



# **Firms' responses to shocks by price, wage and employment in Macedonia**

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# Outline

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- Covariates used in the analysis
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# Motivation and aims of research

- A crucial element of microeconomic and macroeconomic adjustment is the behavior of firms to adverse shocks and their decisions for prices, wages and employment
- Firm-level reactions to shocks form the distribution and dynamics of wages and employment with important policy implications
- Labour market rigidities reduce productivity and profits and may increase the degree to which cost-push shocks and demand shocks are passed on to prices
- On the policy side, higher labour market rigidities decrease the functionality of the monetary policy transmission and make it more difficult to achieve the price stability goal
- The main aim of the paper is to explain the firms' responses to different shocks
- Using the very rich survey database, we analyse the role of the intensity and international character of output market competition, of firm's technology and of the incidence of collective wage-bargaining constraints on firm's adjustment strategies to shocks



# Literature review and theory

- The main reference paper for our research is Bertola et al. (2010)
  - They analyse the overall results of wage and price setting surveys for EU countries with respect to price versus cost and wage versus employment adjustments in response to cost-push shocks
- Dhyne and Druant (2010) also investigates firms' responses to adverse shocks
  - They concentrate their analysis on the reaction of Belgian firms versus other European firms
- Our analysis pay special attention to Macedonian survey data
- More specifically, the paper focuses on the reaction of Macedonian firms to adverse shocks, compares the results of firm-level adjustment strategies with selected EU countries, and we extend the set of explanatory variables




# Literature review and theory (2)

- The relevance of price and cost reactions depends on the shape of the firm's marginal revenues and marginal productivity (hence marginal costs). In turn, these depend on the firm's market power, and on institutional constraints on wage and employment adjustment
- Under flexible prices, margins may be adjusted if the elasticity of demand varies (as in e.g. Gali, 1994). If prices are sticky, however, margins need to be adjusted when costs change. Thus, the relative relevance of the 'increase prices' and 'reduce output' should depend on the extent of price stickiness
- In response to supply shocks that are common to all firms, it is more likely that prices rather than costs are the preferred adjustment strategy, when the output market is more competitive and firms have less control over the prices they charge
- The relevance of employment and wage reactions in a firm's cost-minimisation strategy in response to shocks depends essentially on the elasticity of its demand function, and on institutional constraints. Wage and employment responses are expected to be larger when labour demand is more elastic



# Survey dataset

- Our dataset is based on Survey on wage and price setting in Macedonia. The survey contains questions on wage and price-setting behaviour at the firm level. It was conducted by NBRM in the first half of 2014
- The survey uses the common harmonized questionnaire and sample design, drawn up by the European Central Bank for EU countries within the Wage Dynamics Network (WDN)
- The sample covers 514 firms with different size in regard to employees that operate in manufacturing, construction, trade and market services
- The common questionnaire contains information on how firms respond to three different adverse shocks (oil, wage and demand shocks)
- This paper concentrates on two cost shocks. One shock is an unanticipated increase in the cost of an intermediate input (e.g. an oil price increase), and the other shock represents an unanticipated increase in wages



# Adjustment strategies to cost and wage shocks

## -Descriptive analysis-

- The majority of Macedonian firms prefer to adjust to shocks by reducing their costs, where more than 70 percent of firms indicate that the reduction of other costs is “very relevant” and “relevant” option in response to a cost shock
- Approximately 63 percent of the firms increase prices when facing a cost shock
- Results suggest that the fraction of firms reducing costs and increasing prices after a wage shock is somewhat lower compared with that after a cost shock

### Reaction after cost shock and wage shock

Adjustment strategy	after a cost shock		after a wage shock	
	Av. Score	Proportion	Av. Score	Proportion
Increase prices	2.69	62.54%	2.38	50.15%
Reduce margins	2.39	54.31%	2.08	40.69%
Reduce output	2.22	44.61%	1.91	34.13%
Reduce costs	2.85	71.46%	2.69	65.69%

# Adjustment strategies to cost and wage shocks (2)

## -Empirical correlations between adjustment strategies-

- The diagonal elements of the sub-matrix reporting between-shocks correlations (the bottom-left quarter) significantly exceed the corresponding off-diagonal elements
- This indicates that there is a tendency for firms to use the same adjustment strategies in response to both cost and wage shocks
- As correlations treat deviations from the mean in a symmetric way, lowest numbers indicate that the combination of adjustment strategies tend to go hand in hand in being used
- By looking at the lowest correlations in the “within-shock” sections of the table (figures in bold), the combination of increasing prices and reducing costs seems one of the most popular among the firms in Macedonia
- This gives evidence that cost-push shocks are not passed through proportionately (1:1) in the production chain but smoothed by Macedonian firms

**Correlations across the relevance of different adjustment strategies**

Adjustment strategy		Cost shock				Wage shock			
		Price	Margin	Output	Costs	Price	Margin	Output	Costs
Cost shock	Price	1.0							
	Margin	0.52	1.0						
	Output	0.50	0.51	1.0					
	Costs	<b>0.50</b>	0.53	0.50	1.0				
Wage shock	Price	0.40	0.29	0.16	0.14	1.0			
	Margin	0.20	0.49	0.27	0.27	0.50	1.0		
	Output	0.26	0.36	0.49	0.20	0.39	0.43	1.0	
	Costs	0.31	0.32	0.27	0.56	<b>0.33</b>	0.45	0.37	1.0

Notes: Responses weighted by employment. All correlations are statistically significant at the 1% level. The sample size is kept fixed so that it contains only non-missings for survey questions 23 (on cost-shock) and 25 (on wage shock).





# Cost-cutting strategies -Descriptive analysis-

- About three quarters of firms prefer to reduce non-labour costs, while the other quarter prefers to reduce labour costs
- In reaction to a shock, and without conditioning on any other variable, some 17-20 percent of the responding firms plan to implement their cost reductions by reducing employment
- Only around 6 percent of the firms indicate that they are likely to reduce costs by cutting flexible wage components

## Acceptance of different ways of cost adjustment (share of firms)

Cost-cutting strategy	after a cost shock	after a wage shock
Reduce number of temporary/other employees	10.00%	10.00%
Reduce number of permanent employees	3.70%	4.80%
Reduce hours worked per employee	3.30%	4.90%
Reduce flexible wage components	6.50%	6.10%
Reduce base wages	0.80%	-
Reduce non-labour costs	75.70%	74.20%

Notes: Responses weighted by employment and rescaled excluding non-responses; figures are based on survey questions 24 and 26.



# Covariates used in the analysis

- We are interested to analyse whether cost reduction is a more relevant adjustment strategy than price adjustment for firms that behave as price takers rather than price setters, for this purpose we create the variable **competition**
- The variable **share of foreign sales** in firm's revenues can also proxy for the intensity of price competition, since (controlling for sector and size) market power should be smaller for firms that are more exposed to large international markets
- To account for differences in production technologies and labour intensities across firms, our specifications also include: **labour share** - the share of labour costs in total costs
- To account for wage rigidities, our set of explanatory variables includes **collective agreement, higher level** - a dummy variable showing whether a given firm adopts a collective agreement concluded at national, regional or sectoral level, and **collective agreement, firm level** - a dummy variable indicating the presence of collective bargaining at the level of the firm
- In an alternative specification we considered the firms covered by a **collective agreement at any level** and the **share of variable wages**
- We consider **industry dummies** and **size dummies** in order to control for all kinds of differences in technology



# Covariates used in the analysis (2)

- The dependent variable in the probit regression equals one if the firm indicates that the respective cost-cutting strategy is the most important one, and zero otherwise
- Additional to the covariates already shown, we include more variables on characteristics of the labour market, as we are especially interested in their influence on labour-cost cutting strategies
- we include the **share of temporary employment**, as a continuous variable giving the percentage share of employees with a temporary contract
- we introduce the **share of part-time employment**, which gives the percentage share of employees with a permanent contract, but working part-time
- we use the **share of variable wages**, which is also a continuous variable and gives the percentage share of the total wage bill that is related to individual or company performance related bonuses and benefits



# Methodology

- The study explores the determinants of firms' choice to increase prices and/or lower costs in response to intermediate input and wage shocks by focusing on one of these adjustment strategies at a time
- We model the determinants of price increase and cost-cutting decisions using econometric technique by estimating probit models of the following form

$$Prob(Y = 1) = \Phi(\beta'x),$$

- *Prob* denotes probability,
- *Y* is response variable (endogenous variables, for example the adjustment strategies such as increase prices or reduce costs),
- $\beta$  is a vector of coefficients,
- $x$  is a vector of explanatory variables, and
- $\Phi$  (.) denotes the cumulative normal distribution function



# Empirical results

## -Explanation of responses to shocks-

### Adjustment of prices and (other) costs in response to cost shocks and wage shocks, probit, average marginal effects

	Cost shock		Wage shock	
	Increase prices	Reduce costs	Increase prices	Reduce costs
competition_market2	0.2048** (0.0842)	0.1586* (0.0807)	0.1532* (0.0833)	0.1237 (0.0882)
share_of_foreign_sales	-0.2371** (0.105)	-0.2561** (0.111)	0.0605 (0.1175)	-0.1114 (0.1227)
labour_share	-0.0014 (0.1476)	0.0561 (0.1243)	0.6043*** (0.1327)	0.3858*** (0.1374)
collAgr_higher	-0.1792** (0.0857)	-0.1488 (0.0929)	0.0016 (0.0829)	-0.0742 (0.0927)
collAgr_firml	0.0481 (0.0744)	0.0170 (0.0705)	0.1483* (0.0766)	0.0440 (0.0769)
Observations	514	514	514	514
Pseudo-R <sup>2</sup>	0.1006	0.1099	0.1515	0.0695
Log-likelihood	-305.7	-273.6	-302.3	-307.6
Observed frequency	0.625	0.715	0.501	0.657
Predicted frequency	0.633	0.733	0.500	0.668

Notes: Robust standard errors in parentheses; \*\*\*, \*\*, \* denote significance at the 1%, 5% and 10% significance level, respectively. Not reported: sector and firms' size effects.



# Empirical results (2)

## -Explanation of responses to shocks-

- A firm in a very competitive environment is 15.9 p.p. more likely to reduce costs after a cost shock and 12.4 p.p. after a wage shock
- On the same direction, but contrary to our theoretical considerations, price increases are more likely when competition in the product market is strong. Qualitatively, domestic market competition makes firms in Macedonia more likely to use a combination of both price and cost adjustment
- We find that firms with a higher exposure to foreign product markets are less likely to respond to cost shock by increasing their prices. Exposure to foreign markets implies a qualitatively different effect to that of our more direct measure of price competition, and confirms the theory that firms facing strong competition have very few margins to adapt prices
- Firms with a higher share of foreign sales in total sales seem to be less likely to reduce costs, which theoretically are expected to reduce them when acting in a competitive environment. This possibly can be explained by looking at which type of costs firms in Macedonia apply reduction (labour or non-labour cost)
- Looking at wage rigidities, firms covered by collective bargaining at the firm level are more likely to respond to shocks by increasing prices. Rigidities in wages increase the likelihood that cost-push shock will be passed on to prices and, hence, be a sign of the presence of second round effects
- When the labour cost share is high, prices are more likely to be adapted. Since a higher labour share implies that marginal costs are more sensitive to labour costs, prices are more likely to be raised in response to a general wage increase
- Firms with large share of flexible wage bill are more inclined to reduce costs in response to cost shock



# Determinants of cost-cutting strategies

- On the basis of the simple theoretical considerations, wage and employment responses are expected to be bigger when firms are subject to strong product market competition
- Moreover, they should be smaller when collective agreements reduce wage flexibility, and employment protection legislation (or non-availability of temporary contracts, or technological features) reduces employment flexibility
- To determine factors explaining the choice of the most important cost-cutting strategy, we run a set of probit regressions relating each adjustment choice to theoretically relevant covariates



# Empirical results

## -Determinants of cost-cutting strategies-

Cost adjustment strategies and some relevant covariates, probit, average marginal effects

	Cost shock					Wage shock				
	Permanent employment	Temporary employment	Wages	Hours	Non-labour cost	Permanent employment	Temporary employment	Wages	Hours	Non-labour cost
competition_market2	0.0547*** (0.021)	0.067*** (0.0185)	0.0488 (0.0328)	0.0343 (0.0236)	-0.1701*** (0.05)	-0.0339 (0.0611)	0.0149 (0.0406)	0.0388 (0.0259)	-0.0120 (0.0335)	-0.0652 (0.0761)
share_of_foreign_sales	0.0496 (0.0479)	0.0879 (0.0655)	-0.0781* (0.0455)	-0.0246 (0.0364)	-0.0495 (0.0875)	-0.0690 (0.06)	-0.0117 (0.0503)	-0.0164 (0.0301)	-0.0562 (0.0391)	0.1205 (0.0995)
labour_share	-0.0533 (0.057)	-0.0053 (0.054)	0.0398 (0.0676)	0.1264** (0.0589)	-0.0418 (0.1176)	0.1553 (0.0967)	-0.0090 (0.0874)	0.0530 (0.064)	0.0899* (0.0507)	-0.1740 (0.1375)
coll_agr_higher	0.0438* (0.0257)	0.0080 (0.0367)	-0.0326 (0.0295)	0.1045** (0.052)	-0.0246 (0.0674)	-0.0580 (0.0386)	-0.0067 (0.0383)	-0.0132 (0.0267)	0.1256*** (0.0436)	-0.0253 (0.0784)
coll_agr_firml	-0.0075 (0.0194)	-0.0153 (0.0282)	0.0299 (0.0286)	-0.0612** (0.0307)	0.0066 (0.0591)	0.0030 (0.052)	0.0562 (0.0401)	-0.0106 (0.0255)	-0.0227 (0.0297)	-0.0583 (0.0726)
share_temp_empl	-0.463*** (0.1702)	0.0239 (0.0642)	0.0920 (0.0992)	0.0428 (0.0702)	-0.0616 (0.1735)	-0.2791 (0.2346)	0.1078 (0.0831)	0.1012 (0.0628)	0.0442 (0.0675)	-0.3001 (0.1881)
share_part_time_empl	-0.2694 (0.2709)	-0.1359** (0.0692)	-0.5339* (0.2828)	-0.0428 (0.0692)	0.4544** (0.1826)	-0.4026* (0.2132)	-0.6873 (0.5987)	-0.1908 (0.2523)	0.1943** (0.0981)	0.3687 (0.4365)
share_variable_wages	0.0623 (0.06)	-0.0353 (0.0455)	-0.0714 (0.0772)	-0.0362 (0.0365)	0.0795 (0.1299)	-0.2941** (0.1494)	-0.0666 (0.0735)	-0.1026 (0.0735)	-0.0153 (0.0466)	0.3286** (0.1503)
Observations	433	433	433	433	433	412	412	412	412	412
Pseudo-R <sup>2</sup>	0.2085	0.4552	0.1022	0.1921	0.1876	0.1788	0.1135	0.2103	0.2332	0.1028
Log-likelihood	-56.0	-79.3	-104.3	-52.6	-201.3	-61.4	-111.2	-70.2	-57.7	-197.9
Observed frequency	0.0371	0.1004	0.0726	0.0332	0.7567	0.0483	0.0999	0.0612	0.0488	0.7419
Predicted frequency	0.0084	0.0247	0.0464	0.0134	0.7960	0.0184	0.0692	0.0272	0.0135	0.7714

Notes: Robust standard errors in parentheses; \*\*\*, \*\*, \* denote significance at the 1%, 5% and 10% significance level, respectively. Not reported: sector and firms' size effects.





# Empirical results (2)

## -Determinants of cost-cutting strategies-

- Firms operating in a highly competitive environment are less likely to reduce non-labour costs and more likely to reduce labour costs, regardless which type of labour costs
- Firms covered by collective wage agreements at higher level appear to reduce the number of permanent employees and to adjust the number of hours worked per employee
- Temporary and part time employment in Macedonian firms, acts as a buffer against employment fluctuations for permanent workers
- Firms using a labour intensive technology are associated with a higher likelihood of working hours reduction, whereas structure of remuneration safeguards permanent employment and increases the reaction through non-labour costs after wage shock



# Conclusions

- International character of product market competition reduces the relevance of firms' price reactions to cost shocks, whereas firms' exposure to domestic competition seems to have an opposite effect
- The presence of collective wage agreements at national level makes a price increase less likely, reflecting the weak employment protection in Macedonia. Findings about EU firms are opposite, which reflects their stronger unions
- Firm's technology or labour intensity in production process makes firms more likely to increase prices after wage shock and is in line with the findings for surveyed EU firms
- Results indicate that competition increases the likelihood of cost-cutting strategies via labour costs, particularly through employment reduction, after cost shock
- Fluctuations in permanent employment to cost and wage shock are safeguarded by the presence of temporary and part time employment
- Evaluating the extent to which such features influence the behaviour of firms in Macedonia has important implications for transmission mechanism of monetary policy
- Identifying determinants and factors of firms' price and cost reactions to adverse shocks may help policymakers of Macedonia (and other countries with similar economic characteristics) assess their current policies and design a system that will lead to more optimal policymaking



Thank you for your attention!



# Appendix

## -Results (sector and firms' size effects only)-

**Adjustment of prices and (other) costs in response to cost shocks and wage shocks, probit, average marginal effects**

	Cost shock		Wage shock	
	Increase prices	Reduce costs	Increase prices	Reduce costs
construction_sector	-0.1580 (0.1581)	-0.2619 (0.1666)	-0.0655 (0.1422)	0.0401 (0.1737)
trade_sector	-0.3633*** (0.1206)	-0.4238*** (0.1193)	-0.0846 (0.1157)	-0.1461 (0.1408)
market_services_sector	-0.2398*** (0.0919)	-0.163* (0.0982)	0.0724 (0.102)	-0.0367 (0.1114)
size_employees_5to19	-0.0928 (0.0721)	-0.0572 (0.0681)	-0.0573 (0.0708)	-0.0785 (0.07)
size_employees_20to49	-0.0245 (0.0935)	-0.0296 (0.0874)	-0.0076 (0.0885)	-0.0302 (0.0898)
size_employees_50to199	-0.0878 (0.0926)	0.0144 (0.0903)	-0.1100 (0.0865)	-0.0275 (0.0926)
size_employees_200andmore	-0.0562 (0.1166)	-0.0551 (0.1107)	-0.1600 (0.099)	-0.0874 (0.1157)
Observations	514	514	514	514
Pseudo-R <sup>2</sup>	0.1006	0.1099	0.1515	0.0695
Log-likelihood	-305.7	-273.6	-302.3	-307.6
Observed frequency	0.625	0.715	0.501	0.657
Predicted frequency	0.633	0.733	0.500	0.668

Notes: Robust standard errors in parentheses; \*\*\*, \*\*, \* denote significance at the 1%, 5% and 10% significance level, respectively.

# Appendix (2)

## -Results (sector and firms' size effects only)-

Cost adjustment strategies and some relevant covariates, probit, average marginal effects

	Cost shock					Wage shock				
	Permanent employment	Temporary employment	Wages	Hours	Non-labour cost	Permanent employment	Temporary employment	Wages	Hours	Non-labour cost
construction_sector	-0.0432*** (0.0144)	0.3903** (0.1897)	-0.0479 (0.0314)	-0.0146 (0.0293)	-0.2957* (0.1777)	0.0271 (0.0802)	-0.0401 (0.0434)	-0.0402*** (0.0151)	-0.0263 (0.0304)	0.1683** (0.0848)
trade_sector	0.0026 (0.0518)	-0.0111 (0.0563)	-0.0868*** (0.0279)	-0.0010 (0.0406)	0.1306 (0.0851)	0.0007 (0.0827)	-0.0939*** (0.036)	-0.0409** (0.0177)	-0.1142*** (0.0303)	0.2658*** (0.0759)
market_services_sector	0.0190 (0.0405)	-0.0117 (0.0481)	-0.0105 (0.0386)	-0.0547** (0.0248)	0.0777 (0.0725)	0.0752 (0.0642)	-0.0493 (0.0347)	0.0213 (0.0325)	-0.0905*** (0.0291)	0.0710 (0.0827)
size_employees_5to19	-0.0084 (0.0293)	0.0163 (0.0423)	0.0674 (0.0618)	0.0258 (0.0396)	-0.0523 (0.0628)	0.0588 (0.0522)	0.0598 (0.0633)	0.0040 (0.0426)	-0.0482 (0.0343)	-0.0719 (0.078)
size_employees_20to49	-0.0214 (0.0319)	-0.0197 (0.0404)	0.0932 (0.0896)	0.0468 (0.056)	-0.0065 (0.0767)	-0.0005 (0.0593)	0.0349 (0.0763)	-0.0101 (0.0381)	-0.0412 (0.0308)	0.0147 (0.0885)
size_employees_50to199	-0.0537* (0.0289)	-0.0616* (0.0365)	0.0732 (0.0776)	-0.0149 (0.0362)	0.1000 (0.0673)	-0.0090 (0.0581)	0.0139 (0.0651)	0.0051 (0.0438)	-0.0564* (0.0348)	0.0527 (0.0878)
size_employees_200andm	-0.0299 (0.0242)	0.0289 (0.0527)	0.0818 (0.1008)	-0.0318 (0.0282)	-0.0567 (0.0935)	-0.0335 (0.0552)	0.0846 (0.0988)	0.0465 (0.078)	-0.0664*** (0.0193)	-0.0307 (0.1109)
Observations	433	433	433	433	433	412	412	412	412	412
Pseudo-R <sup>2</sup>	0.2085	0.4552	0.1022	0.1921	0.1876	0.1788	0.1135	0.2103	0.2332	0.1028
Log-likelihood	-56.0	-79.3	-104.3	-52.6	-201.3	-61.4	-111.2	-70.2	-57.7	-197.9
Observed frequency	0.0371	0.1004	0.0726	0.0332	0.7567	0.0483	0.0999	0.0612	0.0488	0.7419
Predicted frequency	0.0084	0.0247	0.0464	0.0134	0.7960	0.0184	0.0692	0.0272	0.0135	0.7714

Notes: Robust standard errors in parentheses; \*\*\*, \*\*, \* denote significance at the 1%, 5% and 10% significance level, respectively.