PRICING BEHAVIOUR IN PORTUGAL: EVIDENCE FROM SURVEY DATA[1]*

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This article 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 and search for evidence of price stickiness in Portugal. The 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, 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 existence of "implicit contracts" between firms and their customers is apparently the main reason for the rigidity observed in prices. Coordination failure, high fixed costs, constant marginal costs, explicit contracts and procyclical elasticity of demand are other valid explanations.

1. INTRODUCTION

In economic literature it is now widely agreed that the way monetary policy is conducted can influence the level of economic activity. The central assumption to obtain real effects from monetary policy is that prices are not fully flexible, remaining fixed for at least very short periods. Price stickiness affects the responsiveness of inflation and output to changes in interest rates. In this context, a better understanding about its degree and sources is critical for the design of optimal monetary policy. This has motivated a renewed interest on this field of research.

In this article, 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 man-

* The opinions expressed in this article are those of the author and not necessarily those of the Banco de Portugal.

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ufacturing. 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 was 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 a similar approach. More recently, in the context of the Eurosystem's Inflation Persistence Network, a number of national studies following 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 and Hoeberichts and Stokman (2004) for the Netherlands. No similar study has ever been conducted for Portugal.

The main advantage of using a survey is that one can ask 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 for instance from the analysis of individual price indices. Another important strength of survey analysis is that it allows to split the process of price determination into its two main components (the "price reviewing stage" and the "price changing stage") and to study them separately, something that it is also impossible with quantitative data where we only have available the final outcome of this process. Finally, survey data also provides a crosscheck of the evidence stemming from the quantitative data.

The main disadvantage of this approach is the need to assume that firms' responses describe what they actually do in practice. Besides that, we have to be aware that responses may be sensitive to various factors, such as the wording of questions and the economic environment in which they are answered[(2)]. Finally, one-off surveys do not have a time dimension, which makes impossible to investigate how different variables evolve over time.

This article is structured as follows. Section 2 describes some characteristics of the market where firms operate with special emphasis on the degree of competition and customer relationships. Section 3 presents evidence of price stickiness on the basis of a number of measures such as the frequency of price reviews and price changes, the speed of price reaction to shocks or the fraction of firms following time-dependent and state-dependent pricing rules. The main theories of price stickiness are examined in section 4. Finally, section 5 presents some concluding remarks. The methodological issues involving the sample selection and the survey design are presented in the Box annexed.

2. 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, we analyse these characteristics.

2.1. Main product and main market

The survey focused on firms' main product, either a good or a service, referred to as the product with the highest turnover in 2003, as a way of avoiding the potential problem of firms considering different products and price strategies in their answers. This could have been a very restrictive limitation to the survey if firms' main product was not representative of their total turnover. Fortunately, this was not the case. Indeed, the main product accounted on average by slightly more than 80 percent of total turnover (Chart 1). This high percentage was broadly expected since our sample excluded a number of sectors where a

(2) For instance, in 2003, the reference year in the survey, Portugal went into recession. According to information released by the Banco de Portugal in its 2005 Annual Report, GDP declined by 1.1 percent, reflecting a rather negative contribution of domestic demand. Gross Fixed Capital Formation went down by 9.9 percent while Private Consumption declined by 0.1 percent. Both consumer and business confidence indicators reached very low levels. This unfavourable economic environment could have had some influence on firms' answers to the survey.

Chart 1
SHARE OF MAIN PRODUCT IN TOTAL TURNOVER
(Question 2)

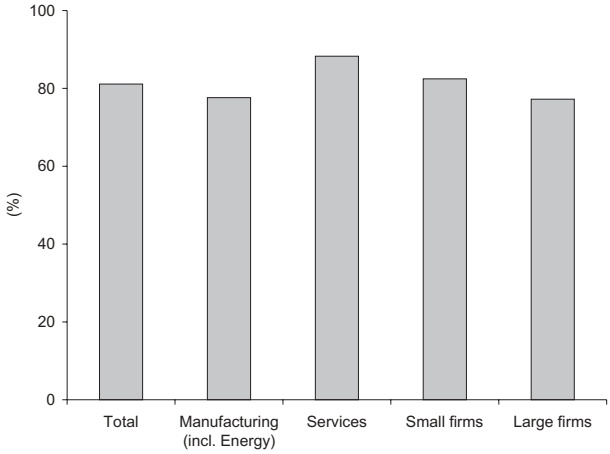


Chart 3
SHARE OF EXPORTS IN TOTAL TURNOVER
(Question 4)

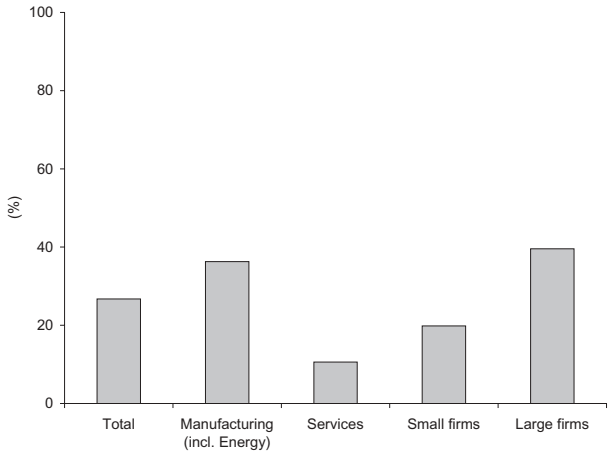


Chart 2
MAIN MARKET
(Question 3)

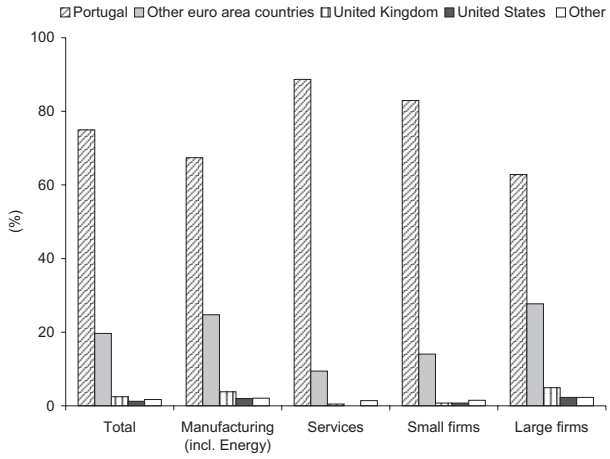
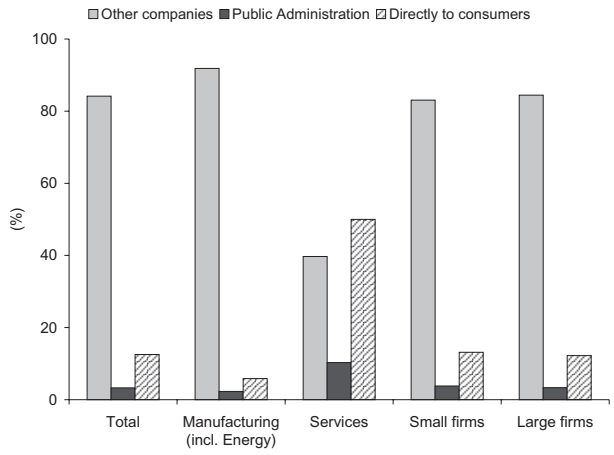


Chart 4
MAIN DESTINATION OF SALES
(Question 5)



main product was considered to be difficult to identify. Analysing results by sector and firm size, the figures are higher in services and for smaller firms[3].

Regarding firms' main market, the domestic market was referred to as the main one by about 75 percent of the firms (Chart 2). As expected, this share was higher in services and for smaller firms. The location of firms' main market is important because price-setting strategies might be different in domestic and foreign markets.

The higher degree of openness found in manufacturing and among larger firms was 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 was higher in manufacturing and for larger 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

(3) The results presented in this article for the total population of firms are weighted in order to correct for possible biases in the response structure as well as to account for the differences in firms' size. For a technical description of the weighting procedure used in this article, see Martins (2005).

Chart 5
TYPE OF RELATIONSHIP WITH CUSTOMERS
(Question 8)

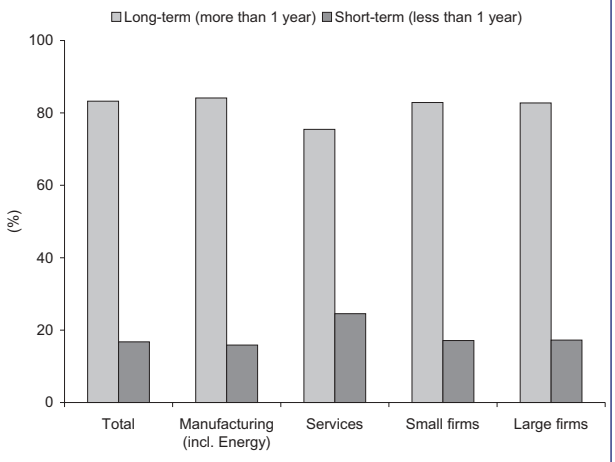
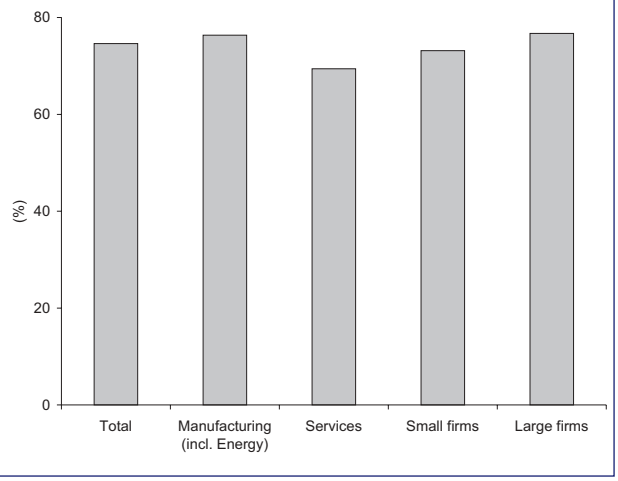


Chart 6
SHARE OF SALES TO LONG-TERM CUSTOMERS IN TOTAL TURNOVER
(Question 9)



the type of price-setting behaviour under analysis refers predominantly to producer prices.

2.2. 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 bear 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)[4]. This figure 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 higher in manufacturing and for larger firms (Chart 6).

2.3. Degree of competition

The degree of competition that firms face is another important variable affecting price-setting decisions. 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 sample coverage 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 most of the firms seem to have limited market power they still possess some degree of autonomy on their price. Indeed, 67 percent of firms considered themselves as mainly price setters (Chart 10).

3. MEASURING PRICE STICKINESS

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

Chart 7
NUMBER OF COMPETITORS IN PORTUGAL
(Question 6)

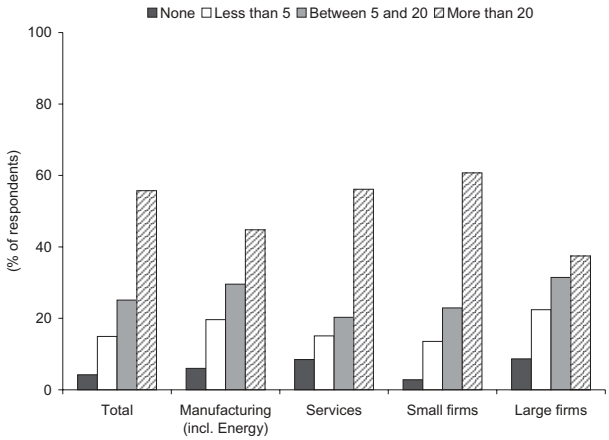


Chart 8
MARKET SHARE OF THE MAIN PRODUCT IN PORTUGAL
(Question 7)

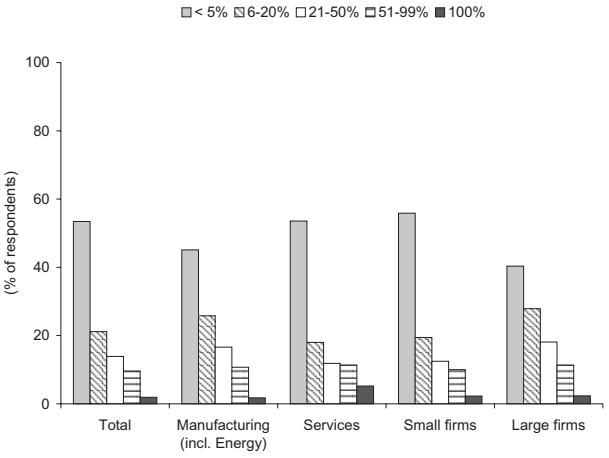


Chart 9
ELASTICITY OF DEMAND
(Question 22; fall in quantities sold if prices increase by 10%)

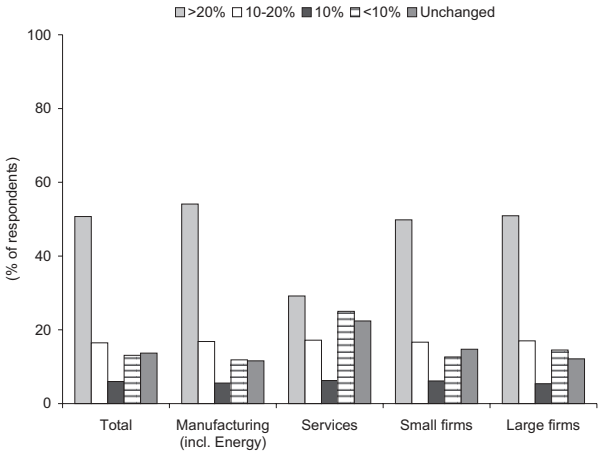
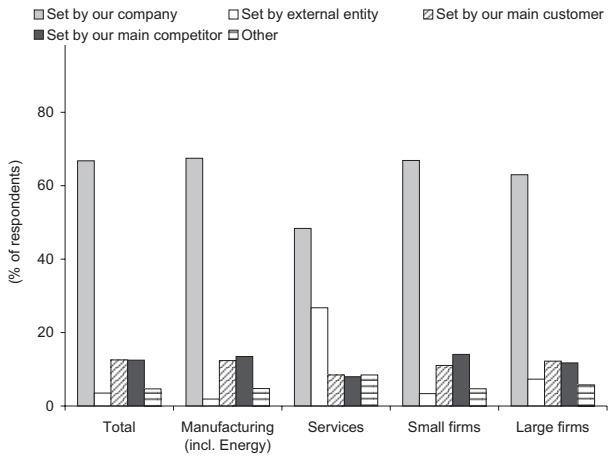


Chart 10
DEGREE OF PRICE-SETTING AUTONOMY
(Question 16; who sets firm's price)



3.1. Time-dependent and state-dependent pricing rules

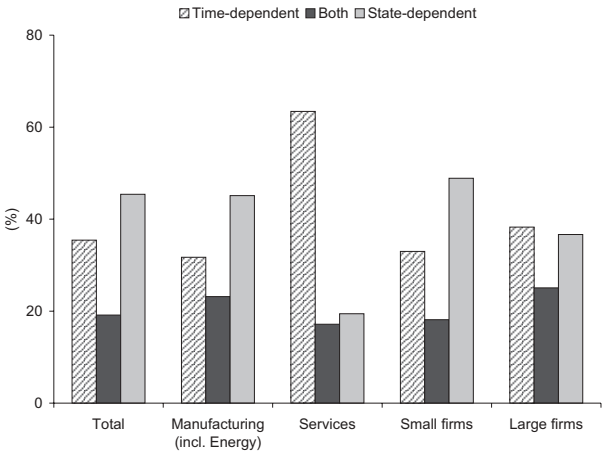
In the literature there are traditionally two approaches for modelling price setting behaviour: the time-dependent rules and the state-dependent rules. Under time-dependent rules, prices are reviewed at discrete time intervals, which are independent of the state of the economy and can be either fixed as in Taylor (1980) or stochastic as in Calvo (1983). As opposed to time-dependent rules, in state-dependent rules the timing of price reviews is endogenous and firms decide to review their prices only when there is a sufficiently large shift in market conditions.

Even though both theories have implicit 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 reviewed at a well-defined frequency or in response to market conditions(5). 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 may 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 11). 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 33 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.

Chart 11
PRICE-ADJUSTMENT STRATEGIES
(Question 18)



3.2. 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 the 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(6). 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. Against this background, they propose the use of the real marginal cost. This choice seems to be supported by the 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, Fuhrer (1997)].

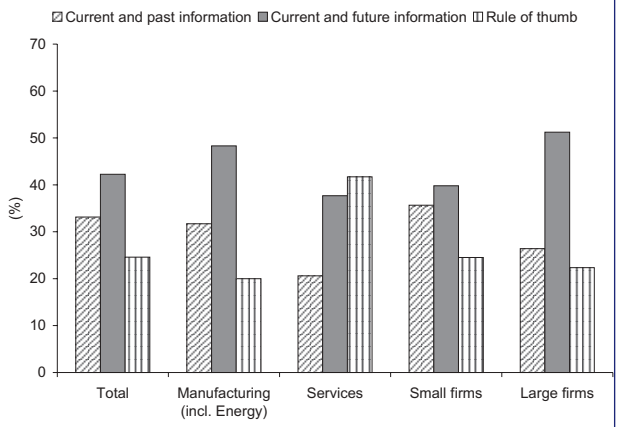
In the context of survey analysis, one can try to test which of the two paradigms seem to describe better the way firms usually formulate their pricing decisions by asking them directly about the information set they take into account when review-

(5) 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.

(6) See, for instance, Roberts (1997).

ing their prices. According to the evidence, an important share of firms (42 percent) review their prices taking into account a wide range information, which includes expectation about future economic developments (Chart 12). However, a large fraction of firms build price decisions without looking to economic projections. About one-quarter of firms simple adopt a rule-of-thumb behaviour based for instance on the overall consumer price index or on wage growth. Results also indicate that larger firms are more forward-looking. This is also true for manufacturing. This is important evidence since departures from fully optimising behaviour could be an additional source of price stickiness.

Chart 12
INFORMATION SET USED IN PRICE REVIEWS
(Question 21)



3.3. The frequency of price reviews and the frequency of price changes

Those firms that follow time-dependent rules, either strictly or only when there are no large shifts in market conditions, were asked to mention the normal frequency of their price reviews. If the costs incurred by firms to collect the relevant information to assess whether the current price is out of line were negligible one would expect firms to conduct price reviews very frequently. 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 could not be large enough when compared to the costs they have to bear(7). 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 13). Comparing results across sectors, the evidence shows that price reviews seem to be more frequent in manufacturing than in services.

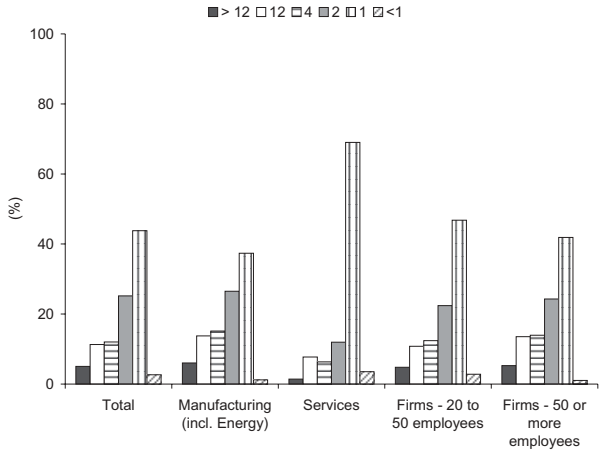
Having analysed the frequency of price reviews the next step was to ask firms how often they actually change their prices. Comparing results for firms that responded both to the question on price reviews and the question on price changes, the evidence shows that, as expected, price changes are less frequent than price reviews: about three quarters of firms responding to the survey reported that they change their prices no more than once a year (Chart 14). These results are in line with the findings of Fabiani *et al* (2005) for the euro area, Blinder *et al* (1998) for the US, Hall *et al* (1997) for the UK and Apel *et al* (2001) for Sweden. As in price reviews, the frequency of price changes seems to be higher in manufacturing than in services. In addition, firms that sell their product mostly to other firms, which is our best proxy for the behaviour of producer prices, seem to change their prices on average more frequently than those that sell their product mostly to final consumers (Charts 15 and 16).

3.4. The direction and magnitude of price changes

One important objective of survey analysis is to investigate to what extent the evidence stemming from quantitative data is 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 the period 1992-2001. In their paper, they conclude *inter alia* that price increases only account for around 60 percent of total price changes and that the magnitude of price increases is broadly similar

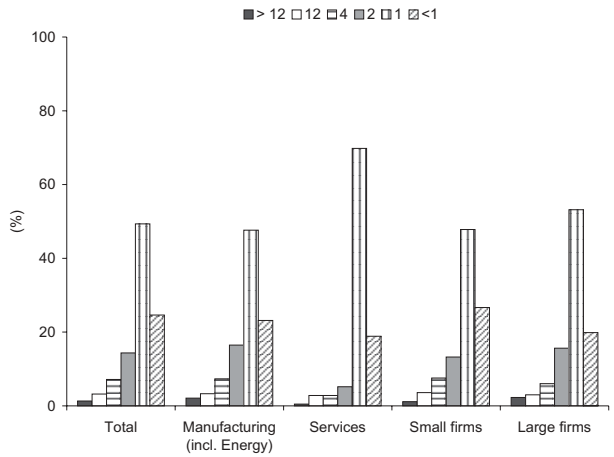
(7) One alternative explanation for the low frequency of price reviews found in data could be attributed to the fact that some firms may consider that it may not make sense for them to review their prices more often simply because the frequency of arrival of new relevant information is also low.

Chart 13
FREQUENCY OF PRICE REVIEWS
(Question 19; number of times in a year)



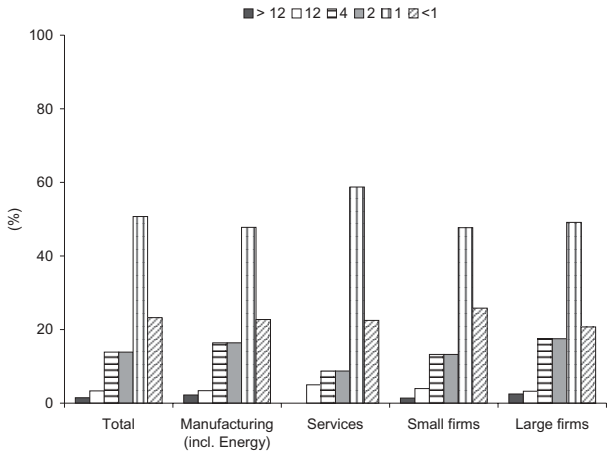
Note: Average frequency: Total=4.0; Manuf.=4.6; Manuf.+Energy=4.6; Serv.=2.5; Firms(20-50)=3.9; Firms(>50)=4.4.
The median is equal to 2 in all cases.

Chart 14
FREQUENCY OF PRICE CHANGES
(Question 20; number of times in a year)



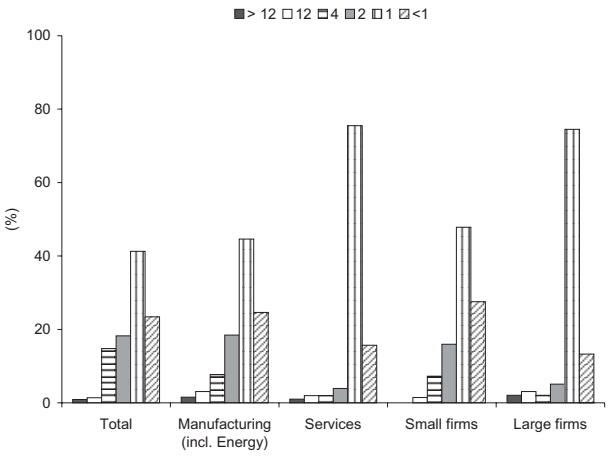
Note: Average frequency: Total=1.9; Manuf.=2.1; Manuf.+Energy=2.1; Serv.=1.5; Firms(20-50)=1.9; Firms(>50)=2.1.
The median is equal to 1 in all cases.

Chart 15
FREQUENCY OF PRICE CHANGES IN PRODUCER PRICES
(Question 20; considering only firms that sell their product mostly to other firms; number of times in a year)



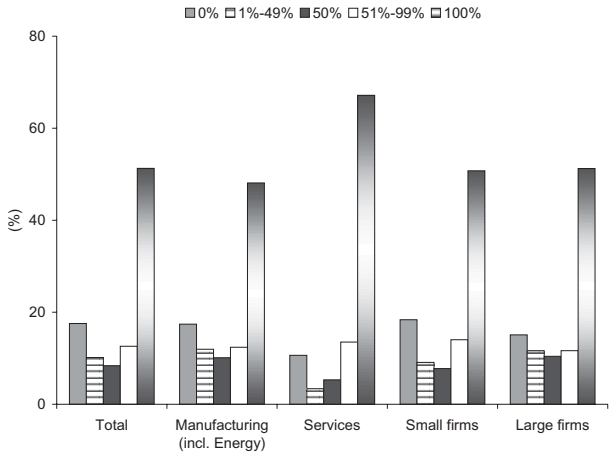
Note: Average frequency: Total=2.1; Manuf.=2.2; Manuf.+Energy=2.2; Serv.=1.7; Firms(20-50)=2.0; Firms(>50)=2.2.

Chart 16
FREQUENCY OF PRICE CHANGES IN CONSUMER PRICES
(Question 20; considering only firms that sell their product mostly to final consumers; number of times in a year)



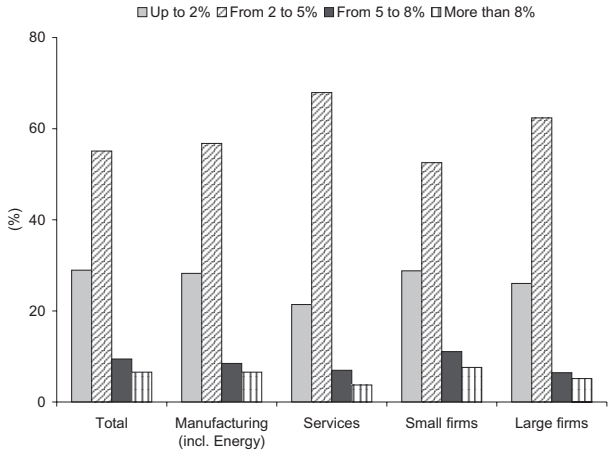
Note: Average frequency: Total=1.7; Manuf.=2.0; Manuf.+Energy=2.0; Serv.=1.5; Firms(20-50)=1.4; Firms(>50)=1.9.

Chart 17
PERCENTAGE OF PRICE INCREASES IN THE MOST RECENT PRICE CHANGES
(Question 14)



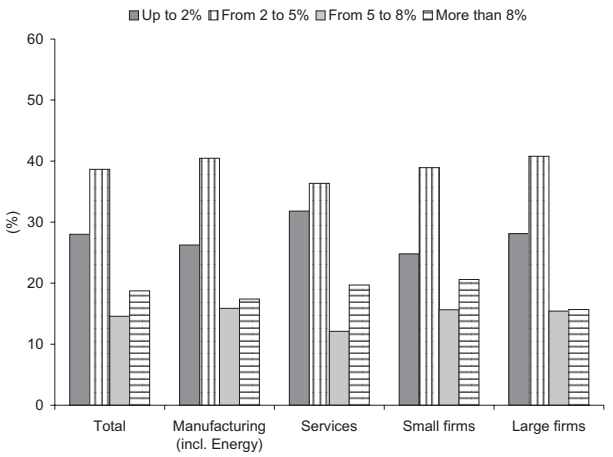
Note: Average percentage: Total=67.5; Manuf.=65.5; Manuf.+Energy=65.5; Serv.=80.1; Firms(20-50)=67.4; Firms(>50)=68.1.

Chart 18
AVERAGE MAGNITUDE OF THE MOST RECENT PRICE INCREASES
(Question 15)



Note: Median percentage: Total=3.1; Manuf.+Energy=3.2; Serv.=3.3; Firms(20-50)=3.2; Firms(>50)=3.2.

Chart 19
AVERAGE MAGNITUDE OF THE MOST RECENT PRICE DECREASES
(Question 15)



Note: Median percentage: Total=3.7; Manuf.+Energy=3.8; Serv.=3.5; Firms(20-50)=3.9; Firms(>50)=3.6.

to the magnitude 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 data confirm that price increases are more frequent than price decreases — about one half of firms did not report any price decrease[8]. Price increases account for almost 70 percent of total changes (Chart 17), i.e. higher than the 60 percent share found in the quantitative data but in line with the result obtained by Loupias and Ricart (2004) for France. Except for the case of services, where this share is particularly high, there is no evidence of strong downward rigidity.

Looking at the magnitude of price changes, survey results also revealed that the absolute magnitude of price decreases is on average higher than that of price increases (3.7 percent against 3.1 percent, respectively). Differences across sectors were not significant but smaller firms seem to be more aggressive in terms of the magnitudes of their price changes (Charts 18 and 19). The positive inflation witnessed 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.

(8) The results of both studies should be compared 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 in general.

Table 1

PERCENTAGE OF FIRMS THAT DO NOT CHANGE THEIR PRICES IN THE FIRST YEAR AFTER A SHOCK

(Question 25; option 6)

	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

Chart 20

SPEED OF PRICE RESPONSE TO A POSITIVE DEMAND SHOCK

(Question 25.1; number of days)

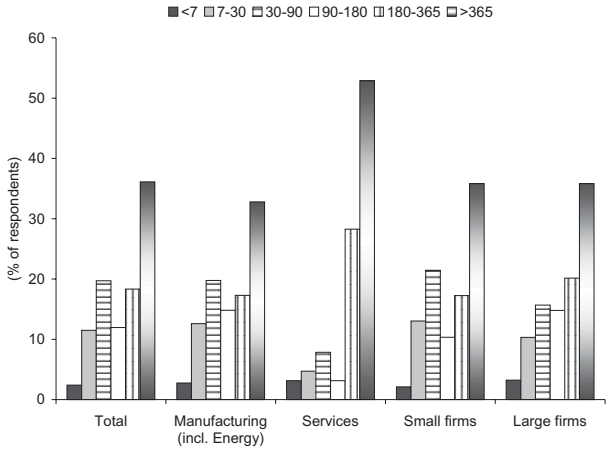


Chart 21

SPEED OF PRICE RESPONSE TO A POSITIVE COST SHOCK

(Question 25.2; number of days)

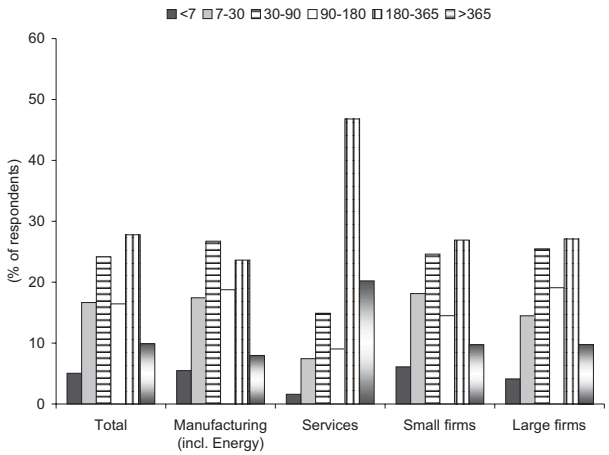


Chart 22

SPEED OF PRICE RESPONSE TO A NEGATIVE DEMAND SHOCK

(Question 25.3; number of days)

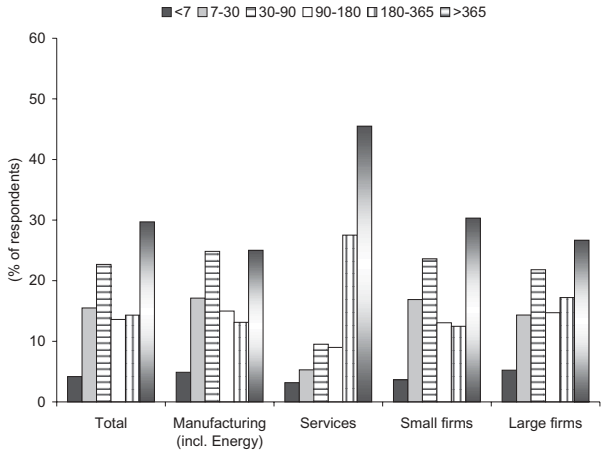


Chart 23

SPEED OF PRICE RESPONSE TO A NEGATIVE COST SHOCK

(Question 25.4; number of days)

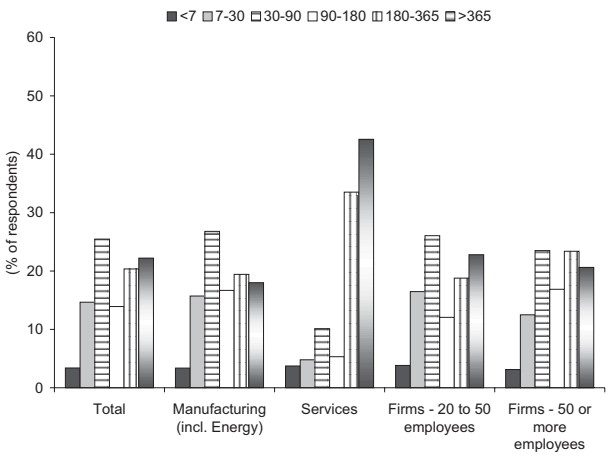


Table 2

THEORIES OF PRICE STICKINESS

(Question 26; mean scores unless otherwise stated)

Questions	Theories	Total:		Memo:			
		Mean scores	*P-value*	Manufacturing	Services	Small firms	Large firms
26.7	Implicit contrats	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 costs	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
26.1	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

3.5. 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 for the presence of price stickiness: infrequent price changes maybe the result of infrequent cost and demand shocks. Against this background and to complement the analysis of frequencies, in the survey firms were asked to report the time that on average elapses between a significant shock (positive or negative) to either demand or costs and the corresponding price change. The 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 this last option, we have to interpret firms' answers as referring to the short-run rigidity in response to a shock they consider as permanent. If for instance firms interpreted a "significant rise in costs" as a permanent rise in costs then any answer that do not include a change in prices would make no sense. Thus, option 6 must be understood as telling us the proportion of firms that maintain their prices in the first year after the occurrence of a given shock.

Table 1 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 20 to 23 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 occurs lies between 38 percent, for positive cost shocks, and 55 percent, for positive demand shocks. For services, these figures are significantly higher (67 and 81 percent, respectively).

4. THE MAIN THEORIES OF PRICE STICKINESS

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

Sources of price stickiness may be present at both stages. Results from 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 show that they change their prices less frequently than they review them. 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, it is analysed the possible origin of these costs.

The method adopted is similar to that of Blinder *et al* (1998), who were the first to implement the large-scale interview method to test different theories of price stickiness. In the survey we asked 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[9]. The 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, agree with several of them.

Table 2 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 bellow. Results of this test show that only in three cases the differences in scores are not statistically different at the 10 percent level.

Results suggest that the presence of "implicit contracts" between firms and their customers is apparently 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". The mean score attached to this theory is surprisingly high given the traditional magnitude of mean, scores in similar studies, which in 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 ranks. The first theory refers to the fact that it may not be in a firm's interest to change their price if their main competitors do not change their prices, while the second refers to the constraint that the presence of high fixed costs puts on firm's decision to reduce its price.

"Constant marginal costs", "Explicit contracts" and "Procyclical elasticity of demand" complete the group of theories with mean scores exceeding the neutral value of 2.5. If costs are an important determinant in firms' pricing decisions and if marginal costs do not change by much, there are no reasons to change prices frequently. This is the main assumption 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 ad-

(9) A detailed description of these theories can be found in Blinder *et al* (1998) or Hall *et al* (2000).

justments", "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 of changing prices, while the second refers to the fact that firms may decide not to change their price in response to a shock if they considered it as having a temporary nature. Finally, some firms may feel reluctant to decrease their price for fear that their customers will think their product has declined in quality. 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 as an important explanation for price rigidity, 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 regularly. 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 disproportionately 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 rank 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.

To conclude, it worth to mention that when analysing the different theories of price rigidity 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, change contract conditions, ...). "Menu costs", "Explicit contracts", "Time lags in price adjustment" or "Pricing thresholds" are theories of nominal rigidity. However, most of the remaining explanations set forth in the literature are theories of 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 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.

5. CONCLUDING REMARKS

In this article, price stickiness in Portugal was analysed based on qualitative data coming from a survey conducted by the Banco de Portugal between May and September 2004. Price stickiness was assessed on the basis of five measures: 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 a half of firms build their price decisions taking into account only historic data.

Results also show that price stickiness seems to be higher in services than in manufacturing (all the five measures point in the same direction). This a stylized fact also identified for the euro as a whole [see Fabiani *et al* (2005)]. The higher degree of price persistence observed in services could reflect its higher labour share. Indeed, there is some evidence [see Alvarez *et al* (2005)] that higher shares of labour input imply lower frequencies of price changes.

Another important finding is that prices seem to go down more frequently than which is normally assumed: slightly more than 30 percent of price changes are price decreases. Moreover, the absolute size of price decreases is even larger than the magnitude of price increases.

Finally, the existence of "implicit contracts" between firms and their customers is apparently the main reason for the rigidity observed in prices. Coordination failure, high fixed costs, constant marginal costs, explicit contracts and procyclical elasticity of demand are other valid explanations.

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METHODOLOGICAL ISSUES

SAMPLE DESIGN

The survey was conducted by the Banco de Portugal between May and September 2004 on 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 in the survey[1].

The Banco de Portugal Central Balance-Sheet Database (Central de Balanços, CB) was the primary source for firm collection. Given the dominance of smaller firms in Portugal, a pure random selection of firms 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 split into two groups according to the number of employees: one group containing firms with 20 or more employees but less than 50, and another group including firms with 50 or more employees. 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 made by stages. The relative frequency of each stratum in the Ministry of Employment Personnel Database (Quadros de Pessoal, QP) - the best proxy of 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, it was used successively the CB 2001, the CB 2000 and finally the QP 2000 databases 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 20 percent of total employment in Portugal.

SURVEY DESIGN AND IMPLEMENTATION

The survey was organised in six sections containing a total of 31 questions (an English version of the survey is shown in annex). For the sake of comparability, a large share of these questions was taken from other similar surveys. This opportunity was also seized 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. It was made an attempt to phrase the questions as much as possible in non-technical language that can be understood by a non-economist.

After the sample had been selected and a first draft of the survey had been designed, in the end of May a pilot survey was carried out on a sample of 20 firms. 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. 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 to be answered by someone well informed about firms' price setting

(1) 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 had some considerable differences vis-à-vis the final draft.

(firms' top managers in most cases). Firms were allowed to answer within fifteen working days either by traditional mail or through a specially created website[2].

A reminder was sent to those firms that had not responded by middle-August. At the end, 1370 valid questionnaires were received[3]. 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 respond.

(2) A help desk was created to support firms, either by phone, fax or email.

(3) The number of firms that sent their questionnaires was a slightly higher but some questionnaires had to be eliminated because some inconsistencies were identified. 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.

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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 be referred to this product and, unless otherwise stated, they should be also referred 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) Germany, Spain, Greece, Italy, Luxembourg, Netherlands, Belgium, Ireland, Finland, France and Austria.

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 changed?

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 describes better 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 sets 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 the price in your company is normally reviewed, without necessarily being changed? (Consider a price review 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. Keeping everything else constant, 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 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 that 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. This is generally due to various factors. 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
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐