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Price Setting in Croatia during the Crisis – Insight from a Firm Survey

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Abstract

Several dimensions of price setting practices during the crisis are explored in this paper. In particular: (i) how prices developed during the crisis in Croatia at firm level; (ii) what is the effect of different shocks (depending on the nature, intensity and duration of the shock) to which a firm was exposed on a price decrease/increase decision; and (iii) are financial frictions and unfavorable financing conditions relevant for firms' decision to raise prices during the crisis, in an attempt to preserve internal liquidity. The analysis is based on the data collected within the third wave survey about the labour market and wages for Croatia that was implemented with cooperation from the Croatian National Bank (HNB) and the European System of Central Banks (ESCB) Wage Dynamic Network (WDN). The survey data structure allows us to directly link product price movements with changes in the economic environment of firms and with a wide range of relevant firm and institutional characteristics. Our findings suggest that 45% of firms in Croatia decreased the price of their main product in the 2010-2013 crisis period, while 28% decided to increase the price. Those firms that were directly exposed to the unfavorable economic environment have a significantly higher probability of price decrease. On the contrary, firms that were exposed to both a decrease in demand and onerous credit conditions were more likely to increase the prices of their products in an attempt to mitigate the effects of unfavorable financing conditions on firms' activity.

Keywords: survey data, negative economic shocks, firm price setting, financial frictions

1. Introduction

This paper analyses the main drivers of different price setting practices of Croatian firms during the 2010-2013 crisis period. The analysis is based on the data collected within the third wave survey about the labour market and wages for Croatia that was implemented with cooperation from the Croatian National Bank (HNB) and the European System of Central Banks (ESCB) Wage Dynamic Network (WDN).[1] In addition to the detailed information about different economic shocks firms were exposed to during the crisis, and consequently labour cost adjustment strategies firms implemented in their attempt to mitigate unfavorable impact of deteriorating economic conditions on firms' activity, the survey also collected the data about changes in the price of the firms' main product.

Therefore, in this paper we use survey data to examine the main determinants of firms' decision to decrease/increase the prices of their products during the crisis in Croatia, by directly linking product price movements with changes in the economic environment firm was exposed to and with wide range of relevant firm and institutional characteristics. This approach is particularly interesting when put into broader prospective of missing disinflation observed during the economic crisis, when price movements proved to be rather resilient compared to deterioration in the economic activity, making most of standardly used macroeconomic models insufficient for adequate analysis of interaction between prices and economic activity.[2] We decide to analyze price developments in Croatia during the crisis, but instead of using macro data, we contribute to the debate from another prospective, employing the survey level data and examining the main drivers influencing decision to decrease/increase prices directly at firm level.

Our work extends results of Pufnik and Kunovac (2012) based on HNB survey about the price movements that was implemented for 2008 and 2009 period, examining how enterprises in Croatia determine and change the prices of their products. Authors show that hypothetical increase in demand and costs are the main determinants of price increase decision, while hypothetical decrease in demand is the most important determinant influencing price decrease decision. Here, we extend the analysis in three ways.

First, our research analyses the price setting decision taken as a response to effective economic shock firm was exposed to, instead of analyzing presumed response to hypothetical economic shock as in Pufnik and Kunovac (2012). Survey literature has shown that reactions to effective economic shocks can differ significantly in their intensity compared to supposed reactions to hypothetical economic shocks, implying that intensity and persistence of the crisis on one hand have crucial role in shaping firms' decisions and on other hand cannot be precisely captured by generic and hypothetical questions.[3]

[1] Summary of the main results of the survey about the labour market and wages for Croatia is given in Kunovac and Pufnik (2015).

[2] Mild response of inflation to severe economic turmoil recorded during the crisis raised questions about the empirical relevance of Phillips curve, as discussed among others in Ball and Mazumder 2011, Hall (2011), Friedrich (2016), Ciccarelli and Osbat (2017) and Bobeica and Jarocinski (2017).

[3] For example, Babecky et all (2010) show on sample of EU countires using first wave WDN survey data about the labour market and wages for 2008 that only 1,6% of firms would decrease base wages of their employees in the case of hypothetical sever negative demand shock. On other hand, Izquierdo et all (2017) use third wave WDN survey results that were collected during global crisis and show that effective decrease in base wages in some

Second, we do not concentrate on demand shock solely, since the great recession had several negative interconnected aspects, all of them affecting firms' activity and possibly influencing firms' decisions. Therefore, we distinguish between different economic shocks; namely demand shock, supplies shock, illiquidity shock, financing shock and volatility shock and assess separately their relative importance contributing to the firms' decision to decrease the prices of products during the crisis. Moreover, we take into consideration not only the nature of the shock, but its' strength and duration.

Third, we analyze the impact of financial frictions on firms' decision to increase prices during the crisis. We start from theoretical considerations of costumer market theory introduced by Gottfries (1991) and Chavalier and Scharfstein (1996) showing that financial distortions create an incentive for liquidity constrained firms to raise the prices of their products during the crisis in an attempt to preserve internal liquidity instead of raising external funds. This causes countercyclical movements of the prices over the business cycle. Based on these theoretical considerations about the role of financial frictions in the price increase decision during the crisis we contribute to the debate empirically by using third wave WDN survey data for Croatia. Empirical literature examining the impact of financial frictions on firms' pricing policies during the global financial crisis is limited, with the most important contributions analyzing the data for US, Spain and Italy. Gilchrist et al (2016) uses micro dataset merging good level prices with firms' balance sheets for sample of US firms and show that while liquidity unconstrained firms decreased the prices of their products during 2008 crisis, liquidity constrained firms follow the opposite pattern and increase the prices of their products in the same period. Authors conclude that financial frictions create an incentive for firms to raise prices during the crisis. Montero and Urtasun (2014) aim at estimating price-cost markups using a firm level data from Central Balance Sheet Data Office for Spanish firms for 1995-2011 period.[4] Their results point to an upward trend in markups since 2008. Thus, authors use available balance sheet data to construct indicators of financial pressure and degree of product market competition and find that these factors contribute to recent growth of markups in Spain after 2008. Our paper follows analysis set by Duca et al (2017) that also relies on third wave WDN data – but concentrating exclusively on Italian dataset. Authors find that probability of rising prices during the crisis is higher for financially constrained firms and for firms perceiving permanent changes in demand, while changes in perceived competition during the business cycle are not statistically significant.

The main results of the paper suggest that most firms in Croatia adjusted the price of the main product during the crisis with slightly less than half of the firms decreasing prices on domestic or foreign market, and almost one third of firms increasing prices. The study confirms importance of degree of competition, interconnection between wage and price determination and changes in costs and demand for likelihood of implementing both price decrease and price increase decisions. On other hand, high degree of illiquidity and decreased customer ability to pay and meet contractual terms during the crisis increase strongly likelihood of the price decrease decision by firms, while the existence of financial constraints coupled with negative

countries experiencing economic turmoil was significantly more pronounced. For example, survey data show that 26% of firms in Croatia implemented base wage cuts in a response to adverse economic environment during 2010 - 2013 period, while Greece recorded the most widespread decrease of base wages in EU with 55% of firms implementing wage cuts.

[4] Authors estimate price markups following approach set by Hall contributions (1986, 88, 90) and upgraded by Klette (1999).

demand environment emerged as significant in increasing the likelihood of price increase decision.

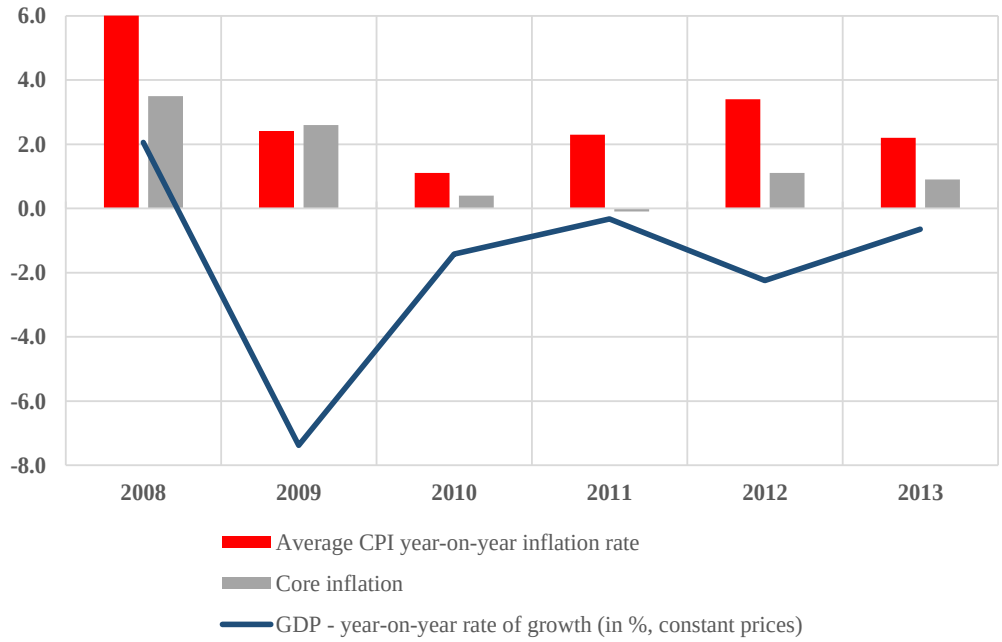
The remaining part of the paper is organized as follows. Section 2 discuss price movements and changes in economic environment in Croatia in the 2010-2013 period. Section 3 examines the main determinants influencing probability of firms' price decrease decision during the crisis, with special emphasis on the nature, intensity and duration of different economic shocks. Section 4 analyses the determinants influencing probability of firms' price increase decision during the crisis, clarifying the role of financial frictions while Section 5 concludes.

2. Price movements and changes in the economic environment during the 2010-2013 period

Despite strong contraction of economic activity in Croatia since 2009, with gross domestic product cumulatively contracting by 12% by the end of 2013, consumer price index remained relatively stable with average consumer inflation of 2.3%, and core inflation of 1% in the same period (Graph1). Hence, disruptive economic trends that persisted for several years did not create disinflation pressures to the extent predicted according to standard Phillips curve relationship. In fact, most macroeconomic models used now days rely on Phillips curve relationship and assume pro cyclicality between prices and economic activity, and thus imply there is a missing link between inflation and economic performance over the crisis. Bobeica and Jarocinsky (2017) extensively analyze "missing disinflation puzzle" in euro area observed after the onset of the economic crisis and conclude that absence of appropriate link between inflation and economic activity is a result of too restrictive macro economic models used (Phillips curve models or New Keynesian DSGE models). Authors employ reduced form and structural Bayesian VAR models that are flexible enough to account for multiplicity of domestic and global factors and find that the global variables explain much of the inflation dynamics in euro area during great recession, implying no missing disinflation puzzle actually exists. [5] Similar macroeconomic analysis is done by Jovičić and Kunovac (2017) for Croatia, although authors in their paper concentrate on more recent time period.

Graph 1. Inflation and real activity in Croatia from 2008 until 2013.

[5] Here we discuss only missing disinflation puzzle, since our analysis covers 2010-2013 period. There is a growing bulk of literature analyzing missing inflation puzzle arising in most advanced economies and especially in euro area after 2012. Among the most important contributions Bobeica and Jarocinsky (2017) in their paper also examine missing inflation puzzle that arise in euro area after 2012 and again find that use of appropriate VAR models can successfully explain and forecast observed inflation dynamics. Jovičić and Kunovac (2017) preform similar analysis in order to explain falling inflation rates that in Croatia were observed only after 2013. Authors estimate and identify small open economy Bayesian VAR and find falling inflation rates in Croatia recorded after 2013 are mainly driven by global factors.



Source: Central Bureau of Statistics, Eurostat

In this paper, we do not analyze whether the link between prices and economic activity for Croatia was indeed broken during the crisis, instead we try to shed light to the interconnection between prices and economic activity during the crisis from another prospective, by using microeconomic approach based on firm level survey data. This will allow us to clarify how different economic and financial shocks are transmitted inside a pricing mechanism at firm level and to examine the main determinants influencing firms' decision to decrease/increase prices. In order to analyze the interaction between firm price-setting decisions and changes in economic environment we use data from Survey about the labour market and wages for Croatia, and its questions referring to price setting decisions of the firms.

The survey about the labour market and wages for Croatia was commissioned by the Croatian National Bank (HNB) and effectively carried out by Ipsos Puls – Market Research Agency, from September to November 2014, while referring to the 2010-2013 period. The final gross sample of firms was a two-stage stratified sample according to: a) the size (5-19, 20-49, 50-199, +200 employees) and b) the sector of economic activity (manufacturing (C), construction (F), trade (G), business services (H-J, L-N)) that was derived from official Registry of Annual Financial Statements of non financial sector (FINA). Within each of the 16 strata, firms were selected randomly. Gross sample consisted of 4548 firms, while realized sample consisted of 301 firm from manufacturing, construction, trade and bussiness services. However, we drop the construction sector from any further analysis (29 firms) since construction is not included in HICP. [6]

Question 2.6 of the Survey ask how did the prices of the firms' main product evolved on domestic and foreign markets during the 2010-2013 crisis. Results (Table 1) show that decrease in prices were more pronounced on domestic market. The price increase decision were also

[6] See Appendix 1 for detailed questionnaire.

more frequent on domestic market compared to foreign market, but the difference between two markets is smaller in the case of price increase decisions.

Table 1 Price evolution during the 2010-2013 period on domestic and foreign market

	How did prices for your main product evolve during 2010-2013? (in %)	
	Domestic market	**Foreign market**
Strong decrease	11	2.2
Moderate decrease	27.2	18.3
Unchanged	37.9	61.9
Moderate increase	23.7	17.3
Strong increase	0.2	0.2

Note: The presented results have been weighted by employment-adjusted weights.

Source: HBN survey.

In remaining sections, we will extensively investigate the main drivers behind price decrease /increase decisions, not distinguishing between domestic and foreign markets. This decision is motivated by the fact that some of the firms that declare to have unchanged prices on the foreign markets are those firms that do not even participate actively on foreign markets – with the major share of their revenues coming from domestic markets, and vice versa.[7] One solution could be to restrict a priori the analysis only on those firms that have significant share of revenues coming from domestic/foreign markets and then analyze respective price decrease/increase decisions for each market, but this resulted in unacceptable small samples for some of the cases. Thus, we continue by analyzing all firms that recorded moderate or strong decrease of the prices of their main product, irrespectively whether the price decrease took place on domestic or foreign market. Cumulatively, 45% of the firms saw decrease (moderate or strong) in the prices of their product over the 2010-2013 period on domestic or foreign market. On other hand, 28% of the firms recorded price increase (on domestic or foreign market) over the same period.

According to the survey data examining changes in the economic environment firms were exposed to during the 2010-2013 crisis (survey question 2.1), 42% of firms were faced with negative demand shock decreasing firm activity, while even 52% of firms faced declined customer ability to pay and meet contractual terms, creating illiquidity problems for firms. Moreover, high share of firms (55%) encountered unfavorable financing conditions during the crisis, in a form of not available credit lines, or too onerous credit conditions, having again negative impact on firms' activity.[8] Overview of firms' exposure to changes in the economic environment during the 2010-2013 period is presented in Table 2.

Table 2 Changes in the economic environment and financing conditions for firms, in %

[7] Survey question 5.2 examines what is the share of revenues of firms' main product coming from domestic and foreign markets.

[8] Detailed description of the effect of changes in the economic activity on firms' activity during the 2010-2013 period according to the results of the WDN survey for Croatia is given in Kunovac and Pufnik (2015). Here the results differ slightly since we have dropped the construction sector from our sample.

How did the following factors affect your firms' activity during 2010-2013 period?			
	Strong or moderate decrease of activity	Unchanged	Strong or moderate increase of activity
The level of demand for your products/services	42	20	38
Volatility/uncertainty of demand for your products/services	40	40	20
Access to external financing through the usual financial channels	18	70	12
Customers' ability to pay and meet contractual terms	52	38	10
Availability of supplies from your usual suppliers	18	62	20
With regard to finance, please indicate for 2010-2013 how relevant were for your firm each one the following happenings?			
	Not relevant/of little relevance	Relevant/Very relevant	
Credit to finance working capital, new investment or debt was not available	69	31	
Credit to finance working capital, new investment or debt was available, but conditions (interest rate and other contractual terms) were too onerous	50	50	

Note: The presented results have been weighted by employment-adjusted weights.

Source: HBN survey.

Changes in the economic environment had strong impact on pricing decisions as shown in Table 3. Among firms that have decided to decrease the prices of their products, more than 50% were exposed to demand or financing shock, while it is striking that 70% of firms encountered declined customers' ability to pay. On other hand, firms that have decided to increase the prices of their products were to a much lesser extent exposed to adverse economic shocks – with exception of financing shock that was wide spread among firms opting for price increase decision. Among the firms that increased the prices of their products 54% of firms encountered unavailable credit lines in their business or were exposed to onerous credit conditions, implying there could be some link between price increase decision and financial frictions that should be furtherly investigated.

Table 3 Pricing decisions by firms and their interaction with adverse economic environment, in%

	% of firms that recorded moderate or strong decrease in prices of main product on domestic or foreign market	% of firms that recorded moderate or strong increase in prices of main product on domestic or foreign market
Total	45	28
of which:		
firms that suffered demand shock	54	18
firms that suffered illiquidity shock	70	30
firms that suffered from unavailable credit lines, or too onerous credit conditions	57	54

Note: The presented results have been weighted by employment-adjusted weights.

Source: HBN survey.

Analyzing incidence of different pricing decisions, for firms that encountered different types of economic shocks provides valuable information, but however this type of analysis is not sufficient to conclude to what extent firms' price change decisions are direct consequence of particular economic shock or to individuate relevant determinants driving firms' pricing decisions. Therefore, to model the main pricing decisions of the firm in remaining part of the paper we use discrete choice models.

3. Determinants of price decrease decision in an environment of negative economic shocks

We now apply binary probit model to examine what are the main factors influencing firms' decision to decrease the price of the main product during the crisis. The model is defined in the following form:

$$P(D_i = 1 \mid X_i) = \Phi\,(\beta' X_i), \qquad (1)$$

where Φ denotes cumulative distribution function of the normal distribution, β referrs to the vector of coefficients, while vector X_i contains explanatory variables.

The depended variable (Di) is a dummy variable constructed on the bases of responses to the survey question 2.6. The variable takes value 1 if the firm stated that the price of the main product (on domestic or foreign market) recorded strong or moderate decrease during the 2010-2013 period.

Explanatory variables take into account basic firm level characteristics – such as firm size (a dummy variable for firms with less than 200 employees) and sector of economic activity (a dummy variable for industry).

We also include the information about the level of competition and market power of the firm. DSGE models developed by Etro and Colciago (2010) show that propagation of exogenous shocks trough economy varies depending on degree of market competition, justifying the inclusion of measures for degree of competition into the analysis. Empirically, Druant et al (2009) study price and wage adjustment using first wave of WDN sample of European firms and show that economic context in which firm operates, such as degree of competition that firm faces on domestic and foreign markets is crucial for price setting decisions. To that purpose, we construct the dummy variable based on question 5.4 that takes value 1 if the degree of competition on domestic or foreign market is characterized as very severe. Moreover, we consider firms' exposure to the foreign markets, by constructing the continuous variable that ranges from 0 to 1 depending on the share of firms' revenues coming from foreign markets (question 5.2).

In addition to these standard variables our regression also contains a dummy variable that equals 1 if firm states there is some sort of link between timing of wage and price changes (question 5.7), since extensive empirical evidence based on WDN data, as presented in Druant et al (2009) show that wage and price changes feed into each other. [9]

Moreover, we take into account relevance of demand changes for price developments as defined by standard Philips curve and impact of cost component arising from new Keynesian Philips curve that relates changes in inflation to movements of marginal costs. Extensive empirical research carried within Inflation Persistence Network and presented in Fabiani et al (2005) also showed that evolution of costs and demand are together with changes in competitors' price the most important factor in firms' price changing decision. Impact of economic crisis on firms' decision to decrease prices is analyzed by the demand shock variable (question 2.1). The variable takes value 1 if the firm states that change in the level of the demand for products/services caused strong or moderate decrease in firms' activity during the 2010-2013 period. Impact of the cost component on price movements is analyzed trough the costs (decrease) variable. Cost (decrease) is a dummy variable constructed based on the question 2.4 that takes value 1 if the firm states total costs recorded moderate or strong decrease over the 2010-2013 period.

Table 4 (Model 1) Probability of implementing price decrease in the 2010-2013 period. Probit model, marginal effects.

[9] Pass through of wages into prices is confirmed among others in Druant et al (2009); Bertola et all (2008); Loupias and Sevestre, (2010); Carlsson and Nordstrom Skans, (2011).

	Model (1)	
	Marginal effect	p-value
Share of revenues from foreign markets	-0.14	0.15
Very severe degree of competition (domestic or foreign)	**0.13**	**0.05***
Total costs (decrease)	**0.19**	**0.01****
Moderate or strong demand shock	**0.16**	**0.01****
Link between wage and price determination	**0.17**	**0.01****
Mc Fadden R-squared	0.11	
LR statistic	39.30	
Prob(LR statistic)	0.00	

Note: Regression includes also control for sector and size. The symbols ***, ** and * denote statistical significance at the levels of 99, 95 and 90% respectively. Source: Author's calculations based on HNB survey.

Probit estimates for probability of price decrease are shown in Table 1. The impact of degree of competition resulted significant for firms' decision to decrease prices, with firms that are faced with high degree of competition being 13% more likely to decrease the price of the main product. On other hand firms with high share of foreign market exposure are less likely to implement price decreases. Although this result complies with theoretical considerations saying that firms operating on foreign markets are more efficient it is not statistically significant.[10] If a firm acknowledges the existence of a link between price and wage changes, this increase likelihood of price decrease by 17%.

As expected, we also confirmed importance of cost component in determining price adjustment probability with firms that recorded decrease in their costs being 19% more likely to decrease prices. When it comes to the impact of the crisis on price determination, firms that recorded change in level in demand that caused decrease in firms' activity are 16% more likely to decrease prices of the main product.

Moreover, we asses separately impact of different aspects of the crisis on firms' decision to decrease prices. We construct additional variables that allow us to distinguish between different economic shocks depending on their nature. Namely, we create five distinct dummy variables for demand shock, volatility shock, financing shock, illiquidity shock and supplies shock, where each of them equals to 1 if firm states that respective shock caused a strong decrease in firms' activity. Given the high correlation between the shock variables, here we consider only shocks resulting in strong decrease in firms' activity.

Although most firms in the sample do not consider financing shock to be particularly relevant for firms' activity, as presented in Table 2, major part of firms however states that they have encountered difficulties in assessing credit for financing of their activities. Thus we construct the financing shock variable on the basis of the question 2.3 that takes value 1 if firm denotes

[10] Galac T. (2015) analyses impact of global crisis on non financial corporations in Croatia and finds exporting firms are more resilient to the crisis in terms of growth of number of employees. Valdec and Zrnc (2015) preform an in depth analysis of exporting firms in Croatia and show exporting firms have overall superior characteristics compared to non exporting firms.

as very relevant the statement saying credit for financing of working capital, new investment or existing debt was not available. We also evaluate the impact of persistence of the crisis on firms' decision to decrease prices, since we suppose not only the nature or intensity of particular economic shock is relevant for price determination at firm level, but also whether economic shock is perceived as temporary or permanent. A dummy variable persistence of low demand equals one if firms evaluates change in level of demand as long lasting (question 2.2).

Table 5 (Models 2-4) Probability of implementing price decrease in the 2010-2013 period. Probit model, marginal effects.

	Model (2)		Model (3)		Model (4)	
	Marginal effect	p-value	Marginal effect	p-value	Marginal effect	p-value
Share of revenues from foreign markets	-0.09	0.34	-0.08	0.4	-0.09	0.39
Very severe degree of competition (domestic or foreign)	**0.14**	**0.04****	**0.13**	**0.05***	**0.13**	**0.06***
Total costs (decrease)	**0.21**	**0.01****	**0.22**	**0.01****	**0.22**	**0.01****
Strong demand shock	0.04	0.75	0.04	0.7	0.01	0.92
Strong financing shock	0.04	0.78				
Very onerous credit conditions			-0.07	0.4	-0.07	0.41
Strong volatility shock	-0.08	0.53	-0.07	0.6		
Persistence of low demand					-0.01	0.99
Strong illiquidity shock	**0.23**	**0.01****	**0.24**	**0.01****	**0.24**	**0.01****
Strong supplies shock	0.03	0.89	0.04	0.85	0.03	0.89
Link between wage and price determination	**0.18**	**0.01****	**0.19**	**0.01****	**0.19**	**0.01****
Mc Fadden R-squared	0.12		0.12		0.12	
LR statistic	43.68		44.24		43.97	
Prob(LR statistic)	0.00		0.00		0.00	

Note: Regression includes also control for sector and size. The symbols ***, ** and * denote statistical significance at the levels of 99, 95 and 90% respectively. Source: Author's calculations based on HNB survey.

In Models 2-4 we distinguish between different types of shocks firm was exposed to and see that among various shocks firms' ability to pay and meet contractual terms resulted as the most important one, increasing price decrease likelihood on average by 24%. Disruptive effect of illiquidity on Croatian firms, more precisely on the firm labour market relevant decisions was found also in Kunovac (2015) showing that firms faced with illiquidity shock are 16% more likely to decrease labour input and 26% more likely to freeze or decrease wages in an attempt to decrease labour costs. Here we find that illiquidity shock is particularly relevant for reduction of the prices that is another channel of firm reaction to changing economic environment.[11]

[11] Firms faced with adverse economic environment in general respond by changes in output, margins, prices or costs. For detailed discussion on this topic, see Fabiani et al (2015).

4. Financial frictions and price increase decisions

After analyzing firms' decision to decrease the price of the main product and its main determinants, in the remaining part of the paper we analyze the most important drivers behind firms' decision to raise price despite recessionary economic environment. As discussed in Section 2, most firms decided to decrease prices of their products during the crisis, but however 28% of firms opted for price increase, the share that is not negligible. Moreover, we have seen that among firms that have opted for price increase 54% suffered from unavailable credit lines or too onerous credit conditions, suggesting that financial constraints could have had a decisive role in firms' price increase decision.

We examine the main determinants influencing firms' decision to raise the price of the main product during the crisis, where the depended variable (Di) is a dummy variable constructed on the bases of responses to the survey question 2.6. This time however, the variable takes value 1 if the firm stated that the price of the main product (on domestic or foreign market) recorded strong or moderate increase during the 2010-2013 period.

Set of explanatory variables used is enriched compared to previous section in line with recent literature contributions that emphasize potential impact of unfavorable financing conditions on countercyclical price movements.[12] A starting point in analysis of impact of onerous financing conditions on prices during recession is Chavalier and Scharfstein (1996) customer market theory model that assumes sticky customer base built on the assumption that consumers face switching costs between similar products of competing firms and considers pricing decisions as a form of firm investment decision. If onerous credit conditions lead to deterioration in internal liquidity position firm can decide to raise prices in order to maintain current cash flows. In this way firm will avoid using expensive external finance, but on other hand will probably in the long run loose a part of its market share.

Duca et al (2017) extend Chavalier and Scharfstein (1996) theoretical model in two dimensions – introducing demand persistence and pro-cyclicality of competitive pressure[13] into basic theoretical model specification that examines the role of financial constraints. They empirically test theoretical assumptions using third wave WDN data for Italy and confirm importance of financial constraints and demand persistence for price increase decisions. On other hand, impact of competition is found to be not significant in applied regression analysis.

Since we also use third waive WDN data in our analysis, we construct additional set of explanatory variables following Duca et al (2017) as closely as possible, only here we

[12] Impact of onerous credit conditions on labour market outcomes (i.e. changes in the labour input and wages) is systematically and extensively analyzed in Bodnar et al (2018) on the sample on 24 European countries. Authors show that firms that are faced with credit difficulties are more likely to adjust the labour input at both intensive and extensive margin and reduce variable part of the wages. However, researches about the impact of onerous credit conditions on pricing decisions during the crisis are still very limited, concentrating on single countries, as stressed in Section 1 of this paper.

[13] Intuitively, if low demand environment is perceived as persistent this will increase the probability of price increase. The main assumption behind pro cyclicality of competitive pressure is that perception of degree of competitive pressure changes over the business cycle, decreasing during recessions and increasing during expansions.

concentrate on Croatian dataset. Complete replication of their set of variables is not possible since WDN third waive questionnaire was completely harmonized among European countries only with respect to the sections examining changes in the economic environment, labour cost adjustments and wage adjustments. Price Section of the questioner was optional and thus not entirely harmonized between countries.[14]

Following closely as possible Duca et al (2017) we redefine set of our variables and construct additional indicators for low degree of competition and financially constrained firms.

Duca et al (2017) concentrate on impact of low competition environment on firm activity so we redefine our variable measuring degree of competition. The variable takes value 1 if firm states it is exposed to low degree of competition on foreign or domestic market (question 5.4).[15]

The variable measuring if the firm is financially constrained in its activities is constructed on the basis of the question 2.3. Indicator for financially constrained firms is extended compared to the financing shock variable constructed in previous section, as it accounts not only for firms stating that credit for financing of working capital, new investment and refinancing of existing debt was not available, but also for firms stating that although credit was available its conditions were too onerous. Indicator for financially constrained firms takes value 1 for all firms that evaluate credit unavailability or onerous credit conditions as relevant or very relevant for their activity.

Finally, we also consider joint interaction between financial constraints and level of demand and degree of persistence of demand, since theoretical considerations of consumer market theory model in fact imply that only joint reaction of these factors could motivate firms to raise prices.

Other explanatory variables are identical to those used in previous Section and include the size, sector of economic activity, interconnection of wage and price changes, exposure to foreign markets, change in level of demand and costs and persistence of low demand. The only difference is that here the cost variable indicates increase in total costs of the firm, instead of decrease in total costs of the firm that was used in previous section. [16]

Table 6 (Model 5) Probability of implementing price increase in the 2010-2013 period. Probit model, marginal effects.

[14] For detailed description of explanatory variables used on Italian dataset, see Duca et al (2017) pages 19-23.

15 Duca et al measure change in level of degree of competition during the crisis, but as previously explained information contained in our questionnaire does not allow us to construct identical variable.

[16] We have also performed the analysis of the main drivers of price increase decision that uses identical set of explanatory variables as in Model 1 of previous Section. The only difference is that we take into account the indicators for increase in level of demand and increase in total cost component. Results are shown in Appendix 2. As expected, an increase in demand and cost component increase likelihood of price increase decision. Economic environment in which firm operates, measured as degree of competition on domestic and foreign markets and institutional environment accounting for interconnection between wage and pricing decisions also resulted significant and have expected signs. These results are interesting for comparison with previous IPN results for euro area and results obtained by Pufnik and Kunovac (2012) for Croatia, but their detailed discussion is behind the scope of this Section, since we have opted to examine more in detail the impact of financing constraints on price increase decisions.

	Model (5)	
	Marginal effect	p-value
Share of revenues from foreign markets	**0.21**	**0.01****
Very low degree of competition (domestic or foreign)	-0.1	0.82
Total costs (increase)	**0.13**	**0.01****
Moderate or strong demand shock (DS)	**-0.22**	**0.01****
Financial constraints (FC)	**-0.11**	**0.07***
Persistence of low demand (PLD)	**0.36**	**0.06***
FC*DS	**0.2**	**0.09***
FC*PLD	**-0.17**	**0.06***
Link between wage and price determination	-0.07	0.13
Mc Fadden R-squared	**0.17**	
LR statistic	**46.94**	
Prob(LR statistic)	0.00	

Note: Regression includes also control for sector and size. The symbols ***, ** and * denote statistical significance at the levels of 99, 95 and 90% respectively. Source: Author's calculations based on HNB survey.

The estimates of Model 5 show that firms that are faced with adverse demand shock and financing shock are respectively 23% and 11% less likely to increase the prices of their products. On other hand, our variable of interest that accounts for contemporaneous exposure to negative economic environment and adverse financing conditions shows that these firms are 20% more likely to increase the prices of their products. Persistence of crisis also had an impact on price increase decisions, since firms that perceive changes in the economic environment as long lasting are 37% more likely to increase the prices of their products. An increase in prices is also more likely for firms with higher share of revenues coming from foreign markets. Here we do not find that low degree of competition contributed significantly to the price increase decisions, as we would expect.

Overall, the results obtained in this section confirm the influence of adverse financing conditions during the crisis on firms' pricing decisions, with firms exposed to decrease in level of demand and some sort of financial constraints being more likely to increase prices. Customer market theory models explain this behavior as an attempt to raise internal financing funds, that will ease financing conditions for firms in short run, but we lead to deterioration of their market share in the long run hampering their market position. Thus, efforts of monetary policy in Croatia implemented in the context of the Loan Program for Development of the Economy in 2012, with the aim to ease conditions of financing for firms during the crisis seem justifiable. [17]

[17] At the beginning of 2012 Croatian National Bank (HNB) reduced reserve requirement rate from 15% to 13,5% and excluded the funds received from multilateral development banks from reserve requirement calculation base. In addition, HNB included 50% of loans granted to economic entities in the context of the Loan Program for the Development of the Economy that was implemented in cooperation with Croatian Bank for Reconstruction and Development in calculation of minimum required foreign currency claims. For more information about the measures adopted by HBN to facilitate financing of the firms during the crisis, see: http://www.hnb.hr/en/-/povoljniji-krediti-samo-temeljem-mjera-hnb-a

5. Conclusions

Several dimensions of price setting practices during the crisis are explored in this paper. In particular: (i) how prices developed during the crisis in Croatia at firm level; (ii) what is the effect of different shocks firm was exposed to on price decrease/increase decision and (iii) are financial frictions and unfavorable financing conditions relevant for firm decision to raise prices during the crisis. According to the data collected during third wave WDN survey for Croatia, slightly less than half of the firms in Croatia decreased the prices of their main product on domestic or foreign market, while almost one third of firms increase prices. Our analysis allowed us to contribute to the debate about the main drivers of inflation over the business cycle from another prospective, by employing granularity of firm level survey data and examining how different economic and financial shocks are transmitted inside a firm pricing mechanism.

The study confirms importance of competition, wage -price linkages and changes in costs and demand for likelihood of implementing both price decrease and price increase decisions.

The regression analysis show that among different types of shocks considered, costumer decreased ability to pay and meet contractual terms had the most important impact for price decrease decisions, during the 2010-2013 period.

On other hand, the analysis reveals the importance of financial frictions for price increase decisions of Croatian firms during the crisis. Firms that were faced with unavailable credit lines or onerous credit conditions in a low demand environment are more likely to increase prices of their products. Existing customer market theory considers this behavior as an attempt to create cash buffers and facilitate servicing of existing financial commitments, which will result in deterioration of future market share.

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Appendix 1 The survey

C1. Information about the firm

C1.1 – What is your main sector of activity? NACE2 sectoral classification. OPTIONAL: Do not ask if information is available from the sampling register.

C1.2 – What was the first year of operation of your firm? OPTIONAL: Do not ask if information is available from the sampling register)

C1.3 – What was the structure, ownership status and autonomy of your firm at the end of 2013?

Structure:	Ownership:	Autonomy:
Single establishment firm □	Mainly domestic □	Parent company □
Multi-establishment firm □	Mainly foreign □	Subsidiary/affiliate □
		Does not apply □

C2. Changes in the economic environment

This section aims at assessing the main changes in economic environment your firm suffered during **2010-2013** . When answering the questions please refer to **"the most significant changes**" taking place over this period.

C2.1 – How did the following factors affect your firm's activity during 2010-2013?
Please choose ONE option for each line.

	Strong decrease	*Moderate decrease*	*Unchanged*	*Moderate increase*	*Strong increase*
The level of demand for your products/services	□	□	□	□	□
Volatility/uncertainty of demand for your products/services	□	□	□	□	□
Access to external financing through the usual financial channels	□	□	□	□	□
Customers' ability to pay and meet contractual terms	□	□	□	□	□
Availability of supplies from your usual suppliers	□	□	□	□	□

C2.2 – For those factors which affected your firm strongly, were the effects transitory, partly persistent or long-lasting for 2010-2013? *Please choose ONE option for each line.*

	Transitory	*Only partly persistent*	*Long-lasting*
The level of demand for your products/services			

	□	□		□
Volatility/uncertainty of demand for your products/services	□	□		□
Access to external financing through the usual financial channels	□	□		□
Customers' ability to pay and meet contractual terms	□	□		□
Availability of supplies from your firm's usual suppliers	□	□		□

C2.3 – With regard to finance, please indicate for 2010-2013 how relevant were for your firm each one the following happenings? ***Please choose ONE option for each line****. Note: credit here refers to any kind of credit, not only bank credit*

	Not relevant	*Of little relevance*	*Relevant*	*Very relevant*
Credit was not available to finance working capital	□	□	□	□
Credit was not available to finance new investment	□	□	□	□
Credit was not available to refinance debt	□	□	□	□
Credit was available to finance working capital, but conditions (interest rate and other contractual terms) were too onerous	□	□	□	□
Credit was available to finance new investment, but conditions (interest rate and other contractual terms) were too onerous	□	□	□	□
Credit was available to refinance debt, but conditions (interest rate and other contractual terms) were too onerous	□	□	□	□

C2.4 – How did these components of total costs evolve during 2010-2013?
Please choose ONE option for each line. See definitions in the Appendix.

	Strong decrease	*Moderate decrease*	*Unchanged*	*Moderate increase*	*Strong increase*
Total Costs	□	□	□	□	□
Labour Costs	□	□	□	□	□
Financing costs	□	□	□	□	□
Costs of supplies	□	□	□	□	□
Other costs (please specify_____)	□	□	□	□	□

C2.5 – Please indicate how each one of the components of labour costs listed below has changed during 2010-2013.
Please choose ONE option for each line. See definitions in the Appendix.

	Strong decrease	*Moderate decrease*	*Unchanged*	*Moderate increase*	*Strong increase*
Base wages or piece work rates	□	□	□	□	□

Flexible wage components (bonuses, fringe benefits, etc.)	□	□	□	□	□
Number of permanent employees	□	□	□	□	□
Number of temporary/fixed-term employees	□	□	□	□	□
Number of agency workers and others (free-lance work, etc, not hired under employment contracts)	□	□	□	□	□
Working hours per employee	□	□	□	□	□
Other components of labour costs (please specify_____)	□	□	□	□	□

C2.6 – How did prices and demand for your main product evolve during 2010-2013?
Please choose ONE option for each line.

	Strong decrease	*Moderate decrease*	*Unchanged*	*Moderate increase*	*Strong increase*
Domestic demand for your main product/service	□	□	□	□	□
Foreign demand for your main product/service	□	□	□	□	□
Prices of your main product in domestic markets	□	□	□	□	□
Prices of your main product in foreign markets	□	□	□	□	□

C.3. Labour force adjustments

C3.1. – How many employees did your firm have on the payroll at the end of 2013? How many agency workers and others workers did your firm have at the end of 2013? *For definitions see Appendix*

Total Number of employees _____ Of which: Permanent full-time _____ Permanent part-time _____ Temporary or fixed-term _____	Total number of agency workers and others _____

C3.2 – At the end of 2013, how were your firm's employees approximately distributed by occupational group or tenure? (*See definitions of the ISCO occupational groups and the definition of tenure in the Appendix*)

OCCUPATIONAL GROUPS		*JOB TENURE*	
Higher skilled non-manual (ISCO: 1, 2, 3)	____%	Below 1 year	____%

Lower skilled non-manual	(ISCO: 4 and 5)	____%	Between 1 and 5 years	____%
Higher skilled manual	(ISCO: 7 and 8)	____%	More than 5 years	____%
Lower skilled manual	(ISCO: 9)	____%		
		TOTAL (= 100%)		TOTAL (= 100 %)

C3.3a – During 2010-2013 did you need to significantly reduce your labour input or to alter its composition?

Need to reduce labour cost or alter its composition — *YES* □ *NO* □

C3.3.bis. If YES, which of the following measures did you use to reduce your labour input or alter its composition when it was most urgent*? Please choose ONE option for each line. See definitions in the appendix*

	Not at all	*Marginally*	*Moderately*	*Strongly*
Collective layoffs	□	□	□	□
Individual layoffs	□	□	□	□
Temporary layoffs	□	□	□	□
Subsidised reduction of working hours	□	□	□	□
Non-subsidised reduction of working hours (including reduction of overtime)	□	□	□	□
Non-renewal of temporary contracts at expiration	□	□	□	□
Early retirement schemes	□	□	□	□
Freeze or reduction of new hires	□	□	□	□
Reduction of agency workers and others	□	□	□	□

C3.4 – Have any of the following actions become more or less difficult, compared to the situation in 2010? *Please choose ONE option for each line.*

	Much less difficult	*Less difficult*	*Unchanged*	*More difficult*	*Much more difficult*
To lay off employees for economic reasons (collectively)	□	□	□	□	□
To lay off employees for economic reasons (individually)	□	□	□	□	□
To dismiss employees for disciplinary reasons	□	□	□	□	□
To lay off employees temporarily for economic reasons	□	□	□	□	□
To hire employees (cost of recruitment, including administrative costs)	□	□	□	□	□
To adjust working hours	□	□	□	□	□
To move employees to positions in other locations	□	□	□	□	□
To move employees across different job positions	□	□	□	□	□
To adjust wages of incumbents employees					
To lower wages at which you hire new employees	□	□	□	□	□

NC3.4b. ONLY FOR THOSE REPORTING CHANGES IN C3.4 – To what factors would you attribute the changes reported in Question C3.4?? *Please choose ONE option for each line.*

	Reforms of labour laws	*Jurisprudence / law enforcement*	*Changes in trade unions behaviour*	*Changes in individual behaviour*
To lay off employees for economic reasons (collectively)	□	□	□	□
To lay off employees for economic reasons (individually)	□	□	□	□
To dismiss employees for disciplinary reasons	□	□	□	□
To lay off employees temporarily for economic reasons	□	□	□	□
To hire employees (costs of recruitment, including administrative costs)	□	□	□	□
To adjust working hours	□	□	□	□
To move employees to positions in other locations	□	□	□	□
To move employees across different job positions	□	□	□	□
To adjust wages of incumbents employees	□	□	□	□
To lower wages at which you hire new employees	□	□	□	□

C3.5 – How relevant is each of the following factors as obstacles in hiring workers with a permanent, open-ended contract? *Please choose ONE option for each line.*

	Not relevant	*Of little relevance*	*Relevant*	*Very relevant*
Uncertainty about economic conditions	□	□	□	□
Insufficient availability of labourwith the required skills	□	□	□	□
Access to finance	□	□	□	□
Firing costs	□	□	□	□
Hiring costs	□	□	□	□
High payroll taxes	□	□	□	□
High wages	□	□	□	□
Risks that labour laws are changed	□	□	□	□
Costs of other inputs complementary to labour	□	□	□	□
Other (please specify for example high minimum wages, high wage rates in collective agreements_____)	□	□	□	□

CS3.6 – In your oppinion, is it necessary to reform labour market regulations in Croatia, involving the following changes?

	Strong decrease	*Moderate decrease*	*Unchanged*	*Moderate increase*	*Strong increase*
Dismissals costs	□	□	□	□	□
Costs of hiring procedures	□	□	□	□	□
Flexibility of working hours	□	□	□	□	□
Costs of early retirement	□	□	□	□	□
Minimum wages	□	□	□	□	□

Costs derived from Collective Agreements	□	□	□	□	□
Unemployment benefits	□	□	□	□	□

C4. Wage adjustments

This section collects information on wage setting and the frequency of wage changes. Most of the questions refer to 2013, but some questions aim at assessing differences between 2008 and 2010-2013.

C4.1 – In 2013: What percentage of your firm's total costs (all operating expenses) was due to labour costs (wages, salaries, bonuses, social security contributions, training, tax contributions, contributions to pension funds, etc.)? *See definitions in the Appendix.*

Labour cost /Total cost _____ %

C4.2 – What percentage of your total wage bill in 2013 was related to individual or company performance related bonuses and benefits?

_____ %

C4.3 – In 2013, did your firm apply a collective pay agreement bargained and signed <u>inside</u> of the firm(at thr firm level) ? and signed <u>outside</u> of the firm (at the national, regional, sectoral or occupational level)?

	At the firm level	Outside the firm
No, such an agreement does not exist	□	□
No, the agreement exists but the firm opted-out	□	□
Yes, such an agreement is in effect	□	□

C4.3b – What is the proportion of your employees covered in 2013 by <u>any</u> collective pay agreement?

Proportion of employees covered by any collective pay agreement (approx.) _____%

C4.4 – How often does the collective pay agreement applied at you firm typically change?

More than once a year □	Once a year □	Between one and two years □	Every two years □	Less frequently than once every two years □	Never/Not applicable □

C4.5 Did your firm adapt changes in base wages to inflation before 2010? And during 2010-2013?

Definition of base wage - direct remuneration excluding bonuses (regular wage and salary, commissions, piecework payments).

	Before2010	During 2010-2013
Yes	□	□
No	□	□
Inflation was too low so that indexation rules were no operative	□	□
There were no legal or other types of indexation rules specifying such an adjustment	□	□

C4.6 – How frequently was the base wage of an employee belonging to the main occupational group in your firm (largest group in Question C3.2) typically changed in your firm? *Please choose <u>ONE option for each line</u>*

	More than once a year	Once a year	Between one and two years	Every two years	Less frequently than once every two years	Never/Not applicable

Before 2010	□	□	□	□	□	□
During 2010-2013	□	□	□	□	□	□

C4.7 – Over 2010-2013, did you freeze or cut base wages in a given year (please indicate in which years)?

	Wages were frozen		Wages were cut			Wages were neither frozen nor cut
	YES	% Workers affected	YES	% Workers affected	(average wage cut)	YES
2010	□	_____%	□	_____%	**(%)**	□
2011	□	_____%	□	_____%	**(%)**	
2012	□	_____%	□	_____%	**(%)**	
2013	□	_____	□	_____%	**(%)**	

CS 4.9 – How relevant is each one of the following reasons in preventing base wage cuts?

Please choose <u>ONE option for each line.</u>

	Not relevant	*Of little relevance*	*Relevant*	*Very relevant*	*Don't know*
Labour regulation/collective agreements prevent wages from being cut	□	□	□	□	□
It would reduce employees' efforts, resulting in less output and poorer service	□	□	□	□	□
It would have a negative impact on employees morale	□	□	□	□	□
It would damage the firm's reputation as an employer, making it more difficult to hire workers in the future	□	□	□	□	□
In presence of the wage cut the most productive employees might leave the firm	□	□	□	□	□
A wage cut would increase the number of employees who quit, increasing the cost of hiring and training new workers	□	□	□	□	□
It would create difficulties in attracting new workers	□	□	□	□	□
Workers dislike unpredictable reductions in income. Therefore workers and firms reach an implicit understanding that wages will neither fall in recessions nor rise in expansions	□	□	□	□	□
Employers compare their wage to that of similarly qualified workers in other firms in the same market	□	□	□	□	□

CS 4.10 – Has any of the following strategies ever been used in your firm to reduce labour costs during 2010-2013?

Please choose <u>as many options as apply to your firm.</u>

Reduction or elimination of bonus payments	□
Reduction or elimination of non pay benefits	□
Change in shift assignements	□
Slowdown or freeze of the rate at which promotions are filled	□
Recruiment of new employees (with simillar skills and experience) at lower wage than those wko left (e.g.due to voluntary quits and retirement)	□
Use of early retirement to replace high employees by entrants with low wages	□
Other strategies (please specify)	□

S4.11 – Considering the main occupational group in your firm (as identified in the question C.3.2) please indicate among the following options which is the most relevant factor in determining entry wage of newly hired employees. Please <u>choose a single option</u>	
Collective pay agreement (signed at any level)	□
Wage of similar employees in the firm	□
Wage of similar employees outside the firm	□
Availability of workers with similar characteristics in the labour market	□
Other reasons (please specify)_____	□

NC4.8 – How did the labour cost of a newly hired worker compare with that of similar (in terms of experience and task assignment) workers at your firm?

	Much lower	*Lower*	*Similar*	*Higher*	*Much higher*
Before 2010	□	□	□	□	□
During 2010-2013	□	□	□	□	□

CS4.12 – Did the decrease of public sector wages of 3% (coming from government decision in Febbruary 2013[18]) directly or indirectly affect the average wage in your company?	
Yes, it had a demonstrational effect, which helped us to justify lowering of wages in our company	□
Yes, it reduced the attractiveness of alternative employment options in the public sector	□
No, it didn't have an effect	□

[18] Uredba o nazivima radnih mjesta i koeficijentima složenosti poslova u javnim službama (NN 25/2013.)

C5. Price setting and price changes

This section collects information on price setting and the frequency of price changes. Some questions aim at assessing differences in 2010-2013 with respect to the period before 2008.

If your firm produces (or sells) more than a single good or service, the answers should refer to the "main product ("activity" or "service"), defined as the one that generated the highest fraction of your firm's revenue in the "reference year". For instance, if your firm produces (or sells) several types of hats and shoes, by "product" we mean "hats" and "shoes" (irrespective of the specific type), whereas by "main product" we mean the one that generated the highest revenue in the "reference year".

NC5.2 – In 2013 what share of the revenues from your firm's main products, activity or service was due to sales in domestic markets and what share in foreign markets?

Sales in the domestic market	____%
Sales in the foreign markets	____%

NC5.4 – How would you characterise the degree of competition domestic and foreign markets for your main product? ***Please choose ONE option for each line***

	Weak	*Moderate*	*Severe*	*Very severe*	*Non applicable*
Domestic markets	□	□	□	□	
Foreign markets	□	□	□	□	

NC5.6 – In 2013, how and how often did you typically change the price of your main product?
Please choose ONE option per column, the one that best describes the situation in your firm

	ON A REGULAR TIME PATTERN	*WHENEVER COSTS and/or DEMAND CONDITIONS CHANGED* (please select in this case the most typical frequency change)
More frequently than a year:		
Daily	□	□
Weekly	□	□
Monthly	□	□
Quarterly	□	□
Half-yearly	□	□
Once a year	□	□
Between one and two years	□	□
Less frequently than once every two years	□	□
Never	□	□
Don´t know	□	□

CS5.7 – How does the timing of price changes relate to that of wage changes?

Please choose a single option

There is no link between the two	□
There is a link but no particular pattern	□
Decisions are taken simultaneously	□
Price changes tend to follow wage changes	□

Wage changes tend to follow price changes	□
Don't know	□

Appendix 2 Probability of implementing price increase in the 2010-2013 period. Probit model, marginal effects.

	Model (6)	
	Marginal effect	**p-value**
Share of revenues from foreign markets	**0.23**	**0.00*** **
Very severe degree of competition (domestic or foreign)	-0.06	0.16
Total costs (increase)	**0.13**	**0.03** **
Moderate or strong demand increase	**0.13**	**0.00*** **
Link between wage and price determination	-0.07	0.12
Mc Fadden R-squared	0.16	
LR statistic	42.58	
Prob(LR statistic)	0.00	

Note: Regression includes also control for sector and size. The symbols ***, ** and * denote statistical significance at the levels of 99, 95 and 90% respectively. Source: Author's calculations based on HNB survey.