



LIETUVOS BANKAS

WORKING PAPER SERIES

No 11 / 2011

**PRICE SETTING IN LITHUANIA:  
MORE EVIDENCE FROM  
THE SURVEY OF FIRMS**

by Ernestas Virbickas

**PRICE SETTING IN LITHUANIA:  
MORE EVIDENCE FROM THE SURVEY OF FIRMS**

by Ernestas Virbickas\*

\*Bank of Lithuania. For correspondence: Economics Department, Bank of Lithuania, Totorių 4, LT-01121 Vilnius, Lithuania; email: [evirbickas@lb.lt](mailto:evirbickas@lb.lt). The author wishes to thank Rūta Rodzko for the support in conducting this research.

© Lietuvos bankas, 2011

Reproduction for educational and non-commercial purposes is permitted provided that the source is acknowledged.

Address

Totorių 4

LT-01121 Vilnius

Lithuania

Telephone +370 5 2680132

Fax +370 5 2124423

Internet

<http://www.lb.lt>

Statement of purpose

Working Papers describe research in progress by the author(s) and are published to stimulate discussion and critical comments.

The Series is managed by Economic Research Division of Economics Department.

The views expressed are those of the author(s) and do not necessarily represent those of the Bank of Lithuania.

ISSN 2029-0446 (ONLINE)

## Contents

ABSTRACT .....	4
INTRODUCTION .....	5
1. SURVEY CONDUCT AND SELECTED RESULTS .....	6
2. TIME-DEPENDENT AND STATE-DEPENDENT PRICE REVIEW.....	9
3. UPWARD AND DOWNWARD PRICE STICKINESS .....	12
4. ASYMMETRIES IN PRICE ADJUSTMENT .....	17
CONCLUSIONS.....	27
REFERENCES .....	29
LIST OF BANK OF LITHUANIA WORKING PAPERS.....	31

## Abstract

The paper examines price setting in Lithuania based on ad hoc survey of the Bank of Lithuania “On Price and Wage Setting”. The study extends the survey data analysis presented in Virbickas (2009). The paper points to the incidence of both the time-dependent and the state-dependent price reviewing policies used by the investigated firms, though the price reviewing practices appear to be somewhat tilted to the state-dependent pricing. Analysis provides evidence on the reasons for upward and downward stickiness of prices. Delayed price adjustment is found to be mostly related to the price adjustment stage rather than the price reviewing stage. The most momentous explanations for not adjusting prices upwards or downwards rest on the cost-based pricing and the explicit contracts. The study finds an asymmetric influence of some of the price factors. In particular, the cost factors are found to be decisive in invoking the price increase rather than the price decrease.

Keywords: price review, price adjustment, price stickiness.

JEL classification: D40, E30.

## Santrauka

Šiame straipsnyje analizuojamas kainų nustatymas Lietuvoje, naudojant Lietuvos banko apklausos „Apie kainų ir darbo užmokesčio nustatymą“ duomenis. Šiame straipsnyje pratęsiama apklausos duomenų analizė, kurią pateikė Virbickas (2009). Tyrimas rodo, kad apklausoje dalyvavusios įmonės peržiūri kainas tiek reguliariai, tiek atsižvelgdamos į tam tikras aplinkybes. Kainų peržiūra atsižvelgiant į aplinkybes vis dėlto yra labiau paplitusi. Straipsnyje pateikiamos kainų nelankstumo didėjimo ir mažėjimo kryptimi priežastys. Kainas keisti delsiama dėl priežasčių, daugiausia atsirandančių ne tiek kainų peržiūros, kiek kainų keitimo etape. Svarbiausios iš šių priežasčių, sąlygojančių kainų nelankstumą didėjimo ir mažėjimo kryptimi, siejamos su sąnaudomis pagrįsta kainodara ir sudarytomis sutartimis. Tyrime nustatytas asimetriškas kai kurių veiksnių poveikis kainoms. Veiksniai, susiję su sąnaudomis, dažniau iššaukia kainų didėjimą nei mažėjimą.

## Introduction

The ways prices are determined may have an impact on the real economic output. Economic shocks may have effects if prices are adjusted in a less responsive pattern. Stickiness of prices adds to a magnitude and length the shocks affect economy, influencing their transmission and having implications for policy design. Practices of pricing, thus, constitute important part of economic setting providing a momentous venue for the research.

The paper presents evidence from the survey on price setting practices in Lithuanian firms. The study draws on the experience of the euro area countries that carried out the research within the Inflation Persistence Network (IPN) coordinated by the European Central Bank. The network conducted price setting research based, among other sources, on firm-level data obtained from the surveys undertaken in nine euro area countries. The IPN surveys delivered a number of stylised facts on the review and the adjustment of prices and on the determinants of pricing behaviour of the euro area firms shedding the light on pricing practices in qualitative terms<sup>1</sup>.

The survey approach to analyse pricing was introduced by Blinder (1991, 1994) and Blinder et al. (1998). This work investigated price setting behaviour in the United States. A similar approach was also used to analyse pricing in other countries. Hall et al. (2000) conducted a research for the United Kingdom, Apel et al. (2005) – for Sweden, Amirault et al. (2006) – for Canada. Dabušinskas and Randveer (2006) investigated pricing in Estonia performing a study similar to the one undertaken under IPN.

The survey analysis carries a few advantages compared to the other methods of study in the price setting research. Surveys on prices allow asking respondents to assess the factors underlying price decisions that are difficult to unveil on the basis of other sources. The pricing questionnaires, for instance, may tackle the reasons for price unresponsiveness or asymmetric adjustment that are hard to analyse using the data on final prices and price indices. The survey questionnaires may scrutinise patterns of price adjustment separately from the ones of price review – something not captured in other datasets. Along the advantages, the method of survey has some disadvantages. Results of the surveys depend critically on the wording of questions. Theoretical concepts may be difficult to explain in a way understandable for the respondents. Because of complexity, the surveys are not always conducted repeatedly limiting possibilities to investigate the issues in a time dimension.

---

<sup>1</sup> The survey findings for the euro area countries are summarised in Fabiani et al. (2006). The pricing evidence for the individual euro area countries is provided in: Kwapil et al. (2007) – for Austria, Aucremanne and Druant (2005) – for Belgium, Loupias and Ricart (2004) – for France, Stahl (2005) – for Germany, Fabiani et al. (2004) – for Italy, Lünemann and Mathä (2006) – for Luxembourg, Hoerberichts and Stokman (2010) – for the Netherlands, Martins (2005) – for Portugal, Álvarez and Hernando (2005) – for Spain.

The purpose of the paper is to investigate price setting practices of Lithuanian firms determining factors, ways and outcomes of pricing. The paper uses firm-level data from an ad hoc survey of the Bank of Lithuania “On Price and Wage Setting” that has already been explored in Virbickas (2009). Apart from pricing patterns, the latter study examined the wage formation and the link between labour costs and prices in Lithuania. The continuation of the survey data analysis covers a few pricing aspects. It considers the time-dependent and the state-dependent price reviewing practices as these practices have implications for the degree of price responsiveness. The study also looks into the reasons for the delayed price adjustment when there are some motives to increase or lower prices. It investigates ten potential explanations for upward stickiness and downward stickiness of prices. The paper, finally, touches the asymmetries in the price adjustment. It studies differences in price response to heightened demand and dampened demand and in response to higher costs and lower costs. Besides reaction to the shocks, the paper looks into the differences in factors for upward and downward change in prices.

The structure of the paper is the following. Section 1 describes the survey conduct and overviews some of the ways of pricing and its environment. The time-dependent and the state-dependent price reviewing policies are analysed in Section 2. Explanations for upward and downward stickiness of prices are studied in Section 3. Section 4 looks into the asymmetries in price adjustment following the demand shocks and the cost shocks as well as into the asymmetric influence of some of the factors. The concluding section summarises findings of the study.

## 1. Survey conduct and selected results

The analysis is based on the survey of the Bank of Lithuania “On Price and Wage Setting”<sup>2</sup>. The survey was undertaken in April and May 2008 referring to firms’ operational activities that occurred in 2007.

The survey inquired the firms operating in economic activities of manufacturing, construction, trade and business services. Firms were stratified according to Sections D-K of NACE rev. 1.1<sup>3</sup>. Apart from economic activities, firms were stratified according to the size

---

<sup>2</sup> A detailed description of survey conduct is provided in Virbickas (2009). Survey questionnaire is available upon request.

<sup>3</sup> Unless otherwise stated, group of economic activities titled “manufacturing” refers to manufacturing and electricity, gas and water supply (Sections D and E of NACE rev. 1.1); economic activities “construction” and “trade” are self-explanatory (Sections F and G of NACE rev. 1.1 respectively); economic activities titled “business services” refer to the rest of the market services (Sections H-K of NACE rev. 1.1).

measured by the number of employees. The survey considered the firm size categories of 5-19, 20-49, 50-149, 150-249 and 250 or more employees.

The survey contacted 2,810 firms. The targeted sample was 500 firms. Due to incomplete responses, however, the answers of only 343 firms are used in the research. Among these firms there are 97 manufacturing, 27 construction, 104 trade and 115 business services firms. Most of the firms are small-sized firms with up to 19 employees. In this sample, sizeable share of employees work in manufacturing and business services. Most of employees are employed by larger firms.

To make the realised sample reflect the distribution of total population of firms, employment adjusted sampling weights are constructed. These weights account for unequal probability of firms making into the realised sample and adjust the realised sample of firms so that to represent employees in the total population. The employment adjusted sampling weights are used in the descriptive analysis of the paper.

Before turning to a more detailed analysis, this section overviews some of the characteristics of firms related to the ways and environment of the price setting.

The survey referred to approaches used to determine the prices. As figured out, the most common practice is to choose prices according to costs and completely self-determined profit margin (see Table 1). This way of pricing – mark-up pricing (often used in imperfectly competitive settings) – is reported by approximately half of the investigated firms. Another incidental way to set prices is to follow the main competitors. This practice is applied by more than a quarter of firms. Mark-up pricing is widely used in all economic activities, while pricing following the main competitors finds more support in trade.

The study pointed to rather widespread use of price discrimination in the investigated firms. Somewhat less than half of the considered firms set the prices individually for each consumer(s), and in approximately one quarter of the firms prices are dependent on quantity of orders. Price discrimination is, thus, reported by almost three quarters of the firms. Individual price setting for each consumer(s) is more common in construction, and price setting dependent on quantity of orders is more widely used in trade and manufacturing. No use of price discrimination was admitted by less than a fifth of the examined firms. A practice to set the same prices for all customers is more popular in business services.

Responses to survey questions deliver information on the customer institutional setup. In the surveyed firms more than 40 percent of the total revenue is generated by sales to the final consumers, around one quarter of the total revenue is due to wholesale and retail firms, and somewhat less than a tenth of the total revenue is due to public sector institutions and firms. Sales to the final consumers are the most prevalent in trade, construction and business services, while in manufacturing sales to the wholesale firms generate the most sizeable share

of the total revenue. The customers of the surveyed firms include not only the final consumers, implying that practices, captured by the survey results, reflect the price setting at both consumer and producer level.

*Table 1. Selected characteristics of the surveyed firms (percent)*

	<i>Manu- facturing</i>	<i>Cons- truction</i>	<i>Trade</i>	<i>Business services</i>	<i>Total</i>
<i>Price setting ways:</i>					
<i>share of firms in which the price is regulated or set by the parent company or by main customer</i>	21.0	2.3	3.8	22.6	15.3
<i>share of firms that set the price following main competitors</i>	28.3	19.7	42.9	19.3	27.0
<i>share of firms that set the price according to costs and completely self-determined profit margin</i>	44.4	68.2	44.8	51.5	50.3
<i>share of firms that set the price in other way</i>	6.4	9.8	8.6	6.5	7.4
<i>Use of price discrimination:</i>					
<i>share of firms that set the same price for all customers</i>	10.5	6.3	18.4	28.2	17.9
<i>share of firms in which price depends on quantity of orders</i>	35.0	10.5	40.0	16.9	26.2
<i>share of firms in which price is set for each customer(s) individually</i>	51.0	83.2	34.2	35.1	46.2
<i>share of firms in which price is set in other way</i>	3.6	0.0	7.4	19.8	9.7
<i>Customer institutional setup:</i>					
<i>share of revenue from sales to wholesale firms</i>	28.3	5.4	6.2	6.5	12.7
<i>share of revenue from sales to retail firms</i>	17.1	6.4	17.3	6.1	11.8
<i>share of revenue from sales to public sector institutions and firms</i>	1.5	9.2	4.9	13.6	7.5
<i>share of revenue from sales to final consumers</i>	27.6	44.8	56.5	43.4	41.8
<i>share of revenue from sales to other customers</i>	25.5	34.1	15.1	30.3	26.1
<i>Customer relationship (share of revenue from sales to regular customers)</i>	76.2	46.6	54.3	67.1	64.1
<i>Foreign sales (share of revenue from sales in foreign markets)</i>	38.1	1.6	6.9	14.5	17.9

*Notes: responses are employment-weighted and rescaled to exclude non-responses.*

*Sources: the survey of the Bank of Lithuania "On Price and Wage Setting" and author's calculations.*

The study pointed to rather high share of revenue generated by sales to the customers that are described as regular ones. Sales to the customers with lasting business relationship account for around two thirds of the total revenue. Such sales are more widespread in manufacturing and business services.

The surveyed firms reported a substantial degree of openness to competition in foreign markets. Firms indicated generating somewhat less than a fifth of their total revenue via

activities in foreign countries. The highest share of total revenue raised by the sales in foreign markets is found in manufacturing and business services.

## 2. Time-dependent and state-dependent price review

Literature differentiates the time-dependent and the state-dependent pricing rules. If firms are following the time-dependent rules, the time between reset of prices is viewed as independent from the economic shocks.

One of the time-dependent models was used by Taylor (1980), who applied the idea of non-continuous adjustment of labour contracts. In the suggested framework only some share of firms are allowed to change the contracts. The adjusted contracts remain unchanged for a certain period of time, which is assumed to be the same for all the firms. Contracts are adjusted in a non-continuous way, therefore the firms, which review the contracts, take into account all the economic factors that are expected to prevail until the next review of contracts.

The other time-dependent model is due to Calvo (1983) that considers a staggered price setting. The model is similar to the one of Taylor except for the assumption on nominal contract duration. In the Calvo model the price duration is assumed to be random and uncertain when prices are reset.

In the time-dependent models firms may not react immediately to the economic shocks unless the shocks occur at the time when firms review the prices. The possibility of response to economic shocks, contingent on the timing and intensity of shocks, is considered in the state-dependent models. All else equal, the state-dependent pricing yields a more responsive price adjustment than the time-dependent pricing.

State-dependent models were used by Barro (1972) and developed further by Sheshinski and Weiss (1977). In Sheshinski and Weiss firms are targeting the difference between the optimal and the actual price and are following the pricing rule  $(s, S)$ . Firms are setting prices so that the difference equals  $S$  and do not adjust the prices, owing to adjustment costs, until the difference reaches  $s$ . Firms, thus, follow the pricing rule under which reset the prices in a state-dependent way.

To investigate the incidence of the time-dependent and the state-dependent pricing, the conducted survey asked the firms to characterise the way of price review. Survey asked the firms whether (1) they review the prices regularly, (2) they review the prices in certain cases (for instance, when costs or demand change), (3) they review the prices regularly and additionally in certain cases (for instance, when costs or demand change), (4) they review the prices due to other reasons or (5) they never review prices without changing them. In the first

case the price review is interpreted as the time-dependent one, in the second case – as the state-dependent one, and in the third case – as the time-dependent one with a switch to the state-dependent price review when it is deemed necessary (thereafter named as the time- and state-dependent price review).

As shown in Table 2, most of the surveyed Lithuanian firms follow the time- and state-dependent practice to review the prices. A practice to review the prices regularly and additionally to review them in certain cases was indicated by 45 percent of the firms. Comparing the incidence of the time-dependent and the state-dependent price reviewing practices, the latter practice appears to be more widely used than the former one. A similar prevalence of the price reviewing practices is found in manufacturing and trade, while in construction and business services it is somewhat different. In construction, as opposed to practices observed in other economic activities, the state-dependent price review appears to be less widely used than the time-dependent one. In business services the time- and state-dependent price reviewing practice dominates though it finds a considerably lower support than in other activities.

*Table 2. Price reviewing practices  
(share of firms; percent)*

	<i>Manu- facturing</i>	<i>Cons- truction</i>	<i>Trade</i>	<i>Business services</i>	<i>Total</i>
<i>Price is reviewed regularly</i>	16.5	21.0	21.2	20.4	19.5
<i>Price is reviewed in certain cases (for instance, when costs or demand change)</i>	30.3	18.1	26.0	34.0	29.0
<i>Price is usually reviewed regularly and additionally in certain cases (for instance, when costs or demand change)</i>	49.8	54.7	47.6	35.9	45.0
<i>Price is reviewed due to other reasons</i>	3.2	4.0	2.1	5.1	3.7
<i>Price is never reviewed without changing it</i>	0.2	2.3	2.9	4.6	2.6

*Notes: responses are employment-weighted and rescaled to exclude non-responses.*

*Sources: the survey of the Bank of Lithuania “On Price and Wage Setting” and author’s calculations.*

Compared to the existing evidence for countries of the euro area (Fabiani et al. 2006) and Estonia<sup>4</sup> (Dabušinskas and Randveer 2006) – the countries where similar surveys were carried out as in Lithuania, the use of price reviewing practices in Lithuania appears to be somewhat tilted to the state-dependent pricing. Although the incidence of the time- and state-dependent price reviewing rule in the euro area, Estonia and Lithuania is quite close, the use of the state-dependent practice is less widely used than the time-dependent one in the euro area and Estonia, while the opposite is found in Lithuania.

Those firms that characterised their price review as a regular one (the cases of the time-dependent as well as the time- and state-dependent price review) were asked to provide the

<sup>4</sup> The survey in Estonia was conducted before this country joined the euro area.

information on how frequently they review the prices. Firms were inquired to indicate whether price reviews occur (1) daily, (2) weekly, (3) monthly, (4) quarterly, (5) half yearly, (6) once a year, (7) once every two years or (8) less frequently than once every two years.

The survey results show that in Lithuania approximately one third of all the surveyed firms (including those that do not characterise their price review as a regular one) review the prices daily to monthly. In almost one quarter of the firms the price review takes a place quarterly to half yearly. Prices appear to be reviewed somewhat more frequently in trade and construction and less frequently in business services.

*Table 3. Frequency of price review  
(share of firms; percent)*

	<i>Manu- facturing</i>	<i>Cons- truction</i>	<i>Trade</i>	<i>Business services</i>	<i>Total</i>
<i>Daily to monthly price review</i>	28.2	41.5	50.8	24.3	33.5
<i>Quarterly to half yearly price review</i>	33.4	31.8	16.0	17.2	23.7
<i>Annual price review</i>	4.7	2.3	1.1	10.3	5.6
<i>Less frequent than annual price review</i>	0.0	0.0	1.1	4.6	1.9
<i>No regular pattern, price never reviewed without changing it</i>	33.8	24.3	31.1	43.7	35.4

*Notes: responses are employment-weighted and rescaled to exclude non-responses; frequency of price review under category “no regular pattern, price never reviewed without changing it” reflects the share of firms that do not review prices regularly as indicated in Table 2 under price reviewing categories “price is reviewed in certain cases (for instance, when costs or demand change)”, “price is reviewed due to other reasons” and “price is never reviewed without changing it”.*

*Sources: the survey of the Bank of Lithuania “On Price and Wage Setting” and author’s calculations.*

Compared to the frequency of price changes, as reported in Virbickas (2009), prices in Lithuania appear to be reviewed more frequently than they are changed. Most of the firms in Lithuania – around one quarter – change the prices quarterly to half yearly, approximately one fifth of the firms change the prices once a year, and somewhat more than one tenth of the firms change the prices less frequently than once a year. Pricing process, thus, takes a place in two stages – the price reviewing stage and the price adjustment stage. This suggests that some forms of price stickiness may occur when prices are reviewed and when they are adjusted.

In comparison to the existing evidence for the euro area (Fabiani et al. 2006) and Estonia (Dabušinskas and Randveer 2006), prices in Lithuania seem to be reviewed more frequently. Among those firms that review the prices regularly, in the euro area and Estonia more than half of firms review the prices up to three times a year, prices are reviewed monthly or more frequently in around one quarter of the firms, while in Lithuania, as it is found out, most of the investigated firms (more than half if to consider only those that review the prices regularly) review the prices daily to monthly.

### 3. Upward and downward price stickiness

Stickiness of prices may occur due to numerous reasons. Firms may shy away from price decisions because it may be costly to review the prices. Firms may also find it costly to adjust the prices or disadvantageous to change them due to response of customers or reaction of competitors. Stickiness of prices may originate at both the price reviewing stage and the price adjustment stage.

To investigate the reasons that prevent from upward and downward price adjustment occurring at both price setting stages the survey analysed the relevance of ten potential explanations for price stickiness. The examined explanations are described below<sup>5</sup>:

- at the starting point, stickiness of prices might be a result of no substantial changes in the costs related to the firms' operational activities. If firms are following the *cost-based pricing*, firms do not alter the prices as long as there are no changes in the costs;
- the prices may remain unchanged due to *explicit contracts* between the firms and their customers. The contracts may foresee the constant prices for the prolonged periods of time contributing to the enduring business relationship between the sellers and buyers of the products. Explicit contracts allow the firms to plan the sales, while customers benefit from lower information and transaction costs;
- business relationship between the firms and their customers may also be build up without engaging into formal contracts. It is observed, that if prices are increased due to the costs, the customers may judge it as a legitimate way of pricing, while if prices are increased due to heightened demand, the customers may view it as unfair. Firms, therefore, may opt to raise the prices following the cost increase shocks, and they may decide to keep the prices constant when facing the demand increase shocks, thus effectively engaging into *implicit contracts*;
- the change in prices might bear costs. It may be costly to print new labels and to attach them, to print new catalogues and to distribute them. The change in prices might also pose some other *menu costs*, like advertising and negotiation costs. As shown by Akerlof and Yellen (1985), Mankiw (1985) and Dixit (1991), even low menu costs might end up in substantial stickiness of prices having sizeable effects on aggregate variables. As already mentioned, price adjustment costs are used in state-dependent models of Barro (1972) and Sheshinski and Weiss (1977) where

---

<sup>5</sup> A summary of explanations for upward and downward price stickiness rests on Fabiani et al. (2006) and Dhyne et al. (2009).

authors use the price adjustment costs that are not related to the size and timing of price changes (hence these costs are menu costs).

The evidence on the size of menu costs is rather scarce, though it shows that menu costs are quite sizeable. Levy et al. (1997) analyse the price adjustment costs at the retailers' level. The authors find that costs of changing the price labels amount to around 0.7 percent of total revenue and around 35 percent of profit margins.

Zbaracki et al. (2004), in addition to physical price adjustment costs, investigate managerial price review costs<sup>6</sup> as well as customer communication and negotiation costs in an industrial firm. According to this study, the total price adjustment costs are equal to around 1.23 percent of total revenue and around 20 percent of profit margins;

- apart from physical price adjustment costs, advertising and negotiation costs, change in prices is related to *information costs*. Before deciding upon new prices, firms analyse the markets, competition pressures and consumer sentiments, thus incurring costs of information gathering and information processing that may prevent from frequent price adjustment;
- product price is an important feature of the product, though it goes along the other features. Every product is accompanied by delivery conditions, repair and replacement schemes, services of update and other attributes. Firms, therefore, may opt to use the *non-price* elements of *competition* when they face the shocks. They can change the time of the delivery, introduce or cut some other services, thus managing product features and the costs, while keeping prices fixed instead of altering them;
- some features of the product, in particular, the quality, are not observed directly. To identify these features the customers may scrutinise the other (observable) characteristics of the product, for instance, product price. If price goes down, the customers may interpret it as a switch to lower quality. Therefore, similarly as in the case above, firms may decide to keep the prices constant even if they can lower them in order to abstain from possibly misleading *quality signal*;
- pricing pattern can also be affected by firms' interaction in the product market. Firms may opt to keep the prices without increasing them if firms expect that the competitors will not be raising prices in response. On the other hand, firms may also wish to keep the prices instead of lowering them if they anticipate that the other firms will cut the prices afterwards. *Coordination failure*, thus, leads to a

---

<sup>6</sup> In Zbaracki et al. (2004), among other costs, managerial price review costs include information costs that are reviewed further below.

kinked demand curve, implying losses for the firms if they increase the prices and only minor gains if they reduce the prices;

- the economic shocks may differ in terms of their nature as well as in their persistence. The shocks may be short lived, the shocks may be long lasting. If firms expect a shock to be a temporary one, they may decide to keep the prices fixed instead of changing them when shock occurs and revising them again when shock reverses back. The *temporary character of shocks*, thus, may imply a sticky price behaviour;
- customers may find some price levels more attractive than the other ones. This is particularly true if customers pay less attention to the last price digit and focus more attention to the other digits. Such kind of *price thresholds* imply a stepwise demand function, which make it optimal for firms to change the prices only if the new prices reach the new thresholds also called pricing points. Firms, thus, may maintain the prices if economic shocks are not significant enough to move the prices to the new price thresholds.

The survey asked respondents how relevant are the above provided explanations for not immediate price adjustment when there are some factors forcing to increase or lower price. The list of explanations did not include a reference to a *quality signal* in case of price increase and did not refer to *implicit contracts* in case of price decrease. Firms were asked to indicate whether each of explanations is (1) not relevant, (2) of little relevance, (3) relevant, (4) very relevant or (5) they do not know.

As shown in Table 4, the most important explanation for not adjusting prices, when there are some reasons to increase them, rests on *cost-based pricing*. Firms indicate that they are not willing to engage into upward price adjustment as long as costs do not change. This is consistent with the relatively wide use of mark-up pricing as it was mentioned in Section 1. The second and the third most important reasons for maintaining prices constant instead of raising them are *explicit contracts* and *implicit contracts*. This mirrors the significance to treasure the business relationship between the firms and their customers avoiding disappointing moves in prices. The finding stands in line with rather substantial role of regular customers in generating income.

The next important reason not to raise the prices relates to firms' concern that the other firms will not adjust the prices. The *coordination failure*, thus, proves to be important in the price setting resembling the evidence on incidence of firms that set the prices following the main competitors. The other rather decisive explanation for not adjusting prices upwards relates to *information costs*. Quite a substantial share of firms admits that information costs

prevent from price decisions, thus indicating that stickiness of prices also occurs at the price reviewing stage.

The other explanations for stickiness of prices – *temporary character of shocks*, *price thresholds*, *non-price competition* and *menu costs* – appear to be less relevant for firms when they decide if to increase the prices. Interestingly, the physical price adjustment costs – *menu costs* – are reported as the least important reason to abstain from price adjustment, though this explanation for price stickiness is frequently used in the literature.

*Table 4. Explanations for upward price stickiness (share of firms for which the explanation is “relevant” or “very relevant”; percent)*

	<i>Manu- facturing</i>	<i>Cons- truction</i>	<i>Trade</i>	<i>Business services</i>	<i>Total</i>
<i>Cost-based pricing</i>	74.0	88.2	65.8	74.0	74.2
<i>Explicit contracts</i>	70.5	64.6	48.2	65.9	63.2
<i>Implicit contracts</i>	70.4	51.2	40.2	41.5	50.9
<i>Coordination failure</i>	39.6	48.1	53.9	31.8	41.1
<i>Information costs</i>	37.0	40.3	38.6	44.7	40.5
<i>Temporary character of shocks</i>	37.1	45.9	34.9	24.6	33.4
<i>Price thresholds</i>	26.8	4.3	32.2	17.5	21.5
<i>Non-price competition</i>	24.9	21.3	17.6	12.3	18.3
<i>Menu costs</i>	15.8	2.0	26.0	18.2	17.0

*Notes: responses are employment-weighted and rescaled to exclude non-responses.*

*Sources: the survey of the Bank of Lithuania “On Price and Wage Setting” and author’s calculations.*

A ranking of the five most important explanations for upward price stickiness in all economic activities is different from the one found for the entire set of firms. For the firms in manufacturing and construction *temporary character of shocks* appears to have greater significance than *information costs* in preventing price increase. Firms in trade report that *coordination failure* is a more relevant explanation for maintaining prices constant instead of raising them as compared to the relevance of *explicit contracts* and *implicit contracts*. This corresponds to observation that trade firms follow the main competitors more often when setting prices. Business services firms express relatively larger importance of *information costs* in comparison to *implicit contracts* and *coordination failure* in clarifying the significance of reasons for upward price stickiness.

The undertaken study shows that three out of five the most important reasons preventing from increasing prices are also relevant when distinguishing the most momentous factors making to abstain from lowering prices. Firms report that *cost-based pricing*, *explicit contracts* and *coordination failure* are among the most important causes of downward price stickiness (see Table 5). In addition, firms indicate that *temporary character of shocks* is very relevant in determination to maintain the prices constant although there are some reasons to decrease them. Firms also find important to keep the prices constant due to a *quality signal*.

*Information costs, non-price competition, price thresholds and menu costs* are found as less momentous factors maintaining prices constant when there are some reasons to decrease them. Similarly as in the case of upward stickiness of prices, *menu costs* appear to be the least important factor in preventing downward price adjustment.

Firms in manufacturing, construction and business services indicate the same five most relevant explanations for downward stickiness of prices as they are reported for the whole sample of investigated firms, though in manufacturing the explanations rank in a different way. Firms in manufacturing claim that a wish to prevent a *quality signal* stands above all the other reasons for price stickiness. *Quality signal* also appears to be the most important factor in trade firms in deciding to maintain the prices constant instead of lowering them. In these firms *quality signal* is followed by *cost-based pricing, temporary character of shocks, non-price competition* and *coordination failure*.

*Table 5. Explanations for downward price stickiness  
(share of firms for which the explanation is “relevant” or “very relevant”; percent)*

	<i>Manu- facturing</i>	<i>Cons- truction</i>	<i>Trade</i>	<i>Business services</i>	<i>Total</i>
<i>Cost-based pricing</i>	56.3	75.3	51.5	66.8	61.7
<i>Explicit contracts</i>	56.3	62.6	26.8	57.1	51.1
<i>Temporary character of shocks</i>	53.8	57.6	47.8	47.7	50.9
<i>Quality signal</i>	59.2	46.5	51.7	37.5	48.1
<i>Coordination failure</i>	43.8	44.2	33.0	33.2	37.8
<i>Information costs</i>	37.4	28.5	32.8	23.5	30.2
<i>Non-price competition</i>	24.4	33.4	36.5	22.0	27.4
<i>Price thresholds</i>	24.5	4.0	20.2	21.3	19.6
<i>Menu costs</i>	24.1	0.0	21.6	13.5	16.4

*Notes: responses are employment-weighted and rescaled to exclude non-responses.*

*Sources: the survey of the Bank of Lithuania “On Price and Wage Setting” and author’s calculations.*

The relative importance of factors for sticky price behaviour in Lithuania stands close to the existing evidence obtained for the euro area (Fabiani et al. 2006) and Estonia (Dabušinskas and Randveer 2006). The undertaken study in the euro area investigated reasons of price stickiness without distinguishing the factors preventing from upward and downward price adjustment, therefore results for the euro area are comparable to the ones for Lithuania only to a limited extent. Nevertheless, a few the most important explanations for sticky price behaviour in the euro area appear to be relevant in Lithuania. In particular, *cost-based pricing, explicit contracts* and *coordination failure* turn out to be among the most momentous factors explaining stickiness of prices in the euro area and sluggishness of upward and downward price adjustment in Lithuania. In addition, *implicit contracts* are also reported as an important explanation for maintaining prices constant in the euro area and Lithuania (this applies for Lithuania when firms consider if to increase the prices). In contrast

to results obtained for Lithuania, *information costs* do not appear among the most explanatory factors of price stickiness in the euro area.

The survey in Estonia, similarly as in Lithuania, inquired the firms to evaluate separately the factors preventing from upward and downward price adjustment. This survey, however, did not include *temporary character of shocks* as a potential explanation for sticky price behaviour, while it included *implicit contracts* as an explanatory factor for sticky downward price adjustment. The results indicate that Estonia and Lithuania share a few the most important explanations for upward and downward stickiness of prices, namely, *cost-based pricing*, *explicit contracts*, *implicit contracts*, *coordination failure* and *quality signal*. As opposed to the case of Lithuania, *information costs* do not rank among the most momentous factors preventing from the price adjustment in Estonia.

#### 4. Asymmetries in price adjustment

Pricing behaviour may feature different characteristics in the face of distinct economic shocks. Firms may find it optimal, for instance, because of customer specifics, to handle prices differently when demand increases and demand decreases. Firms may also deal with prices dissimilarly, say, due to employed technologies, when costs go up and costs go down.

To analyse the asymmetries of price response to economic shocks, the survey asked the firms if they adjust the prices when the demand changes or the costs change enough to review the prices. Firms were inquired whether (1) they would change the prices, (2) they would not change the prices or (3) they do not know what their reaction would be in response to four types of shocks: a demand increase shock, a demand decrease shock, a cost increase shock and a cost decrease shock.

The answers make it difficult to infer whether firms react differently in case of the heightened demand and the dampened demand, while firms' reaction to the higher costs and the lower costs appears to embed some asymmetry. As shown in Table 6, the share of firms that adjust the prices following the demand increase is somewhat higher than the share of firms changing the prices in the case of demand decrease. Along with this, the survey shows that the fraction of firms maintaining the prices in the face of heightened demand is also higher than the fraction of firms not changing the prices in the case of dampened demand. This pattern of responses is observed in manufacturing, while in other economic activities it differs somewhat. In construction and business services larger share of firms adjust the prices and smaller share of firms maintain the prices in the case of higher demand than in the case of lower demand, while in trade the opposite pattern of reaction to demand shocks is observed.

Response of firms to cost increase and cost decrease shocks turns to possess asymmetric reaction. Considerably larger share of firms adjust the prices in the face of cost increase than in the case of cost decrease, while the fraction of firms maintaining the prices is smaller following the higher cost shock than in the case of the lower cost shock. This response pattern is evident in all the investigated economic activities.

It is noticeable that firms' response to the demand increase and the demand decrease shocks differs markedly from the response to the respective cost shocks. Smaller share of firms change the prices and larger share of firms maintain the prices when the demand increases compared to the case when the costs increase. Entirely the opposite reaction of firms is observed in the cases of the demand decrease and the costs decrease. Such response pattern is found in all the considered economic activities.

*Table 6. Incidence of price change in response to demand and cost shocks (share of firms; percent)*

	<i>Manu- facturing</i>	<i>Cons- truction</i>	<i>Trade</i>	<i>Business services</i>	<i>Total</i>
<i>Demand increase shock:</i>					
<i>firms that change the price</i>	49.2	72.1	44.7	50.2	51.7
<i>firms that do not change the price</i>	47.6	27.9	50.0	42.7	43.6
<i>firms that do not know</i>	3.3	0.0	5.3	7.1	4.6
<i>Demand decrease shock:</i>					
<i>firms that change the price</i>	48.4	46.2	52.0	30.4	42.4
<i>firms that do not change the price</i>	42.4	34.5	36.1	49.6	42.5
<i>firms that do not know</i>	9.2	19.3	11.9	20.1	15.1
<i>Cost increase shock:</i>					
<i>firms that change the price</i>	92.2	95.7	76.6	80.9	85.3
<i>firms that do not change the price</i>	7.4	2.3	11.7	4.6	6.6
<i>firms that do not know</i>	0.5	2.0	11.6	14.6	8.1
<i>Cost decrease shock:</i>					
<i>firms that change the price</i>	37.4	42.3	27.8	23.0	30.9
<i>firms that do not change the price</i>	52.2	43.6	63.8	59.2	56.0
<i>firms that do not know</i>	10.4	14.1	8.4	17.7	13.1

*Notes: responses are employment-weighted and rescaled to exclude non-responses.*

*Sources: the survey of the Bank of Lithuania "On Price and Wage Setting" and author's calculations.*

Firms, that indicated a change in prices following the analysed shocks, were asked to provide the information on the length of lag of the price adjustment. As shown in Table 7, the average length of lag of the change in prices ranges from 2.2 to 2.7 months depending on the shock. The length of lag is quite similar in the case of increased demand shock and decreased demand shock, and the length of lag is also quite alike in the case of higher cost shock and lower cost shock. The lag of price adjustment appears to be marginally longer following the cost shocks than in the face of the demand shocks. The time elapsed until the prices are changed is somewhat longer in business services.<sup>7</sup>

<sup>7</sup> The evidence on price response to the demand and the cost shocks in Lithuania is not compared to the one for the euro area and Estonia as the studies for the latter countries (Fabiani et al. 2006 and

A number of characteristics of firms might affect their decisions on prices following the shocks. The way of pricing might be influenced by contracts with customers, degree of market competition, contracts of labour and other factors. To get a perception of the determinants of pricing decisions in the face of shocks and possible asymmetric influence of some of the factors, firms' reaction to the shocks is modelled using binary probits. All the models (the models of response to heightened demand, dampened demand, higher costs and lower costs) include four sets of explanatory variables, namely, the one gauging the production technologies, the one accounting for labour compensation settings, the one capturing market competition, and the one reflecting the interaction of firms with their customers.

Table 7. Lag of price change in response to demand and cost shocks (months)

	<i>Manu- facturing</i>	<i>Cons- truction</i>	<i>Trade</i>	<i>Business services</i>	<i>Total</i>
<i>Demand increase shock</i>	2.3	1.6	1.9	2.9	2.3
<i>Demand decrease shock</i>	1.8	2.2	1.8	3.1	2.2
<i>Cost increase shock</i>	2.5	1.9	1.7	3.4	2.5
<i>Cost decrease shock</i>	2.5	2.4	1.8	3.7	2.7

Notes: responses are employment-weighted and rescaled to exclude non-responses.

Sources: the survey of the Bank of Lithuania "On Price and Wage Setting" and author's calculations.

The first three sets of variables consist of variables that are used in the regression analysis in Virbickas (2009). To be more specific, the set of variables accounting for differences in production technologies contains five variables: *labour share* – the share of the labour costs in the total costs (this variable is expressed as a percentage); *trade firms* and *services firms* – the economic activity dummy variables; the latter variables take the value 1 if the firm is a trade firm (Section G of NACE rev. 1.1) or any other market services firm (Sections H-K of NACE rev. 1.1) respectively and take the value 0 otherwise (the reference category is manufacturing firms, Sections D-F of NACE rev. 1.1); *firms 20-49* and *firms 50 or more* – the firm size dummy variables; the latter variables take the value 1 if the number of firm's employees is between 20 and 49 or 50 or more respectively and take the value 0 otherwise (the reference category is the firms with up to 19 employees). The set of variables proxying labour compensation settings includes two variables: *collective pay agreements* – a dummy variable that takes the value 1 if the firm applies any collective pay agreement and takes the value 0 otherwise; *flexible wage share* – the share of individual or company performance-related bonuses in the total wage bill (this variable is expressed as a percentage). The set of market competition variables comprises of two variables: *competition* – a dummy

---

Dabušinskas and Randveer 2006, respectively) report the patterns of price adjustment in a way different from the one used in this paper.

variable, which is constructed using responses to the question whether the firm decreases its price following the price decrease of the product of the main competitor; the latter variable takes the value 1 if the firm is “very likely” to decrease the price and takes the value 0 if the firm is “likely”, “not likely” or “not at all” likely to decrease the price; *foreign sales share* – the share of revenue generated by foreign sales in the total revenue (this variable is expressed as a percentage).

Regression analysis includes a set of three explanatory variables that reflect the ways and outcomes of interaction of firms with their customers:

- *regular customers share* – a variable that is constructed to account for the influence of non-formal business relationship of firms with their customers. The incidence of regular customers could possibly grasp the importance of, as titled above, implicit contracts. *Regular customers share* is the share of revenue generated by sales to such customers. The latter variable is expressed as a percentage;
- *wholesale and retail firms share* – a variable to capture the effects of the type of customer in shaping the behaviour of firms. Different types of customers might incur different costs when searching for an optimal price. The costs might be lower for the firms – wholesale and retail firms, and the costs might be higher for the final consumers. Firms therefore may have different pricing behaviour depending on the customers to whom they sell. *Wholesale and retail firms share* is the share of revenue generated by sales to wholesale and retail firms. The variable is expressed as a percentage;
- *price discrimination* stands to grasp whether firms set the prices differently for different customers. Price discrimination represents the pricing outcome when prices are accommodated to customer ability or willingness to pay. Price discrimination therefore renders a different pricing pattern as compared to the one under non-discriminatory setting. *Price discrimination* – a dummy variable that takes the value 1 if the firm sets the price individually for customer(s) or depending on the quantity of orders or on some other factors and takes the value 0 if the firm sets the same price for all customers.

The dependent variable in all the models is the binary variable that takes the value 1 if the firm changes the price in response to the shock (i.e. in response to the demand increase, the demand decrease, the cost increase and the cost decrease) and takes the value 0 if it does not change the price.

Estimation results from binary probit models are provided in Table 8. To make it conscious, the analysis is limited to marginal effects on the probability that the firm changes the price following the shock.

Regression analysis shows that pricing decisions are influenced by the degree of competition when facing the demand shocks. Firms encountering stronger competition are more likely to change the prices not only when demand decreases but also when demand increases. The finding on the role of competition in influencing price response to dampened demand is in line with the one reported in Virbickas (2009).

The results indicate that the price adjustment is less likely in the face of demand increase when firm's revenue generated by sales to regular customers is higher. This shows the importance of non-formal – implicit – contracts in taking decisions on prices and corroborates with the conclusions drawn on the upward stickiness of prices. Higher share of sales to the regular customers does not appear to be statistically significant in shaping reaction of firms to the demand decrease.

*Table 8. Explanations for price change in response to demand and cost shocks (marginal effects for binary probit models; the table provides only marginal effects on the probability that the price is changed in response to the shock)*

	<i>Type of shock:</i>			
	<i>demand increase</i>	<i>demand decrease</i>	<i>cost increase</i>	<i>cost decrease</i>
<i>Labour share</i>	0.001	-0.001	0.000	-0.003**
<i>Trade firms</i>	-0.028	0.036	-0.067*	-0.035
<i>Services firms</i>	0.057	-0.031	0.038	-0.035
<i>Firms 20-49</i>	-0.151*	-0.023	0.040**	-0.102
<i>Firms 50 and more</i>	0.079	0.084	0.012	0.007
<i>Collective pay agreements</i>	-0.085	-0.034	0.006	-0.090
<i>Flexible wage share</i>	0.002	-0.002	-0.001	-0.001
<i>Competition</i>	0.205***	0.201***	-0.023	0.086
<i>Foreign sales share</i>	0.002	-0.001	-0.001**	0.001
<i>Regular customers share</i>	-0.003***	-0.002	0.001**	0.001
<i>Wholesale and retail firms share</i>	-0.001	0.000	0.000	-0.001
<i>Price discrimination</i>	0.147*	0.244***	-0.021	-0.080
<i>Pseudo R-squared</i>	0.077	0.056	0.143	0.037
<i>Wald statistic</i>	27.690	19.110	21.600	13.340
<i>Prob. (Wald statistic)</i>	0.006	0.086	0.042	0.345
<i>Number of observations</i>	287	264	291	267

*Notes: \* coefficient is statistically significant at the level of 10 percent, \*\* – significant at the level of 5 percent, \*\*\* – significant at the level of 1 percent; p-values are computed using Huber-White robust standard errors.*

*Sources: the survey of the Bank of Lithuania “On Price and Wage Setting” and author's estimations.*

Analysis shows that the firms accommodating the prices to different customers are more likely to adjust the prices when facing demand shocks. Firms that adhere to price discrimination are more likely to change the prices responding to both the demand increase and the demand decrease shocks. One more factor having an impact on price decisions when demand varies is the size of the firm. Firms with 20 to 49 employees are less likely to adjust

the prices following the demand increase as compared to the smaller firms. Firm size does not show up as a factor for price decisions in the case of demand decrease.

The study identifies a few forces influencing the pricing pattern following the higher costs shock, while the above described explanatory variables do not explain satisfactorily pricing behaviour in the face of lower costs shock, therefore no inferences are drawn from the latter regression. Estimates show that higher share of revenue generated by foreign sales reduces the likelihood of price adjustment when costs increase. Presumably this relates to stronger competition effects. The higher share of revenue generated by sales to regular customers has an opposite impact. In the face of cost increase shock, in contrast to the case of demand increase shock, price adjustment appears to be more likely when firms have stronger business relationship with their customers. This corresponds to propositions laid down in the implicit contracts theory.

Regression estimates point to another two factors associated with price decisions when costs increase. Firms in trade turn out to be less likely to adjust the prices in response to the higher costs as compared to the manufacturing firms, and the firms that employ 20 to 49 employees seem to be more likely to alter the prices following this shock than the smaller firms.

To check the robustness of estimation results, all the models are estimated using alternative definitions of the dependent variables. These variables are constructed as binary variables that take the value 1 if the price is adjusted in three or less months following the shock (i.e. following the demand increase, the demand decrease, the cost increase and the cost decrease) and take the value 0 if the price is changed after three months or it is not changed. Robustness analysis shows that under the different definition of the dependent variable it cannot be concluded that in the face of demand increase price adjustment is more likely in firms that use price discrimination. Firms that employ 20 to 49 employees, contrary to the findings mentioned above, do not turn out to be less likely to respond to the higher demand by changing the prices as compared to the smaller firms. Additionally, the examination shows that the investigated set of variables is not statistically significant in describing firms' response to the cost increase using an alternative definition of the dependent variable.

Further regression analysis is conducted to test whether the firms are more or less likely to react to the demand increase and the cost increase as opposed to the demand decrease and the cost decrease. Data on both demand shocks and both cost shocks is pooled together. The model of responses to changes in demand and the model of responses to movements in costs include all explanatory variables outlined above. Apart from these variables, models include a dummy variable indicating whether responses concern the

upward change in demand and the upward change in costs respectively. *Demand increase* and *cost increase* take the value 1 if responses indicate reaction of firms to the increase in demand and the increase in costs respectively and take the value 0 otherwise. The dependent variables are defined as binary variables taking the value 1 if the firm changes the price following the investigated shocks and take the value 0 if it does not. Regression results conform to the ones presented earlier in this section. They point to a more likely response of the firms by adjusting the prices following the cost increase rather than the cost decrease, while the difference in reaction to opposite changes in the demand is not found to be statistically significant (see Table 9).

The inferences concerning reaction to upward as opposed to downward change in demand and costs appear to be robust when the dependent variables in the models of pooled demand and cost shocks are redefined as in the robustness analysis above.

*Table 9. Explanations for price change in response to pooled demand and cost shocks (marginal effects for binary probit models; the table provides only marginal effects on the probability that the price is changed in response to the shock)*

	Type of shock:	
	demand change	cost change
<i>Labour share</i>	0.000	-0.002
<i>Trade firms</i>	0.005	-0.104*
<i>Services firms</i>	0.017	0.001
<i>Firms 20-49</i>	-0.087	-0.014
<i>Firms 50 and more</i>	0.084	0.016
<i>Collective pay agreements</i>	-0.059	-0.056
<i>Flexible wage share</i>	0.000	-0.002
<i>Competition</i>	0.202***	0.028
<i>Foreign sales share</i>	0.000	0.000
<i>Regular customers share</i>	-0.002***	0.001
<i>Wholesale and retail firms share</i>	0.000	-0.001
<i>Price discrimination</i>	0.192***	-0.069
<i>Demand increase</i>	-0.025	-
<i>Cost increase</i>	-	0.608***
<i>Pseudo R-squared</i>	0.051	0.351
<i>Wald statistic</i>	36.430	216.630
<i>Prob. (Wald statistic)</i>	0.001	0.000
<i>Number of observations</i>	551	558

*Notes:* \* coefficient is statistically significant at the level of 10 percent, \*\* – significant at the level of 5 percent, \*\*\* – significant at the level of 1 percent; *p*-values are computed using Huber-White robust standard errors.

*Sources:* the survey of the Bank of Lithuania “On Price and Wage Setting” and author’s estimations.

To investigate the asymmetries in price adjustment the survey also inquired the firms to provide the information on the reasons that caused the upward change in prices and the reasons that were behind the downward change in prices in recent years. Firms were asked to render an assessment of the following potential explanations for the change in prices: a

change in labour costs, a change in capital costs, a change in prices of raw materials or services that the firms buy, a change in taxes, a change in prices of the competitors, a regularity of the price change, a change in the demand, the administrative measures of public authorities, a general price level (price change) in the country, and a change in the prospects of the inflation and/or other macroeconomic variables. The list of potential explanations for the price increase also included a change in quality of the main product, while the series of potential explanations for the price decrease also covered a change in the technology that lowered the costs and competitors' introduction of new and better products. Firms were requested to indicate whether the provided explanations were (1) not relevant, (2) of little relevance, (3) relevant, (4) very relevant for price increase and for price decrease or (5) they do not know.

The firms responded that the most momentous reasons for the upward price adjustment are related to the costs. In particular, higher prices of raw materials or services that the firms buy and higher labour costs top the list of reasons for price increase (see Table 10). Among the other five most decisive factors of the upward change in prices are a consideration of the general price level (price increase) in the country, higher quality of the main product and higher taxes. The analysed factors related to market conditions, like, an increase in prices of the competitors and an increase in the demand, stand out as somewhat less explanatory reasons for the price increase. A change in the prospects of the inflation and/or other macroeconomic variables and an increase in costs of capital are also viewed as somewhat less momentous explanations for the upward change in prices, while a regular increase in prices and consideration of the administrative measures of public authorities rank as the factors of the lowest importance.

Firms in manufacturing and business services point out the same five factors that are viewed as the most momentous ones for the upward price adjustment as they are found for the whole sample of the surveyed firms. Construction and trade firms, however, attach relatively more importance to some other factors. In particular, for the firms in construction higher quality of the main product ranks somewhat below and a change in the prospects of the inflation and/or other macroeconomic variables ranks somewhat higher in the list of explanations for the price increase. Trade firms attach relatively lower importance to higher taxes and greater importance to higher costs of capital when assessing the reasons for the upward price adjustment.

Survey rendered rather different ranking of the explanations for price decrease as compared to the ranking of the factors for price increase. Firms indicated that the most decisive explanations for the downward price adjustment are related to market conditions. A decrease in prices of the competitors, a decrease in the demand and competitors' introduction

of new and better products stand out among the five most momentous factors for the price decrease (see Table 11). The other most decisive factors are a consideration of the general price level (price decrease) in the country and a decrease in prices of raw materials or services that the firms buy. A change in the technology that lowered the costs and a change in the prospects of the inflation and/or other macroeconomic variables are regarded as less important explanations for the downward price adjustment. All the other investigated explanations, including those related to the costs – a decrease in costs of capital and a decrease in labour costs – are viewed as least relevant ones.

*Table 10. Reasons for price increase during recent years  
(share of firms for which the reason is “relevant” or “very relevant”; percent)*

	<i>Manu- facturing</i>	<i>Cons- truction</i>	<i>Trade</i>	<i>Business services</i>	<i>Total</i>
<i>Prices of raw materials or services (that the firm buys) increased</i>	98.6	100.0	95.3	92.4	96.1
<i>Labour costs increased</i>	92.4	90.5	79.3	95.8	90.4
<i>General price level (price increase) in the country was taken into account</i>	57.0	89.5	64.4	59.1	64.5
<i>Quality of the main product increased</i>	67.8	44.9	53.2	70.5	61.9
<i>Taxes increased</i>	53.9	71.2	48.2	62.8	58.4
<i>Prospects of the inflation and/or other macroeconomic variables changed</i>	44.5	62.2	42.0	55.0	50.3
<i>Competitors increased the price</i>	49.7	48.8	49.3	36.1	45.0
<i>Demand increased</i>	31.0	60.3	40.2	49.6	43.8
<i>Capital costs increased</i>	34.2	48.8	50.3	38.2	41.3
<i>Price is increased regularly</i>	23.9	35.7	19.6	29.4	26.7
<i>Administrative measures of public authorities were taken into account</i>	8.5	4.6	7.2	10.9	8.4

*Notes: responses are employment-weighted and rescaled to exclude non-responses.*

*Sources: the survey of the Bank of Lithuania “On Price and Wage Setting” and author’s calculations.*

Firms in trade report a similar set of the five most explanatory factors of the downward price adjustment, while firms in other economic activities assign somewhat larger importance to some other factors. Firms in manufacturing rate a decrease in prices of raw materials or services that the firms buy somewhat lower, and they rate a change in the technology that lowered the costs somewhat higher. Construction firms express greater significance of a change in the prospects of the inflation and/or other macroeconomic variables and lower significance of a decrease in the demand and competitors’ introduction of new and better products in explaining the downward price adjustment. Firms in business services render a particularly different ranking of the most decisive reasons for the price decrease. These firms lend a significantly lower importance to a decrease in the demand and competitors’ introduction of new and better products, and they assign higher importance to a change in the technology that lowered the costs and a change in the prospects of the inflation and/or other macroeconomic variables.

The evidence on reasons for the price increase and the price decrease in Lithuania compares to the one obtained for the euro area and Estonia. The studies on both the euro area (Fabiani et al. 2006) and Estonia (Dabušinskas and Randveer 2006) assess five potential explanations for upward and downward change in prices, in particular, a change in labour costs, a change in costs of raw materials, a change in financial costs, a change in the demand, and a change in prices of the competitors. These studies point to an increase in costs of raw materials and an increase in labour costs as the most momentous explanations for the upward price adjustment in the euro area and Estonia exactly matching the reported findings for Lithuania. The studies on the euro area and on Estonia show that the most decisive reasons for the downward price adjustment in these countries are a decrease in prices of the competitors, a decrease in costs of raw materials and a decrease in the demand. It conforms to the evidence elicited in the case of Lithuania where all these three explanations for the price decrease rank among the top ones.

*Table 11. Reasons for price decrease during recent years  
(share of firms for which the reason is “relevant” or “very relevant”; percent)*

	<i>Manu- facturing</i>	<i>Cons- truction</i>	<i>Trade</i>	<i>Business services</i>	<i>Total</i>
<i>Competitors lowered the price</i>	96.2	92.5	89.7	42.8	82.3
<i>Demand decreased</i>	85.0	64.2	75.4	12.2	63.6
<i>General price level (price decrease) in the country was taken into account</i>	50.9	100.0	58.5	41.1	57.7
<i>Competitors introduced new and better products</i>	71.5	64.2	62.6	6.9	53.9
<i>Prices of raw materials or services (that the firm buys) decreased</i>	46.8	71.6	58.6	34.2	51.1
<i>Technologies improved what in turn lowered the costs</i>	64.5	43.3	29.3	53.9	48.7
<i>Prospects of the inflation and/or other macroeconomic variables changed</i>	24.3	92.5	28.5	30.9	36.1
<i>Capital costs decreased</i>	12.6	35.8	23.0	29.3	22.5
<i>Labour costs decreased</i>	22.2	7.5	15.2	25.7	18.8
<i>Taxes decreased</i>	11.0	14.9	23.1	25.7	18.3
<i>Price is lowered regularly</i>	19.9	0.0	13.6	27.3	16.9
<i>Administrative measures of public authorities were taken into account</i>	10.3	0.0	8.1	0.0	6.1

*Notes: responses are employment-weighted and rescaled to exclude non-responses.*

*Sources: the survey of the Bank of Lithuania “On Price and Wage Setting” and author’s calculations.*

Assessment of the investigated explanations for the movements in prices reveals asymmetric influence of some of the factors on upward and downward change in prices. The cost factors, specifically, a change in labour costs and a change in prices of raw materials or services that the firms buy, turn out to be more decisive in invoking the price increase rather than the price decrease (see Table 12). This corroborates with the above unfolded evidence on rather more likely price adjustment following the cost increase than in response to the cost decrease. The factors related to market conditions, in particular, a change in prices of the

competitors and a change in the demand, appear to be more momentous in inducing the price decrease rather than the price increase – the observation that did not come out in the preceding shock analysis.

Manufacturing, trade and business services firms report the same most important factors leading to more likely price increase and more likely price decrease as they are found out for the whole set of the analysed firms with one exception in business services. In the latter economic activity only a change in prices of the competitors is viewed as the explanation for more likely downward change in prices. In construction somewhat different list of concerning factors is uncovered. Here, among the factors invoking more likely price increase, a change in taxes ranks somewhat higher than a change in prices of raw materials or services that the firms buy, and, among the factors causing more likely price decrease, a change in the prospects of the inflation and/or other macroeconomic variables is regarded as more important than a change in the demand.

*Table 12. Asymmetry of price change reasons (difference between the shares of firms for which the reason for price increase and price decrease is “relevant” or “very relevant”; percentage points)*

	<i>Manu- facturing</i>	<i>Cons- truction</i>	<i>Trade</i>	<i>Business services</i>	<i>Total</i>
<i>Labour costs changed</i>	70.2	83.0	64.1	70.1	71.6
<i>Prices of raw materials or services (that the firm buys) changed</i>	51.9	28.4	36.6	58.2	45.0
<i>Taxes changed</i>	42.9	56.3	25.1	37.1	40.1
<i>Capital costs changed</i>	21.6	13.0	27.3	9.0	18.8
<i>Prospects of the inflation and/or other macroeconomic variables changed</i>	20.2	-30.3	13.5	24.1	14.2
<i>Price is changed regularly</i>	4.0	35.7	6.0	2.1	9.8
<i>General price level (price change) in the country was taken into account</i>	6.1	-10.5	5.9	18.0	6.9
<i>Administrative measures of public authorities were taken into account</i>	-1.8	4.6	-0.9	10.9	2.3
<i>Demand changed</i>	-54.1	-3.9	-35.2	37.4	-19.9
<i>Competitors changed the price</i>	-46.5	-43.7	-40.4	-6.7	-37.2

*Notes: responses are employment-weighted and rescaled to exclude non-responses.*

*Sources: the survey of the Bank of Lithuania “On Price and Wage Setting” and author’s calculations.*

The reported most decisive factors causing the price increase rather than the price decrease and vice versa stand out in line with the ones reported for the euro area (Fabiani et al. 2006) and Estonia (Dabušinskas and Randveer 2006).

## Conclusions

The study of the firm-level data from an ad hoc survey disclosed a series of features of price setting practices in Lithuanian firms. The survey pointed to the incidence of both the time-

dependent and the state-dependent price reviewing policies used by the investigated firms. Most of them review the prices depending on the time and in certain – state-dependent – cases. Nevertheless, the price reviewing practices are somewhat tilted to the state-dependent pricing as the occurrence of the firms, reviewing prices only in certain cases, is more widespread than the prevalence of the firms that review the prices only regularly. All else equal, the state-dependent pricing implies a more responsive way of the price setting.

According to the survey, somewhat more than one third of all the analysed firms review the prices in a non-regular pattern. Approximately one third of the investigated firms review the prices daily to monthly, and almost one quarter of the firms review them quarterly to half yearly. Prices turn out to be reviewed more frequently than they are changed implying that the stickiness of prices might occur at both the price reviewing stage and the price adjustment stage.

Yet, in examining the delay in price adjustment when there are reasons to increase or lower prices, firms mostly refer to explanations related to the price adjustment stage. Firms indicate that the most momentous explanations for not adjusting prices either upwards or downwards are related to the costs that they encounter in operational activities – cost-based pricing – and formal contracts (or, alternatively, explicit contracts) with their customers. The list of reasons for upward stickiness of prices is followed by non-formal contracts (or, alternatively, implicit contracts), lack of coordinated actions with other firms – coordination failure – and information costs. Among the most important factors for sticky downward price adjustment firms also mention the temporary character of shocks, the possibly misleading signal on the quality and aforementioned failure of coordination between the firms. The physical price adjustment costs – menu costs – are viewed as least significant in causing upward and downward stickiness of prices.

The analysis finds an asymmetric influence of some of the price factors. The cost factors, namely, movements in labour costs and movements in prices of raw materials or services that the firms buy, appear to be more decisive in invoking the price increase rather than the price decrease. In corroboration, survey results indicate that prices are more likely to respond to the higher cost shocks rather than to the lower cost shocks. At the same time, evidence on the influence of factors related to market conditions is less clear-cut.

Regression analysis pointed to asymmetry in the effects stemming from operational characteristics of firms when they decide on prices. The non-formal contracts, proxied by the revenue from sales to regular customers, are found to limit price adjustment when demand goes up, but not when demand goes down. Price accommodation to different customers turns out to contribute to the response of prices to the demand decrease, but not to the demand increase.

## References

- Akerlof, G. A., Yellen, J. L. (1985). A Near-Rational Model of the Business Cycle, with Wage and Price Inertia. *The Quarterly Journal of Economics*, Vol. 100, No 5, pp. 823-838.
- Altissimo, F., Ehrmann, M., Smets, F. (2006). Inflation Persistence and Price-Setting Behaviour in the Euro Area: a Summary of the IPN Evidence. *Occasional Paper Series*, No 46, European Central Bank.
- Álvarez, L. J., Hernando, I. (2005). The Price Setting Behaviour of Spanish Firms: Evidence from Survey Data. *Working Paper Series*, No 538, European Central Bank.
- Amirault, D., Kwan, C., Wilkinson, G. (2006). Survey of Price-Setting Behaviour of Canadian Companies. *Working Paper*, No 2006-35, Bank of Canada.
- Apel, M., Friberg, R., Hallsten, K. (2005). Microfoundations of Macroeconomic Price Adjustment: Survey Evidence from Swedish Firms. *Journal of Money, Credit, and Banking*, Vol. 37, No 2, pp. 313-338.
- Aucremanne, L., Druant, M. (2005). Price-Setting Behaviour in Belgium: What Can Be Learned from an Ad Hoc Survey? *Working Paper Series*, No 448, European Central Bank.
- Barro, R. J. (1972). A Theory of Monopolistic Price Adjustment. *Review of Economic Studies*, Vol. 39, No 1, pp. 17-26.
- Blinder, A. S. (1991). Why Are Prices Sticky? Preliminary Results from an Interview Study. *The American Economic Review*, Vol. 81, No 2, pp. 89-96.
- Blinder, A. S. (1994). On Sticky Prices: Academic Theories Meet the Real World, in Mankiw, N. G. (ed.), *Monetary Policy*, Chicago, The University of Chicago Press, pp. 117-154.
- Blinder, A. S., Canetti, E. R. D., Lebow, D. E., Rudd, J. B. (1998). *Asking About Prices: a New Approach to Understanding Price Stickiness*. New York, Russell Stage Foundation, 380 p.
- Calvo, G. A. (1983). Staggered Prices in a Utility-Maximizing Framework. *Journal of Monetary Economics*, Vol. 12, No 3, pp. 383-398.
- Dabušinskas, A., Randveer, M. (2006). Comparison of Pricing Behaviour of Firms in the Euro Area and Estonia. *Working Paper Series*, No 8/2006, Eesti Pank.
- Dhyne, E., Konieczny, J., Rumler, F., Sevestre, P. (2009). Price Rigidity in the Euro Area – An Assessment. *European Economy: Economic Papers*, No 380, European Commission.
- Dixit, A. (1991). Analytical Approximations in Models of Hysteresis. *Review of Economic Studies*, Vol. 58, No 1, pp. 141-151.

- Fabiani, S., Druant, M., Hernando, I., Kwapil, C., Landau, B., Loupias, C., Martins, F., Mathä, T., Sabbatini, R., Stahl, H., Stokman, A. (2006). What Firms' Surveys Tell Us about Price-Setting Behaviour in the Euro Area. *International Journal of Central Banking*, Vol. 2, No 3, pp. 3-47.
- Fabiani, S., Gattulli, A., Sabbatini, R. (2004). The Pricing Behaviour of Italian Firms: New Survey Evidence on Price Stickiness. Working Paper Series, No 333, European Central Bank.
- Hall, S., Walsh, M., Yates, A. (2000). Are UK Companies' Prices Sticky? *Oxford Economic Papers*, Vol. 52, No 3, pp. 425-446.
- Hoeberichts, M., Stokman, A. (2010). Price Setting Behaviour in the Netherlands: Results of a Survey. *Managerial and Decision Economics*, Vol. 31, No 2-3, pp. 135-149.
- Kwapil, C., Scharler, J., Baumgartner, J. (2007). Price-Setting Behavior of Austrian Firms. *Empirica*, Vol. 34, No 5, pp. 491-505.
- Levy, D., Bergen, M., Dutta, S., Venable, R. (1997). The Magnitude of Menu Costs: Direct Evidence from Large U.S. Supermarket Chains. *The Quarterly Journal of Economics*, Vol. 112, No 3, pp. 791-825.
- Loupias, C., Ricart, R. (2004). Price Setting in France: New Evidence from Survey Data. Working Paper Series, No 423, European Central Bank.
- Lünnemann, P., Mathä, T. Y. (2006). New Survey Evidence on the Pricing Behaviour of Luxembourg Firms. Working Paper Series, No 617, European Central Bank.
- Mankiw, N. G. (1985). Small Menu Costs and Large Business Cycles: A Macroeconomic Model of Monopoly. *The Quarterly Journal of Economics*, Vol. 100, No 2, pp. 529-537.
- Martins, F. (2005). The Price Setting Behaviour of Portuguese Firms: Evidence from Survey Data. Working Paper Series, No 562, European Central Bank.
- Sheshinski, E., Weiss, Y. (1977). Inflation and Costs of Price Adjustment. *Review of Economic Studies*, Vol. 44, No 2, pp. 287-303.
- Stahl, H. (2005). Price Setting in German Manufacturing: New Evidence from New Survey Data. Working Paper Series, No 561, European Central Bank.
- Taylor, J. B. (1980). Aggregate Dynamics of Staggered Contracts. *The Journal of Political Economy*, Vol. 88, No 1, pp. 1-23.
- Virbickas, E. (2009). Wage and Price Setting Behaviour of Lithuanian Firms. *Monetary Studies*, Vol. 13, No 2, pp. 5-21.
- Zbaracki, M. J., Ritson, M., Levy, D., Dutta, S., Bergen, M. (2004). Managerial and Customer Costs of Price Adjustment: Direct Evidence from Industrial Markets. *The Review of Economics and Statistics*, Vol. 86, No 2, pp. 514-533.

## List of Bank of Lithuania Working Papers

- No 11: “Price Setting in Lithuania: More Evidence from the Survey of Firms” by Ernestas Virbickas, 2011.
- No 10: “What Caused the Recent Boom-and-Bust Cycle In Lithuania? Evidence from a Macromodel with the Financial Sector” by Tomas Ramanauskas, 2011.
- No 9: “Potential Output in DSGE Models” by Igor Vetlov, Tibor Hlédik, Magnus Jonsson, Henrik Kucsera and Massimiliano Pisani, 2011.
- No 8: “The Implementation of Scenarios Using DSGE Models” by Igor Vetlov, Ricardo Mourinho Félix, Laure Frey, Tibor Hlédik, Zoltán Jakab, Niki Papadopoulou, Lukas Reiss and Martin Schneider, 2010.
- No 7: “Wage and Price Setting Behaviour of Lithuanian Firms” by Ernestas Virbickas, 2010.
- No 6: “Building an Artificial Stock Market Populated by Reinforcement-Learning Agents” by Tomas Ramanauskas and Aleksandras Vytautas Rutkauskas, 2009.
- No 5: “Estimation of the Euro Area Output Gap Using the NAWM” by Günter Coenen, Frank Smets and Igor Vetlov, 2009.
- No 4: “The Effects of Fiscal Instruments on the Economy of Lithuania” by Sigitas Karpavičius, 2009.
- No 3: “Agent-Based Financial Modelling: A Promising Alternative to the Standard Representative-Agent Approach” by Tomas Ramanauskas, 2009.
- No 2: “Personal Income Tax Reform: Macroeconomic and Welfare Implications” by Sigitas Karpavičius and Igor Vetlov, 2008.
- No 1: “Short-Term Forecasting of GDP Using Large Monthly Datasets: A Presudo Real-Time Forecast Evaluation Exercise” by G. Rünstler, K. Barhoumi, S. Benk, R. Cristadoro, A. Den Reijer, A. Jakaitienė, P. Jelonek, A. Rua, K. Ruth and C. Van Nieuwenhuyze, 2008.