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Pricing Behaviour of Croatian Companies: Results of a Firm Survey and a Comparison with the Eurozone

Andreja Pufnik and Davor Kunovac

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PUBLISHER
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Publishing Department
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Phone: +385 1 45 64 555
Contact phone: +385 1 45 65 006
Fax: +385 1 45 64 687

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Abstract

This paper aims to clarify the issue of price stickiness, i.e. the relatively slow adaptation of prices to changes in the economic environment. The median enterprise in Croatia changes the price of its main product less frequently than once a year, i.e. more rarely than the median enterprise in the eurozone (once a year). Prices are more flexible downwards in the event of major demand shocks, whereas in the event of major changes in costs it is the other way round. The implicit contract theory and the cost-based pricing theory are the most important elements for the explanation of price stickiness in Croatia. It was shown that price stickiness is strongly related to the efforts to build long-term business relationships with customers, and to customer preferences for stable nominal prices. Increased demand and higher costs (especially raw material prices and wages) are the main factors influencing decisions on price increases. Moreover, shocks resulting in a change in trading conditions (reduced demand and a lower price by a competitor) are the key driving factors of price decreases.

JEL:
D40, E31, L11

Keywords:
price setting, price stickiness, survey data

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Contents

1 Introduction

An important issue for monetary policy decision-makers is the degree of price stickiness, i.e. the relatively slow adjustment of prices to changes in the economic environment (shocks). The macroeconomic literature published during the 1990s and later, has generally supported the hypothesis that nominal prices are fairly sticky, suggesting that, given such a situation, monetary policy can produce real effects, at least in the short run (Clarida *et al.*, 1999).

Important tools for establishing the degree and causes of price stickiness are direct surveys of enterprises about how they adjust the prices of their products. The popularity of such surveys increased as conventional methods of research into price stickiness based on the econometric analysis of aggregate time series failed to respond to numerous questions. It has been increasingly warned that the answers are to be found at the micro level, i.e. where pricing decisions are made, and that the focus should not be on only one enterprise or on a particular market, but the survey should cover a wide range of enterprises. The research works by Blinder (1991) and Blinder *et al.* (1998) have popularised the use of surveys involving direct questions to enterprises about their price-setting and changing behaviour with a view to shedding more light on price stickiness, which makes it possible to collect a lot of qualitative information. Many central banks have conducted such surveys in recent years, and published their results (Great Britain in 1997, Sweden in 2001, Canada in 2006, Spain in 2005, Italy in 2004, Austria in 2005, etc.)[1]. This is an attempt to apply their experiences to Croatia.

This paper shows the results of a survey on how enterprises in Croatia determine and change the prices of their products. The survey for the CNB was carried out by GfK Croatia – Market Research Centre, from 5 October to 3 December 2010, and it covered 295 enterprises from the industrial and services sectors.

The paper is organised as follows: Section 2 provides basic technical information about how the survey was carried out. Section 3 presents information on the representativeness of the main product for the total sales revenues of an enterprise and analyses the main characteristics of the market that have a major impact on an enterprise's pricing strategy. Section 4 explores the strategies for the determination, revision and adjustment of prices applied by enterprises. In Section 5, possible causes of price stickiness are examined, and various price stickiness theories are ranked according to their relevance for price determination in Croatia. Section 6 deals with an analysis of the driving factors of price increases or decreases. Section 7 seeks to identify, using regression models, the characteristics of an enterprise that are associated with the frequency of price changes. In addition, the model results are presented, showing which characteristics of the enterprise are associated with the likelihood of a price change after a demand or cost shock.

1 Surveys based on the pricing questionnaires in nine eurozone countries were conducted within the IPN (*Inflation Persistence Network*) project which involved economists from the ECB and the central banks of the Eurosystem participants. The results of these surveys are summarised in Fabiani *et al.* (2005) and Fabiani *et al.* (2007). When comparing the questionnaire results for Croatia with those for the eurozone it should be borne in mind that the former questionnaire was conducted in 2010, and enterprises were asked to comment on the economic situation in 2009, which was different from that in 2003 or 2004 when the eurozone surveys had been conducted.

2 Carrying out the Survey

The Survey Questionnaire has been developed by the CNB. In order to ensure the comparability of the survey results between Croatia and the eurozone countries, the questionnaire was drawn up on the basis of pricing questionnaires from nine eurozone countries developed within the IPN (*Inflation Persistence Network*) project. The appropriateness and comprehensibility of the questions were checked by pilot-surveying those enterprises that have not been included in the gross sample for the Survey. Based on this pilot survey, minor changes and adjustments were made to the questionnaire itself, in order to facilitate the completion of the questionnaire by respondents.

The Survey was carried out on a sample of enterprises used in the Business Confidence Survey for the industrial and services sectors (excluding retail trade), which has been conducted on a monthly basis by the Ipsos Puls agency and which was in line with the methodology prescribed by the European Commission in all of its aspects, including sample representativeness. The gross sample included a total of 1009 enterprises, of which 383 came from the productive sector and 626 from the services sector. The target population covered all firms registered in the RC, and the sample framework is the Fina database which includes, among other things, the data on the number of employees, total turnover and the region where the firm operates. These data have been used for population stratification and for the adjustment of the gross sample in order to make it as representative as possible, with respect to the size of firms and the regions in which they have their registered offices. In the stratification process, the type of activity was also used, but only as a general category (production or services), because a more detailed distribution would have resulted in very small sub-samples for particular activities. The final gross sample of firms was a two-stage stratified sample according to:

a) the region – there are three statistical regions or levels of NUTS (Nomenclature of Territorial Units for Statistics); and
b) the size of enterprises within each region (three sizes: up to 49 employees, 50-199 employees and over 200 employees).

Within each of the nine strata, enterprises were selected randomly.

The Survey was carried out by GfK Croatia – Market Research Centre in the period from 5 October to 3 December 2010 by means of an on-line questionnaire. It covered a total of 295 enterprises from all over Croatia. All firms from the gross sample received an e-mail invitation from GfK to participate in the Survey, together with an explanation of the survey's objectives. In order to increase the response to the Survey, attached to the questionnaire was a copy of the invitation letter signed on behalf of the CNB by its vicegovernor Relja Martić. The questionnaire was meant exclusively for those persons in an enterprise who participated in making pricing decisions, primarily the owners of firms, executive or financial directors or Management Board members.

Within the interviewing process, each e-mail invitation message included a link to the on-line version of the questionnaire. The respondents were provided with an opportunity to contact the project manager by telephone if they needed additional explanations or any other assistance in connection with the project.

Table 1 Final sample of enterprises

Size of firm	Activity			
	Industry		Services	
	N	%	N	%
Up to 49	36	30.8	95	53.4
50 – 199	40	34.2	51	28.7
200 and more	41	35	32	18
TOTAL	117	100	178	100

Source: CNB Survey.

The questionnaire was returned by a total of 295 enterprises, i.e. the response rate was 29%, a satisfactory percentage, given the complexity of the questionnaire which comprised 34 questions. The final sample was weighted by adjusting the shares of enterprises with respect to their size, type of activity and region in the final sample with the respective shares in the gross sample.

3 Basic information on the main product and market structure

The questionnaire began with the identification of an enterprise's main product and the basic characteristics of the market in which the enterprise operates, as well as of the key determinants of the enterprise's price determination and adjustment strategy. This primarily related to the geographic location of the market in which the enterprise sells its products (Croatia, eurozone or other countries), the customer structure, the share of regular customers (i.e. those with which the enterprise has had business relationships for more than a year), and the degree of competition in the market.

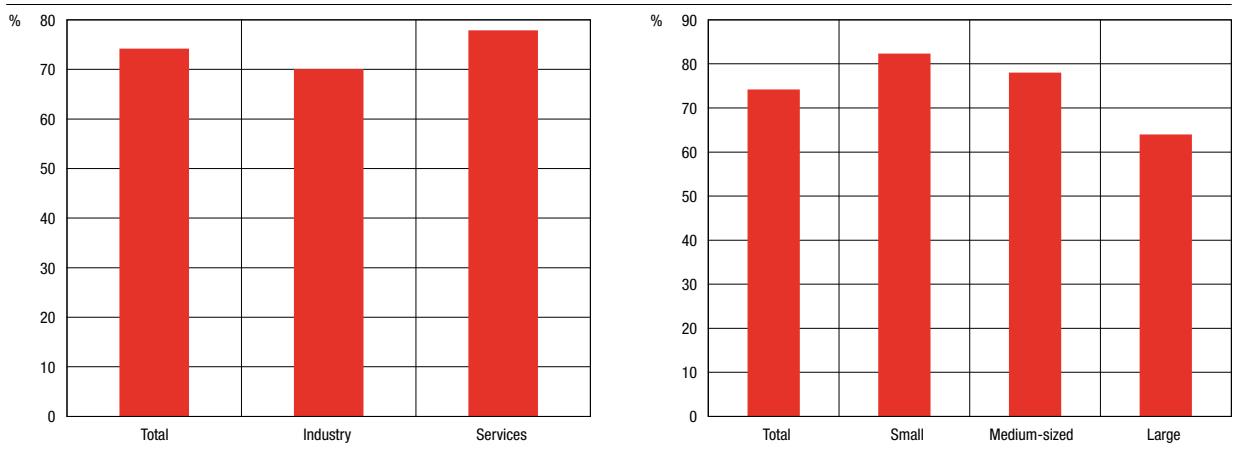
3.1 Main product and the geographic location of the market

In order that the responding companies should focus on only one product and the strategy used for setting the price of that product, the questionnaire adheres to the concept of the main product. This is a good (or a service) that accounts for the largest share in the total sales revenues generated in the Croatian market in 2009, or a product that, in a respondent's view, best represents the main activity of the enterprise.

It was shown that the share of the main product in a company's total sales revenues stood at an average of 74%, suggesting that the main product was representative of the total sales revenues. This finding was also due to a decision about the exclusion from the Survey of sectors in which it is difficult to identify the main product (e.g. retail trade).

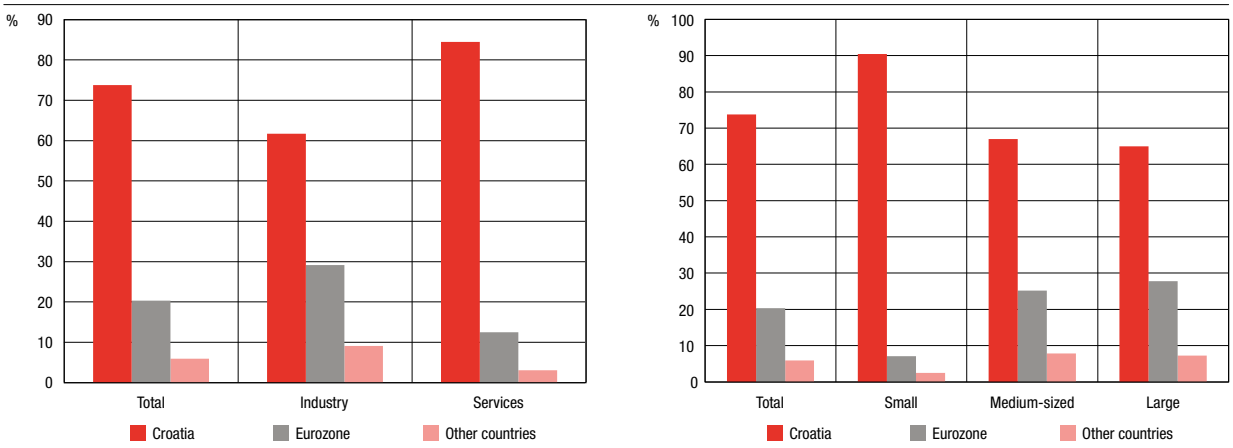
Figure 2 shows that most of enterprises' total revenues are generated in the domestic market (74%), and a markedly smaller share in the eurozone market (20%) and in other countries (6%). It is evident that

Figure 1 The share of the main product in total revenues (Question 1.4)



Note: Small enterprises include those with up to 49 employees, medium-sized those with 50 to 199 employees and large enterprises are those with 200 and more employees.
Source: CNB Survey.

Figure 2 Geographic location of the market (Question 1.5)



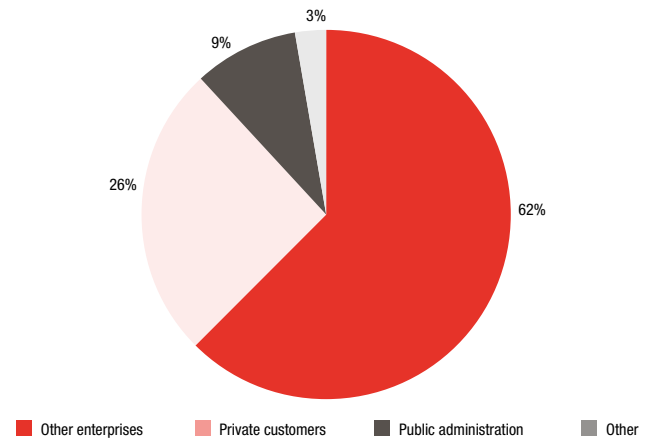
Source: CNB Survey.

enterprises from the services sector, i.e. small enterprises, are far more oriented to the domestic market than the average.

3.2 Customer structure and type of relationship with customers

As shown by the survey results, other enterprises predominate in the customer structure, with their share in the sales revenues standing at an average of 62%. A considerably smaller share of enterprises' total revenues from the sale of the main product comes from direct sale to customers. Therefore, the main purpose of this Survey is to analyse the producer price-setting policy. This finding is similar to that obtained for the eurozone, where other enterprises also predominate in the sales revenues (75%), which shows the strong participation of the industrial sector in the samples.

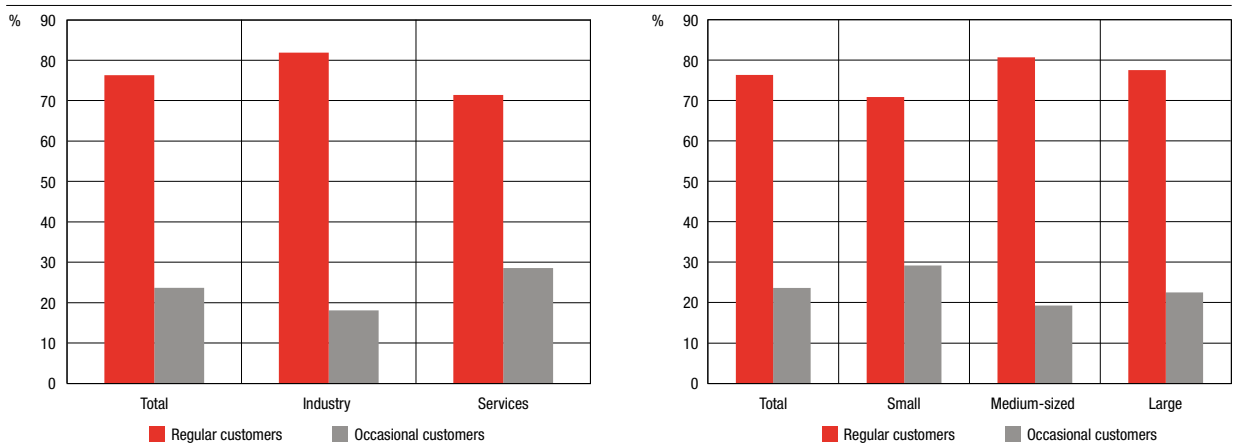
Figure 3 Customer structure (Question 2.1)



Source: CNB Survey.

Furthermore, the type of relationship between an enterprise and customers (long-term[2] or occasional) can influence the enterprise's pricing policy. It is assumed that enterprises that have predominantly long-term relationships with their customers review the prices more rarely, i.e. they try to delay price changes in the event of certain shocks. Such behaviour can be accounted for by the fact that an enterprise that has significant number of customers for more than one year can consider it has some kind of implicit contract with those customers, which in turn results in the enterprise having less flexible prices. The results show that the share of revenues from the main product sale pertaining to regular customers, i.e. those with which an enterprise has had business relationships for more than a year (on a long-term basis), amounts to 76% and is larger in industry than in the services sector. This finding is in line with that obtained for the eurozone (Fabiani (2005), where regular customers account for about 70% of an enterprise's total sales revenues.

Figure 4 Types of relationship with customers: the share of regular customers in total sales revenues from the main product (Question 2.4)



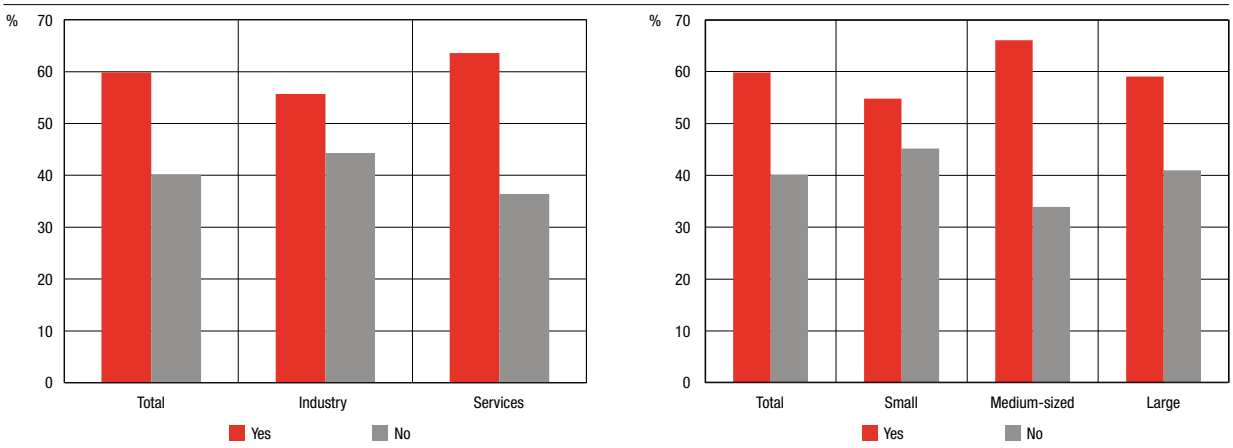
Source: CNB Survey.

3.2.1 Ensuring long-term relationships with customers through explicit contracts

Enterprises may have written or oral contracts with their customers by which they undertake to offer a product at a fixed price during a certain period. Enterprises enter into such contracts in order to establish long-term business relationships with their customers and ensure stable revenues in the future. Similarly, customers prefer stable nominal prices which enable them to foresee future costs and help reduce the shopping time. Therefore, explicit contracts can be important generators of price stickiness. As shown by Figure 5, 60% of Croatian enterprises apply formal contracts by which the price of the main product is fixed for a certain period of time. In 66% of enterprises that apply fixed-price contracts, the share of such contracts in the total sale of the main product exceeds 50%.

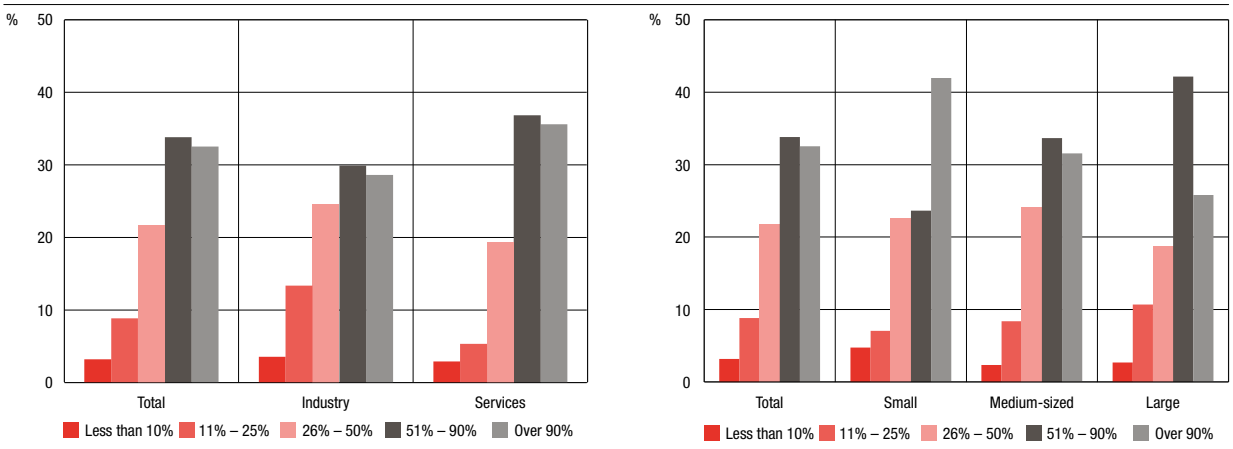
2 An enterprise is considered to have a long-term relationship with customers if it has done business with those customers for more than a year.

Figure 5 The existence of explicit contracts (Question 3.4)



Source: CNB Survey.

Figure 6 The share of sales through a fixed-price contract in the total sales of the main product (Question 3.4a)



Source: CNB Survey.

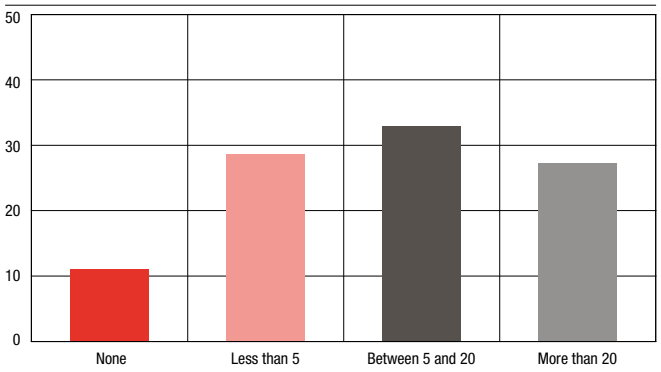
3.3 Degree of competition in the market

The degree of competition facing an enterprise in the market is an important factor that influences the pricing decisions of enterprises. In a perfectly competitive market, the price is equal to marginal costs and there is no mark-up or price stickiness. The latter is only possible when there is a deviation from perfect competition, i.e. when enterprises enjoy a certain degree of autonomy in price setting. The lower the degree of competition (the enterprise operates in conditions similar to those of a pure monopoly) the higher the likelihood that the enterprise will not change the price immediately after a change in marginal costs.

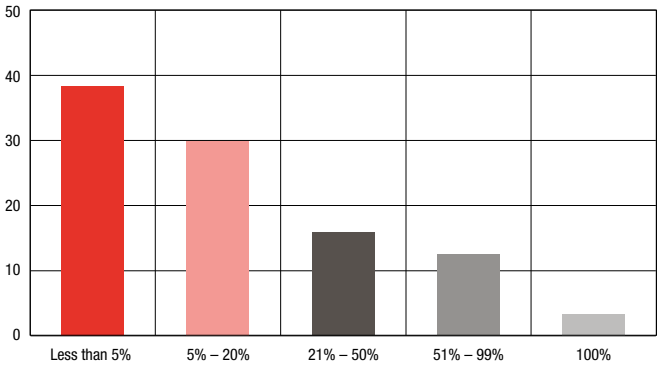
The Survey includes several questions about the degree of competition in the market. In questions 2.2 and 2.3 enterprises are asked to indicate the number of competitors for their main products they have in the domestic market, and the share of the main product in the domestic market respectively. It showed that a relatively large number of enterprises have limited market power, i.e. they operate in conditions of a relatively high degree of competition. So, for example, 27% of enterprises have more 20 competitors in the domestic market, and 33% of them have 5 to 20 competitors. In addition, the market share of 38% of enterprises is less than 5% and the market share of an additional 30% of enterprises is from 5% to 20%.

Figure 7 Degree of competition in the market

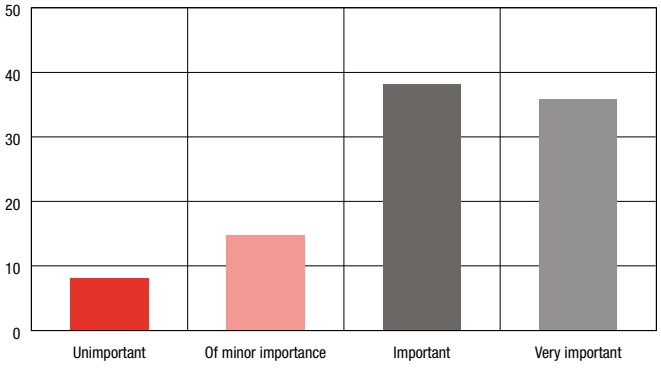
a) Number of competitors in the domestic market (Question 2.2)



b) Market share of the main product in the domestic market (Question 2.3)



c) Importance of a change in the competitor's price for a decrease in the price of own product (Question 6.7)



Source: CNB Survey.

Furthermore, given some drawbacks of the previously mentioned two measures of the degree of competition, Álvarez and Hernando (2005)[3] suggest an alternative measure in which the degree of competition facing a particular enterprise is related to the importance attached by the enterprise to a change in the competitor's price in situations where it decides to reduce the price of its product[4]. It is therefore considered that an enterprise is facing strong competition if its response to the question: "To what extent does a change in a

3 There are three chief disadvantages of these measures: firstly, their subjectivity; secondly, the possibility that, despite a small number of large enterprises (having large market shares) in a given market, there is a high degree of competition (e.g. the telecommunications market); and thirdly, the possibility that, despite a large number of competitors in a market, they can have relatively great market power in a particular local market (e.g. bars and restaurants).

4 The authors refer to the work by Hoeberichts and Stockman (2006), who suggest a strong correlation between this measure and the degree of competition.

competitor's price influence a decrease in the price of your own product?" is "important" or "very important". It has been shown that 74% of Croatian enterprises are faced with relatively strong competition, i.e. they have limited market power. While the results show that most of the enterprises operate in highly competitive environments, about one third of enterprises still enjoy some degree of autonomy in setting the prices of their products, which is a key prerequisite for a certain degree of price stickiness. Taken as a whole, the domestic market can be assessed as an imperfectly competitive market.

4 Price-setting, price-reviewing and price-changing strategies

This section explores the main characteristics of the pricing policies of Croatian enterprises. The primary goal is to answer the question whether enterprises review the prices of their products at set intervals or each time the economy is hit by a sufficiently strong shock. In addition, an attempt is made to examine other significant pricing policy elements, for example whether the price reviews are based on historical information or on the forecasts of future movements, the degree of an enterprise's autonomy in price setting, the degree of price discrimination, the frequency of price reviews and price changes, etc.

4.1 Price reviewing rules: at fixed time intervals vs. in response to changes in market conditions

Current practice shows that enterprises do not adapt their prices continuously in response to shocks occurring in the economy; this behaviour is accounted for by price adaptation costs. The economic literature modelling this fact indicates two basic types of behaviour by enterprises in reviewing[5] the prices of their products. One, where enterprises normally review the prices of their products at specific time intervals, regardless of the economic situation (*time-dependent pricing rules*), and the other, where enterprises normally review the prices every time the economy is hit by a sufficiently strong shock (*state-dependent pricing rules*)[6], for example a change in the raw material prices, a change in demand or in the competitor's price. In the event of shocks, the time-dependent pricing approach results in stickier prices, given that the time of price adjustment does not correspond with the emergence of the shock. Therefore, one of the indicators used for assessing the degree of price stickiness in the economy is the share of enterprises reviewing their prices at fixed time intervals, as opposed to the share of enterprises in which price reviewing is normally prompted by changes in the market conditions.

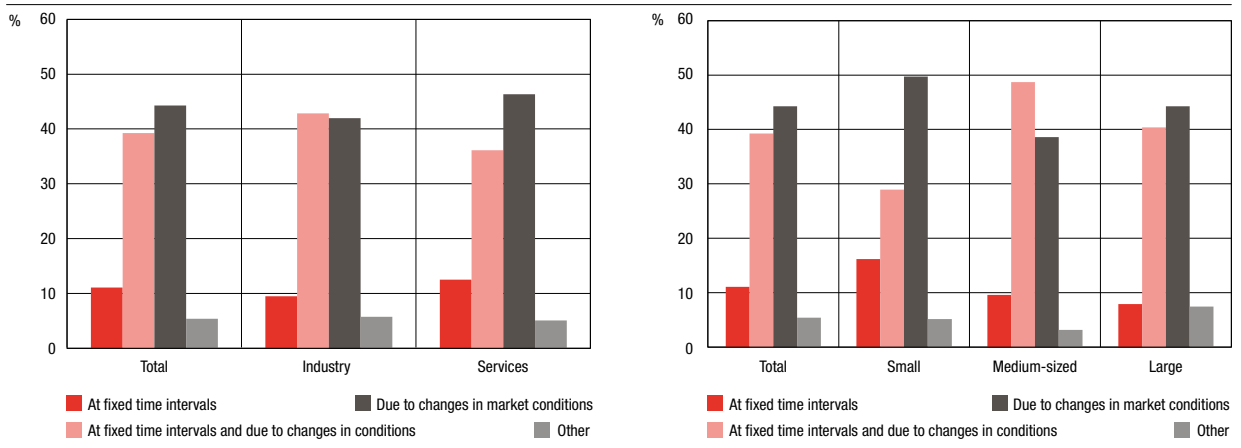
These two approaches to price reviewing have different effects on the nominal shock transmission, or monetary policy transmission to real economy. If the share of enterprises applying the time-dependent pricing approach is larger in one economy than in another, this fact, together with other unchanged conditions, can amplify the effect of nominal shocks on the real economy in the short run.

According to the survey results for Croatia, 11% of all enterprises apply the time-dependent pricing approach; 44% of them review their prices only in response to major changes in market conditions and 39% follow mixed strategies, i.e. when the market situation is normal, they apply the time-dependent strategy, and in the event of severe shocks they move to the state-dependent strategy. The share of enterprises using the

5 It is assumed that enterprises occasionally review the prices of their products without necessarily changing them. A price review means the assessment of all information relevant for setting a price.

6 That is, when the difference between the actual and the optimal price is sufficiently great for the benefit of the price change to exceed its cost.

Figure 8 Price adjustment strategy (Question 4.1)



Source: CNB Survey.

former strategy is slightly larger in the services sector and in small enterprises. Hence, under normal conditions, about 50%[7] of enterprises apply the time-dependent approach to price reviewing. However, in the event of major shocks in the economy, only 11% of enterprises will continue to apply the time-dependent approach, while 84% will follow the strategy that depends on the market situation (state-dependent strategy). The share of enterprises applying the state-dependent strategy in the event of major market shocks is larger in Croatia than in the eurozone (about two thirds of the total[8]), which leads to a conclusion that the price stickiness is less pronounced in Croatia than in the eurozone, i.e. that price flexibility in the event of shocks is higher in Croatia.

4.2 The role of information: the price reviewing strategy based on historical information vs. the one based on the expectations of future movements

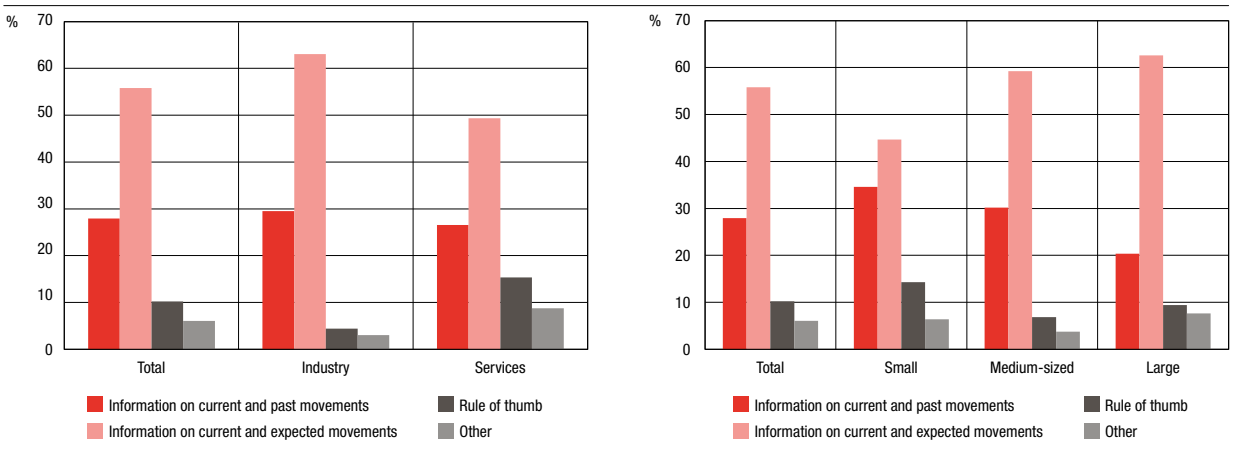
An enterprise reviews the prices of its products in an optimal way if it uses a wide range of information and indicators relevant for profit maximisation, including expectations about the future movements of relevant economic variables. By contrast, the use of information on the past movements of economic indicators and the application of a particular pricing rule can increase the rigidity of price adjustment in the event of certain shocks. This is why the questionnaire contains a question about the information set used by enterprises for reviewing their prices (Question 4.3). Moreover, because a deviation from optimal behaviour can also be the result of applying a rule of thumb, which can further lead to a sluggish response of prices to shocks, the question was raised whether enterprises apply a specific rule (e.g. a fixed percentage change, indexation to consumer price inflation or to the exchange rate, wage growth, etc.).

There is abundant literature showing that the new Keynesian Phillips curve (NKPC), which involves both marginal cost and expectations of future inflation, may provide a good explanation of the inflation dynamics in different countries. The NKPC models emphasize rational expectations, implying that those enterprises that can change their prices do so by looking ahead, taking into account their expectations about a future average market price and aggregate demand. The inability of the NKPC to account for inflation persistence, i.e. the current sluggish price adjustment, led to the inclusion of the past inflation rate in the NKPC, i.e. the creation

7 The sum of enterprises exclusively applying the time-dependent approach and those applying the mixed approach.

8 Fabiani (2005).

Figure 9 Information set used for price reviews (Question 4.3)



Source: CNB Survey.

of the so-called hybrid new Keynesian Phillips curve. It proved that the hybrid versions of the NKPC, which include past economic movements, better describe the actual price movements. Therefore, the inflation dynamics are the consequence of the decisions of two types of enterprises – those that change their prices by looking ahead and others that make pricing decisions on the basis of the past inflation.

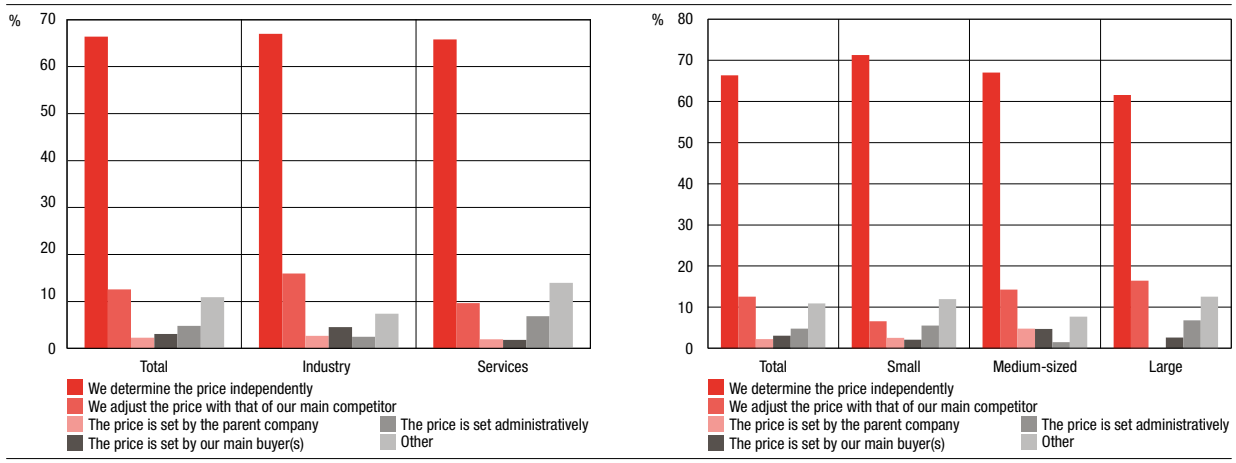
As shown by the survey results, the bulk of enterprises in Croatia (56%) review their prices on the basis of information on current and expected movements in numerous indicators (demand, costs, the main competitors' prices, etc.) that are relevant for profit maximisation. Furthermore, a sizeable portion of Croatian enterprises (28%) take their pricing decisions on the basis of the current and expected movements of numerous indicators, without taking into account economic projections. About 10% of Croatian enterprises apply a particular pricing rule, i.e. they tie their prices, for example, to the price index or wage growth. Taken as a whole, the survey results for Croatia support the inflation dynamics modelling on the basis of the hybrid NKPC[9]. These results are not significantly different from those for the eurozone, where about a half of enterprises base their price-reviewing decisions on a wide range of information, including expected economic movements, while about a third of enterprises in the eurozone only take into account past economic movements.

4.3 Price-setting methods as a significance indicator of imperfect competition in the economy

It is well known that, in perfect competition, all enterprises in the same market set their prices at a unique market clearing level; there are no mark-ups and prices are equal to marginal costs, so that there is no price stickiness. Price stickiness only occurs when there is a deviation from perfect competition, i.e. when enterprises enjoy a certain degree of price– setting autonomy. In imperfect competition models, enterprises set their prices by adding a mark-up to the marginal costs, so that there is manoeuvre room for leaving the prices unchanged in the event of cost changes. While, on the one hand, over 70% of enterprises in Croatia face severe competition, i.e. they have limited market power (as described in Section 3.3), the survey results, on the other hand, suggest that the bulk of them (about two thirds) still enjoy autonomy in setting the prices of their products, which is a key prerequisite for some degree of price stickiness (Figure 10). This share is almost the same in both industrial and services sectors.

9 This conclusion is in line with Krznar (2011), indicating that, according to the results of many NKPC specifications, the hybrid version of an open-economy NKPC provides the best possible explanation for the domestic inflation rate dynamics.

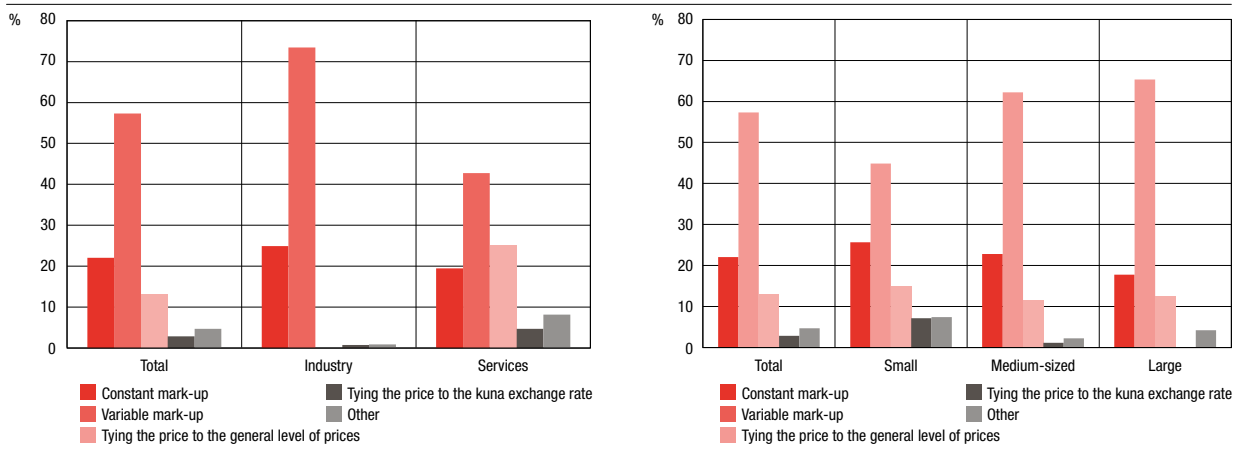
Figure 10 Degree of enterprises' autonomy in setting the main products' prices (Question 3.2)



Source: CNB Survey.

Enterprises applying independent price policies were supposed to indicate in the questionnaire whether they set their prices by adding a mark-up (constant or variable) to the costs, or using another strategy (e.g. tying the prices to the general level of prices or to the kuna exchange rate). According to Figure 11, most of the said enterprises set their prices by adding a certain variable mark-up to the costs, while only a very small portion of enterprises tie the prices to the kuna exchange rate movements. The autonomous setting of product prices using mark-ups is a pricing method predominantly applied by enterprises in the eurozone (about 54%).

Figure 11 Autonomous setting of the main products' prices by enterprises (Question 3.3)



Source: CNB Survey.

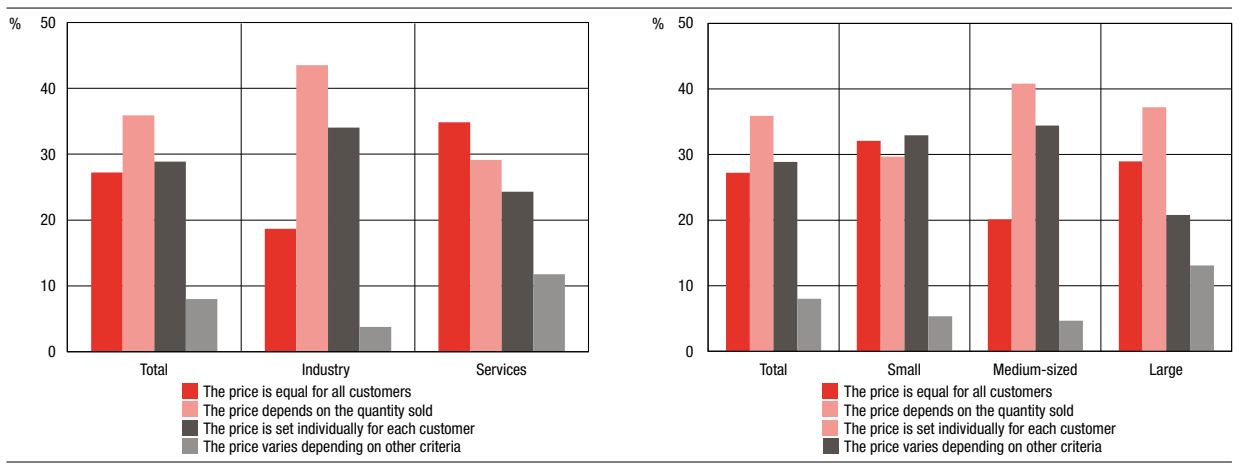
While the econometric model results (see p. 28) suggest a positive correlation between the degree of price flexibility and the degree of market competition in Croatia, it should be noted that this correlation is not generally monotonous. Coordination failure is a problem that occurs neither in a perfectly competitive market nor in a monopolistic market (its opposite), but it is the major cause of price rigidity in imperfectly competitive markets. Without a coordination mechanism enabling enterprises to change prices simultaneously the prices may remain fixed despite changes in market conditions. That is, when an enterprise intends to raise the price of a product but hesitates to do so, fearing that it will lose customers unless other enterprises follow its example. By contrast, if an enterprise lowers a price, this can spark off a price war and lead to a drop in profits.

Against such a background, price stickiness is expected to be less pronounced if there is a market leader whose price reductions are mainly followed by other enterprises (followers). As shown by Figure 1, only 13% of enterprises in Croatia set their prices in accordance with those of the main competitor (leader), while this portion is slightly larger on average in the eurozone (26%). This indicator suggests that, with all other conditions unchanged, there is stronger likelihood of nominal price rigidity in Croatia than in the eurozone market. There is another case worth noting, when no positive correlation between the degree of price flexibility and the degree of market competition can be expected, that is, when free access to a competitive market influences enterprises, for example, to refrain from raising their products' prices in order to discourage new enterprises from entering the market.

4.4 Existence of price discrimination

Another important feature of enterprises' price policies is the possible existence of some form of price discrimination. To establish this, there is a question in the questionnaire whether the price of the main product is equal for all customers, whether it depends on the quantity sold or whether it is determined case by case. It showed that the policy of equal prices for all customers does not prevail in practice, as less than one third of enterprises (27%) charge the same prices to all customers (Figure 12). The remaining enterprises charge different prices, depending on the quantity sold (36%) or depending on the customer (29%). However, there are considerable differences in the results between industry and services. In industry, as little as 19% of enterprises apply the same price to all customers, while this share is markedly larger in the services sector (35%). In addition, it has been observed that price differentiation is slightly less pronounced in small than in large enterprises. The said results are in accordance with those for the eurozone, where price discrimination is also common practice in enterprises. Fabiani (2005) notes that models involving the assumption of monopolistic competition (such as the new Keynesian models) provide a better description of most markets than models assuming the existence of perfect competition.

Figure 12 Existence of price discrimination (Question 3.1)



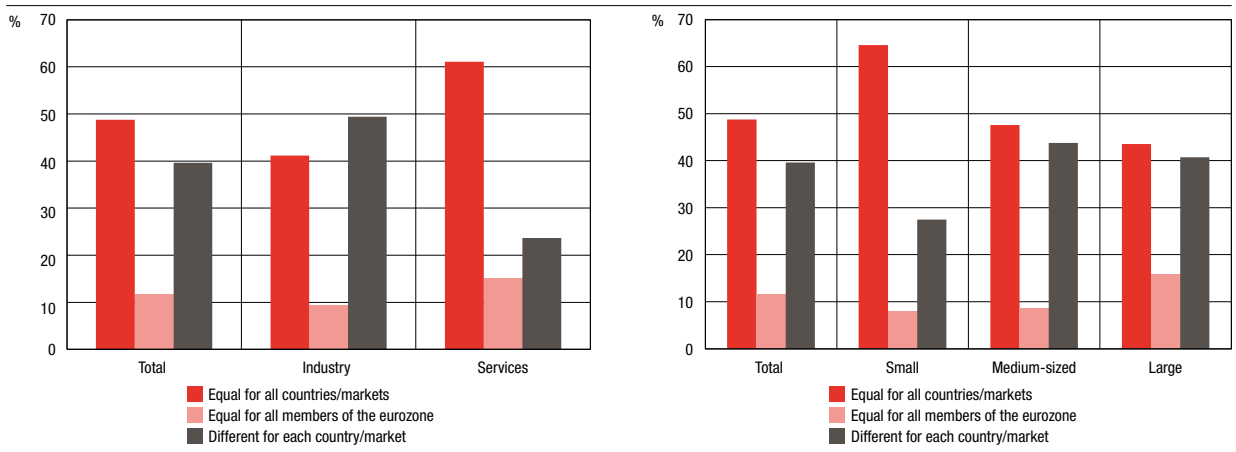
Source: CNB Survey.

4.4.1 Price discrimination in export markets

The purpose of the enterprise survey was to examine whether there is price discrimination in export markets, i.e. whether enterprises set different prices for their main products in different markets[10]. The results

10 This strategy is known in the literature as *"pricing to market"*.

Figure 13 Price discrimination in export markets (Question 7.2)



Source: CNB Survey.

show that about 51% of exporting companies practice some sort of price discrimination, with 40% of enterprises setting different prices across countries and the remaining 11% having the same price for all members of the eurozone. As concerns other countries, the price of the main product differs from country to country.

The main factors encouraging this price discrimination are the competitors' prices in foreign markets, followed by transportation costs and exchange rate movements. The former two factors have proved to be the most important in the surveys conducted at the eurozone level.

Table 2 Relevance of particular factors for different prices in export markets (Question 7.3)

	Average rating[1]	Important and very important, %[2]
Competitors' prices	3.6	95.7
Transportation costs	3.1	77.7
Movements of the payment currency exchange rate	3.1	80.8
Cyclical demand fluctuations in the market	2.9	74.5
Other characteristics of the market (tastes, living standards, etc.)	2.8	60.7
Tax system (e.g. VAT rate)	2.4	42.3

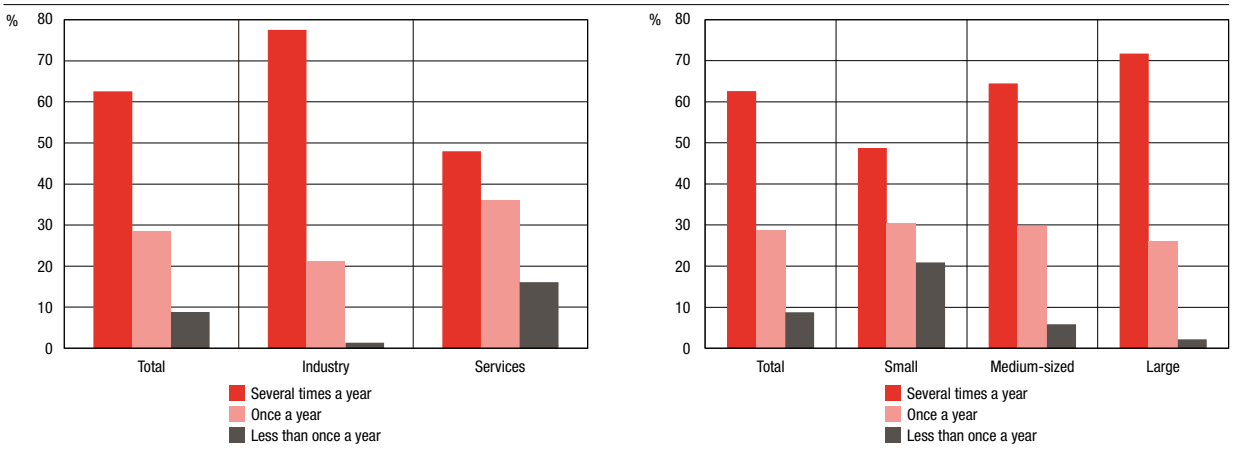
[1] For each factor, one of the following options was to be chosen: 1 – unimportant; 2 – of minor importance; 3 – important; 4 – very important; 0 – unable to evaluate.
[2] The share of enterprises considering a particular factor relevant or very relevant.
Source: CNB Survey.

4.5 Frequency of the main product's price reviews and changes

The frequency of product price reviews is one of the indicators of price stickiness; information related to this indicator can only be obtained through enterprise surveys. The surveyed enterprises that exclusively or predominantly apply the time-dependent price reviewing strategy are asked to indicate the frequency with which they review their prices. According to the results obtained, over one third (37%) of enterprises review their prices once a year or even less frequently. The share of such enterprises is even larger in the services and small-enterprise sectors (52% and 51% respectively). Among the causes of a relatively low frequency of price reviews are a sporadic information flow and the costs related to the gathering of information necessary for price reviewing.

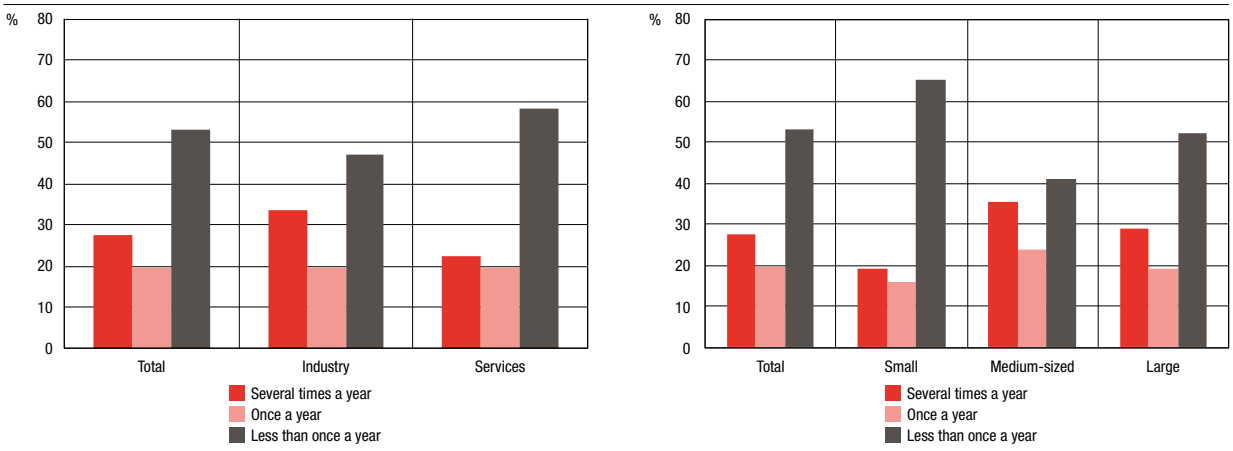
One of the measures of the degree of price stickiness is the number of price changes in a year, or alternatively, the average duration between two consecutive price changes. Therefore, enterprises were asked how frequently they changed the prices of their main products. In the first step, three response options were offered: several times a year, once a year, and less than once a year. As expected, price changes were less frequent than

Figure 14 Frequency of main product price reviews (Question 4.2)



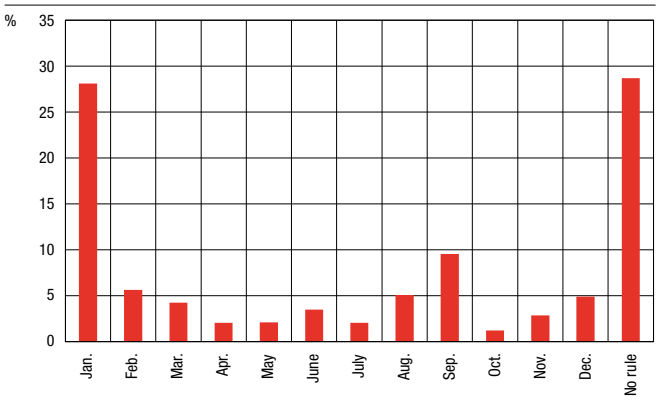
Source: CNB Survey.

Figure 15 Frequency of main product price changes (Question 6.1)



Source: CNB Survey.

Figure 16 Monthly distribution of price changes by enterprises that change their prices once a year (Question 6.1)



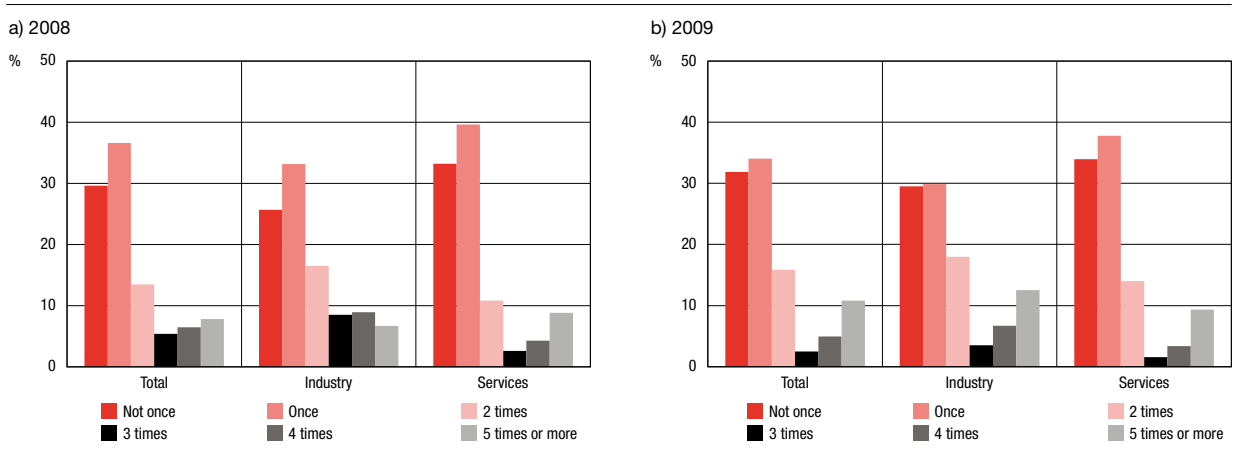
Source: CNB Survey.

price reviews, so that about three fourths of enterprises (72%) changed their main products' prices once a year or less frequently. The results show that the median enterprise in Croatia changes its main product's price less frequently than once a year. This finding is different from that for the eurozone, where the median enterprise changes its main product's price once a year. The relatively rare changes of the main products' prices suggested by the survey results for Croatia are in line with the results of an empirical analysis of the domestic inflation rate based on the new Keynesian Phillips curve (Krznar, 2011), suggesting that the price change frequency parameter is relatively low, i.e. that enterprises change their prices on average every eight quarters.

As in the case of price reviews, it was shown that the prices of services and those charged by small enterprises are less frequently changed. Also shown was that, as a rule, 71% of all enterprises that change their prices once a year do so in a particular month, most often January (28%) or September (10%).

In the next step, the enterprises were supposed to answer how many times the prices of their main products changed during 2008 and 2009, the years marked by strong volatility of crude oil and food raw material prices in the global market, i.e. by their increase in the first half of 2008, followed by a gradual decline, which was spurred by expectations of reduced demand for raw materials as a result of a global economic slowdown. According to the survey results, enterprises changed their prices more frequently in these years, so that the median enterprise changed the price of its main product once a year.

Figure 17 Frequency of the main product's price changes in 2008 and 2009 (Question 6.2)



Source: CNB Survey.

4.6 The speed of price adjustment after shocks

The analysis of the price change frequency is an important indicator of the degree of price stickiness, i.e. of a slow response to shocks. However, according to Blinder (1998), this is not enough for a conclusion that price stickiness exists, because rare changes in prices can be due to the fact that severe shocks of production cost changes or demand changes are rare. Therefore, the next question to enterprises was how much time elapsed between a considerable demand shock or a cost shock and the corresponding change in prices (the possibility that enterprises do not change prices was also taken into account).

An analysis of the cases of significant demand shocks (Table 3) shows that the share of enterprises adjusting their prices up to three months after a demand decrease shock (51.5%) is larger than that in the case of a demand increase shock (44.7%). This leads to a conclusion that in the case of significant demand shocks, prices are more flexible downwards than upwards. The reverse is true for significant cost change shocks, that is, prices have proved to be more flexible in cases of substantial production cost increases than in cases of production cost decreases. According to the survey results, in the case of a cost increase, 49.7% of enterprises change their prices up to three months after the shock, while in the case of a cost decrease the percentage is lower (42.9%).

Table 3 Percentages of enterprises that change prices up to three months from a shock (Question 6.8)

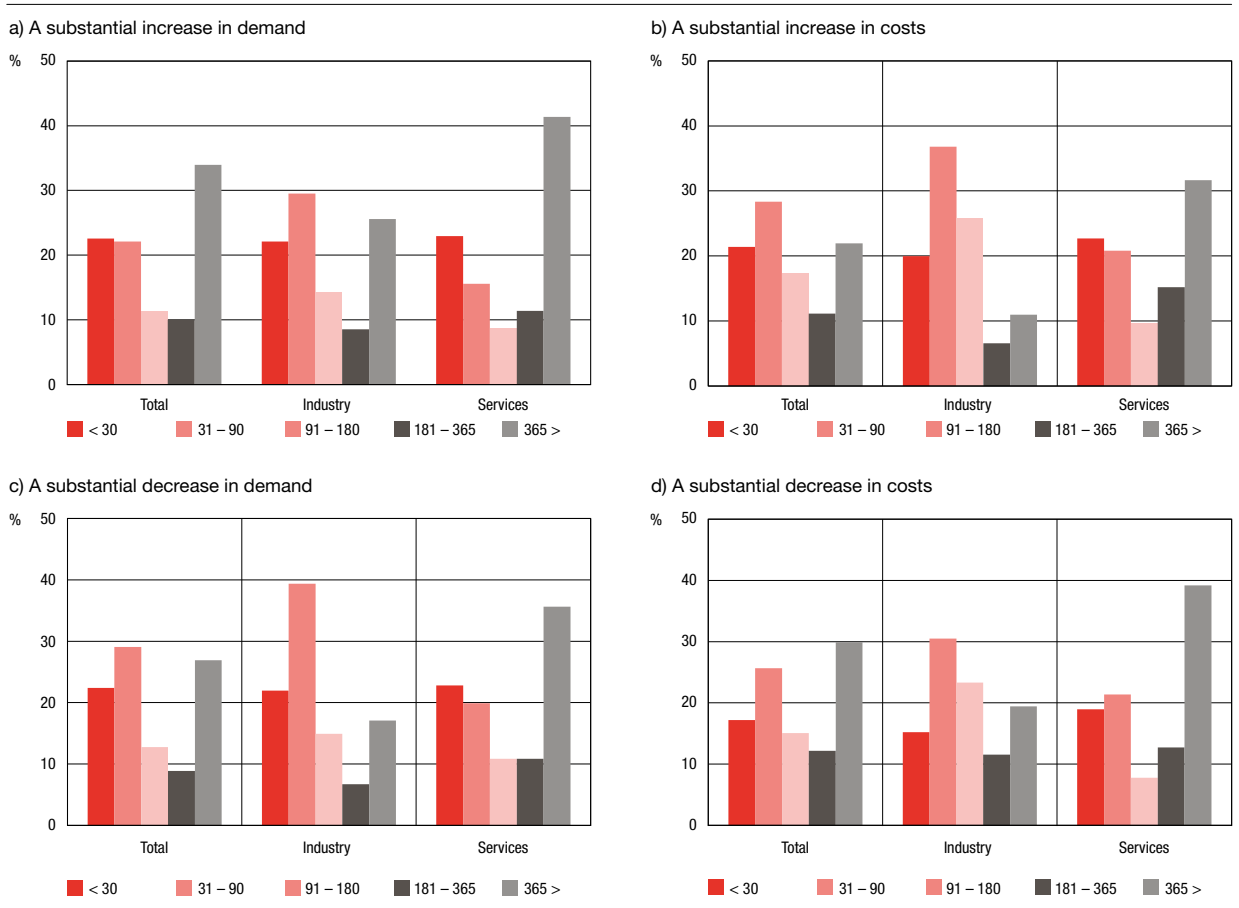
	Total	Industry	Services	Small	Medium-sized	Large
A substantial increase in demand	44.7	51.6	38.5	36.2	51.8	46.1
A substantial decrease in demand	51.5	61.3	42.7	39.3	61.3	53.9
A substantial increase in production costs	49.7	56.7	43.5	43.5	57.1	49.0
A substantial decrease in production costs	42.9	45.7	40.3	41.4	43.5	43.6

Source: CNB Survey.

According to the survey results, the median enterprise changes the price of its main product up to three to six months after a significant demand or cost shock, except in the case of a substantial decrease in demand to which the median enterprise responds more rapidly, after one to three months.

The analysis was carried out in five eurozone countries showing that enterprises in these countries mostly respond to shocks more rapidly than Croatian enterprises, i.e. that price stickiness is more pronounced in Croatia. The median enterprise in Austria, France, Luxembourg or Portugal[11] changes its price one to three months after a shock (regardless of the source and direction of the shock). Only in Spain[12] do enterprises mainly respond to shocks more slowly, i.e. with a lag of over three months (regardless of the source and direction of the shock).

Figure 18 The time lag with which enterprises change their main products' prices after a shock (Question 6.8)



Source: CNB Survey.

11 See Kwapil *et al.* (2005), Loupias *et al.* (2004), Lünnemann *et al.* (2006) and Martins (2005).

12 See Álvarez *et al.* (2005).

5 Main theories of price stickiness

The survey results show that price changes are rarer than price reviews. This may be the due to the fact that a price review might show that there is no need for a price change, or that an enterprise believes the price change cost would exceed its benefit. An enterprise sometimes decides to postpone a price change or to make just a slight change in the price.

This section therefore examines the possible reasons for postponing price changes. The survey contains a list of ten price stickiness theories, each of them summarised in one sentence understandable to the general public. Each theory suggests different causes of price stickiness. The theories do not exclude each other, so that enterprises were allowed to indicate several theories relevant (or irrelevant) to their respective businesses. Economic literature offers numerous explanations of price stickiness. The pioneering works are Blinder (1991) and Blinder et al. (1998), in which the price-setting behaviour of enterprises in the USA is examined on the basis of the firm surveys carried out. These works, in which the interviewing method was used as a new way for empirical relevance testing of various price stickiness theories, have subsequently spurred the conduct of such surveys in numerous other countries. Below is a presentation of major theories of price stickiness (according to Blinder, 1998 and Fabiani, 2005).

1. Cost-based pricing

This theory represents an old Keynesian idea of prices being based on costs (of labour and raw materials), and it is assumed that prices do not change unless there is a change in costs. Given that the prices set by one enterprise constitute costs for of another enterprise in the production chain, this can result in a considerable time lag in price adjustment after a shock.

2. Explicit contracts

Enterprises may have written or oral contracts with their customers by which an enterprise undertakes to offer a product at a certain price during a certain period. The price can only be changed after renegotiation. The reason why enterprises enter into such contracts is that they want to establish long-term relationships with the customers in order to ensure stable revenues in the future. Such arrangements are also attractive to customers, because they enable them to anticipate their future costs and reduce the shopping time. Customers can therefore focus on an average price in the long run, rather than on a current price. The idea of explicit contracts as relevant factors of price rigidity has been introduced into the economic literature through wage contracts.

3. Implicit contracts

According to this theory, as in the case of explicit contracts, enterprises seek to establish long-term relationships with the customers, i.e. to earn the loyalty of customers by changing the prices as rarely as possible. Prices can go up as a result of higher costs and increased demand. According to the implicit contract theory, customers consider higher costs a valid reason for a price increase, while they do not consider higher prices due to stronger demand justifiable. Hence, in order to avoid jeopardising their relationships with customers, enterprises refrain from changing their prices in response to shocks caused by considerable increases in demand.

4. Coordination failure

As in the case of explicit contracts, this relatively old concept has been introduced through labour market analyses. It implies that an enterprise hesitates to increase or decrease a price until other enterprises do so, because it assumes that it will lose customers if it raises the price without other enterprises following its example. By contrast if an enterprise reduces a price, this can this can spark off a price war and lead to a drop in profits. Accordingly, an enterprise will change its prices after a shock only if other enterprises do the same.

Without a coordination mechanism allowing enterprises to change prices simultaneously, the prices can remain fixed.

5. Menu costs (e.g. price list printing costs)

Each price change entails costs (the printing and distribution of new price lists). Therefore, an enterprise bearing such costs will change prices less frequently than a similar enterprise that has no such costs.

6. Costly information

This concept is broader than the term *menu costs* (which only relates to the actual cost of price list printing). It implies that the bulk of the price change cost relates to the time and effort spent by managers in order to collect relevant information and to take and implement adequate decisions.

7. Temporary shocks

When an enterprise expects a shock to be temporary, it may consider it a right decision not to adjust prices, because the new optimal price is considered to be short-lived and the enterprise assumes that the price will soon have to be adjusted in the opposite direction, which can undermine its relationships with customers.

8. Change of non-price factors

The price of a product is only one of the characteristics that can be adjusted in response to changes in the environment. This means that in times of low (high) demand, enterprises can reduce (extend) the delivery time or provide more (fewer) additional services.

9. Judging quality by price

It is argued that enterprises would not reduce the prices of their products, because customers could interpret such reductions as reductions in quality. Therefore, enterprises prefer to keep nominal prices constant.

10. Pricing thresholds

Many enterprises set thresholds for their prices, assuming than even a small increase in the price above such a threshold will strongly affect demand. In the event of milder shocks, an enterprise will postpone the price adjustment until it is justified to increase the price to the next threshold level.

The theories of price stickiness are classified into three groups (Tables 4 and 5) according to their average ratings: the first group includes theories with an average rating higher than 2.9; the second group contains those with an average rating between 2.5 and 2.8, and the third group includes theories with an average rating lower than 2.1. According to the average rating results, the implicit contracts and cost-based pricing theories are the most relevant in accounting for price stickiness in Croatia (the first group of theories). It showed that price stickiness is closely related to enterprises' endeavours to establish long-term business relationships with their customers and to customers' preferences for stable nominal prices. This finding is in line with that shown in Section 3.2, i.e. that the share in revenues from the main product sale pertaining to regular customers, i.e. those with which the enterprise has had a business relationships for over a year, stands at an average of 76%.

Price stickiness can also be accounted for by the explicit contract, co-ordination failure and temporary shocks theories, as well as by a theory of lower prices as indicators of quality deterioration (the second group of theories).

By contrast, the third group theories, primarily the preference for prices to remain at a certain psychological level and menu costs (e.g. price list printing, website updating costs, etc.), as well as the costs of collecting and processing information are not suitable for explaining price stickiness in Croatia. However, it should be noted that in the customer structure of the surveyed enterprises other enterprises prevail, whereas

Table 4 Main theories of price stickiness – reasons for delaying a price increase (Question 5.1)

	Price increase	
	Average rating[1]	Important and very important, %[2]
Our customers prefer stable prices. Frequent changes in prices may undermine our business relationships with customers.	3.27	80.1
Prices mainly depend on labour and raw material costs; therefore we will not change the prices until the costs change.	3.15	80.2
We have written/oral contracts with our customers, which provide that prices can only be changed upon expiry of such contracts.	2.83	62.9
There is a risk that our competitors will not change their prices.	2.78	64.3
There is a risk that we will subsequently have to adjust our prices in the opposite direction.	2.46	51.0
There is a possibility of applying alternative price change measures (e.g. a change in delivery time).	1.97	23.2
The costs of the collection and processing of information used for taking decisions on price changes.	1.84	20.1
A preference for prices to remain at a certain psychological level (e.g. HRK 9.99).	1.78	17.6
There are menu costs (e.g. price list printing and website updating costs, etc.).	1.63	10.4

[1] For each factor, one of the following options was to be chosen: 1 – unimportant; 2 – of minor importance; 3 – important; 4 – very important; 0 – unable to evaluate.
[2] The share of enterprises considering a particular factor as important or very important.
Source: CNB Survey.

Table 5 Main theories of price stickiness – reasons to refrain from decreasing prices (Question 5.1)

	Price decrease	
	Average rating[1]	Important and very important, %[2]
The prices mainly depend on labour and raw material costs, so that we will not change prices until the costs change.	3.01	76.4
Our customers prefer stable prices. Frequent price changes might undermine our business relationships with customers.	2.86	68.5
We have written/oral contracts with our customers, which provide that prices can only be changed upon expiry of such contracts.	2.66	57.5
There is a possibility that a customer would misinterpret price reductions as a quality deterioration.	2.59	55.0
There is a risk that our competitors will not change their prices.	2.57	51.0
There is a risk that we will subsequently have to adjust our prices in the opposite direction.	2.52	53.4
There is a possibility of implementing alternative price change measures (e.g. a change in delivery time).	2.01	27.1
The costs of collection and processing of information used for taking decisions on price changes.	1.79	18.5
A preference for prices to remain at a certain psychological level (e.g. HRK 9.99 kuna).	1.77	20.8
There are menu costs (e.g. price list printing and website updating costs, etc.).	1.61	12.8

[1] For each factor, one of the following options was to be chosen: 1 – unimportant; 2 – of minor importance; 3 – important; 4 – very important; 0 – unable to evaluate.
[2] The share of enterprises considering a particular factor as important or very important.
Source: CNB Survey.

a significantly smaller share of total revenues from the sale of the surveyed enterprises' main products is generated by direct sales to customers. This could be the reason why the pricing thresholds and the menu costs theories proved to be less relevant for explaining price stickiness in the economy.

The relevance results for specific theories of price stickiness in Croatia are in line with the results for the eurozone, indicating that implicit and explicit contracts are the most important for explaining price stickiness. Other relevant explanations for price stickiness in the eurozone include cost-based pricing and co-ordination failure.

6 An analysis of factors stimulating changes in the main product's price

The surveyed enterprises were also asked to rank the factors influencing decisions to increase or decrease the price of a product according to their relevance. The purpose of the question was, among other things, to examine if there is asymmetry in the relevance of the factors that induce a price increase or decrease.

The factors inducing increases in the main products' prices are ranked according to the average ratings obtained and are shown in Table 6. The results show that increases in demand and costs (especially the raw material and wage costs) are the main factors influencing decisions on price increase. Findings related to the relevance of particular factors influencing price increases differ slightly from those for the eurozone, where the raw material and labour costs are the main factors in raising the prices, whereas demand for the main product ranks lower.

Table 6 Factors influencing the main product's price increase (Question 6.7)

	Price increase	
	Average rating[1]	Important and very important, %[2]
Changes in demand for the main product	3.17	78.0
Changes in raw material prices	3.14	73.6
Changes in labour costs	3.11	77.8
Quality improvement of the main product	3.07	79.2
Changes in energy and fuel prices	3.01	70.2
Changes in the competitors' prices	2.92	72.4
Changes in the kuna exchange rate	2.79	62.6
Changes in other production costs	2.65	58.4
Lower productivity	2.61	56.1
Changes in financing costs (e.g. interest rates)	2.59	56.3

[1] For each factor, one of the following options was to be chosen: 1 – unimportant; 2 – of minor importance; 3 – important; 4 – very important; 0 – unable to evaluate.
[2] The share of enterprises considering a particular factor as important or very important.
Source: CNB Survey.

Table 7 Factors influencing the main product's price decrease (Question 6.7)

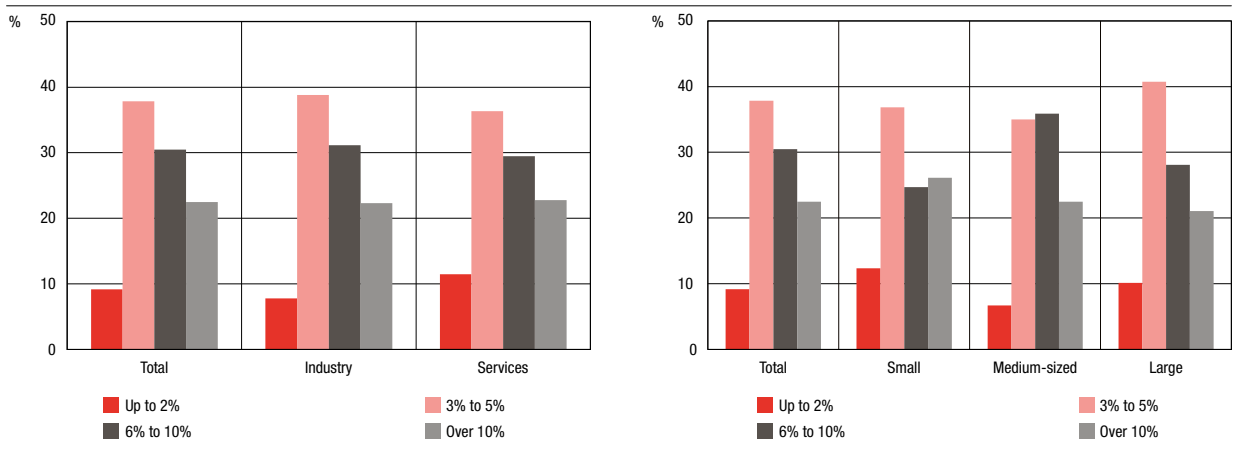
	Price decrease	
	Average rating[1]	Important and very important, %[2]
Changes in demand for the main product	3.21	80.2
Changes in the competitors' prices	3.05	74.0
Changes in raw material prices	2.97	68.1
Intention to acquire a market share	2.90	68.6
Changes in labour costs	2.89	66.4
Changes in energy and fuel prices	2.84	66.0
Changes in the kuna exchange rate	2.69	57.2
Productivity increases	2.56	53.2
Changes in other production costs	2.55	51.9
Changes in financing costs (e.g. interest rate)	2.52	51.0

[1] For each factor, one of the following options was to be chosen: 1 – unimportant; 2 – of minor importance; 3 – important; 4 – very important; 0 – unable to evaluate.
[2] The share of enterprises considering a particular factor as important or very important.
Source: CNB Survey.

While changes in demand for the main product remain the key factor of influence in the event of a price decrease as well, the importance of fluctuations in competitors' prices is even greater (Table 7). Changes in raw material prices remain a highly ranked factor influencing price decreases. Findings related to the relevance of particular factors in reducing prices are in line with those for the eurozone, where the shocks prompting changes in market conditions (a decrease in demand and in the competitors' prices) are the most important factors of influence on price decrease.

As in the eurozone, financial costs have proved to be a less important factor of influence on price change. These results show that changes in the kuna exchange rate also represent a less important factor influencing price change. Enterprises were further asked about the amount of the kuna exchange rate increase or decrease that would motivate them to change the prices of their main products (Question 6.10). According to the survey results, a relatively small number of enterprises (9%) would change the prices of their products in response to a relatively small change in the exchange rate (up to 2%). The bulk of enterprises (38%) would adjust the prices of their products in the event of a change in the exchange rate from 3% to 5%. About 22% of them would change the prices only in the event of substantial exchange rate changes (of over 10%).

Figure 19 Intensity of the strengthening/weakening of the kuna exchange rate necessary to effect a change in the main product's price (Question 6.10)



Source: CNB Survey.

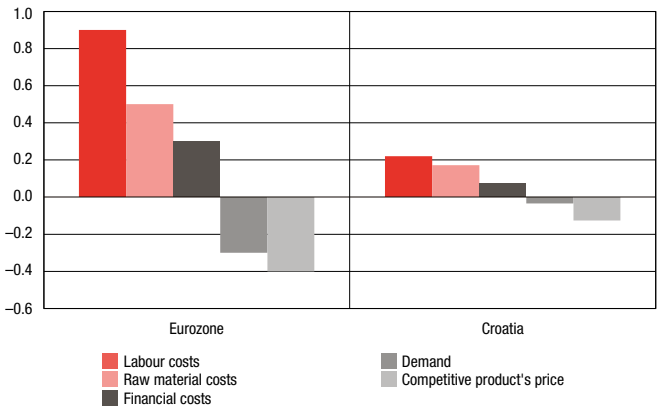
In order to establish if there is asymmetry in the relevance of the factors influencing a price increase or decrease, we calculated the difference between average ratings for five factors influencing a decision on a price increase and a decrease. An explanation of a possible asymmetry suggested in the literature is the implicit contract theory, that is to say, if customers consider that price increases caused by higher costs are justified (as argued in the said theory) and that those caused by stronger demand are not, enterprises are more likely to increase their prices in response to cost shocks than in response to demand shocks, because they do not want to undermine their business relationships with customers.

Figure 20 suggests that, as in the eurozone, asymmetry exists in Croatia and that changes in the cost-related factors are relatively more important for stimulating price increases[13], whereas changes in demand and in the competitors' prices are relatively more important for price decreases[14]. However, this asymmetry is much less pronounced in Croatia than in the eurozone.

13 The difference between the average rating for a particular cost factor obtained for a price increase and the average rating for a price decrease is positive.

14 The difference between the average rating for factors associated with market conditions, obtained for a price increase and the average rating for a price decrease is negative.

Figure 20 Asymmetry in the relevance of factors stimulating price increases/decreases
(difference between the average ratings for a particular factor in the case of a price increase vs. a price decrease)



Source: CNB Survey.

7 Determinants of price stickiness

7.1 Determinants of price change frequency

This chapter tries to identify the main determinants of the frequency with which the prices of domestic enterprises' main products are changed. In other words, based on the survey responses and using simple linear models, we seek to determine those characteristics of enterprises that account for more frequent or rarer price changes, and to estimate their marginal influence on the price change frequency.

The values of the variable explained here have been obtained on the basis of the responses to Question 6.2, in which enterprises indicated how many times they changed the prices of their main products during 2008 and 2009. As the number of the product price changes belongs to the set of negative integers (i.e. it assumes the values of 0,1,2,3...), its dynamics cannot be modelled by standard linear regression models for continuous data. Instead of them, one of the so-called count data models, such as the Poisson regression model or (the slightly more general) negative binomial regression model, is used.

7.1.1 Methodology – Poisson and negative binomial regressions

Let us first assume that the number of price changes, marked as Y, has a Poisson distribution with parameter μ. The consequence of this is that the probability of exactly y changes is given by the following formula:

$$P(Y = y) = \frac{e^{-\mu}\mu^{y}}{y!}, za\ y = 0, 1, 2, \ldots$$

A well-known characteristic of the Poisson distribution is that the first two moments (expectation and variance) are identical. In our case $E(Y) = Var(Y) = \mu$. The Poisson regression model is defined by the relation between the expectation parameter of the upper Poisson distribution and a series of characteristics of an enterprise, which account for the frequency of price changes. This relation is most often exponential:

$$\mu_i = E(Y_i \mid x_i) = (Var(Y_i \mid x_i)) = \exp(x'_i\beta),$$

where x_i represents variables explaining the frequency of price changes, and β is the parameter to be estimated[15]. The assumed function form entails a marginal influence of the change of a (continuous) variable x_i on the number of price changes:

$$\frac{\partial E(Y \mid X)}{\partial x_i} = \beta_i \exp(X'\beta),$$

it follows, therefore, that the estimated parameter β only suggests the direction of response, while the marginal effect varies for different enterprises. In our case, instead of a classic marginal effect on the change in frequency, we observed the percentage change of the expected frequency of changes in the prices of an enterprise having a certain characteristic. For example, the fact that an enterprise has a certain characteristic is presented in the model by the associated dummy variable taking the value of 1, i.e. $x_k = 1$. Then, the relative contribution of exactly this characteristic to the expected price change frequency is given by the following relation:

$$\frac{E(Y_i \mid X, x_k = 1)}{E(Y_i \mid X, x_k = 0)} = \exp(\beta_k).$$

In practice, the Poisson regression assumption about the equality of conditional expectations and variance is often not satisfied. For example, in the event of *overdispersion,* when data variance is higher than expected, the maximum likelihood estimates do not have all the expected good qualities. More precisely, these estimates are often consistent, but underestimated standard errors result in (too) high *t*-statistics and high significance of the given parameters. Therefore, the standard Poisson model is generalised by assuming the so-called negative binomial distribution of data with the following density:

$$f(y \mid \alpha, \mu) = \frac{\Gamma(\alpha^{-1} + y)}{\Gamma(\alpha^{-1})\Gamma(y)} \left(\frac{\alpha^{-1}}{\alpha^{-1} + \mu}\right)^{\alpha^{-1}} \left(\frac{\mu}{\alpha^{-1} + \mu}\right)^{y},$$

where Γ is the standard gamma function. From this distribution, a Poisson distribution is obtained as a special case, assuming $\alpha = 0$. In contrast to the Poisson distribution, this model's variance is a more general, quadratic function of expectations, standing at $\mu + \alpha\mu^2$, where α is an additional parameter to be estimated.

7.1.2 The analysis results for the determinants of the price change frequency

The variables used in this analysis to explain the frequency of changes in domestic enterprises' prices can be classified into several basic groups.

The basic quality characteristics of an enterprise that can influence the frequency of price changes in the model are taken into account by using two indicator variables: for *Small enterprises* and for enterprises from the *Industry* sector.

The influence of *demand* and *cost structure* of an enterprise on price change frequency is measured by three variables: *Demand, Energy* and *Labour costs.* These variables have been constructed on the basis of responses to the Survey Question 6.7, in which the enterprises indicated the relevance of changes in particular factors for the change of their main products' prices in the domestic market. If an enterprise assessed one of the factors as important or very important, in the event of a price change (in this case – a price increase), the associated indicator variable assumes the value of zero; otherwise, it assumes the value of zero.

The influence of an *enterprise's market power and the degree of competition* on the frequency of price changes is measured by three indicators. First, we observe enterprises with the shares of the main product in the domestic market of over 50%. Then, as an important extreme case, we take into account the fact that such an enterprise has no major competitors for its main product. Finally, in order to measure the influence of a high degree of competition in developed foreign markets, we also identify enterprises generating more than half of their revenues from selling their main products in the eurozone countries.

The last group of variables has been constructed in order to analyse more closely how *the pricing methods of*

15 Parameters for this model can be estimated by the maximum likelihood method, assuming the exponential relationship and independence of the observed data.

Table 8 Determinants of the price change frequency, a negative binomial model

	Negative binomial model			
	Estimate	Standard error	Relative contribution	
Constant	2.43	0.49		***
Small enterprises	–0.49	0.23	0.61	**
Industry	0.22	0.26	1.24	
Demand	0.52	0.25	1.69	**
Energy	–0.69	0.33	0.50	**
Labour market	–0.57	0.29	0.57	*
Share of main product in the RC market > 50%	–0.27	0.35	0.76	
Share of revenues from the main product sale in the eurozone market > 50%	1.08	0.34	2.93	***
No major competitors.	–0.84	0.27	0.43	***
Administratively set price of the main product	–1.42	0.35	0.24	***
Constant mark-up	–0.57	0.27	0.57	**
Variable mark-up	0.09	0.28	1.10	
Share of revenues from the sale based on formal contracts > 50%	–0.86	0.21	0.42	***
Mc Fadden R-squared	0.13			

Note: The dependent variable has been constructed as the total number of price changes in 2008 and 2009 (Question 6.2).
The symbols ***, ** and * denote statistical significance at the levels of 99, 95 and 90%.
Source: Authors' calculation.

enterprises influence the frequency of price changes. For this purpose, indicators have been constructed for enterprises with administratively set main products' prices, for enterprises that charge constant or variable mark-ups on their prices and for enterprises generating the bulk of their revenues from formal contract-based sales.

In the first step of the analysis, a Poisson model is estimated, followed by the hypothesis testing of this model's adequacy. On the basis of the test, the null hypothesis of equidispersion is rejected in favour of an alternative hypothesis stating that the conditional variance is higher than the model expectations. The testing is usually carried out in two steps, whereas the test results in the second step, based on a standard t-test of redundancy of the linear model variable (t=7.9), suggest the inadequacy of the Poisson model. For detailed information on the test, see Cameron and Trivedi, 1990. Hence, along with the basic model, a negative binomial model has been estimated, using robust standard error estimates. The parameters have been estimated using the maximum likelihood method.

Table 8 gives the estimates of the influence of the said variables on the price change frequency in domestic enterprises based on a negative binomial model[16]. The estimated models suggest the following: The size of an enterprise has a significant influence on price stickiness. Thus, small enterprises change their prices less frequently on average, by about 40 percentage points (1-0.61) according to the negative binomial model, and by about 70 percentage points (1-0.33) according to the Poisson model, than medium-sized and large enterprises. Furthermore, the Poisson model results suggest that industrial enterprises also change their prices less frequently on average, which is, to some extent, contrary to the survey results. However, by adjusting the model for equidispersion of variance (the negative binomial model), this result becomes statistically insignificant.

The indicators used for the approximation of enterprises' marginal costs suggest that enterprises that change the prices of their products primarily on the basis of labour and energy costs make such changes less frequently than others. These results only partly match expectations: since the cost of labour is normally changed (negotiated) once a year, it can be expected that enterprises that change the prices of their products primarily on the basis of labour costs, would make such changes less frequently. However, as energy prices are changed frequently, it can be expected that enterprises changing their prices primarily on the basis of energy

16 Estimates based on the Poisson model are given in the Annex.

costs would make such changes more frequently than other enterprises. As expected, enterprises that employ demand for their main products as the key pricing factor change prices more frequently than others.

A statistically significant and economically relevant finding of this analysis relates to the influence of the degree-of-competition indicator on the frequency of price changes. For example, enterprises with the shares of the main products in the domestic market exceeding 50% change their prices less frequently, about 20 percentage points according to the negative binomial model, or 70 percentage points according to the Poisson model. Furthermore, enterprises with no major competitors in the domestic market according to both models change their prices more than twice as infrequently as enterprises doing business in a competitive environment. These results match the expectations that enterprises operating under conditions of relatively weak competition change their prices more rarely than those operating in relatively more competitive environments. By contrast, enterprises generating the bulk of their revenues in the eurozone market or in more competitive environments change their prices more frequently than other firms (about three times more frequently, according to both models). It should be noted that this variable reflects not only the degree of import competition but also the importance of the foreign price dynamics for domestic enterprises.

The pricing methods of enterprises and their relationships with clients also have an important influence of the price change frequency. As expected, enterprises setting their main products' prices administratively change the prices less frequently. Moreover, enterprises charging a constant mark-up on variable marginal costs when setting their prices change the prices less frequently on average than those applying different price-setting policies. Finally, enterprises deriving the bulk of their revenues from formal contract-based sales choose to change the prices more rarely, which is only to be expected as such enterprises can change the price of a product only subject to renegotiation of the sale contract.

7.2 Determinants of the price change after a demand shock or a cost shock

The analysis of determinants of the price change frequency provides a valuable insight into the possible sources of price stickiness. However, the frequency analysis itself is not sufficient to ensure that price stickiness exists, as rare price changes may be the consequence of the rare occurrence of major cost change and demand change shocks. In addition, it is not *a priori* clear to what extent the changing of prices by enterprises is the consequence of shocks. Therefore, as a complement to the previously mentioned analysis, we tried to identify these enterprises and see how they change prices due to shocks. For this purpose we used the following standard probit model:

$$P = (y_i = 1 \mid x_i) = \Phi(x_i^{\tau}\beta),$$

where Φ is a normal distribution function, y_i is the indicator variable taking the value of one in the case that an enterprise changes the price of its main product within one year[17] as a response to a shock, x_i is a set of explanatory variables consisting of the variables used in the previous price change frequency analysis. In this way, we defined four indicator variables relating to the shock of a considerable increase and decrease in demand, and a production cost shock. In accordance with this, we estimated the parameters of four probit models in order to identify the characteristics of enterprises that are related to a price change after a shock. Therefore, besides the coefficients, we also calculated the marginal effect of a particular variable in the model on the likelihood of a price change, as well as the associated standard errors and the level of significance of the effect.

Table 9 shows the model results explaining the enterprises' responses to changes in demand for their main products. The basic findings are as follows. There are a number of characteristics of enterprises associated

17 In order to test the robustness of the obtained results, the analysis was also carried out for shorter periods of response to the observed shocks. The results for probit models testing the responses of enterprises are very similar in qualitative terms to those shown in Tables 8 and 9, and are therefore not disclosed here.

Table 9 Responses of enterprises to demand shocks

	Negative demand shock					Positive demand shock				
	Estimate	Marginal effect	Standard error	p-value		Estimate	Marginal effect	Standard error	p-value	
Constant	0.15	0.04	0.08	0.62		–0.33	–0.11	0.10	0.29	
Small enterprises	–0.54	–0.15	0.05	0.01	***	–0.21	–0.07	0.06	0.25	
Industry	0.32	0.08	0.05	0.12		0.10	0.04	0.06	0.59	
Demand	1.01	0.27	0.06	0.00	***	1.14	0.38	0.07	0.00	***
Energy	0.15	0.04	0.06	0.46		0.14	0.05	0.07	0.48	
Labour market	0.04	0.01	0.06	0.86		–0.02	–0.01	0.07	0.93	
Share of main product in the RC market > 50%	–0.04	–0.01	0.08	0.89		0.06	0.02	0.09	0.81	
Share of revenues from the main product sale in the eurozone market > 50%	0.24	0.06	0.07	0.39		0.48	0.15	0.07	0.04	**
No major competitors	–0.06	–0.02	0.09	0.86		0.02	0.01	0.10	0.94	
Administratively set price of the main product	–0.94	–0.33	0.15	0.03	**	–1.13	–0.43	0.15	0.00	***
Constant mark-up	0.03	0.01	0.07	0.91		–0.12	–0.04	0.08	0.63	
Variable mark-up	0.25	0.07	0.06	0.23		0.40	0.13	0.06	0.04	**
Share of revenues from sales based on formal contracts > 50%	–0.38	–0.10	0.05	0.04	**	–0.40	–0.14	0.06	0.02	**
McFadden R-squared	0.22					0.21				
LR statistic	71.45					78.13				
Prob(LR statistic)	0.00					0.00				

Note: The symbols ***, ** and * denote statistical significance at the levels of 99, 95 and 90%.
Source: Authors' calculation.

with the likelihood of price changes due to both types of demand shock. For example, as expected, enterprises in which the main products' prices are set administratively respond to shocks with less likelihood of a price change within a year than other enterprises, i.e. by about 30% after a negative and 40% after a positive demand shock. In addition, the estimated likelihood of a price change within a year due to a demand shock is less for enterprises selling their products mainly on the basis of formal contracts. And finally, those enterprises that indicated a demand change as very important for a change in their prices are significantly more likely (by about 30%) to change prices within a year due to a demand shock. The degree-of-competition indicators have generally proved insignificant for the enterprises' responses to demand shocks.

Asymmetry in the response to demand shocks is reflected in the fact that enterprises setting their prices with variable mark-ups are more inclined to change prices in the event of a demand increase, but are only insignificantly inclined to do so in the event of a demand decrease. Similarly, there is less likelihood (15%) that small enterprises will change their prices in response to a fall in demand, whereas this effect is insignificant in the case of a rise in demand.

Table 10 shows the responses of enterprises to a change in production costs. Here, too, the likelihood of price changes is strong for enterprises that attach great importance to demand. This applies to both positive and negative shocks. In line with expectations, enterprises that set their prices taking account of energy prices and labour costs are more likely to change the prices of their main products within a year after a cost shock. However, this is an asymmetric relation and it applies only to responses to a cost increase. Moreover, enterprises in which the main products' prices are set administratively are less likely to change prices in response to negative cost shocks within a year than other enterprises (by about 30%). In addition, the estimated likelihood of a price change within a year due to a demand shock is less for enterprises selling their products on the basis of formal contracts under which the price of the main product is fixed for a certain period of time. As in the

Table 10 Responses of enterprises to production cost shocks

	Negative demand shock					Positive demand shock				
	Estimate	Marginal effect	Standard error	p-value		Estimate	Marginal effect	Standard error	p-value	
Constant	0.01	0.00	0.09	0.98		0.06	0.01	0.06	0.86	
Small enterprises	–0.21	–0.06	0.06	0.27		–0.49	–0.09	0.04	0.03	**
Industry	0.35	0.10	0.05	0.07	*	0.36	0.06	0.04	0.13	
Demand	0.56	0.16	0.06	0.01	***	0.48	0.08	0.04	0.05	**
Energy	0.23	0.07	0.06	0.23		0.54	0.10	0.04	0.01	**
Labour market	0.32	0.09	0.06	0.12		0.42	0.07	0.04	0.08	*
Share of the main product in the RC market > 50%	–0.33	–0.11	0.09	0.23		0.05	0.01	0.06	0.88	
Share of revenues from the main product sale in the eurozone market > 50%	–0.02	–0.01	0.07	0.94		0.36	0.06	0.05	0.24	
No major competitors	0.43	0.11	0.06	0.10	*	0.20	0.03	0.05	0.53	
Administratively set price of the main product	–0.74	–0.26	0.15	0.08	*	–0.53	–0.12	0.11	0.27	
Constant mark-up	0.17	0.05	0.07	0.50		0.50	0.07	0.04	0.06	*
Variable mark-up	0.20	0.06	0.06	0.31		0.45	0.07	0.04	0.05	**
Share of revenues from sales based on formal contracts > 50%	–0.34	–0.10	0.05	0.05	*	–0.18	–0.03	0.04	0.39	
McFadden R-squared	0.22					0.21				
LR statistics	71.45					78.13				
Prob(LR statistic)	0.00					0.00				

Note: The symbols ***, ** and * denote statistical significance at the levels of 99%, 95% and 90%.
Source: Authors' calculation.

case of demand shocks, the degree-of-competition indicators have a very limited influence on the likelihood of a price change due to cost shocks.

An important finding in this respect is an asymmetric reaction to a negative or a positive cost shock of enterprises that set their prices with variable mark-ups. The analysis results suggest that enterprises are inclined to change the prices only after a fall in costs, while the reaction is insignificant in the case of a rise in production costs.

8 Conclusion

The paper presents the results of a firm survey on the price setting and reviewing behaviour of Croatian enterprises, in order to shed more light on the issue of price stickiness, i.e. of a relatively slow adaptation of prices to changes in the economic environment. This is an important issue for monetary policy makers, because, according to the macroeconomic literature, monetary policy can produce real effects in the event of price stickiness, at least in the short run. Presented below are the complete results of a firm survey analysis for Croatia, with an emphasis on a difference in the pricing practices between this country and the eurozone, based on Fabiani *et al.* (2005).

Price stickiness occurs when there is a deviation from perfect competition, i.e. when enterprises enjoy a certain degree of autonomy in price-setting decisions. The survey results suggest that imperfect (monopolistic)

competition models more accurately describe the domestic market situation than perfect competition models, because it showed that the bulk (about two thirds) of enterprises in Croatia enjoy autonomy in setting the prices of their products. Most of these enterprises determine the prices by adding some sort of a variable mark-up to the costs. The survey results further show that price discrimination prevails in practice, where the prices charged to different customers most often depend on the quantity sold, and less than a third of all enterprises apply equal prices to all customers.

Under normal circumstances, about 50% of enterprises apply the time-dependent pricing rules. However, in the event of major economic shocks, only 11% of enterprises would stick to that strategy, while 84% of them would move to the state-dependent pricing strategy. The share of enterprises applying the state-dependent pricing rules in the event of major market shocks is larger in Croatia than in the eurozone where it accounts for about two thirds of the total. This indicator therefore suggests that price stickiness is less pronounced in Croatia than in the eurozone, i.e. that price flexibility in the event of shocks is higher in Croatia.

Taken as a whole, the survey results for Croatia support the modelling of inflation dynamics on the basis of the hybrid new Keynesian Phillips curve, as it showed that the bulk of enterprises in Croatia (56%) review their prices on the basis of information on the current and expected future movements of numerous economic indicators, while a sizable portion of enterprises (28%) make their pricing decisions on the basis of the current and past movements of numerous indicators, without taking into account economic projections.

The median enterprise in Croatia changes its main product's price less frequently than once a year. This finding differs from that for the eurozone, where the median enterprise changes the price once a year. The relatively rare changes of the main product's price suggested by the survey results for Croatia are in line with the results of an empirical analysis of the domestic inflation rate based on the new Keynesian Phillips curve (Krznar, 2011), showing that the price change frequency parameter is relatively low, i.e. that enterprises change prices on average every eight quarters.

Rare price changes may be the consequence of the rare occurrence of severe shocks of production cost change and demand change. Therefore, the enterprises were asked about the time that passed between a major demand shock or a major cost shock and the ensuing price change, and it showed that the median enterprise changes its main product's price three to six months after a major demand or cost shock, except in the case of a substantial decrease in demand to which the median enterprise responds more rapidly (after one to three months). The analysis carried out in five eurozone member countries demonstrates that enterprises in these countries respond more rapidly to shocks than those in Croatia. Thus, the median enterprise in Austria, France, Luxembourg or Portugal changes its price one to three months after a shock (regardless of the source or direction of the shock).

An analysis of severe shocks in demand shows that a larger portion of Croatian enterprises (51.5%) adapt their prices up to three months after a demand decrease shock than after a demand increase shock (44.7%). This suggests that prices are more flexible downwards than upwards in the case of major demand shocks. The reverse is true for major cost change shocks.

The results based on average ratings show that the implicit contract theory and the cost-based pricing theory are the most important for the explanation of price stickiness in Croatia. It was shown that price stickiness is strongly related to the efforts to build long-term business relationships with customers, and to customer preferences for stable nominal prices. This finding is correlated with the discovery that the share in revenues from sales of the main product to steady customers, i.e. those with which an enterprise has had a business relationship for over a year, is 76% on average. The theories relevant for the explanation of price stickiness also include the explicit contract, co-ordination failure and temporary shocks theories, as well as the theory of price reduction as a sign of quality deterioration.

Increased demand and higher costs (especially of raw materials and wages) are the main factors influencing price increase decisions. These results deviate slightly from those for the eurozone, where the raw materials and labour costs are the most important factors influencing price increases, while demand for the main product ranks lower. Shocks that influence changes in market conditions (changes in demand and in the competitor's price) are the most important factors influencing price decreases.

The estimated regression models suggest that the size of an enterprise has a significant influence on price

stickiness, i.e. small enterprises change their prices less frequently on average. A statistically significant and economically relevant finding of this analysis is that enterprises operating in relatively less competitive environments change their prices less frequently than enterprises doing business in conditions of relatively vigorous competition. The manner in which enterprises set prices and their relationships with customers also have an important influence on the frequency of price changes. Thus, enterprises in which the main product's price is set administratively, and those deriving the bulk of their revenues from formal contract-based sales change their prices less frequently.

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Annex A: CNB Survey on the price-setting behaviour of enterprises in Croatia

Introductory notes

Through its monetary policy aimed at maintaining low, stable and predictable rates of inflation, the Croatian National Bank seeks to support economic growth in Croatia. There are numerous theories about the price-setting behaviour of enterprises. The purpose of this research is to test these theories in practice and to help better understand the price-setting behaviour of Croatian enterprises.

This Survey is aimed at providing information on the price-setting policy of your firm. The questions relate to the main product (a good or service) sold by your firm in the Croatian market. You can indicate, for example, a product that had the largest share in total sales revenues in 2009, or a product which, in your opinion, best represents your firm's main activity. Your answers should relate to that product and, unless otherwise specified, to the year 2009.

The term "price" refers to the actual selling price of your main product. Therefore, we request that, if it is habitual in your business activity to allow discounts on the prices stated in the pricelist, your answers should relate to the discounted price of a good or service. However, if your firm applies different prices to different customers, your answers should relate to the most common type of customer.

The Croatian National Bank guarantees strict confidentiality of your responses, which will only be used for purposes of economic research. Thank your for your cooperation.

IMPORTANT: As this Survey is to be the basis for a future CNB analysis of the price-setting behaviour of Croatian enterprises, it is extremely important that the responding person should be a member of your firm's management board who is involved in the decision-making processes and who participates in setting the prices of the products and services offered by your firm.

Please return the completed questionnaire before _____ .

QUESTIONNAIRE

1 BASIC INFORMATION ON THE FIRM AND MAIN PRODUCT

1.1 What was the total revenue of your firm in 2009?

Please choose one of the categories below:

1. – up to HRK 100,000 (go to Question 1.2)
2. – HRK100, 001 to HRK 500,000 (go to Question 1.2)
3. – HRK 500,001 to HRK 1,500,000 (go to Question 1.2)
4. – over 1,500,000 (go to Question 1.2)
5. – I do not know/I do not want to answer.

1.2 What was the average number of employees in your firm in 2009?

Please choose one of the categories below:

1. – 1 to 50 employees
2. – 50 to 199 employees
3. – 200 or more employees
4. – I do not know/I do not want to answer.

1.3 Specify your main product (a good or service) in the Croatian market:

_____

1.4 What was the share of revenues from your main product in the total sales revenues in 2009?

_____ %

1.5 What percentage of the total sales revenues from your main product relates to each of the following markets?

Please note that the total must be 100%.

- Croatia ____ %
- eurozone ____ %
- other countries ____ %
- Total 100 %

2 BASIC INFORMATION ON THE MARKET STRUCTURE FOR YOUR MAIN PRODUCT IN CROATIA

2.1 What is the structure of your customers according to the share in sales revenues from your main product?

Please note that the total must be 100%.

- other firms ____ %
- private customers ____ %
- public administration (central or local government) ____ %
- other (please, specify) ____ %
- Total 100 %

2.2 How many major competitors (domestic and foreign) do you have for your main product in the Croatian market?

(Please, choose only one option.)

- none ____
- less than 5 ____
- between 5 and 20 ____
- over 20 ____

2.3 What is the market share of your main product in the Croatian market?

(Please, choose only one option.)

- less than 5% ____
- 5% – 20% ____
- 21% – 50% ____
- 51% – 99% ____
- 100% ____

2.4 What are the percentages of revenues generated from the sale of your main product in the Croatian market to your regular customers, i.e. those with which you have been doing business for over a year, and to your occasional customers?

Please note that the total must be 100%.

- regular customers ____ %
- occasional customers ____ %
- Total 100 %

3 SETTING THE PRICE OF YOUR COMPANY'S MAIN PRODUCT

3.1 The actually charged selling price (the one that includes discounts) of your main product in the Croatian market:

- is the same for all customers ____
- depends on the quantity sold ____
- is determined on a case-by-case basis ____
- differs depending on other criteria *(please specify)* _____ ____

3.2 Which of the following statements best describes the way of setting the price of your main product?

(Please choose only one option.)

- We set the price independently (e.g. on the basis of costs). ____ *(go to Question 3.3)*
- We set the price in accordance with the price of our main competitor. ____ *(go to Question 3.4)*
- The parent company sets the price. ____ *(go to Question 3.4)*
- The price is set by our main customer(s). ____ *(go to Question 3.4)*
- The price is set administratively. ____ *(go to Question 3.4)*
- Other *(please, specify)* _____ ____ *(go to Question 3.4)*

3.3 There are different pricing methods. Please, indicate the degree to which the statements below apply to your company:

(Please, quote the relevant importance for each answer by choosing one of the options: 1 – unimportant; 2 – of minor importance; 3 – important; 4 – very important; 0 – unable to evaluate)

- We set the price by adding a constant profit margin to the variable production costs per unit (i.e. the costs of labour and other inputs, e.g. raw materials). ____
- We set the price by adding a profit margin to the variable production costs per unit, which varies depending on the market conditions. ____
- We tie the price to movements in the general price level (e.g. the consumer price index). ____
- We tie the price to the kuna exchange rate ____
- Other *(please, specify)* _____ ____

3.4 Does your company normally use formal contracts to fix the price of your main product for a given period?

- No. _____ (*Go to Question 3.6*)
- Yes. _____ (*Go to Question 3.4a*)

3.4a The share of sales based on the said fixed-price contracts in total sales of your main product accounts for:

- less than 10% ____
- 11% – 25% ____
- 26% – 50% ____
- 51% – 90% ____
- almost the total sales (over 90%). ____

3.5 If you use fixed-price contracts, for how long do you usually warrant your price?

- (number of months) ____

3.6 Assume that your firm operates at a normal production level, but wants to step up production. How would this change the variable production costs per unit (i.e. the costs of labour and other inputs, e.g. raw materials)?

(Please choose only one option.)

- The costs will increase. ____
- The costs will remain unchanged. ____
- The costs will decrease. ____
- I do not know. ____

4 REVIEWING THE PRICE OF THE MAIN PRODUCT

(It is assumed that companies occasionally review the prices of their products, without necessarily changing them; price revision is considered to be the assessment of all information relevant for price determination; this note should perhaps be displayed separately in order to make sure that the respondents will read it.)

4.1 When do you review the price of your main product (without necessarily changing it)?

(Please choose only one option.)

- at defined time intervals; (*go to Question 4.2*)
- usually at defined time intervals, but sometimes also in reaction to changes in market conditions (e.g. changes in the raw material prices, demand or in the competitors' prices); (*go to Question 4.2*)
- without a predetermined time interval, but in reaction to changes in market conditions (e.g. changes in the prices of raw materials, demand or the competitors' prices; (*go to Question 4.3*)
- other; (please specify) _____ (*go to Question 4.3*)

4.2 At what frequency is the price of your main product reviewed?

(Please choose only one option.)

- several times a year:
  daily __ weekly__ monthly__ quarterly__ semi-annually__ at irregular time intervals ___;
- once a year, normally in:
  Jan.__ Feb.__ March__ April__ May__ June__ July__ Aug.__ Sept.__ Oct.__ Nov.__ Dec.__ no specific month __.
- less than once a year:
  at an interval of ____ years;
  no rules on that. _____.

4.3 What information do you mostly take into account when reviewing the price of your main product?

(Please choose only one option.)

- Information regarding current and past movements in numerous indicators relevant for profit maximization (demand, costs, the prices of main competitors, etc.); ____
- Information regarding current and expected movements of numerous indicators relevant for profit maximization (demand, costs, the prices of main competitors, etc.); ____
- We usually apply a rule of thumb (e.g. fixed percentage change, indexation to consumer price inflation, exchange rate or wage growth; etc.). ____
- Other (please specify) _____

5 FACTORS INFLUENCING THE POSTPONEMENT OF CHANGES IN THE MAIN PRODUCT'S PRICE

5.1 Which of the factors listed below influence your decision to refrain from a change of your main product's price in the Croatian market?

(Please quote the relevant importance of each factor by choosing one of the following options: 1 – unimportant; 2 – of minor importance; 3 – important; 4 – very important; 0 – unable to evaluate)

	Reasons to refrain from a price increase	Reasons to refrain from a price decrease
1. The risk that our competitors will not change their prices.		
2. The risk that we will subsequently have to readjust our prices in the opposite direction.		
3. We have written/oral contracts with our customers specifying that prices can only be changed upon expiry of the relevant contract.		
4. The preference for maintaining prices at a certain psychological threshold (e.g. HRK 9.99).		
5. The prices depend predominantly on labour and raw material costs. Therefore we will not change the price until the costs change.		
6. The costs implied by price changes (e.g. menu costs, website updating costs, etc.)		
7. The costs involved in collecting and processing information used for taking decisions on price changes		
8. A possibility to apply alternative price changing measures (e.g. changing the delivery time)		
9. The preference of our customers for stable prices. Changing prices frequently may threaten customer relationships		
10. A risk that customers may interpret a reduction in price as a reduction in quality		
11. Other factors (please specify)		

6 CHANGING THE PRICE OF THE MAIN PRODUCT

The questions below do not relate to price reviews but to actual price changes.

6.1 How often do you change the price of your main product?

- several times a year:
  daily ___ weekly ___ monthly ___ quarterly ___ semi-annually ___
  at irregular time intervals _____;
- once a year, normally in:
  Jan.__ Feb.__ March__ April__ May__ June__ July__ Aug.__ Sept.__ Oct.__ Nov.__ Dec.__ no specific month __.
- less than once a year:
  at an interval of ____ years.
  no rules on that. _____.

6.2 How many times did the price of your main product change during 2008 and 2009?

Number of changes in: 2008 ____
2009 ____

6.3 Taking into account changes in your main product's price over these two years (see the answer to question 6.2), please state the number of increases.

Number of increases: _____

6.4 Taking into account changes in your main product's price referred to in the previous question, please specify the most frequent rate of price change:

In the case of price increase (one option only)		In the case of a price decrease (one option only)	
up to 2%	_____	up to 2%	_____
3% – 5%	_____	3% – 5%	_____
6% – 10%	_____	6% – 10%	_____
over 10%	_____	over 10%	_____

6.5 If you decide to increase the price of your main product, e.g. by 10%, by what percentage do you expect the sales of this product to decline (all other conditions unchanged, including your competitors' prices)?

- by more than 10% _____
- by about 10% _____
- by less than 10% _____
- the sales will remain unchanged. _____

6.6 If you decide to decrease the price of your main product by 10%, by what percentage do you expect the sales of this product to go up (all other conditions unchanged, including your competitors' prices)?

- by more than 10% _____
- by about 10% _____
- by less than 10% _____
- the sales will remain unchanged. _____

6.7 Please evaluate the importance of the factors listed below with respect to their influence on changes in the price of your main product in the Croatian market

(please quote the relevant importance of each factor by choosing one of the options: 1 – unimportant; 2 – of minor importance; 3 – important; 4 – very important; 0 – unable to evaluate)

	Driving factors of:	
	Price increase	Price decrease
1. A change in labour costs		
2. A change in energy and fuel prices		
3. A change in raw material prices		
4. A change in financing costs (e.g. interest rate)		
5. A change in other production costs		
6. A change in demand for the main product		
7. A change in productivity		
8. A change in the competitors' prices		
9. A change in the quality of the main product		
10. Intention of gaining a market share		
11. A change in the kuna exchange rate		
12. Other factors *(please specify)*		

6.8 Please indicate how long it takes your company to change the price of its main product in the Croatian market in reaction to the following events:

	Less than one month	1 – 3 months	3 – 6 months	6 – 12 months	Over 1 year	The price has not changed
a considerable increase in demand						
a considerable increase in production costs						
a considerable decline in demand						
a considerable decline in production costs.						

6.9 In the event of a considerable increase in the prices of inputs (e.g. fuels and agricultural raw materials), please assess the importance of the following actions you would take in order to maintain the level of your profit margin:

(please quote the relevant importance of each action by choosing one of the options: 1 – unimportant; 2 – of minor importance; 3 – important; 4 – very important; 0 – unable to evaluate)

- raise the selling price _____
- reduce other costs (*please specify*) _____ _____
- increase productivity or the volume of production _____
- another way of bringing the profit margin back to the former level *(please specify)* _____

6.10 What percentage of an increase/decrease in the kuna exchange rate would drive you to change the price of your main product?

(only to be filled out by export/import companies)

- up to 2% _____
- 3% – 5% _____
- 6% – 10% _____
- over 10%. _____

7 SETTING THE PRICE OF YOUR MAIN PRODUCT IN EXPORT MARKETS

(only to be filled out by companies selling their main products in both the Croatian and foreign markets)

7.1 In which currency do you set the price of your export product?

- HRK _____
- a foreign currency (please specify the currency) _____

7.2 You may have different prices depending on the market in which you operate. Which of the following statements best describes the price of your main product?

(Please choose only one option.)

- The price denominated in a foreign currency is equal for all countries/markets. ___ (go to Question 7.4)
- The price denominated in a foreign currency is equal for all eurozone countries, but is different for other countries. ___ (go to Question 7.3)
- The price denominated in a foreign currency is different for each country/market. ___ (go to Question 7.3)

7.3 What is the importance of the following factors for the variance in price-setting behaviour across markets?

(Please quote the relevant importance of each answer, by choosing one of the options: 1 = unimportant 2 = of minor importance 3 = important 4 = very important 0 = unable to evaluate)

- the competitors' prices _____
- exchange rate movements of the currency used for payment _____
- tax system (e.g. VAT-rate) _____
- cyclical fluctuations in demand on the market _____
- other conditions in the market (e.g. taste, standard of living, etc.) _____
- transportation costs _____
- other factors (please specify) _____ _____

7.4 Is competition for your main product stronger in the foreign market than in the domestic market?

(Please choose only one answer)

- yes _____
- no _____
- I do not know. _____

The following information on your company and yourself will only be used for checking the appropriateness of the selection of the company and the responding person, in order for the collected data to be analysed within the sector to which the company belongs, and will not be used for any other purpose. Therefore, we request that you provide accurate and complete information.

The company:

Name (please enter the full company name): _____

Address (of the company's registered office): _____

The company's principal business activity according to the attached classification of activities _____

The responding person:

Name and surname: _____

Job (please indicate your position in the company): _____

Telephone No: _____

Fax No: _____

E-mail address: _____

On behalf of the Croatian National Bank and GfK – Croatia – Market Research Centre, we thank you for participating in this Survey. We wish you a lot of success in business!

The questionnaire was answered:

by telephone _____,

by means of an online-interview _____,

by e-mail _____.

Annex B: Estimates of the price change frequency determinants obtained on the basis of the Poisson model

Poisson model

	Estimate	Standard error	Relative contribution	
Constant	3.23	0.09		***
Small enterprises	–1.10	0.06	0.33	***
Industry	–0.61	0.05	0.55	***
Demand	0.56	0.07	1.75	***
Energy	–0.88	0.06	0.42	***
Labour market	–1.07	0.05	0.34	***
Share of the main product in the RC market > 50%	–1.07	0.09	0.34	***
Share of revenues from the main product sale in the eurozone market > 50%	1.31	0.05	3.71	***
No major competitors.	–0.99	0.14	0.37	***
Administratively set price of the main product	–1.38	0.31	0.25	***
Constant mark-up	–0.14	0.10	0.87	
Variable mark-up	0.51	0.04	1.67	***
Share of revenues from sales based on formal contracts > 50%	–1.64	0.06	0.19	***
Mc Fadden R-squared	0.45			

Note: The dependent variable is constructed as the total number of price changes in 2008 and 2009 (Question 6.2).
The symbols ***, ** and * denote statistical significance at the levels of 99%, 95% and 90%.
Source: Authors' calculation.

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The first page of the manuscript should contain the article title, first and last name of the author and his/her academic degree, name of the institution with which the author is associated, author's co-workers, and the complete mailing address of the corresponding author to whom a copy of the manuscript with requests for corrections shall be sent.

Additional information, such as acknowledgments, should be incorporate in the text at the end of the introductory section.

The second page should contain the abstract and the key words. The abstract is required to be explicit, descriptive, written in third person, consisting of not more than 250 words (maximum 1500 characters). The abstract should be followed by maximum 5 key words.

A single line spacing and A4 paper size should be used. The text must not be formatted, apart from applying bold and italic script to certain parts of the text. Titles must be numerated and separated from the text by double-line spacing, without formatting.

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