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Abstract

This study investigates the pricing behaviour of firms in the euro area on the basis of surveys conducted by nine Eurosystem national central banks. Overall, more than 11,000 firms participated in the survey. The results are very robust across countries. Firms operate in monopolistically competitive markets, where prices are mostly set following mark-up rules and where price discrimination is a common practice. Our evidence suggests that both time- and state-dependent pricing strategies are applied by firms in the euro area: around one-third of the companies follow mainly time-dependent pricing rules while two-thirds use pricing rules with some element of state-dependence. Although the majority of firms take into account a wide range of information, including past and expected economic developments, about one-third adopts a purely backward-looking behaviour. The pattern of results lends support to the recent wave of estimations of hybrid versions of the New Keynesian Phillips Curve. Price stickiness arises both at the stage when firms review their prices and again when they actually change prices. The most relevant factors underlying price rigidity are customer relationships– as expressed in the theories about explicit and implicit contracts –and thus, are mainly found at the price changing (second) stage of the price adjustment process. Finally, we provide evidence that firms adjust prices asymmetrically in response to shocks, depending on the direction of the adjustment and the source of the shock: while cost shocks have a greater impact when prices have to be raised than when they have to be reduced, reductions in demand are more likely to induce a price change than increases in demand.

JEL codes: E30, D40.

Keywords: price setting, nominal rigidity, real rigidity, inflation persistence, survey data.

1. Introduction

In recent decades, a substantial amount of theoretical research devoted to improving the microeconomic foundations of macroeconomic behaviour has shown that the nature of nominal rigidities plays a key role in determining the effects of different shocks on the economy. This theoretical research has made clear that a thorough understanding of the extent and causes of the sluggish adjustment of nominal prices is crucial to the design and conduct of monetary policy. In this respect, empirical work aimed at an improved characterisation of the price-setting behaviour of firms is of major interest for monetary policy making. The objective of this paper is to deepen our understanding of the behavioural mechanisms underlying price setting by using a methodological approach –asking firms directly about how they set prices– that is particularly well-suited for the purpose at hand.

Although the increasing availability of quantitative consumer and producer price micro databases has recently provided detailed descriptions of the periodicity and magnitude of price changes in a number of economies[1], these quantitative characterisations of price dynamics are not enough to understand the underlying rationale of the behaviour of price setters. There are certain aspects of firms' pricing polices that can only be investigated on the basis of the qualitative information obtained from surveys. In particular, firms' responses can provide valuable insights into the relative importance of nominal versus real rigidities or the type of information set used in the revision of prices. Furthermore, the use of survey results allows us to investigate separately the two stages of the price adjustment process (i.e. the review stage and the implementation stage), to empirically assess alternative theories on price stickiness and to test whether the response of prices to shocks differs depending on the nature (costs/demand) or the sign of the disturbances. Finally, survey results are also useful in cross checking the evidence obtained from quantitative databases.

The use of surveys to explore the price setting behaviour of firms was pioneered by the seminal work of Blinder (1991 and 1994) and Blinder et al. (1998) for the United States.[2] This work has led to the conduct of similar surveys in other countries: Köhler (1996) in Germany, Hall et al. (1997 and 2000) in the United Kingdom, Apel et al. (2005) in Sweden and Amirault et al. (2004) in Canada.

Within this line of research, this paper provides an in-depth study of firms' price-setting mechanism in the euro area on the basis of the evidence obtained from surveys conducted in 2003 and 2004 in nine euro area countries (Austria, Belgium, France, Germany, Italy, Luxembourg, the Netherlands, Portugal and Spain), covering 94% of euro area GDP.[3] The national surveys were designed following a decentralised approach.[4] The surveys were conducted either by phone, internet or post; a small number took the form of face-to-face interviews.[5] The number of respondents in each country ranged from 333 to 2,008. All together, more than 11,000 companies in the euro area were surveyed. The sectoral coverage was limited to manufacturing in some countries, while in others pricing behaviour in construction, trade and services was also investigated (see Table B.1 in Appendix B for the sectoral coverage). There is some over-representation of the industrial sector in most

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[1]   See Bils and Klenow (2004) and Dyhne et al. (2005).
[2]   For a very early example of this kind of work, see Hall and Hitch (1939).
[3]   The detailed results for each country can be found in the country-specific studies conducted in the framework of the IPN: Kwapil et al. (2005) for Austria (AT), Aucremanne and Druant (2005) for Belgium (BE), Loupias and Ricart (2004) for France (FR), Stahl (2005) for Germany (DE), Fabiani et al. (2004) for Italy (IT), Lünnemann and Mathä (2005) for Luxembourg (LU), Hoeberichts and Stokman (2005) for the Netherlands (NL), Martins (2005) for Portugal (PT), and Álvarez and Hernando (2005) for Spain (ES). These works can be withdrawn from the ECB website.
[4]   See Appendix A and the national studies mentioned in footnote 3 for a detailed description of the main characteristics of the national surveys.
[5]   The contact in each responding firm was in most cases one of the senior managers.

of the national samples, which explains why the majority of companies (75% on average) sell their main product predominantly to other firms.[6] Thus, the conclusions we draw are mainly related to producer prices rather than to consumer prices.

The national surveys display a sufficiently high degree of comparability across countries, despite the adoption of a decentralised approach in their design.[7] Thus, a number of common characteristics can be observed in the full set of results from all of the countries. The country coverage and the high comparability of the national surveys imply that these common features may be regarded as stylised facts underlying the price-setting mechanism in the euro area.

It is worth emphasising that these important common patterns do not appear to depend on the way the national surveys were conducted, the number of questions asked, the precise wording and order of the questions and the options within a particular question. The results are therefore characterised by a high degree of robustness that is further strengthened by the fact that the nine national surveys were carried out under different business cycle conditions.[8]

The structure of the paper follows the different stages of the price setting process. Section 2 deals with the price reviewing stage and provides evidence on the time- or state-dependent nature of firms' pricing policies, the information set used and the frequency of price reviews. Section 3 investigates how firms set prices, documents the frequency of price changes and explores the empirical support of alternative theories on price stickiness. The responses on the factors underlying price setting are analysed in Section 4. Finally, Section 5 concludes.

2. Price reviews

This section documents the main features of the first step of the price adjustment process, the one in which firms evaluate the price they want to set, taking into account the information they have and checking whether it coincides with the price they currently charge.

2.1 Time-dependent versus state-dependent pricing rules

Individual firms do not continuously adjust their prices in response to all the relevant shocks in the economy. To model this fact, the theoretical literature considers mainly two types of pricing behaviour: time-dependent pricing rules and state-dependent ones. According to the former, either with a deterministic [Taylor (1980)] or a stochastic [Calvo (1983)] process of price adjustment, firms review their prices periodically, i.e. the timing of the review is exogenous and does not depend on the state of the economy.

Firms following state-dependent pricing rules review their prices whenever there is a large enough shock. A standard justification for this type of discontinuous adjustment is the existence of a fixed cost of changing prices [see, for instance, Sheshinski and Weiss (1977), Caballero and Engel (1993), or Dotsey et al. (1999)]. The existence of price adjustment costs implies in state-dependent models that firms change their price only when the latter gets sufficiently "out of line" and, consequently, price reviews are likely to be a lot more frequent than price changes, as firms want to be aware of shocks in order to react as fast as possible. In time-dependent models, firms review –and change, if they find it optimal to do so– their price only on a periodic basis.

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[6] Appendix B summarises the main characteristics of the market in which the firms operate.
[7] See Appendix B for an analysis of the comparability of the national surveys.
[8] This coincidence of results lessens to some extent the potential significance of the drawbacks traditionally attached to the use of surveys: first, the qualitative nature of the information gathered, which sometimes makes it difficult to ascertain the precise importance of a given statement; second, the lack of a time dimension, which means that they cannot be used to assess whether pricing patterns change over time; finally, the degree of uncertainty that surrounds the quality of the answers provided by the respondents.

Table 1. Firms (in each category) following:

a) Mainly time-dependent rules
(percentages)(1)

	Total	Employees			Sector			Perceived competition			
		1-49	50-199	>=200	goods	trade	services	very low	low	high	very high
BE	26	23	21	24	22	29	24	25	23	22	19
FR (2)	39	-	-	-	39	-	-	-	-	-	-
DE	26	24	29	28	26	-	-	27	21	25	33
ES	33	31	35	36	29	32	40	42	32	29	31
IT	40	-	39	42	40	35	45	37	35	51	19
LU	18	18	17	18	23	16	14	25	14	10	25
NL	36	34	42	-	26	34	40	35	36	35	36
AT	41	43	33	35	37	-	44	42	34	39	35
PT	35	33	36	42	32	-	63	47	42	38	25
EURO AREA (3)	**34**				**32**						

b) Both time- and state-dependent rules
(percentages)(1)

	Total	Employees			Sector			Perceived competition (4)			
		1-49	50-199	>=200	goods	trade	services	very low	low	high	very high
BE	40	39	47	44	42	36	48	43	40	44	38
FR (2)	55	-	-	-	55	-	-	-	-	-	-
DE	55	56	53	58	55	-	-	51	64	58	45
ES	28	24	29	32	25	24	34	18	29	33	31
IT	46	-	47	38	45	62	26	45	53	43	40
LU	32	29	34	36	27	39	32	25	39	33	27
NL	18	17	24	-	19	21	16	12	18	16	24
AT	32	30	39	44	36	-	29	35	37	36	39
PT	19	18	22	30	23	-	17	14	19	22	28
EURO AREA (3)	**46**				**46**						

Notes: (1) Re-scaled figures excluding non-responses. (2) In the case of France, the issue has not been addressed directly; the information in the table has been estimated on the basis of the answers to other questions. (3) Weighted average (GDP weights). (4) As an indicator of the degree of competition we use the degree of perceived competition defined as the importance firms attribute to competitors' prices in influencing a reduction in their own prices (unimportant, of minor importance, important, very important). Appendix B reports information on the degree of perceived competition for the samples used in the national surveys.

In the presence of shocks, time-dependent pricing rules might lead to stickier prices than state-dependent rules. Hence, almost every national questionnaire investigates whether firms follow mainly time-dependent, state-dependent pricing rules, or a combination of both. In this latter case, the idea is that firms can follow time-dependent pricing rules as an implementation of state-dependent ones under a stable environment [as in Sheshinski and Weiss (1977)] rather than purely time-dependent rules. To distinguish between these two groups, some national questionnaires asked firms whether they switch to state-dependent rules upon the occurrence of specific events.

Given that the firms following mainly time-dependent rules or both strategies are supposed, under certain assumptions, to introduce more rigidity in the price transmission mechanism than those following mainly state-dependent rules, our analysis

focuses on cross-country comparisons of the share of mainly time-dependent firms (Table 1a) and of those which follow both types of rules (Table 1b).[9]

In the euro area as a whole 34% of the interviewed firms follow purely time-dependent rules; roughly around 35-40% for six countries (FR, ES, IT, NL, AT, PT) and below 30% for three countries (BE, DE, LU). These results are in line with those obtained by Blinder et al. (1998), who report that in the United States 40% of firms undertake meaningful periodic price reviews.[10] Overall, the results are also consistent with the figures obtained for Sweden by Apel et al. (2005), who report that only 23% of the firms are found to follow time-dependent pricing rules when significant events occur. The results for the United Kingdom by Hall et al. (2000), however, are at odds with the above-mentioned ones, as 79% of the firms are found to be time-dependent (10% of the firms are found to follow both time and state-dependent pricing rules and 11% state-dependent rules).[11] Around two-thirds of the companies in the euro area follow pricing rules with some element of state-dependence. Among these firms, those using a mixed strategy are predominant, except in four countries (ES, LU, NL, PT).

The share of firms following mainly time-dependent rules generally increases slightly with the size of the firm when the number of employees is greater than 50; it is higher for services than for trade (except for Belgium and Luxembourg) and higher for trade than for industry (except for Italy and Luxembourg). There is, however, no clear-cut evidence on the relationship between pricing rules and the degree of market competition.

Stylised fact 1 – _Both time- and state-dependent pricing strategies are used by euro area firms. Around one-third of the companies follow mainly time-dependent pricing rules while the remaining two-thirds use pricing rules with some element of state-dependence._

2.2 Information set used in price reviews

The so-called New Keynesian Phillips Curve (NKPC) models, which emphasise rational expectations and hence the existence of forward-looking price-setters, are increasingly used for monetary policy analysis [see, for instance, Woodford (2003)]. Despite their theoretical success, however, these models generally fail to generate the sluggishness in price behaviour that is empirically observed. Conversely, hybrid versions of the NKPC including backward-looking or rule-of-thumb terms have been reported to provide a better representation of the observed price movements. The information set used by companies when making their pricing decisions has indeed important implications for the sluggishness of price adjustments in response to a broad range of disturbances. Backward-looking behaviour aside, price stickiness may also stem from firms using some form of rule-of-thumb in setting their price [Galí and Gertler (1999), and Galí et al. (2001)] or from indexation schemes [Christiano et al. (2005)] or from stickiness in gathering information [Mankiw and Reis (2002)]. In all these cases, deviations from fully optimising behaviour generate an additional source of sluggishness in the response of inflation to shocks.

Six national surveys (BE, ES, IT, LU, AT, PT) provide data on the information set on which firms base their pricing decisions when they review their prices. This is an important piece of evidence that reflects different degrees of optimality of price setting strategies. Companies applying rules of thumb (for instance, changing prices by a fixed percentage, or

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[9] Figures concerning firms following mainly state dependent rules are not reported in the text.

[10] The gross figure for this share is 60%, but Blinder et al. (1998) remove the 20% of firms that change their prices less frequently than every fourth review and those reporting that they change their prices more frequently than they have price reviews. Indeed, the previous mentioned firms rely as much on reviews based on state-dependent rules as on time-dependent ones.

[11] Nevertheless, comparison of the share of mainly time-dependent firms across countries is uneasy because this figure may be very sensitive to the interpretation threshold between "mainly time-dependent" and "both time and state-dependent".

following a CPI indexation rule) may end up charging a price that deviates substantially from the optimal price if a large shock occurs. In this sense, these companies behave non-optimally. At the other extreme, price reviews are addressed in an optimal way if companies use a wide set of indicators relevant for profit maximisation, including expectations about the future economic environment.

On average, 48% of the firms in the euro area evaluate their prices on the basis of an information set that includes expectations about the future economic conditions (Table 2). There are some differences across countries in the share of forward-looking firms, which ranges from 28% in Spain to 68% in Italy.

A large fraction of firms, however, does not behave optimally, either due to backward-looking behaviour or to the use of rules-of-thumb. About one third of firms take only historical data into account. For those surveys that included the rule-of-thumb option (such as indexation based on the consumer price index, a fixed percentage adaptation, etc.), the results indicate that this pricing method is adopted by 37% of firms in Belgium, 33% in Spain, 30% in Luxembourg and 25% in Portugal.

Overall, the pattern of results reported in this section lends support to the recent wave of estimations of hybrid versions of the New Keynesian Phillips Curve.

Table 2. Information set for pricing decisions
(percentages)

	BE	ES	IT	LU	PT	AT	EURO AREA (1)
Rule of thumb	37	33	n.a.	30	25	n.a.	
Past/Present context	29	39	32	26	33	37	**34**
Present/Future context	34	28	68	44	42	12	**48**
Past, present and future	n.a.	n.a	n.a.	n.a	n.a.	51	

Note: (1) Weighted average (GDP weights). Note that the percentages for the euro area do not add up to 100 as different answer-categories were used in the various countries.

Information available for Spain and Luxembourg shows that smaller firms tend to be more backward-looking than larger ones and, conversely, larger firms tend to attach more importance than smaller ones to expectations about future conditions when assessing their prices.

Stylised fact 2 – *Around half of the firms review their prices taking into account a wide range of information, including both past and expected economic developments; one-third of them adopt a backward-looking behaviour.*

2.3 How often do firms review their prices?

All national surveys contain a question about how often firms that follow time-dependent rules assess their prices. Typically, the respondents were given a choice among several categories (daily, weekly, monthly, quarterly, etc.).[12] Belgium, Luxembourg and Spain opted for a slightly different formulation, asking whether the respondents review

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[12] All those firms indicating that they carry out periodic price reviews and those applying time-dependent pricing rules in normal circumstances (and state-dependent reviews in exceptional circumstances) were asked at what intervals they review their prices.

their prices more than once a year, once a year or less than once a year; within these categories respondents had to specify the number of times.[13]

Table 3 groups the results into three classes: the share of respondents that review their price a maximum of three times a year, between four and eleven times a year, and at least twelve times a year.

In all countries, the largest share of firms review their prices at most three times a year (57% for the euro area as a whole).

Table 3. Frequency of price reviews per year
(percentages) (1)

	BE	DE	ES	FR	IT	LU	NL	AT	PT	EURO AREA (2)
≥ 12	4	30	7	31	28	26	37	29	5	**26**
4 – 11	8	17	7	22	14	20	19	25	26	**17**
≤ 3	88	53	86	47	57	54	44	46	69	**57**
median	1	3	1	4	1	2	4	4	2	

Notes: (1) Re-scaled figures excluding non-responses. (2) Weighted averages (GDP weights).

With respect to the median frequency of price reviews, countries can be classified into three groups: in Belgium, Spain and Italy the median firm checks its price once a year, while in France, the Netherlands and Austria checks are carried out on a quarterly basis; German, Luxembourg and Portuguese firms fall between the two.

In order to find regularities in the price reviewing pattern in the euro area, we investigate whether firms' size, sector and competitive environment have an effect on the reviewing behaviour. We apply a Chi-square test to examine whether the distribution of frequencies is equal for each of the aforementioned characteristics. Firm's size explains differences in Spain, France, Luxembourg, the Netherlands and Austria. In all these countries, except France, large firms review their prices more frequently than smaller ones. Similarly, Amirault et al. (2004) find that large firms change prices significantly more often than small or medium-sized firms. They argue that senior staff at small firms has numerous tasks in addition to reviewing and adjusting prices and, consequently, managerial costs associated with the price setting process might be particularly onerous for small firms.[14]

With regard to the degree of competition, firms facing higher competitive pressures review their prices more frequently. In seven out of the nine countries, firms indicating that competitors' prices have a very important effect on their own pricing decisions review their prices more often than other firms. The exceptions are Austria and Belgium, where the competitive environment does not give rise to any difference.

Finally, there are some interesting differences across sectors. The Chi-square test rejects the null hypothesis of equality across sectors in all seven countries for which this analysis is possible (in Germany and France services are not covered) at the 10% significance level. In five countries (IT, LU, NL, AT, PT), services firms review their prices significantly less frequently than firms operating in other sectors. Albeit not statistically significant, this tendency can also be observed in Belgium and Spain. In Spain, Luxembourg and the Netherlands, firms in the trade sector review their prices significantly more often than

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[13] As Table 3 shows, Belgium and Spain report significantly higher shares (nearly 90%) of respondents indicating that they review their prices at most three times a year. This result suggests that the format of the answer-categories might be relevant.

[14] They do not distinguish between the frequency of price reviews and the frequency of price changes and their argument probably has more to do with the price reviewing stage.

firms in the trade or services sectors. This is not the case for the other two countries that report results for trade (BE, IT).

Stylised fact 3 – *In most countries the modal number of price reviews lies in the range of one to three times a year. Services firms review prices less frequently than firms in the other sectors. Firms facing high competitive pressures review their prices more frequently.*

There may be different reasons for the finding that price reviews happen with a relatively low frequency. On the one hand, the frequency could be related to the (potentially sporadic) arrival of information. In other words, it may not make sense for firms to review their prices more often, as no additional information is available.[15] On the other hand, there may be costs associated with price reviews. In the presence of informational costs, it may be optimal for firms to forego obtaining the most topical information instead of incurring the associated costs. This issue is investigated in Section 3.4.

3. Price changes

This section focuses on the implementation stage in the price adjustment process. In particular, we investigate to what extent firms follow a mark-up pricing rule. We also analyse to what extent firms use alternative forms of price discrimination. The section also documents the frequency of price changes and the empirical support of alternative theories of price stickiness.

3.1 How do firms set prices?

3.1.1 Mark-up pricing as a dominant strategy

A standard result in imperfectly competitive models is that, under quite general conditions, firms choose to charge a price that represents a mark-up over marginal cost and have therefore some room for not adjusting it when facing a variation in costs.[16] On the contrary, in the case of perfect competition, all firms belonging to the same market set their prices at a unique market clearing level; there is no mark-up and prices always equal marginal costs. Thus, price rigidities do not arise.

All questionnaires address the issue of how companies set their prices. In some cases (BE, ES, LU, NL, AT, PT), firms were first asked to indicate whether they have an independent price setting policy, or whether their price is either regulated or set by the main company of the same group, or dictated by the main customer. Firms with an independent price-setting policy were asked to specify whether their price is set as a margin (mark-up) on costs or depends on the price of their main competitor(s) or is set according to other strategies.[17] In the remaining countries, firms were directly asked to indicate their price setting rule, choosing from among the above-mentioned options.

The option that the price is set as a margin applied to costs requires some clarification. First, its formulation varies marginally across the national questionnaires. The main reason is

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[15] Kashyap (1995) rejects this hypothesis. He observes different reviewing behaviour also for products having similar cost and demand characteristics. However, if products are alike then the arrival of the necessary information should also be correlated.

[16] Within the models with imperfect competition, some assume time-varying mark-ups, with important implications for business cycle fluctuations. See sections 8 and 9 in Rotemberg and Woodford (1994) for an overview of different models with exogenously and endogenously determined time-varying mark-ups.

[17] The last option (mainly "regulated prices" and "price set by customers") is included in only some questionnaires.

that, whereas the theoretical literature refers to the concepts of mark-up and marginal costs, most businesspeople might not easily understand this terminology. In order to avoid confusion on the side of the respondents, the concept of mark-up has typically been translated into "profit margin" while the concept of marginal costs has been translated into a number of different expressions: "unit variable costs (cost of labour and of other inputs)"; "(variable) unit costs"; "unit variable production costs"; "variable production costs per unit". Second, all country questionnaires investigate whether mark-up pricing is applicable in general terms, except in the cases of Belgium[18], Germany and the Netherlands, where a distinction is made between constant and variable mark-up.

Table 4 summarises the results of the national surveys by grouping the answers into three alternatives: "mark-up over costs", "price set according to competitors' prices", and "other".

The results confirm findings of similar studies for the United Kingdom and the United States. In the euro area, more than half of the firms fix their price as a mark-up (fixed or variable) over costs. At the two extremes we find Germany (73%) and France (40%). For those countries (Belgium, Germany and the Netherlands) in which respondents could distinguish between constant and variable mark-up, the latter type dominates. In Belgium and Spain sectoral differences are very limited, whereas in Italy only 16% of firms in the trade sector follow this rule (see Table C1 in Appendix C); in the Netherlands this percentage is instead much higher (71%).

Table 4. Price setting rules
(percentages)(1)

	BE			DE			ES	FR	IT	NL			PT	EURO AREA
	tot	*const*	*var(2)*	*tot*	*const*	*var*				*tot*	*const*	*var*	*(3)*	*(4)*
Markup	46	13	33	73	4	69	52	40	42	56	27	30	65	**54**
Competitors' price	36			17			27	38	32	22			13	**27**
Other	18			10			21	22	26	21			23	**18**

Notes: (1) Re-scaled figures excluding non-responses. (2) Firms adopting a mark-up price setting rule and responding "important" or "very important" to a least one of the theories concerning counter-cyclical mark-ups. (3) In the case of Portugal the issue was not addressed directly; the information reported in the table has been estimated on the basis of the answers to other questions. (4) GDP weights.

With respect to the size breakdown, the national surveys indicate that smaller firms tend to rely more on mark-up pricing than larger ones. This result, however, could be partly spurious, since in our sample large firms are in general found to face a higher degree of competition.

Figure 1 shows a negative relationship between the share of firms following a mark-up rule and the degree of market competition. This finding, similar across countries, is consistent with the idea that in a highly competitive environment firms are essentially price-takers and do not fix their prices as a mark-up over costs.

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[18] In the case of the Belgian survey, a distinction was made between the "actual" and the "desired" mark-up. The notion of desired mark-up is embedded in the specific wording used, referring explicitly to a "completely self-determined profit margin" rather than to a profit margin in more general terms. Moreover, the survey investigates in an indirect way whether desired mark-ups are variable, by testing the relevance of four theories, which generate endogenous counter-cyclical movements in desired mark-ups as a source of real rigidity. The importance attached to these theories allows computing the fraction of firms for which (counter-cyclical) variable mark-ups are applicable in the Belgian case.

Stylised fact 4 – *Mark-up (constant or variable) pricing is the dominant price setting practice adopted by firms in euro area. The lower the level of competition, the more frequently used this method is.*

Figure 1. Mark-up rule and perceived competition
(percentages)
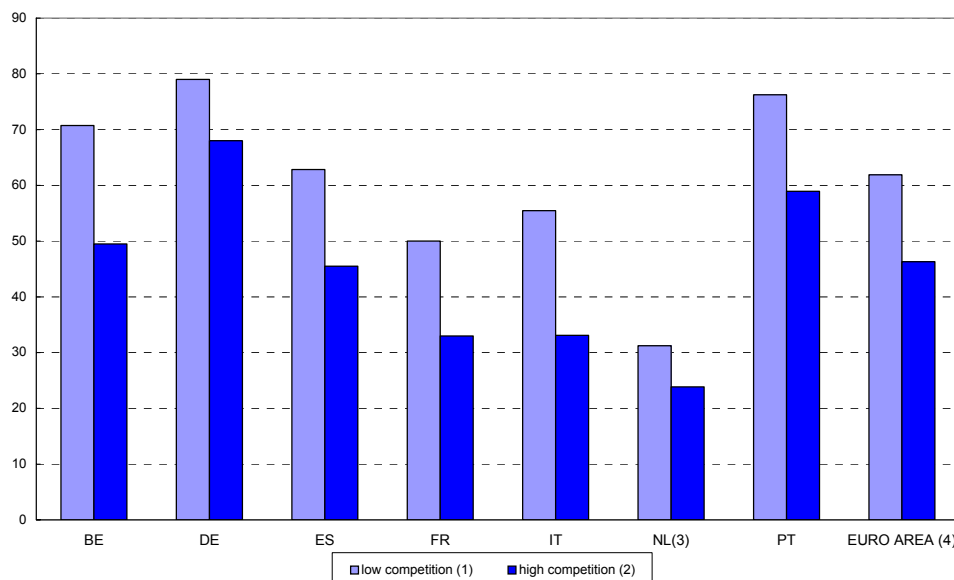
Notes: (1) Mean share for a "very low" and "low" degree of perceived competition. (2) Mean share for a "very high" and "high" degree of perceived competition. (3) For the Netherlands, the percentage of firms adopting a fixed mark-up is considered. (4) Weighted average (GDP weights).

The share of firms setting their price according to those of their main competitors ranges from 38% in France to 13% in Portugal. Differences with respect to size are moderate.

Stylised fact 5 – *Prices of around 30% of euro area firms are shaped by competitors' prices.*

Finally, for a minority of respondents the price is set according to "other" rules. The share amounts to only 10% in Germany, while it rises to 26% in Italy, where it is particularly high in trade and services (49 and 40% respectively, see Table C1 in Appendix C), possibly due to the strict regulatory framework in such sectors.[19] The percentage of companies following "other" rules is also generally higher in the case of large firms than in that of small firms.

3.1.2 Price discrimination

One of the main features characterising the price setting mechanism is the presence of some form of price discrimination. Generally, a firm is interested in applying price discrimination –i.e. in selling each unit of the same product at different prices either

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[19] Trade and services are not included in the German survey. If goods only are considered, the share amounts to only 19% in Italy.

to the same costumer or to different costumers– in order to extract a higher fraction of consumer surplus than it would be able to obtain if it charged a uniform price.

Price discrimination may take many forms: the price of a product may vary according to the type of customer, the geographical area in which it is sold, the number of units purchased or the specific time at which it is sold, to name but a few.[20]

The presence of some form of price discrimination is investigated in several of the national questionnaires. The findings presented in Figure 2 strongly reject the use of a uniform pricing scheme as a general rule to describe the price setting behaviour of euro area firms. In particular, the percentage of firms setting prices on a case-by-case basis or in accordance to the quantity of the product sold is, on average, around 80% in the euro area, ranging from 65% in Spain[21] to 92% in Germany. In the other four countries (FR, IT, LU, PT) the figure is around 75%.

Stylised fact 6 – *Price discrimination is common practice for euro area firms.*

Figure 2. Price discrimination
(percentages)
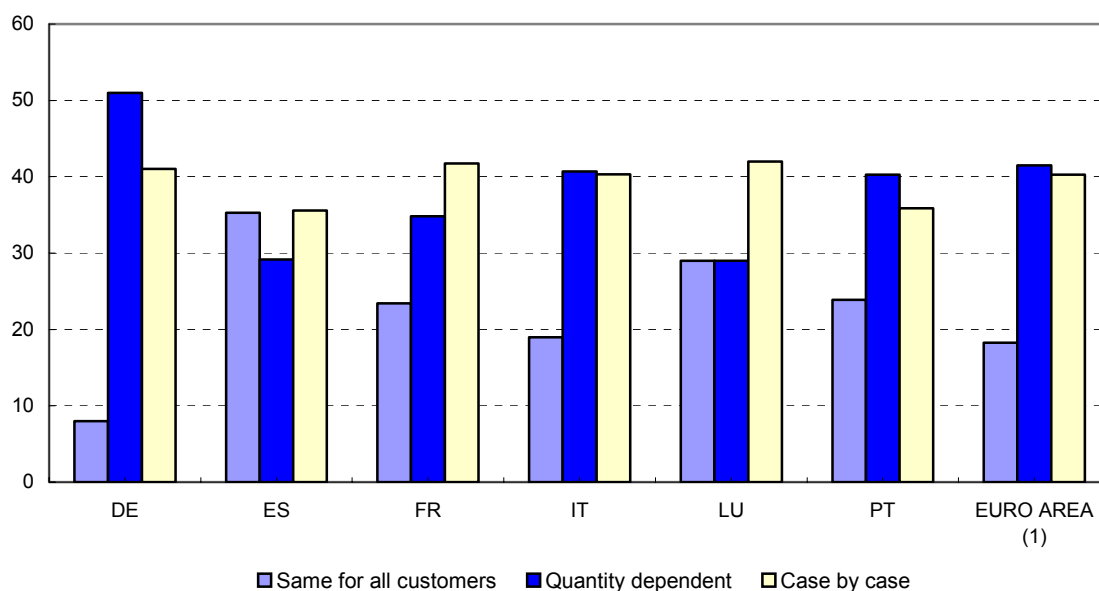
Note: (1) Weighted average (GDP weights).

There is not a clear relationship between the extent of price discrimination and the size of the companies, except in Luxembourg, which reported a positive relationship. By contrast, if anything, smaller firms seem to make a slightly more frequent use of differentiated prices in France, Italy and Portugal.

More significant differences are found across sectors, although on this point the data is restricted to only few countries. In particular, uniform pricing is, as expected, more common in the trade sector. The share of companies in this sector charging the same prices to all customers is around 55% in Italy and Spain and 44% in Luxembourg. The corresponding

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[20] See Chapter 3 in Tirole (1988) for a detailed theoretical analysis of alternative forms of price discrimination.
[21] In the Spanish case the number of firms using some form of price discrimination is likely to be higher, as firms are allowed to choose "other form of price discrimination" as a fourth option; these firms have not been taken into account in Figure 2.

figures for the overall samples in these countries are 19%, 35% and 29%, respectively. At the other extreme, the share of companies setting their prices on a case-by-case basis or according to the quantity sold is highest in manufacturing, which may explain the high numbers for Germany (Figure 2).[22]

Finally, no clear pattern arises in terms of the relationship between the frequency of price discrimination and the degree of competition. In four countries (DE, ES, LU, PT), the higher the intensity of competition, the higher the use of some forms of price discrimination. However, in France the lowest proportion of firms applying uniform pricing is found for those with an intermediate degree of competition. On the contrary, in Italy firms facing an intermediate degree of competition display the highest proportion of uniform pricing.

3.1.3 Pricing to market

The law of one price states that, adjusted for exchange rates, the price of a product must be the same across national markets. A substantial amount of empirical studies, however, rejects the validity of this law in the short run. A common explanation of departures from the law of one price is that transaction (arbitrage) costs between different geographical markets are high enough that firms can discriminate their prices across countries. In other words, when national markets are segmented by transport costs or other barriers, exporting firms are able to set a different price in each market. "Pricing to market" is the usual term in the international trade literature for price discrimination across national markets.[23]

Given the open-economy nature of most euro area economies, the price setting behaviour of exporters is a relevant issue. The surveys conducted in Belgium, Spain, Luxembourg and Portugal include some specific questions, directed at firms operating in more than one market, which may provide valuable insights.

Firstly, questionnaires for Belgium, Spain and Luxembourg ask whether the price charged in different countries is the same or not. Table 5 shows that around 50% of the exporting firms apply some form of pricing to market. As Aucremanne and Druant (2005) point out, this is a high proportion given that the exports of the countries considered are mostly directed towards the euro area. Price discrimination is even more frequent in the case of firms selling outside the euro area. In the Spanish sample, 60% of these companies charge different prices across non-euro area countries. In the case of Portugal, the question is put differently. It only involves those firms exporting to countries outside the euro area, which are asked what would happen to the local price of their product in the selected country if the euro appreciated by 5%. For about 60% of the firms, the price would either remain unchanged or increase by less than 5%.

Table 5. Pricing behaviour on foreign markets
(percentages)

	BE	ES	LU
Price in euro is same for all countries	33	47	56
Price in euro is same for euro area countries	9	6	5
Price in euro is different for all countries	58	47	39

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[22] In Luxembourg the highest share of price discriminating firms is found in the construction sector, where about 65% of firms discriminate case by case and a further 24% on the basis of the quantity sold. This reflects the different nature of this market, as a lot of business is made via public tenders and direct negotiations with customers.

[23] See pp. 711-712 in Obstfeld and Rogoff (1996) for a brief review of the empirical evidence on pricing to market.

The questionnaires in the four countries include a question on the importance of several factors in explaining differentiated price setting between markets. Table 6 reports the average scores of the different factors.

One interesting observation is that the ranking is very similar in all four countries. Competitors' market prices and transportation costs seem to be the most relevant determinants; cyclical fluctuations in demand rank immediately below.

Exchange rate developments and structural market conditions have a moderate importance regarding the decision to apply pricing to market. Exchange rate movements receive a higher score for those firms exporting outside the euro area. Nevertheless, even for these firms this factor is ranked below –at least in the Spanish sample– competitors' prices and demand. Finally, the local market tax system is generally singled out as the least important factor for explaining price differences across countries. As Aucremanne and Druant (2005) indicate, this factor is more important in consumer-oriented firms, for which differences in indirect taxation are presumably more relevant.

Stylised fact 7 — Competitors' prices on the foreign market and transportation costs are the most relevant factors for pricing to market behaviour.

Table 6. Importance of factors in differentiated price setting across markets
(mean scores)(1)

	BE	ES	LU	PT
Price of competitors	3,4	3,2	3,3	-
Transportation costs and other factors	2,9	-	3,1	3,0
Cyclical fluctuations in demand	2,5	3,0	2,7	2,7
Structural market conditions	2,5	2,5	2,8	2,5
Exchange rate of payment currency	2,4	2,2	1,8	2,5
Market rules	2,1	-	2,7	2,8
Tax system	1,6	1,8	2,2	2,2

Note: (1) Respondents are asked to indicate the importance of each factor, the alternative scores being (1) unimportant, (2) of minor importance, (3) important, (4) very important

3.2   How often do firms change their prices?

A first, although admittedly rough, measure of the degree of price stickiness is given by the number of price changes per year or, alternatively, by the average time elapsed between two consecutive price changes. The average duration of price spells is an essential ingredient in the calibration of DGSE models, which are widely used for monetary policy analysis [see, for instance, Woodford (2003), and Galí, López-Salido and Vallés (2003)]. The empirical assessment of the degree of price flexibility has until very recently mainly relied on macroeconomic evidence.[24] In recent years, the availability of large-scale data sets of individual consumer prices has contributed to improve the measurement of the duration of price spells [see, for instance, Dhyne et al. (2005)]. In this respect, survey results are useful for cross-checking the evidence obtained from these quantitative databases.

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[24]   Smets and Wouters (2003) and Rabanal and Rubio-Ramírez (2005) are two recent examples of papers providing estimates of the average duration of prices.

All national surveys, except that for Germany, contain a question on the number of price changes per year.[25] In particular, five questionnaires (BE, ES, LU, NL, AT) ask about the average number of price changes per year in recent years and three (IT, FR, PT) the number of price changes in a given year.

Table 7 groups the results into four categories: (1) at least four price changes per year; (2) two or three price changes per year; (3) one price change per year, and (4) less than one price change.[26]

The country results are very homogenous with the exception of Germany, where a different data source was used to obtain this specific information (see footnote 25). On average, almost 40% of the firms in the euro area change their price once a year (the percentage share rises to 51% if Germany is excluded from the computation of the mean). In all countries except Germany and Luxembourg, approximately 70% of the respondents adjust their price a maximum of once a year.[27] On average, only around 34% of the firms change their price more frequently than once a year.

In all but one country, the median firm changes its price once a year. These results are consistent with the evidence presented in Dhyne et al. (2005) who, on the basis of large-scale data sets of individual consumer price data for euro area countries, find that the average duration of a price spell, based on a set of indirect estimators, ranges from 4 to 5 quarters.[28] Looking at the frequencies of price changes found in similar surveys for other countries, our results are in line with the findings of Apel et al. (2005) for Sweden, who report that the modal number of actual price changes per year lies at the yearly frequency. However, this yearly frequency is lower than the median frequencies of price changes per year found in Blinder et al. (1998) for the United States, Hall et al. (1997) for the United Kingdom and Amirault et al. (2004) for Canada; they report 1.4, 2 and 4 price changes per year, respectively. The relatively low frequency of price adjustment in the euro area when compared to the United States is consistent with the empirical evidence based on the analysis of micro CPI data [see Dhyne et al. (2005)] and on macro models [see Galí, Gertler and López-Salido (2003)].

Table 7. Frequency of price changes per year
(percentages) (1)

	BE	DE	ES	FR	IT	LU	NL	AT	PT	EURO AREA (2)
≥ 4	8	21	14	9	11	27	11	11	12	**14**
2– 3	18	21	15	24	19	27	19	15	14	**20**
1	55	14	57	46	50	31	60	51	51	**39**
<1	18	44	14	21	20	15	10	24	24	**27**
median	1	1	1	1	1	2	1	1	1	

Notes: (1)   Re-scaled figures excluding non-responses.   (2) Weighted averages (GDP weights).

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[25] Since the German questionnaire does not contain a question on the number of price changes, the figures in Table 8 concerning Germany are based on the number of months with price changes in 2003, reported by the same sample of firms as in the IFO business survey. The figures are quite different from those obtained for the rest of the countries, probably on account of the particularly low demand faced by German firms in that year.

[26] The categories in Table 7 are not the same as those used in Table 3, since the number of price changes in most countries is considerably lower than that of price reviews.

[27] In Luxembourg this is largely due to the inclusion of the construction sector and its relative share in the responses (22%). Excluding this sector, as in the case of most other countries, would also result in a median of one price change per year.

[28] This comparison should be taken with some caution because the sample period of both data sources -surveys and micro CPI data- differs and because the survey on pricing behaviour includes both producer and consumer prices.

As with price reviews, we also focus on whether there are common features underlying differences in price changing behaviour across countries. Again, the firms' size is not relevant in most countries. Nevertheless, Hoeberichts and Stokman (2005) find in the Dutch survey, which is the only one containing information on one-person firms, that these firms have the most rigid prices.

Conversely, the competitive environment and the sector help to explain differences in the frequency of price changes. The results are in line with those obtained for price reviews. With the exceptions of Austria and Portugal, in all countries firms facing strong competitive pressures tend to change their prices significantly more often than those not subject to such pressures. In all seven countries where the data covers more than one sector, the Chi-square test for the equality of the distribution of price-change frequencies across sectors rejects the null hypothesis at the 5% level, pointing to significant sectoral differences. In five countries (BE, IT, LU, AT, PT) firms in the services sector change their prices less frequently than firms in other sectors; in four countries (ES, IT, LU, NL) firms operating in the trade sector change their prices more frequently than firms in other sectors.

Stylised fact 8 – *The median firm changes its price once a year. Prices are stickier in the services sector and more flexible in the trade sector. In most countries, firms facing strong competitive pressures adjust their prices more frequently.*

3.3 The relationship between price reviews and price changes

Taking into account only the companies that provided information concerning the frequency of price reviews and the frequency of price changes, all countries report that price reviews are conducted more frequently than price changes. Even with the categorised data used, at the euro area level the share of firms changing their prices less than quarterly (a maximum number of three times per year) is 86%, compared with 57% of firms reviewing their prices with the same frequency (Table 8). Similar evidence is found in all but two countries.[29]

Table 8. Comparison between price reviews and price changes per year
(percentages)(1)

	BE	DE	ES	FR	IT	LU	NL	AT	PT	EURO AREA (2)
Price reviews ≤ 3	88	53	86	47	57	54	44	46	72	**57**
Price changes ≤ 3	91	79	88	91	89	73	89	90	88	**86**

Notes: (1) Re-scaled figures excluding non-responses.   (2) Weighted averages (GDP weights).

Stylised fact 9 – *Price changes are less frequent than price reviews.*

All in all, the evidence provided in this section is consistent with the notion that price adjustment takes place at two stages. First, the firms review their prices to check whether

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[29] Both in Belgium and in Spain the frequency of price reviews is only slightly higher than the frequency of price changes. As already mentioned, this might be partly explained by the format of the answer-categories. In these two countries, firms are asked whether they review/change their prices more than once a year, once a year or less than once a year. A substantial fraction of firms indicate that they review/change their prices once a year. If these questions had been formulated allowing for more answer-categories, the fraction of firms declaring a yearly frequency of reviews/changes would have been lower.

they are at the optimal level or need to be changed. As shown in Section 2.3, they do this at discrete time intervals (the majority of firms less than four times per year). Thus, some kind of stickiness can already be observed at the first stage of price setting.

Once the price review has taken place, firms may change their prices. However, they do so less frequently than they review the prices. One explanation of why prices are left unchanged may be that there is no reason to change them.[30] Alternatively, even though firms decided to incur the informational costs of the price review, there may be other factors effectively preventing a desired price adjustment. Such factors are addressed in the next section.

3.4 Why do firms hold prices constant?

The economic literature provides manifold explanations for sticky prices. As Blinder (1991) points out, however, it is difficult to evaluate how close the various theories come to the obstacles to changing prices encountered in the real world (one problem being observational equivalence). Thus, Blinder applied the interview method as a new way of examining the empirical relevance of different theories. He explained selected theories in face-to-face interviews with managers and assumed that they would recognise the line of reasoning if it came close to their way of thinking. All the national surveys on which this paper is based apply similar methodologies, presenting managers with different theories chosen according to their relevance in the economic literature, as well as their rankings in the surveys already conducted for other countries [Apel et al. (2005), Blinder et al. (1998) and Hall et al. (1997)]. Before turning to the results, we summarise the most relevant theories.

1. Cost-based pricing. Inputs' costs are an important determinant in a firm's pricing decision. One line of reasoning based on this argument is that if costs do not change, prices will not change either. As products pass different production stages, a (demand or cost) shock somewhere in the production chain will take some time until it is propagated through the chain to finally reach consumers. Blanchard (1983) models production chains with n stages and assumes adjustment lags at each level of production. Even small lags in the adjustment process of a single firm can add up to long lags, when taking into account the whole production chain.

2. Explicit contracts. Firms have contractual arrangements with their customers, which may be in written form or orally agreed and in which they guarantee to offer a certain product at a specific price. An explanation why firms engage in such agreements is that it is in their interest to build up long-run customer relationships in order to stabilise their future sales. Customers, on the other hand, are attracted by a constant price because it makes their future costs more predictable and helps to minimize transaction costs (e.g. shopping time). Thus, customers might focus on the long-run average price rather than on the spot price. This is probably the most straightforward explanation of sticky prices. The idea that explicit contracts may be central for price stickiness was first introduced in the economic literature through wage contracts [e.g. Fischer (1977)].

3. Implicit contracts. This explanation is closely linked to the explicit contract theory, but goes one step further. With implicit contracts firms also want to build up long-run customer relationships, and they try to win customer loyalty simply by changing prices as little as possible. This idea goes back to Okun (1981), who distinguishes between price increases due to cost shocks and those that are due to demand shocks. He argues that higher costs are an accepted rationale for rising prices, while increases in demand are viewed as unfair. Consequently, firms hold prices constant in the face of demand shocks, as they do not

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[30] Although almost all national surveys address the issue of price reviews and price changes while referring to "normal conditions", in most cases it is not possible to control for the fact that the observed price behaviour is in fact related to the occurrence of particular shocks, either of an idiosyncratic nature or of a common one.

want to jeopardize customer relationships. They only adjust prices in response to cost shocks. The idea that consumers wish to buy from firms whose prices are "fair" is also applied by Rotemberg (2005).

4. Co-ordination failure. This theory focuses on the interactions between firms as explanation for sticky prices. Like in the case of explicit contracts this idea was first introduced for the analysis of the labour market [e.g. Clower (1965) and Leijonhufvud (1968)]. The argument is that the firm assumes that if it were to raise its price, it would lose customers as no other firm would follow suit. On the other hand, if the firm were to decrease its price, it would not increase its market share as all competitors would follow suit. After a shock a firm might, thus, want to change its price, but only if the other firms also change their prices. Without a co-ordinating mechanism that allows firms to move together, prices may remain fixed.

5. Menu costs. Sheshinski and Weiss (1977) motivate the idea that the act of changing prices –printing and distributing new price lists– generates costs. Thus, a company facing these costs will change its prices less frequently than an otherwise identical firm without such costs. Akerlof and Yellen (1985) and Mankiw (1985) show that even "small" costs of changing prices can lead to nominal rigidities with "large" macroeconomic effects. In order to distinguish between different kinds of costs associated with price changes, we will use the term menu cost in a narrow sense and focus on the physical cost of changing prices.

6. Costly information. Ball and Mankiw (1994) suggest a broader use of the term menu costs, in the sense that it includes more than just the physical costs of changing prices. In particular they argue that "the most important costs of price adjustment are the time and attention required of managers to gather the relevant information and to make and implement decisions" (p. 142). The distinction between these informational costs and physical menu costs enables us to investigate their relative importance in pricing decisions.

7. Temporary shocks. When firms regard the shock they are face as temporary, they may consider appropriate to forego a price adjustment, as they expect the optimal new price to be short-lived as well. It is not relevant whether the shock is indeed temporary or not, the main issue being how the firms assess the duration of the shock.

8. Change non-price factors. The price of a product is just one feature that can be adjusted in reaction to a changing environment. Firms can vary the delivery time, modify the quality of the product or alter the level of service they offer in relation to the sale, to name but a few of the options that they have.

9. Judging quality by price. This line of reasoning reverses the argument used in the theory above addressing the issue of non-price factors. The argument is that firms do not decrease the price of their product because customers might wrongly interpret the price decrease as a reduction in quality. Thus, they prefer to hold their nominal prices constant.

10. Pricing thresholds. Firms may set their prices at psychological attractive thresholds, for example choosing EUR 9.90 instead of EUR 10.00. Attractive pricing strategies can cause price stickiness, because firms may postpone price adjustments in face of small shocks calling for small price changes until new events justify a large price change to the next pricing threshold.

All the national questionnaires asked the managers a question along the following lines: "If there are reasons for changing the price of your main product, which of the following factors may well prevent an immediate price adjustment?". The list following this question offers the ten above mentioned theories, expressed in simple terms, as possible explanations. The respondents could indicate their degree of agreement with each theory, choosing from among four categories: unimportant (1), of minor importance (2), important (3) and very important (4), where the numbers in brackets indicate the scores attached

to each category.[31] Columns 1 to 9 in Table 9 present the mean scores assigned by the firms in each country to the various theories. Column 10 reports the average of the country results, which is taken as an indication of the overall ranking for the euro area. Based on this ranking, two groups of theories can be distinguished: the first consists of those theories that have an average score well above 2, while the second comprises the remaining ones. The last four columns of the table show the ranking of the same theories in the surveys by Blinder et al. (1998) for the United States, Apel et al. (2005) for Sweden, Hall et al. (1997) for the United Kingdom and Amirault et al. (2004) for Canada.

The theory of "implicit contracts" receives the highest average score (2.7) and ranks first in five country studies. With an average score of 2.6, "explicit contracts" is the second most important explanation for sticky prices at the euro area level (it ranks most important in four countries). The same average score is attributed to "cost-based pricing". Finally, with an average score of 2.4, "co-ordination failure" can also be regarded as a relevant factor behind price stickiness.

Implicit and explicit contracts are both based on the idea that firms want to establish long-run relationships with customers in order to make future sales more predictable. The high score obtained by these theories is consistent with the data presented in Table 10, which shows that long-term relationships with customers are indeed a widespread phenomenon in the euro area. In this respect, Okun (1981) argues that price increases which are due to cost increases are viewed as fair by customers, while price increases which are due to a tight market are regarded as unfair. If this is the case –and the results suggest that managers indeed share this perception– it would be more likely that firms increase their prices in response to cost shocks than to demand shocks.

Table 9. The importance of theories explaining price stickiness
(mean scores)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	BE	DE	ES	FR	IT	LU	NL	AT	PT	EURO AREA (1)	US	SW	UK	CA (2)
Implicit contracts	2.5		2.6	2.2		2.7	2.7	3.0	3.1	**2.7**	4	1	5	2/7
Explicit contracts	2.4	2.4	2.3	2.7	2.6	2.8	2.5	3.0	2.6	**2.6**	5	3	1	3
Cost-based pricing	2.4			2.5		2.7		2.6	2.7	**2.6**	2	2	2	1
Co-ordination failure	2.2	2.2	2.4	3.0	2.6	2.1	2.2	2.3	2.8	**2.4**	1	4	3	5/8
Judging quality by price	1.9		1.8			2.2	2.4	1.9	2.3	**2.1**	12		10	
Temporary shocks	1.8	1.9	1.8	2.1	2.0	1.7	2.4	1.5	2.5	**2.0**				
Change non-price factors	1.7		1.3			1.9	1.9	1.7		**1.7**	3		8	4
Menu costs	1.5	1.4	1.4	1.4	1.6	1.8	1.7	1.5	1.9	**1.6**	6	11	11	10
Costly information	1.6		1.3			1.8		1.6	1.7	**1.6**		13		10
Pricing thresholds	1.7		1.5	1.6	1.4	1.8	1.8	1.3	1.8	**1.6**	8	7	4	

Notes: (1) Unweighted average of countries' scores. Columns 11 to 14 report the ranking of the theories in Blinder et al. (1998), Appel et al. (2005), Hall et al. (1997) and Amirault et al. (2004), respectively. (2) In the column for Canada, two figures are reported for the implicit contracts and co-ordination failure theories, because in the Canadian questionnaire there are two different statements related to these theories.

The theories ranked third and fourth are consistent with the price setting strategies indicated by firms as the most common ones. Cost-based pricing, which ranks third, confirms the findings of Section 3.1.1, where we report that the majority of firms set their price as a mark-up over costs. In other words, relatively stable costs and/or the sluggishness of the price response to cost changes are an important explanation for sticky prices. The theory ranked fourth –co-ordination failure– relates instead to the interaction between

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[31] In the Dutch questionnaire the scaling is more detailed (from 1 to 10). Results have been re-scaled for comparability.

firms on the same market. As shown in Section 3.1.1, nearly 30% of the firms follow the competitor's price when they decide upon their own price. Together with the fear of a lack in coordinating price movements, this provides a further explanation for sticky prices, namely, that firms prefer not to change their prices as long as none of their competitors moves first.

Table 10. Firms-customers relationships
(percentages)(1)

	BE	DE	ES	FR	IT	LU	NL	AT	PT	EURO AREA (2)
long term	78	57	86	54	98	85		81	83	**70**
occasional	22	43	14	46	2	15		19	17	**30**

Notes: (1) Re-scaled figures excluding non-responses. In the case of Belgium, France and Italy, this refers to relationships with other firms. (2) Weighted averages (GDP weights).

Each of the top four theories ranks either first or second in the studies available for non-euro area countries [Blinder et al. (1998), Appel et al. (2005), Hall et al. (1997) and Amirault et al. (2004)]. Moreover, the fact that the national surveys for the euro area were conducted in different ways confirms that the findings do not depend on the survey method, on the particular wording used or on the ordering of the answer-categories.[32]

The importance attached to the various theories differs only slightly across sectors (for detailed results see Table C5 in Appendix C). In particular, in the goods and the services sectors the ranking is very similar to the one presented in Table 9. There are small differences in the trade sector: explicit contracts receive a lower average score (2.0) while, as expected, pricing thresholds are slightly more important than in the other sectors.

The remaining theories are on average not considered as important obstacles to price adjustment by euro area firms. This group includes prominent candidates such as physical menu costs and costly information. Although they are frequently used explanations for price stickiness in the theoretical literature [e.g. Ball and Mankiw (1994)], in practice they seem to be of minor importance. Furthermore, the ranking attached to the various causes behind price stickiness provides some evidence on whether these factors have a greater bearing on the first or the second stage of price adjustment, as discussed in Section 3.3. Our analysis suggests that, for the majority of the firms, the main obstacles are not associated with the review stage but rather with the price change stage. In fact, the theory labelled "information costs" –i.e. costs associated with gathering and processing information for pricing decisions (stage one of price adjustment)– receives one of the lowest scores in all the country questionnaires that included this category. A similar result is reported by Apel et al. (2005) and Amirault et al. (2004).

Stylised fact 10 – Implicit and explicit contracts are the most relevant explanations for sticky prices, which suggests that price rigidities are associated with customers' preference for stable nominal prices. Other relevant explanations rest on cost-based pricing and co-ordination failure. These results suggest that the main impediments for more frequent price adjustment are associated with the price change stage rather than with the price review stage of the price setting process.

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[32] The ordering of the theories differs considerably across the various questionnaires. For example, in the Dutch questionnaire the theory of implicit contracts is the second answer-category, while it appears in ninth place in the Austrian questionnaire. Nevertheless, in both country studies, the theory is regarded as the most important explanation. Overall, we do not find an association between the ordering of the answer-categories and the scores given to the theories by respondents.

Overall, our findings are in line with the results of Zbaracki et al. (2004), who report quantitative estimates of the different costs of price adjustments. They differentiate between costs of producing and distributing price sheets (what we call menu costs), managerial costs (information costs in our terminology) and customer costs of price adjustments. They conclude that while approximately one quarter of the overall costs of changing prices are due to menu costs and information costs, three quarters arise because customers dislike price changes.[33]

4. Factors driving price changes

4.1 Asymmetries of price reactions

The empirical literature provides evidence that price increases and price decreases do not occur with the same (conditional) probability. Dhyne et al. (2005) show for the euro area that price reductions are moderately less frequent than price increases: four out of ten price changes are decreases.[34] Analogous results are obtained by Lünnemann and Mathä (2005b) using price index data. Asymmetries are also found with respect to the size of price changes, as average price increases tend to be smaller than average price decreases. The results for the United States are quite similar: Klenow and Kryvtsov (2004) report that 45% of all price changes are price reductions.

In order to analyse what drives price changes and whether there are asymmetries depending on the direction of the price adjustment, all national surveys included questions about factors that are important for pricing decisions. Respondents were asked to assign scores between 4 (very important) and 1 (completely unimportant) to cost factors (labour costs, raw material costs and financial costs) and market conditions (demand and competitors' prices) according to their importance for price adjustment. The question was posed separately for price increases and decreases. The results are presented in Tables 11 and 12, respectively, which contain the mean scores for every factor in each country as well as the euro area average score in the last column.

Table 11 shows that costs of raw materials and labour costs are the most important factors in driving prices upwards. These factors receive an average score of 3.0 and rank first and second in every country. As for price decreases, Table 12 shows that competitor's price (with an average score of 2.8) is the most important element for downward price adjustments, followed by changes in demand conditions and costs of raw materials. Financial costs do not seem to be relevant. These results hold for all sectors and are not sensitive to differences in the firm's size (as can be seen in Figure C1 and C2 in Appendix C).

To conclude, at the euro area level firms are more prompted to change their prices in response to shocks that lead to profit losses (rising costs of raw materials and labour as well as a decrease in the competitor's price) than to shocks leading to profit gains (decreasing labour and financial costs as well as improving demand conditions and an increase in the competitor's price).

The national surveys were conducted in periods (see Appendix A for details) characterised by different growth rates across the nine countries. However, despite differences in business cycle conditions, the results are very similar. In other words, the answers provided by the respondents concerning the factors driving their prices do not seem to be sensitive to the economic outlook prevailing at the time the national surveys were conducted.

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[33] While our results suggest that menu costs and information costs are equally unimportant (in relation to other costs, especially customer costs), Zbaracki et al. (2004) estimate that managerial costs are six times the menu costs.

[34] Some country surveys (FR, NL, PT) investigate the share of price increases and decreases, which turn out to be around 70 and 30% respectively.

Table 11. The importance of different factors driving price increases
(mean scores)

	BE	DE	ES	FR	IT	LU	NL	AT	PT	EURO AREA (1)
Labour costs	2.9	2.7	2.7	2.5	2.9	3.5	2.7	3.4	3.3	**3.0**
Costs of raw materials	2.9	3.4	3.1	3.0	3.3	-	2.5	3.1	3.6	**3.1**
Financial costs	2.2	1.9	1.8	-	2.3	3.0	2.1	1.9	2.5	**2.2**
Demand	2.2	2.2	2.4	2.0	2.4	2.3	2.3	1.9	2.5	**2.2**
Competitors' price	2.5	2.1	2.5	2.3	2.6	2.4	2.5	2.0	2.7	**2.4**

Note: (1) Unweighted average of countries' scores.

Table 12. The importance of different factors driving price decreases
(mean scores)

	BE	DE	ES	FR	IT	LU	NL	AT	PT	EURO AREA (1)
Labour costs	2.1	1.9	2.0	1.9	2.4	2.6	2.1	1.3	3.0	**2.1**
Costs of raw materials	2.3	2.8	2.6	2.6	2.9	-	2.0	2.2	3.3	**2.6**
Financial costs	1.8	1.6	1.5	-	2.1	2.5	1.8	1.6	2.3	**1.9**
Demand	2.5	2.4	2.4	2.3	2.8	2.7	2.5	2.0	3.0	**2.5**
Competitors' price	2.9	2.6	2.7	2.8	2.8	2.8	2.7	2.6	2.9	**2.8**

Note: (1) Unweighted average of countries' scores.

In order to present an even clearer picture on the asymmetries in the driving factors for price increases and decreases, Figure 3 shows the difference of the reported scores for each factor. The results reveal a strikingly regular pattern of positive asymmetries for costs and negative asymmetries for market conditions.

Figure 3. Asymmetries in price driving factors
(difference between scores regarding price rises and price decreases)
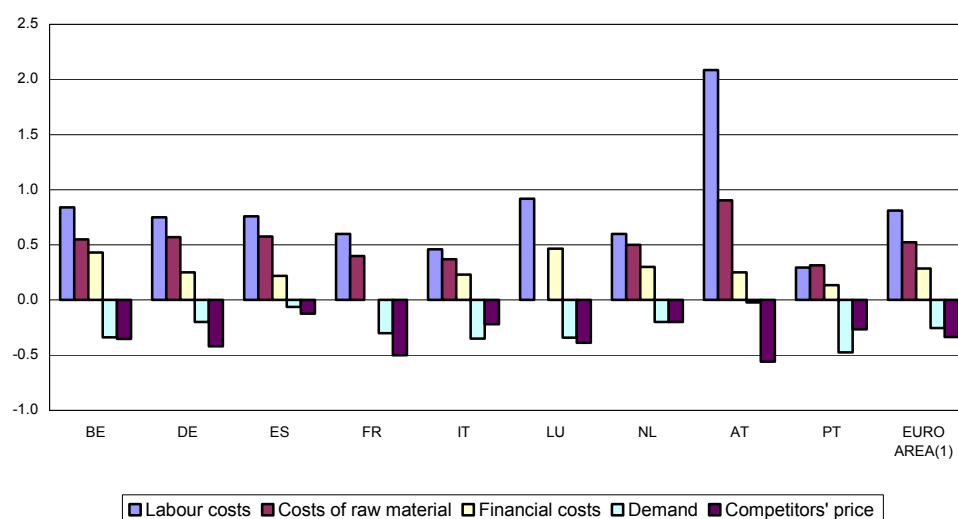
Note: (1) Unweighted average of countries' scores.

Stylised fact 11 – *Cost shocks are more relevant in driving prices upwards than downwards, while shocks to market conditions (changes in demand and the competitor's price) matter more for price decreases than for price increases.*

Our findings about cost shocks are in line with the conclusions from Peltzman (2000) who suggests that output prices respond asymmetrically to cost shocks depending on the direction of the shock. He provides evidence that, on average, prices respond faster to input price increases than to decreases and that the immediate response after a positive cost shock is at least twice the response to a negative shock.

The importance of implicit contracts as explanation for price stickiness, revealed in Section 3.4, may provide a rationale for this asymmetry. If, as argued by Okun's "customer market" theory, customers view price increases due to cost increases as fair and price increases due to increased demand as unfair, firms sould be more likely to increase their prices in response to cost shocks than to demand shocks, as they try to avoid jeopardising customer relationships.

While Peltzman (2000) only focuses on the asymmetry with regard to cost shocks, we additionally find that demand shocks also affect prices asymmetrically. Negative demand shocks seem to be more likely to induce price adjustments than positive demand shocks. Interpreting monetary policy shocks as demand shocks, we can compare our results with the discussion in the literature. Two classes of models can be identified. Both imply asymmetric effects of money on output[35], but they have different implications about how nominal shocks affect prices. The first strand of literature is based on the assumption of a convex aggregate supply curve [e.g. Ball and Romer (1989 and 1990), Caballero and Engel (1992), and Tsiddon (1993)]. These models imply that positive money-supply shocks have a larger effect on prices than negative ones. In contrast to this conclusion, the second strand of literature argues that positive money-supply shocks have a smaller effect on prices than negative ones. De Long and Summers (1988) associate this view with models focusing on credit rationing in the monetary transmission mechanism. They argue that positive nominal shocks have a smaller effect on aggregate demand and thus also a smaller effect on prices (assuming a linear supply curve). Our results support the second strand of literature, which sometimes is referred to as "pushing on a string" [see Karras (1996)].

Finally, section 3.2 showed that in nearly all countries firms facing stronger competitive pressures tend to change their prices significantly more often than those not subject to such pressures. Thus, we expect the degree of competition to matter also in shaping pricing behaviour when it comes to the driving forces of price adjustment. The influence of competition is shown separately for price-raising shocks in Figure 4 and price-decreasing shocks in Figure 5. As the differences between countries are limited, we present average scores for the euro area for two types of firms, namely firms facing either severe or limited competition.

The degree of competition indeed matters. For firms facing higher competitive pressures cost and demand factors are more important in pricing decisions. The differences between the two groups are largest in the case of price-decreasing shocks, especially on the demand side. Interestingly, the results of the national surveys suggest that price responses to labour cost shocks are more or less the same regardless of the degree of competition. An explanation might be that in most euro area countries wage adjustments are the outcome of yearly or half-yearly collective bargaining agreements at the national or sectoral level and, thus, all firms in a sector are equally affected.

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[35] Cover (1992) concludes that positive shocks in the money supply have no significant effect on output, whereas negative shocks reduce output. These results about the asymmetry of monetary policy shocks with regard to the sign of the shocks are also confirmed by other studies [e.g. Karras (1996) and De Long and Summers (1988)].

Figure 4. Perceived competition and price-raising factors in the euro area (1)
(average scores)
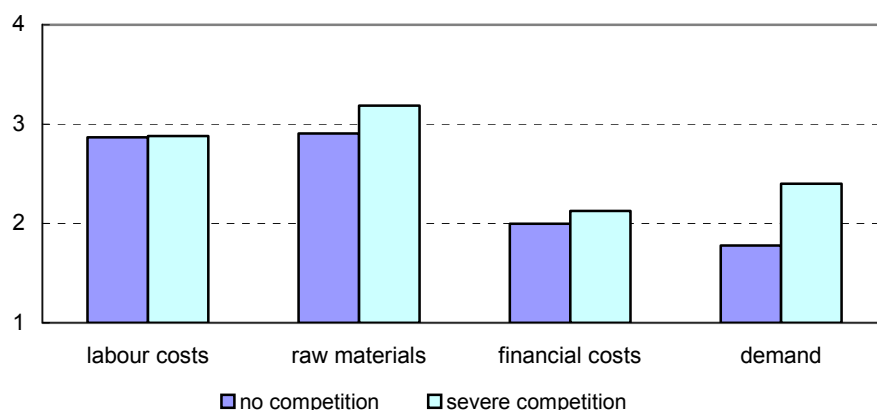
Note: (1) Unweighted averages of countries' scores.

Figure 5. Perceived competition and price-reducing factors in the euro area (1)
(average scores)
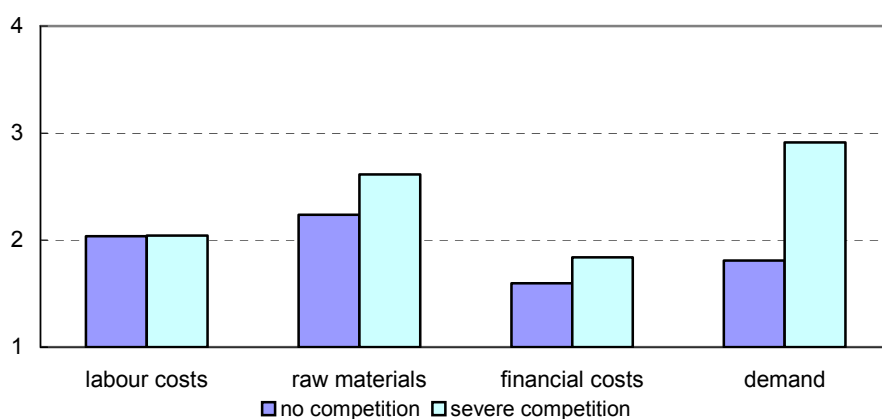
Note: (1) Unweighted averages of countries' scores.

Stylised fact 12 – *Firms in highly competitive markets are more likely to respond to changes in underlying factors, especially in the case of demand shocks.*

4.2 Price adjustment after shocks

Five countries (ES, FR, LU, AT, PT) investigated further the issue of price reactions after shocks, focusing also on the time lag of the price response. Firms were asked whether they change their prices in reaction to a specific shock or not. In the case of a positive answer, they were requested to indicate the time (number of months) elapsed before the price change is implemented.

Table 13. Firms not adjusting their prices in response to a shock
(percentages)(1)

	higher demand	lower demand	higher costs	lower costs
ES	33	26	13	25
FR	23	22	18	27
LU	38	33	12	32
AT	63	52	8	38
PT	34	26	9	19

Note: (1) Re-scaled figures excluding non-responses.

Table 14. Speed of price adjustment after shocks
(percentages)(1)

	higher demand	lower demand	higher costs	lower costs
ES				
<1 month	18	21	15	13
1 – 3 months	17	21	18	18
>3 months	65	58	67	69
FR				
<1 month	35	37	34	31
1 – 3 months	34	35	27	29
>3 months	31	28	39	40
LU				
<1 month	34	42	47	40
1 – 3 months	24	31	25	28
>3 months	42	27	28	32
AT				
<1 month	4	3	2	2
1 – 3 months	51	71	65	61
>3 months	45	26	33	37
PT				
<1 month	22	28	24	23
1 – 3 months	31	32	27	33
>3 months	47	40	49	44

Notes: (1) Re-scaled figures excluding non-responses.

Table 13 presents the share of respondents answering that they hold their prices constant in reaction to a specific shock. The results support the same conclusion about asymmetries as the previous section, though the issue is approached from a different angle: lower demand is more likely to lead to price adjustments than higher demand, while the opposite is true for cost shocks. Moreover, comparing the first and third columns, we observe that a larger share of firms adjust their price in reaction to increasing costs than to higher demand, which further corroborates what found in Section 3.4 and 4.1.

Table 14 refers to the firms that change their price after a shock: it presents the share of respondents that adjust prices within a month, between 1 and 3 months and after a period of more than 3 months. The median firm changes its price 1 to 3 months after a shock in France, Luxemburg, Austria and Portugal, while the median firm in Spain waits for more than 3 months –regardless of the sign and source of the shock. Thus, an adjustment process of one quarter in macro models for France, Luxembourg, Austria and Portugal and of two or more quarters for Spain seems to be justified on the ground of these findings.

4.3 Determinants of the probability of price adjustments after shocks

In order to analyse what underlying factors (e.g. characteristics of the firm or the market the firm is operating in) might explain the probability of a price change in response to a shock, four countries (FR, ES, IT, AT) estimated simple probit models of the general form:

$$P(y_j = 1) = F(b_1 x_{1j} + ... + b_m x_{mj})$$

where F is the cumulative function of the normal distribution, y_j is a zero-one dummy, $P(y_j{=}1)$ denotes the probability of observing a change in firm j's price in response to a demand or a cost shock[36] and x_{ij} represents a set of i explanatory variables for firm j, which might influence the way in which prices react to shocks. Among these variables, a number of factors are considered, for example the degree of market competition, the shape of the marginal cost curve, the relationships with customers, regulated prices, the export share and the cost structure.[37] The models are estimated separately for upward and downward demand and cost shocks.[38]

The main results from this exercise are summarised in Table 15. There is some evidence that real rigidities, as captured by a flat marginal cost curve and by the fact that customers incur high search costs as well as a low export share reduce the responsiveness of prices to positive demand shocks. Furthermore, the results from all four countries suggest that price stickiness in response to demand shocks is higher when the degree of market competition is lower. This finding is valid for upward and downward shocks to demand and underlines the results shown in Figure 4 and 5, namely that changes in demand are more likely to induce a price reaction when competition is higher. Finally, the impact of the cost structure on the probability of price adjustment has been explored in the Spanish survey.[39] The results indicate that the higher is the labour share, the lower is the price response to both types of shocks. Moreover, the higher is the share of energy inputs on total costs the higher is the probability of a fast price adjustment, although this effect is not significant in the case of costs shocks. The underlying idea is that as wage changes typically take place once a year we expect more labour intensive industries to carry out price revisions less frequently. On the contrary, given that oil products change their prices very often, firms which are highly intensive in the use of energy inputs in the production process are expected to adjust their prices more often.

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[36] For Spain, the dependent variable is a dummy variable that is set to unity if the firm declares that it changes its price within a period of three months after the shock and zero otherwise.

[37] In principle, for given nominal rigidities (due, for instance, to the presence of menu costs), stronger competition should induce a greater responsiveness of prices to cost and demand shocks [Martin (1993), and Small and Yates (1999)]. Similarly, the existence of a long-standing relationship between a firm and its customers is likely to generate a resistance to change prices continuously in order not to disappoint the customers. As Hall (1986) recognises, variable marginal costs should make price adjustments more likely in the face of a shock.

[38] For Austria, a further distinction has been made between large and small shocks. In the case of France and Italy, pooled results for upward and downward shocks are also available.

[39] Both the labour share and the share of energy inputs have been measured at the NACE 2-digit level.

Table 15. Factors underlying price flexibility
(main results of probit analysis)(1)

FACTORS	IT		FR		AT		ES	
	Demand increase	Demand decrease	Demand increase	Demand decrease	Demand increase	Demand decrease	Demand increase	Demand decrease
High competition	+	+	+	+	+	+	no	+
Variable marginal costs	+	no	no	no	+	no	n.a.	n.a.
Low search costs	+	no	no	no	+	+	n.a.	n.a.
Regulated price	no	no	no	no	n.a.	n.a.	–	–
High export share	no	no	+	no	+	+	n.a.	n.a.
Labour share	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	–	–
Share of energy inputs	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	+	+
	Costs increase	Costs decrease	Costs increase	Costs decrease	Costs increase	Costs decrease	Costs increase	Costs decrease
High competition	–	–	+	no	no	no	no	no
Low search costs	no	no	–	–	no	no	n.a.	n.a.
Regulated price	–	no	–	–	n.a.	n.a.	–	–
High export share	–	–	no	no	no	no	n.a.	n.a.
Labour share	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	–	–
Share of energy inputs	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	no	no

Note: (1) "+" denotes that the factor is positively and significantly related to the probability of a price increase/ decrease in response to an increase/decrease in demand/costs; "-" denotes that the factor is negatively and significantly related to the probability of a price increase/decrease in response to an increase/decrease in demand/costs; "no" denotes that the factor is not significantly related to the probability of a price increase/ decrease in response to an increase/decrease in demand/costs. "n.a" indicates that the factor is not included in the probit model.

5. Summary and conclusions

This study investigates the pricing behaviour of firms, based on the responses of around 11,000 euro area companies surveyed by nine Eurosystem NCBs. The information collected sheds light on important aspects that can hardly be assessed otherwise, such as price-setting practices, the information set used in the price-adjustment process, reasons for price stickiness and asymmetries in pricing behaviour.

The evidence appears to be very robust across countries and neither affected by the differences in the national questionnaires (such as different languages, different wording and differences in answer categories, etc.) nor by the business cycle conditions prevailing in the countries at the time the surveys were conducted. Consequently, it is possible to draw conclusions for the euro area as a whole, a summary of which is given below.

Regarding the reviewing stage of the price setting process our evidence suggests that both time- and state-dependent pricing strategies are applied by firms in the euro area. Around one-third of the companies follow mainly time-dependent pricing rules while the remaining two-thirds use pricing rules with some element of state-dependence. Although the majority of firms take into account a wide range of information, including past and expected economic developments, about one-third adopts a purely backward-looking behaviour. The pattern of results lends support to the recent wave of estimations of hybrid versions of the New Keynesian Phillips Curve including past inflation in order to explain inflation developments.

Two pieces of evidence from our surveys suggest that the model of perfect competition with the law of one price does not seem to be the blue print for most of the goods and service markets in the euro area. Firstly, mark-up pricing is the dominant price setting practice adopted by firms in the euro area, which suggests that these firms have some form

of market power and can set their prices above marginal costs. Secondly, price discrimination is a common practice among euro area firms. In particular, the share of firms setting prices on a case-by-case basis or depending on the quantity of the product sold is, on average, around 80% in the euro area. This also suggests that models with monopolistic competition, like New Keynesian models, may be a better description for most goods and service markets than those that assume perfect competition.

In most countries the modal number of price reviews lies in the range of one to three times per year and in nearly all countries on which this report is based, the median firm changes its price once a year. This result is in line with the evidence presented in Dhyne et al. (2005) who, on the basis of individual consumer price data for euro area countries, find that the average duration of a price spell ranges from 4 to 5 quarters. However, this yearly frequency is lower than the median frequency of price changes per year reported in Blinder et al. (1998) for the United States, which lies at 1.4 price changes per year. This result is consistent with the comparison between the two areas based on the analysis of micro CPI data [see Dhyne et al. (2005)] and with the estimates on price duration based on macro models [see Galí, Gertler and López-Salido (2003)].

There are some significant differences across sectors with regard to the frequency of price adjustments. Services firms review and change prices less often than others –a result supported by Dhyne et al. (2005), and Lünnemann and Mathä (2005b). Furthermore, we find that firms operating in the trade sector adjust their prices more frequently. Another structural characteristic explaining differences in the frequency of price adjustment is the competitive pressure the firms are facing: companies operating in markets with severe competition review and adjust their prices more frequently. The degree of competition in a market indeed seems to matter for pricing strategies. We provide evidence that the lower the level of competition, the more frequently firms use mark-up rules in their pricing decisions. Furthermore, our results suggest that firms in highly competitive markets are more likely to respond to changes in underlying factors (e.g. cost and demand factors potentially driving price changes) than firms facing low competition.

Overall, our results are in line with the idea that price setting takes place at two stages. First, firms review their prices to check whether they are at the optimal level or whether they need to be changed. Second, if firms find out that the price deviates from its optimal level, they need to decide whether to change the price or not. We provide evidence that there are obstacles to price adjustments at both stages. However, the main obstacles to price adjustment lie at the second stage of price setting. In contrast to the suggestion of Ball and Mankiw (1994), informational costs, which are important at the reviewing stage of price setting, do not seem to be among the most important obstacles to price changes. The fear that a price adjustment could jeopardize customer relationships (expressed in the theories on implicit and explicit contracts) is found to be a much more important explanation for rigid prices. This finding is consistent with the results of Zbaracki et al. (2004), who conclude that one quarter of the overall costs of changing prices is due to menu costs and information costs, while three quarters are arising because customers dislike price changes. The implicit contract theory going back to Okun (1981), which was recognised as very relevant by our respondents, suggests that customers regard price increases in response to cost shocks as fairer than price adjustments in response to demand shocks. This finding ties in with Rotemberg (2005), who also argues that fairness is an important driving force in customers' buying decisions.

Finally, we provide evidence that firms adjust prices asymmetrically in response to shocks, depending on the source of the shock and the direction of the adjustment. Changes in costs are the main factor underlying price increases, whereas changes in market conditions (demand and competitors' prices) are the driving forces behind price reductions. Moreover, prices seem to be more flexible downwards than upwards in response to demand shocks, while the opposite result holds in the face of cost shocks.

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Appendix A – Surveys' characteristics

	WHEN WAS THE SURVEY CONDUCTED	WHO CONDUCTED THE SURVEY	HOW WAS THE SURVEY CONDUCTED	SAMPLE	# FIRMS IN THE SAMPLE/ RESPONSE RATE	REFERENCE MARKET
BE	Feb. 2004	Banque Nationale de Belgique	Traditional mail	Existing sample of the monthly business survey of the National Bank of Belgium	≈ 5600 / 35%	Main market
DE	June-July 2004	External institute (IFO)	Traditional mail	Existing sample of the IFO monthly business survey	≈ 2740 / 46%	Domestic market
ES	May-Sept. 2004	External company	Traditional mail, with prior contact by phone. Responses by mail, phone, fax, internet	Sample designed by Banco de Espana, stratified by sector and level of employment	≈ 3000 / 69%	Main market
FR	Dec. 2003 - Feb. 2004	Banque de France branches	Traditional mail with prior contact by phone, or phone or face to face interviews	Existing sample of the monthly business survey of Banque de France	≈ 4300 / 38%	Domestic market
IT	Feb.-Mar. 2003	External company (Poster s.r.l.)	Mainly by internet with prior contact by phone. Respondents could also return the completed questionnaire by fax	Sample drawn from the existing sample used by the Bank of Italy to conduct a quarterly survey on inflation expectations	729 / 46%	Main market
LU	Aug.-Nov. 2004	Banque centrale du Luxembourg	Traditional mail	Sample drawn from the National Statistical Institute	≈ 1100 / 30%	Domestic market
NL	May 2004	External institute (TNS-NIPO)	Internet	Panel of owners, higher/top level management	1870 / 67%	Not specified
AT	Jan.-Feb. 2004	WIFO (Austrian Institute of Economic Research)	Traditional mail	Existing sample of the Austrian Business Cycle Survey	≈ 2.500 / 36%	Main market
PT	May-Sept. 2004	Banco de Portugal	Traditional mail. Respondents could return the completed questionnaire on paper, by e-mail or through a website	Existing sample from the Banco de Portugal Central Balance-Sheet Database	2494 / 55%	Not specified

Appendix B – What can be compared across national studies?

The nine national surveys share a number of common features, which allow a meaningful comparison to be made, despite the adoption of a decentralised approach.[40] They all focus on the pricing behaviour with respect to the firm's main product, which is found to account for 60% or more of the turnover of the respondents. In other words, the scope of the survey is much broader than it might have been expected from the single or main product approach.

Comparability with respect to sectoral coverage and firm size

The sectoral coverage, which is shown in Table B.1, varies across the national surveys. While some countries cover more or less the entire economy, others are focused only on the industrial sector.

Overall, there appears to be a reasonably solid basis for comparing the industrial and the services sectors across countries. In the case of the trade sector, which is covered in five country studies, the number of firms surveyed seems to be sufficient to allow a meaningful comparison.[41] Conversely, the coverage of the construction sector, both in terms of countries and numbers of firms included in the various samples, is not sufficient. Results for the total sample, industry, trade and other services are presented in the main text, with the aim of comparing sectoral patterns; additional sectoral results are presented in Appendix C.

Table B.1 - Sectoral coverage
(percentages; the number of respondents is given in brackets)

	BE	DE	ES	FR	IT	LU	NL	AT	PT	EURO AREA (1)
Industry	38 (753)	100 (1228)	44 (888)	100 (1662)	65 (215)	20 (67)	18 (219)	76 (661)	84 (1157)	**62 (6850)**
Trade	24 (478)	-	26 (515)	-	14 (46)	22 (73)	22 (271)	-	-	**13 (1383)**
Other services	18 (364)	-	30 (605)	-	20 (68)	37 (125)	60 (756)	24 (212)	16 (213)	**21 (2343)**
Construction	20 (384)	-	-	-	1 (4)	22 (74)			-	**4 (462)**
Total	100 (1979)	100 (1228)	100 (2008)	100 (1662)	100 (333)	100 (339)	100 (1246)	100 (873)	100 (1370)	**100 (11038)**

Note: (1) Percentages for the euro area are computed on the basis of the absolute figures reported in brackets, which are the sum of the firms in each category over the nine countries.

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[40] Clearly though, the survey characteristics (when and by whom the survey was conducted, the survey method and the sample design) may have an impact on the results, which is difficult to quantify. The same applies to the different weighting procedures adopted by the NCBs and to the fact that the surveys where conducted in different languages.

[41] The industrial sector covers Sections D and E of the NACE Rev. 1 classification (manufacturing; electricity, gas and water supply), while trade covers Section G (retail and wholesale trade) and services other than trade covers Sections H, I and K (hotels and restaurants; transport, storage and communication; real estate, renting and business activities).

Table B.2 – Firm size, based on the number of employees
(percentages)

	BE	DE	ES	FR	IT	LU	NL (1)	AT	PT	EURO AREA (2)
1-49	75	29	42	18	-	46	81	53	39	**47**
50-199	17	35	23	43	39	43	19	28	38	**29**
>=200	8	36	35	39	61	11	-	19	23	**24**

Notes: (1) In the Netherlands, the size classes are defined as follows: 1-49; ≥50.
(2) Percentages for the euro area are computed on the basis of absolute figures, which are the sum of the firms in each category over the nine countries (not reported in the Table).

The national surveys cover firms of different sizes in terms of numbers of employees (Table B.2). Since it can be assumed that a firm's size matters from the point of view of pricing behaviour, not only because of the generally different environment in which large and small firms operate, the differences in size structures of the various samples should be taken into account when comparing results across countries. In order to explore these differences, results are given for the following size classes: 1-49 employees, 50-199 employees, 200 employees and above.

Main characteristics of the market in which the firm operates

The environment and the structure of the market are crucial determinants for a firm's pricing behaviour. It is therefore important to establish whether a firm operates on the domestic or on the foreign market, whether its relationships are mainly with other firms or with consumers and whether these relationships are long-standing or occasional in nature. Moreover, the degree of market competition is a key factor in the pricing strategy of a firm.

The national surveys ask very similar questions on the above-mentioned characteristics, with some qualifications. In particular, the questionnaires differ with respect to the reference market, i.e. some country questionnaires ask about pricing in the domestic market (DE, FR, LU) and others about pricing in the main market (BE, ES, IT, AT), while in the remaining questionnaires the market is not specified.[42] To infer reliable results for the euro area, it is important that the responses of the majority of firms refer to the domestic (national) market or at least to the euro area. The top part of Table B.3 shows that, for all countries, this is indeed the case for the industrial sector.[43] The openness of individual euro area countries is reflected by the fact that around 30% of the respondents have a foreign market as the main market for their main product and that in many cases this market is a euro area country.

The fact that the majority of the companies (75% on average) sell their main product predominantly to other firms (Table B.3, item 2) is a reflection of the dominance of the industrial sector in the national samples. Therefore, survey results refer mostly to the behaviour of producer prices rather than to consumer prices.

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[42] See Appendix A.
[43] This is even more evident in the services sector, which is not included in the item 1 in Table B.3.

Table B.3 – Market structure
(percentages) [1]

	BE	DE	ES	FR	IT	LU	NL	AT	PT	EURO AREA [2]
1. Main market for the main product Industry [3]										
- domestic	55	78	85	64	73	58	72	69	67	**73**
- foreign	45	22	15	36	27	42	28	31	33	**27**
2. Main customer										
- other firms	56	89	58	66	73	-	-	84	84	**75**
- consumers	40	7	39	30	25	-	-	9	13	**21**
- public sector	4	4	3	4	2	-	-	7	3	**3**
3. Firm-customer relationships [4]										
- long term	78	57	86	54	98	85	-	81	83	**70**
- occasional	22	43	14	46	2	15	-	19	17	**30**
4. Perceived competition [5]										
- very low	18	19	27	19	10	15	5	20	8	**17**
- low	22	23	19	17	25	17	25	18	21	**21**
- high	30	34	24	38	37	37	49	30	39	**35**
- very high	30	24	30	25	29	31	22	32	32	**26**

Notes: (1) Re-scaled figures excluding non-responses. (2) Weighted averages (GDP weights). (3) Only the information under item 1 of the table refers to the industrial sector; the other three items refer to the whole sample in each national survey. (4) In the case of Belgium, France and Italy, this refers to relationships with other firms. (5) Measured by the importance a firm attaches to competitors´ prices when considering reducing its own prices.

Most of the companies (an average of 70% in the euro area) have a long-term relationship with their customers (Table B.3, item 3), which may act as a kind of "implicit" contract. In the case of Italy the share is particularly high, as it refers to companies that have long-term relationships with other companies.[44]

Item 4 of Table B.3 shows how respondents perceive the degree of competition they face on their main market, proxied by the importance they attribute to competitors' prices in influencing a reduction in their own prices (unimportant, of minor importance, important, very important). Although the majority of the firms perceive that competition is high or very high, the share of those operating in an environment of weak competition (very low and low) is on average just below 40%. It is worth remarking that the national surveys also ask firms to report information on other measures of market competition, such as the number of competitors in their main market or their market share. However, as these proxies provide in some cases diverging information on the degree of competition, we stick to the "direct" evidence on how firms judge the severeness of their competitive environment.

All in all, the evidence on market characteristics provided by the surveys shows that firms in the euro area operate in a monopolistically competitive environment and that relationships with customers are important and of a long-standing nature.

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[44] The share is lower for firms' relationships with consumers.

Appendix C – Sectoral results

Table C.1 - Price setting rules
(percentages) (1)

(weight%)	BE			DE			ES	FR	IT	NL			PT(3)	EURO AREA(4)
	3.7			29.8			9.8	21.6	17.8	6.3			1.8	
	total	const.	var.(2)	total	const.	var.				total	const.	var.		
Markup														0
goods	49	14	35	73	4	69	55	40	48	63	28	34	67	56
trade	41	11	30	-	-	-	50	-	16	71	37	34	-	37
services	49	18	31	-	-	-	50	-	43	45	19	26	48	46
Competitors' price														0
goods	40			17			24	38	33	19			13	27
trade	33			-			26	-	35	21			-	30
services	39			-			31	-	18	24			8	24
Other														0
goods	11			10			22	22	19	18			19	17
trade	26			-			23	-	49	8			-	33
services	11.9			-			20	-	40	31			44	31

Notes: (1) Re-scaled figures excluding non-responses. (2) Firms adopting a mark-up price setting rule and responding "important" or "very important" to a least one of the theories concerning counter-cyclical mark-ups. (3) In the case of Portugal the issue was not addressed directly; the information reported in the table has been estimated on the basis of the answers to other questions. (4) GDP weights.

Table C.2 – Information set for pricing decisions
(percentages)

	BE	ES	IT	LU	AT	PT	EURO AREA (1)
Goods							
Rule of thumb	29	29	-	28	-	20	
Past/Present context	27	42	31	18	33	32	34
Present/Future context	45	29	69	54	13	48	50
Past, present and future	-	-	-	-	55	-	
Trade							
Rule of thumb	35	33	-	21	-	-	
Past/Present context	35	49	33	28	-	-	38
Present/Future context	30	18	67	51	-	-	47
Past, present and future							
Services							
Rule of thumb	46	37	-	40	-	42	
Past/Present context	23	30	29	25	35	21	29
Present/Future context	31	33	71	35	13	38	55
Past, present and future	-	-	-	-	53	-	

Note: (1) Weighted average (GDP weights).

Table C.3 - Frequency of price reviews per year
(percentages) (1)

	BE	DE	ES	FR	IT	LU	NL	AT	PT	EURO AREA (2)
Goods										
>= 12	7	30	5	31	30	11	39	35	20	**26**
4 – 11	12	19	6	22	15	21	19	29	15	**16**
<=3	81	51	90	47	55	68	42	37	65	**58**
median	1	-	1	4	-	2	4	4	2	
Trade										
>= 12	2	-	17	-	32	44	56	-	-	**29**
4 – 11	4	-	12	-	19	11	16	-	-	**15**
<=3	94	-	72	-	49	44	28	-	-	**56**
median	1	-	1	-	-	4	12	-	-	
Services										
>= 12	3	-	2	-	20	13	24	24	9	**15**
4 – 11	5	-	6	-	11	21	21	22	6	**11**
<=3	92	-	92	-	70	67	55	53	85	**74**
median	1	-	1	-	-	2	1	2	2	

Notes: (1) Re-scaled figures excluding non-responses.   (2) Weighted averages (GDP weights).

Table C.4 - Frequency of price changes per year
(percentages) (1)

	BE	DE	ES	FR	IT	LU	NL	AT	PT	EURO AREA (2)
Goods										
>= 4	14	21	11	9	13	12	5	11	13	**15**
2– 3	15	21	10	24	18	22	18	22	17	**18**
1	51	14	59	46	51	45	67	60	48	**39**
0	20	44	20	21	19	22	10	8	23	**28**
median	1	1	1	1	1	1	1	1	1	
Trade										
>= 4	6	-	28	-	5	43	20	-	-	**14**
2– 3	27	-	20	-	41	27	28	-	-	**32**
1	53	-	43	-	40	22	45	-	-	**43**
0	14	-	9	-	15	8	7	-	-	**12**
median	1	-	1	-	1	2	1	-	-	
Services										
>= 4	4	-	7	-	5	16	6	10	6	**6**
2– 3	7	-	18	-	5	27	14	11	5	**10**
1	64	-	64	-	57	36	67	44	70	**60**
0	25	-	11	-	33	22	13	35	19	**24**
median	1	-	1	-	1	1	1	1	1	

Notes: (1) Re-scaled figures excluding non-responses. (2) Weighted averages (GDP weights).

Table C.5 - Ranking of theories explaining price stickiness
(mean scores)

	BE	DE	ES	FR	IT	LU	NL	AT	PT	EURO AREA (1)
Goods										
Implicit contracts	2.7	-	2.5	2.2	-	2.6	2.8	3.1	3.2	2.7
Explicit contracts	2.6	2.4	2.2	2.7	2.7	2.8	2.6	2.9	2.6	2.6
Cost-based pricing	2.4	2.2	-	2.5	-	2.7	-	2.7	2.7	2.5
Co-ordination failure	2.4	-	2.4	3.0	2.6	2.1	2.2	2.4	2.9	2.5
Temporary shocks	1.9	1.9	1.8	2.1	2.0	1.9	2.5	1.6	2.5	2.0
Judging price by quality	1.9	-	1.7	-	-	1.8	2.4	1.8	2.3	2.0
Change non-price factors	2.0	-	1.4	-	-	1.9	2.1	1.6	-	1.8
Menu costs	1.5	1.4	1.3	1.4	1.5	1.7	1.6	1.5	1.9	1.5
Costly information	1.7	-	1.3	-	-	1.7	-	1.7	1.7	1.6
Pricing thresholds	1.5	-	1.3	1.6	1.3	1.6	1.7	1.3	1.8	1.5
Trade										
Implicit contracts	2.4	-	2.6	-	-	2.4	2.6	-	-	2.5
Explicit contracts	1.8	-	1.9	-	1.9	2.3	2.3	-	-	2.1
Cost-based pricing	2.5	-	-	-	-	2.3	-	-	-	2.4
Co-ordination failure	2.2	-	2.6	-	2.7	2.4	2.3	-	-	2.4
Temporary shocks	1.8	-	1.8	-	2.1	1.7	2.4	-	-	2.0
Judging price by quality	2.1	-	1.8	-	-	2.1	2.4	-	-	2.1
Change non-price factors	1.7	-	1.3	-	-	1.8	2.0	-	-	1.7
Menu costs	1.7	-	1.6	-	1.8	1.7	1.9	-	-	1.7
Costly information	1.6	-	1.4	-	-	1.7	-	-	-	1.6
Pricing thresholds	2.1	-	1.7	-	2.0	2.0	2.1	-	-	2.0
Services										
Implicit contracts	2.7	-	2.6	-	-	2.8	2.8	3.0	3.0	2.8
Explicit contracts	2.7	-	2.6	-	3.0	2.8	2.5	3.0	2.8	2.8
Cost-based pricing	2.5	-	-	-	-	2.8	-	2.5	2.7	2.6
Co-ordination failure	2.0	-	2.4	-	2.3	2.0	2.1	2.1	2.7	2.2
Temporary shocks	1.7	-	1.8	-	1.9	1.7	2.3	1.5	2.2	1.9
Judging price by quality	2.0	-	2.0	-	-	2.3	2.5	1.9	2.2	2.1
Change non-price factors	1.6	-	1.3	-	-	1.7	1.9	1.8	-	1.7
Menu costs	1.4	-	1.4	-	1.6	1.9	1.6	1.5	1.9	1.6
Costly information	1.6	-	1.3	-	-	1.8	-	1.6	1.7	1.6
Pricing thresholds	1.6	-	1.6	-	1.3	1.7	1.7	1.2	1.9	1.6

Note: (1) Unweighted average of countries' scores.

Figure C.1 – Price-raising factors in the euro area
(average scores) [1]

Legend: ■ 1-49 workers □ 50-199 workers □ >199 workers ■ goods ■ trade ■ other services
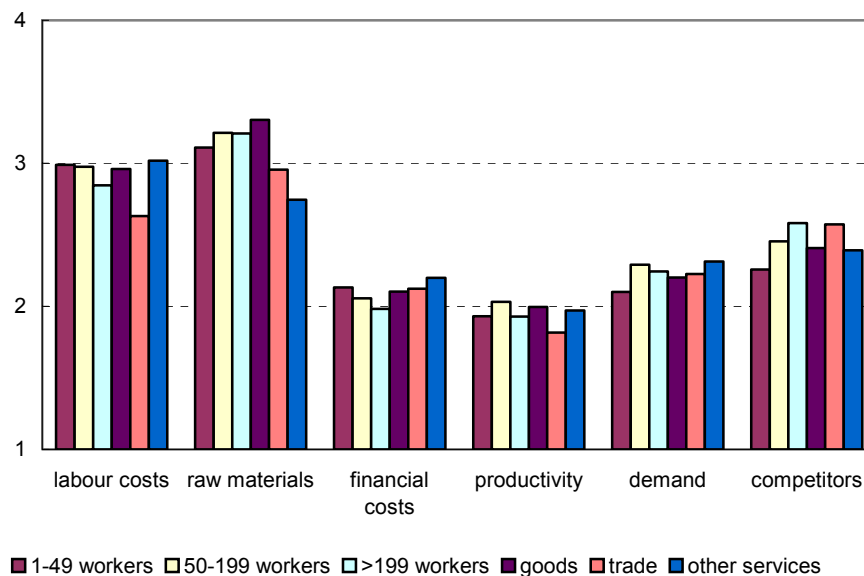
Note: (1) Unweighted averages of countries' scores.

Figure C.2 - Price-reducing factors in the euro area
(average scores) [1]

Legend: ■ 1-49 workers □ 50-199 workers □ >199 workers ■ goods ■ trade ■ other services
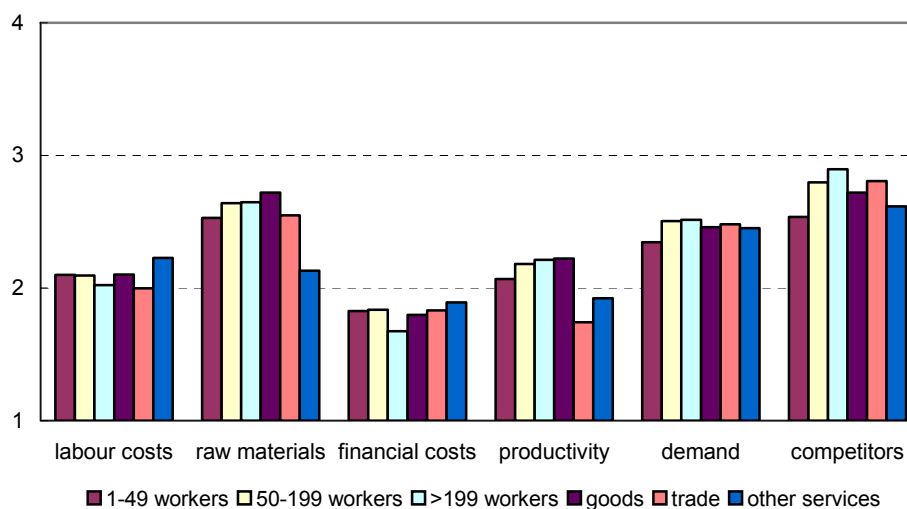
Note: (1) Unweighted averages of countries' scores.

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