a key role in explaining nominal rigidity and the real effects of nominal shocks.

To summarise this section, according to the survey results the main reason for the rigidity observed in prices is the presence of implicit contracts between firms and their customers under which the former pledge to stabilise their prices as a way to increase customer loyalty, that is, to decrease the price elasticity of demand. Other relevant sources of price stickiness are coordination problems arising from the preference of firms not to change their prices unless their competitors do so, the constraint imposed by a high proportion of fixed costs, marginal costs that vary little when costs are an important determinant in firms' pricing decisions or the presence of formal contracts that are costly to renegotiate. In contrast, respondents did not consider alternative explanations such as menu costs, pricing thresholds and costly information very relevant. These findings are broadly in line with the results reported by Fabiani *et al.* (2005) for the euro area as a whole.

7 Factors driving price changes: nominal rigidity and real rigidity

In the survey, firms were also asked to rank a list of factors in terms of their importance both for a price increase decision and for a price decrease decision. The aim of these questions was to investigate for the presence of asymmetries in firms' response to a number of different shocks. Results suggest that cost factors, in particular the price of raw materials and wage costs, are the main factors driving price increase decisions (Table 5A). Regarding price decreases, even though the price of raw materials remains as the main factor, the importance of demand fluctuations and competitors' price is higher, while wage costs lose some of their relevance (Table 5B). In section 5, evidence showed that prices seem to be stickier in services, which could reflect a higher degree of nominal wage rigidity in this sector. One piece of evidence that is consistent with this conclusion is shown in Tables 5A and 5B where wage costs are by a considerable margin the most important driving force behind pricing decisions in services.

Table 5A - Most important factors for a price increase decision (Question 23)

Question	Factor	Total:		Memo:			
		Mean score	P-value	Manufact.	Services	Small firms	Large firms
23.1	Price of raw materials	3.59	0.00	3.69	2.91	3.56	3.61
23.2	Wage costs	3.28	0.00	3.27	3.31	3.38	3.21
23.4	Competitors' price	2.67	0.00	2.68	2.65	2.63	2.70
23.5	Financing costs	2.50	0.62	2.47	2.64	2.60	2.43
23.3	Demand	2.50	-	2.52	2.44	2.48	2.52

Table 5B - Most important factors for a price decrease decision (Question 24)

Question	Factor	Total:		Memo:			
		Mean score	P-value	Manufact.	Services	Small firms	Large firms
24.1	Price of raw materials	3.27	0.00	3.37	2.58	3.32	3.24
24.3	Demand	2.98	0.88	3.00	2.85	2.97	2.99
24.2	Wage costs	2.98	0.49	2.90	2.96	3.11	2.90
24.4	Competitors' price	2.94	0.00	2.96	2.87	2.89	2.97
24.5	Financing costs	2.36	-	2.37	2.35	2.46	2.30

Note: Firms were asked to indicate the importance of each option in a scale ranging from 1 ("not important") to 4 ("very important"). The p-values were computed for testing the hypothesis that the mean score of a given theory is significantly different from that ranked just below. Manufacturing includes Energy.

In the remainder of this section, a probit model is estimated as an alternative way to identify the factors that determine firms' responses to shocks. In particular, the model tries to get some insight on how asymmetrical Portuguese firms react to the different types of shocks[20]. The dependent variable in the regressions can take two values: it equals 1 if a firm indicates in question 25 that it changes its price in the first year after a given demand or cost shock (options 1 to 5) and it equals 0 otherwise. Cost and demand shocks are analysed separately. Some of the regressors of the model try to capture the degree of real rigidity in order to test the hypothesis raised by Ball and Romer (1990) and introduced in the previous section that nominal rigidity is magnified by real rigidity. This is the case of the variables *Mark.share* and *Exports* that are included as proxies for the degree of firms' exposure to domestic and foreign competition, respectively[21]. Intuitively, the more competitive the market were firms operate, the greater the incentive for firms to adjust their prices in response to shocks in order to avoid a fall in profits.

Other proxies for real rigidity are also used. The slope of the marginal cost curve, captured by the dummy variable *MC.shape* takes on the value 1 when variable costs do not vary by much (Question 26.11). A flatter cost curve is expected to reduce the incentive to change prices in reaction to demand shocks. The dummy variable *Search* tries to capture the likelihood that customers face search costs in their relationship with firms such as the costs of comparing prices across different firms to make the best purchasing decisions. We expect that the lower the search costs, the higher the incentive for firms to change their prices in response to shocks. Search costs are presumably higher for final consumers than for firms, so this variable takes on the value 1 if firms deal mainly with final consumers and 0 otherwise. In addition, the presence of a long-term relationship between firms and their customers is likely to generate some resistance to change prices. To capture this idea, a dummy variable (LT) is included that takes on the value 1 when firms deal preferably with long-term customers. The dummy variable *Price.discr* accounts for the fact that firms may discriminate their prices depending on the customer while the variable *Price.reg* allows for the possibility that

[20] A similar analysis was also made by Small and Yates (1990) for the UK, Fabiani *et al* (2005) for the euro area, Fabiani *et al* (2004) for Italy, Kwapil *et al* (2005) for Austria and Loupias and Ricart (2004) for France.

[21] *Mark.share* is equal to the reported market share while *Exports* is also a continuous variable that is equal to the share of exports in total turnover.

the price is subject to some form of regulation. Finally, the model includes two dummies (*Serv* and *Size*) to distinguish between firms from services and firms from manufacturing as well as between firms of different sizes.

Table 6A shows the probit estimates for both positive and negative demand shocks while Table 6B does the same for cost shocks. Apparently results do not support the idea that nominal rigidity is affected by the market structure. As expected, our measure of market structure - the market share - is inversely correlated with the probability of changing prices in all regressions, but the coefficients are not significantly different from zero regardless of the shock under analysis. Other proxies such as the number of competitors or the degree of perceived competition were also tested but the results were qualitatively the same[22]. There is no evidence that customer relationships, captured by the presence of search costs and of a long-term relationship with customers, affect the response of prices to different types of shocks. This is somewhat at odds with the finding reported in the last section indicating that the existence of implicit contracts was a central explanation for price stickiness. As expected, the probability of changing prices following a demand shock is significantly lower for firms with a flat marginal curve. The results also show that for both demand and cost shocks this probability is positively and significantly affected by the presence of some form of price discrimination. Another robust (but not surprising) finding is that the transmission to prices of different shocks is easier when there is no price regulation. It was also found that service firms are less likely to adjust their prices after a demand or a cost shock. Finally, size is only significant in the case of a negative shock being positively correlated with the probability of a price decrease.

[22] This variable takes on the value 1 when firms consider in question 24.4 a decrease in their competitors' price as important or very important in terms of a price decrease decision.

Table 6A - Price response to demand shocks: results from probit regressions

	Positive demand shock			Negative demand shock		
	Coef.	St. err.	P-val	Coef.	St. err.	P-val
Constant	0.215	0.168	0.199	0.368	0.174	0.034
Mark.share	-0.081	0.094	0.388	-0.098	0.099	0.322
Exports	-0.004	0.122	0.978	0.112	0.130	0.388
MC.shape	-0.168	0.091	0.065	-0.223	0.097	0.021
LT	0.140	0.118	0.236	0.269	0.121	0.026
Search	0.034	0.161	0.831	-0.010	0.165	0.950
Price.discr.	0.321	0.105	0.002	0.243	0.109	0.026
Price.reg	-0.603	0.295	0.040	-0.164	0.284	0.564
Size	-0.003	0.093	0.974	0.098	0.097	0.311
Serv	-0.323	0.145	0.026	-0.364	0.148	0.014
# observ.	944			943		

Table 6B - Price response to cost shocks: results from probit regressions

	Positive cost shock			Negative cost shock		
	Coef.	St. err.	P-val	Coef.	St. err.	P-val
Constant	1.245	0.193	0.000	0.519	0.153	0.000
Mark.share	-0.027	0.123	0.820	-0.018	0.099	0.855
Exports	-0.236	0.160	0.140	-0.070	0.129	0.586
LT	0.009	0.150	0.950	0.177	0.116	0.128
Search	0.154	0.202	0.450	-0.045	0.156	0.774
Price.discr.	0.269	0.132	0.042	0.209	0.108	0.053
Price.reg	-0.890	0.253	0.000	-0.258	0.241	0.284
Size	0.111	0.120	0.358	0.186	0.095	0.050
Serv.	-0.396	0.171	0.021	-0.602	0.138	0.000
# observ.	1055			1053		

8 Concluding remarks

In this paper, price stickiness in Portugal was analysed on the basis of qualitative data coming from a survey conducted by the Banco de Portugal between May and September 2004. The main conclusions were the following:

- Results point to the presence of a considerable degree of price persistence: most firms do not

review or change their prices more than once a year; time lags in price adjustments were found to be significant; slightly more than half of the firms follow time-dependent price reviewing, though only one-third stick to this practice after the occurrence of specific shocks; and, finally, more than half of the firms build their price decisions taking into account only historical data;

- The degree of price stickiness seems to be higher in services than in manufacturing (all the indicators point in the same direction). This is a stylised fact also identified for the euro as a whole. The higher degree of price persistence observed in services could reflect its higher labour share, which in general is associated with lower frequencies of price changes;

- Another important finding is that prices seem to go down more frequently than what is normally assumed: slightly more than 30 percent of total price changes are price decreases. This result is in line with the evidence from the quantitative data, both for Portugal and for the euro area as a whole. Moreover, according to the evidence collected in the survey, the absolute size of price decreases seems to be even larger than the magnitude of price increases;

- Customers' preference for stable prices, which take the form of "implicit contracts", is apparently the main reason for the persistence observed in prices. Other relevant sources were also found: coordination problems arising from the preference of firms not to change their prices unless their competitors do so, the constraint imposed by a high proportion of fixed costs, marginal costs that vary little when costs are an important determinant in firms' pricing decisions or the presence of formal contracts that are costly to renegotiate.

Even though the findings reported in this paper are broadly in line with the evidence obtained in other similar studies for the euro area and with conclusions coming from the analysis of micro datasets for Portugal, they should in any case be interpreted with some prudence. Besides the drawbacks that are in general associated with survey data, it is worthwhile mentioning that results reported in this paper only reflect pricing behaviour in a limited number of Portuguese firms. While in manufacturing almost all two-digit NACE sectors were covered, this is not the case in services, where a number of important sub-sectors, such as wholesale and retail trade, were excluded. In addition, results both for

manufacturing and services were presented in aggregate terms. However, these sectors are far from being homogeneous. The analysis of pricing behaviour at a more disaggregated level will certainly be one of the topics on the research agenda.

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Table A1 - Weighting procedure

		Population structure		Response structure				Rescaling factors		#firms after rescaling
Sectors	Size	E_h	$\frac{E_h}{E}$	n_h	e_h	$\frac{e_h}{e}$	$\frac{(4)}{(7)}$	(8) × (5)	$\frac{(8)}{\theta}$	n_h^*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
15-16	1	17328	2.1	63	2147	0.7	2.8	178.2	1.4	85.2
	2	51411	6.2	94	20492	7.0	0.9	82.7	0.4	39.5
17	1	13934	1.7	29	1001	0.3	4.9	141.5	2.3	67.6
	2	69462	8.4	97	22217	7.6	1.1	106.3	0.5	50.8
18	1	31401	3.8	63	2073	0.7	5.3	334.5	2.5	159.8
	2	66799	8.0	99	14213	4.9	1.6	163.1	0.8	77.9
19	1	12910	1.6	32	1096	0.4	4.1	132.1	2.0	63.1
	2	36229	4.4	56	10656	3.7	1.2	66.7	0.6	31.9
20	1	9010	1.1	30	1004	0.3	3.1	94.4	1.5	45.1
	2	14776	1.8	21	5702	2.0	0.9	19.1	0.4	9.1
21	1	1651	0.2	7	224	0.1	2.6	18.1	1.2	8.6
	2	8704	1.0	13	3594	1.2	0.8	11.0	0.4	5.3
22	1	6831	0.8	27	854	0.3	2.8	75.7	1.3	36.2
	2	14751	1.8	20	3755	1.3	1.4	27.5	0.7	13.2
23-24	1	3557	0.4	10	342	0.1	3.6	36.5	1.7	17.4
	2	19621	2.4	25	8238	2.8	0.8	20.9	0.4	10.0
25	1	4235	0.5	12	383	0.1	3.9	46.5	1.9	22.2
	2	14120	1.7	17	4830	1.7	1.0	17.4	0.5	8.3
26	1	12817	1.5	46	1488	0.5	3.0	138.9	1.4	66.4
	2	38296	4.6	64	13579	4.7	1.0	63.3	0.5	30.2
27	1	1529	0.2	5	129	0.0	4.2	20.8	2.0	9.9
	2	7155	0.9	14	4016	1.4	0.6	8.7	0.3	4.2
28	1	17194	2.1	48	1545	0.5	3.9	187.3	1.9	89.5
	2	28095	3.4	56	9081	3.1	1.1	60.7	0.5	29.0
29	1	9897	1.2	24	860	0.3	4.0	96.8	1.9	46.3
	2	20309	2.4	33	6693	2.3	1.1	35.1	0.5	16.8
31	1	1497	0.2	5	170	0.1	3.1	15.4	1.5	7.4
	2	17289	2.1	11	11867	4.1	0.5	5.6	0.2	2.7
32	1	531	0.1	2	93	0.0	2.0	4.0	1.0	1.9
	2	13540	1.6	5	3881	1.3	1.2	6.1	0.6	2.9
33	1	658	0.1	2	74	0.0	3.1	6.2	1.5	3.0
	2	3594	0.4	3	930	0.3	1.4	4.1	0.6	1.9
34	1	1613	0.2	8	284	0.1	2.0	15.9	1.0	7.6
	2	31867	3.8	20	12972	4.5	0.9	17.2	0.4	8.2

Table A1 - Weighting procedure (cont.)

		Population structure			Response structure			Rescaling factors		#firms after rescaling
Sectors	Size	E_h	$\frac{E_h}{E}$	n_h	e_h	$\frac{e_h}{e}$	$\frac{(4)}{(7)}$	$(8) \times (5)$	$\frac{(8)}{\theta}$	n_h^*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
35	1	1153	0.1	5	170	0.1	2.4	11.9	1.1	5.7
	2	9575	1.2	6	6305	2.2	0.5	3.2	0.3	1.5
36	1	12473	1.5	39	1230	0.4	3.6	138.6	1.7	66.2
	2	15688	1.9	35	6847	2.4	0.8	28.1	0.4	13.4
37	1	442	0.1	2	65	0.0	2.4	4.8	1.1	2.3
	2	371	0.0	1	74	0.0	1.8	1.8	0.8	0.8
40-41	1	489	0.1	2	79	0.0	2.2	4.3	1.0	2.1
	2	15743	1.9	6	11503	4.0	0.5	2.9	0.2	1.4
60	1	8848	1.1	19	608	0.2	5.1	96.9	2.4	46.3
	2	40412	4.9	44	25559	8.8	0.6	24.4	0.3	11.7
61	1	278	0.0	1	45	0.0	2.2	2.2	1.0	1.0
	2	1379	0.2	5	947	0.3	0.5	2.6	0.2	1.2
62	1	273	0.0	1	35	0.0	2.7	2.7	1.3	1.3
	2	10902	1.3	4	9910	3.4	0.4	1.5	0.2	0.7
63	1	4974	0.6	16	506	0.2	3.4	55.1	1.6	26.3
	2	17567	2.1	19	11330	3.9	0.5	10.3	0.3	4.9
64	1	395	0.0	2	72	0.0	1.9	3.8	0.9	1.8
	2	38344	4.6	10	32757	11.2	0.4	4.1	0.2	2.0
80	1	11432	1.4	21	728	0.3	5.5	115.6	2.6	55.2
	2	24479	2.9	42	8047	2.8	1.1	44.8	0.5	21.4
85	1	3665	0.4	14	515	0.2	2.5	34.9	1.2	16.7
	2	9146	1.1	15	3378	1.2	0.9	14.2	0.5	6.8
Total		830639	100.0	1370	291193	100.0	117.9	2867.5	56.3	1370

Notes: Source: Ministry of Employment Personnel Database (Quadros de Pessoal, QP). Size 1 refers to firms with 20 or more employees but less than 50 while Size 2 refers to firms with 50 or more employees. E_h is the number of employees in the population in stratum h, E the total number of employees in the population for the selected strata, n_h the number of respondents in stratum h, e_h the number of employees of the responding firms in stratum h and e the total number of employees of the responding firms. θ is a constant calculated as the ratio between the sum of column (9) and the sum of column (5) that assures that after rescaling the total number of firms equals n=1370. All ratios are expressed in percentage. NACE two-digit sectors: 15-Food and beverages; 16-Tobacco; 17-Textiles; 18-Wearing apparel; 19-Leather products; 20-Wood and wood products; 21-Paper products; 22-Publishing and printing; 23-Coke and refined petroleum; 24-Chemicals and chemical products; 25-Rubber and plastic products; 26-Other non-metallic mineral products; 27-Basic metals; 28-Fabricated metal products; 29-Machinery and equipment; 31-Electrical machinery; 32-Radio, TV and communication equipment; 33-Medical, precision and optical instruments; 34-Motor vehicles; 35-Other transport equipment; 36-Furniture; 37-Recycling; 40-Electricity and gas; 41-Water; 60-Land transport; transport via pipelines; 61-Water transport; 62-Air transport; 63-Supporting transport activities; travel agencies; 64-Post and telecommunications; 80-Education; 85-Healthcare (excluding social work).

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SURVEY ON PRICE-SETTING BEHAVIOUR

The questions concern the **main product** sold by your company (either a good or a service). You can choose, for instance, the product with the highest turnover in 2003 or any other product that you considered as a reference of your main activity. The answers should refer to this product and, unless otherwise stated, they should also refer to 2003. The Banco de Portugal guarantees the strict **confidentiality** of your answers, which will be only used for economic research. The Banco de Portugal is very grateful for your collaboration.

Company name: _____
Company economic classification (5-digit code): _____ Fiscal Number: _____
Person that answers the survey: _____
Phone Number: _____ E-*mail*: _____ Date: _____

General Information

1. What is your main product? _____

2. The percentage that your main product represents in the total turnover is about:

2.1. _____ %

3. What is your main market (*choose only one option)*?

3.1. Portugal ☐
3.2. Other euro area countries [1] ☐
3.3. United Kingdom ☐
3.4. United States ☐
3.5. Other countries ☐

4. If you sell your product abroad, what percentage of your turnover is due to exports?

4.1. _____ %

4.2. I don't wish to answer or I don't have enough information to do so ☐

5. What is the main destination of your sales (*choose only one option*)?

5.1. Wholesalers ☐
5.2. Retailers ☐
5.3. Companies of your own group ☐
5.4. Other companies (private and public) ☐
5.5. Public Administration (State, Municipalities,...) ☐
5.6. Directly to consumers (via your own stores or through catalogues or Internet) ☐
5.7. Others channels, please specify _____ ☐

6. In the Portuguese market, how many competitors do you have?

6.1. We don't have any main competitor ☐
6.2. Less than 5 ☐
6.3. Between 5 and 20 ☐
6.4. More than 20 ☐

7. What is the market share of your main product in Portugal (*choose only one option*)?

7.1. Less than 5% ☐
7.2. 6%-20% ☐
7.3. 21%-50% ☐
7.4. 51%-99% ☐
7.5. 100% ☐

8. The kind of relationship that you have with your customers is essentially (*choose only one option*):

8.1. Long-term (more than 1 year) ☐
8.2. Short-term (less than 1 year) ☐

9. The percentage of your sales that goes to long-term customers is approximately %

[1] Alemanha, Espanha, Grécia, Itália, Luxemburgo, Países Baixos, Bélgica, Irlanda, Finlândia, França e Áustria.

10. What is the importance of the following factors for the competitiveness of your product? *[Use the following options: 1-unimportant; 2-of minor importance; 3-important; 4-very important; 0-I can't evaluate]*

		1	2	3	4	0
10.1.	The price					
10.2.	The quality					
10.3.	The degree your product is different from your competitors					
10.4.	The delivery period					
10.5.	The presence of a long-term relationship					
10.6.	The after-sales service					
10.7.	Other factors, please specify _____					

General information on price setting

11. The price of your main product (*choose only one option*):

11.1. Is the same for all customers
11.2. Depends on the quantity sold but according to a uniform price list
11.3. Is decided case by case.

12. Is there any particular month (or months) where the price of your main product is most likely to change?

12.1. No.
12.2. Yes. Which?

J	F	M	A	M	J	J	A	S	O	N	D

13. How many times did the price of your main product change in 2002 and 2003?

	2002	2003
Number of times		

14. Taking as a reference, for instance, the last changes in price (increases or reductions), indicate (approximately) the percentage of them that implied a price increase (suggestion: consider for instance the last ten price changes %

15. Taking as a reference, for instance, the same price changes considered in the last question, indicate the most frequent size of your price changes:

	Up to 2%	From 2 to 5%	From 5 to 8%	More than 8%
For price increases [choose only one option]				
For price reductions [choose only one option]				

16. Which of the following situations is a better description of the way your price is normally set (choose only one option):

16.1. The price is set by our company
16.2. The price is set by an external entity (Government, regulatory body,)
16.3. The price is set by our main customer(s)
16.4. The price is set by our main competitor(s)
16.5. Other, please specify _____

17. Does your company usually set formal contracts that fix the price for a stated period?

17.1. No

Yes. The percentage that these contracts represent in total sales is

17.2. Less than 10%
17.3. 11-25%
17.4. 26-50%
17.5. 51-90%
17.6. Almost all (>90%)

18. The price in your company is reviewed, without necessarily being changed (choose only one option):

18.1. At a well-defined frequency (annually, quarterly...) (*If yes, go to question 19*)
18.2. Generally at a defined frequency, but sometimes also in reaction to market conditions (changes in the price of raw materials or in demand conditions) (*If yes, go to question 19*)
18.3. Without any defined frequency, being reviewed in reaction to market conditions (changes in the price of raw materials or in demand conditions) (*If yes, go to question 20*)
18.4. None of these cases applies to my company (*If yes, go to question 20*)

19. [Answer to this question if you chose options 18.1 or 18.2 in the previous question]. At what frequency is the price in your company normally reviewed, without necessarily being changed? (Consider a price revision as an assessment of all information relevant for price determination)

- **19.1.** Daily ☐
- **19.2.** Once a week ☐
- **19.3.** Once a month ☐
- **19.4.** Quarterly ☐
- **19.5.** Two times a year ☐
- **19.6.** Once a year ☐
- **19.7.** Less than once a year ☐

20. On average, at what frequency is the price actually changed?

- **20.1.** Daily ☐
- **20.2.** Once a week ☐
- **20.3.** Once a month ☐
- **20.4.** Quarterly ☐
- **20.5.** Two times a year ☐
- **20.6.** Once a year ☐
- **20.7.** Less than once a year ☐

21. Which information do you most take into account when calculating the price of your main product (choose only one option)?

- **21.1.** Information regarding the current and past behaviour of all variables relevant for profit maximization (demand, costs, the price of main competitors…) ☐
- **21.2.** Information regarding the recent behaviour of all variables relevant for profit maximization as well as their future prospects ☐
- **21.3.** We basically apply an indexation rule over one or more variables relevant for profit maximization (e.g. consumer price inflation, wage growth…) ☐

22. All other things being equal, including the price of your competitors, if you decide to increase the price of your main product for instance by 10% by what percentage do you think the quantities sold by your company would fall?

- **22.1.** More than 20% ☐
- **22.2.** Between 10 and 20% ☐
- **22.3.** About 10% ☐
- **22.4.** Less than 10% ☐
- **22.5.** Quantities would remain unchanged ☐

Reasons for changing prices

23. What is the importance of the factors listed below in terms of a price increase decision? [*Use the following options: 1-unimportant; 2-of minor importance; 3-important; 4-very important; 0-I can't evaluate*]

	1	2	3	4	0
23.1. An increase in the price of raw materials	☐	☐	☐	☐	☐
23.2. An increase in wage costs (including taxes)	☐	☐	☐	☐	☐
23.3. An increase in demand	☐	☐	☐	☐	☐
23.4. An increase in our competitors' price	☐	☐	☐	☐	☐
23.5. An increase in financing costs	☐	☐	☐	☐	☐
23.6. Other, please specify	☐	☐	☐	☐	☐

24. What is the importance of the factors listed below in terms of a price decrease decision? [*Use the following options: 1-unimportant; 2-of minor importance; 3-important; 4-very important; 0- I can't evaluate*]

	1	2	3	4	0
24.1. A decrease in the price of raw materials	☐	☐	☐	☐	☐
24.2. A decrease in wage costs (including taxes)	☐	☐	☐	☐	☐
24.3. A decrease in demand	☐	☐	☐	☐	☐
24.4. A decrease in our competitors' price	☐	☐	☐	☐	☐
24.5. A decrease in financing costs	☐	☐	☐	☐	☐
24.6. Other, please specify _____	☐	☐	☐	☐	☐

25. Companies sometimes differ in the speed their prices respond to changes in demand and costs: [*Use the following options: 1 - Less than 1 week; 2 - From 1 week to 1 month; 3 - From 1 to 3 months; 4 - From 3 to 6 months; 5 - From 6 months to 1 year; 6 - The price remains unchanged*]

	1	2	3	4	5	6
25.1. After a significant increase in demand, how much time on average elapses before you raise your prices?	☐	☐	☐	☐	☐	☐
25.2. After a significant increase in production costs, how much time on average elapses before you raise your prices?	☐	☐	☐	☐	☐	☐
25.3. After a significant fall in demand, how much time on average elapses before you reduce your prices?	☐	☐	☐	☐	☐	☐
25.4. After a significant decline in production costs, how much time on average elapses costs before you reduce your prices?	☐	☐	☐	☐	☐	☐

Reasons to postpone price changes

26. Companies sometimes decide to postpone price changes or to change their price only slightly. There is often a variety of reasons for this. Some of them are listed below. Please indicate their importance in your company. [*Use the following options: 1-unimportant; 2-of minor importance; 3-important; 4-very important; 0- I can't evaluate*]

		1	2	3	4	0
26.1.	The risk that our competitors do not change their prices					
26.2.	The fact that the next price adjustment can only occur after a certain period of time					
26.3.	The risk that we subsequently have to readjust our prices in the opposite direction					
26.4.	The existence of written contracts specifying that prices can only be changed when the contract is renegotiated					
26.5.	The preference for maintaining prices at a certain psychological threshold (ex. 199 euros)					
26.6.	The costs implied by price changes (ex. changing price lists)					
26.7.	The preference of our customers for stable prices. Changing prices frequently could threaten customer relations.					
26.8.	The costs involved in collecting the relevant information for price decisions.					
26.9.	An important part of our costs is fixed hampering price decreases when, for instance, market conditions are less favourable					
26.10.	There is a risk that customers may interpret a reduction in price as a reduction in quality					
26.11.	The variable costs in our company do not change by much with market conditions, making our price quite stable					
26.12.	Our type of customers changes over the business cycle. During a recession we lose the least loyal customers and retain the most loyal ones. As the latter are less sensitive to price changes, the price can be kept basically unchanged during a recession.					

27. Some products are characterised by having a short duration (sometimes less than 1 year). This is the case for instance of those products that change collections seasonally, such as clothing or footwear, or products that change their models regularly, such as house appliances or computers. For some of these products the price may be kept unchanged during the (relatively short) lifetime of each collection or model. Is this situation valid for your main product?

27.1. Yes ☐

27.2. No ☐

Information regarding price behaviour in international markets

(*only to be filled out by companies operating in international markets*)

28. What is the importance of the following factors in discriminating your price between markets? [*Use the following options: 1-unimportant; 2-of minor importance; 3-important; 4-very important; 0- I can't evaluate*]

		1	2	3	4	0
28.1.	Exchange rate changes					
28.2.	The country tax system					
28.3.	Structural market conditions (tastes, standard of living, ..)					
28.4.	Cyclical fluctuations in country demand					
28.5.	Market rules					
28.6.	Transportation costs					
28.7.	Other factors, please specify					

29. If a significant share of your sales (at least 20 percent) goes to one single country outside the euro area, if the euro appreciates by 5 percent vis-à-vis the currency of that country how would you change the price in that market of your main product (choose only one option)?

29.1. The price would increase more than 5% ☐

29.2. The price would increase less than 5% ☐

29.3. The price would increase by 5% ☐

29.4. The price would remain basically unchanged ☐

Information on wage setting

30. On average, at what frequency wages are normally changed in your company?

30.1. More than 2 times a year ☐

30.2. Twice a year ☐

30.3. Once a year ☐

30.4. Less than once a year ☐

31. Is there any particular month (or months) where the wages are most likely changed?

31.1. No ☐

31.2. Yes. Which one? ☐

J	F	M	A	M	J	J	A	S	O	N	D
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

THANK YOU