Wage dynamics and financial performance: Evidence from Czech firms

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18 December 2017

Abstract

This paper examines how the financial performance of the firm affects its wage policy. For this purpose, we match the data on Czech firms from the Wage Dynamics Network survey covering the period 2010–2013 with the balance sheet data. Controlling for a number of firm-specific characteristics and the environment in which the firms operate, we find that financial performance matters for wage setting: contractual wages are more likely to grow in firms with the higher ratio of cash flow to total assets and in firms that invest more. Conversely, firms that froze or cut contractual wages during the survey period had lower cash flow over total assets, but not necessarily lower investment ratio. Flexible wage component exhibits similar pattern, yet being more sensitive to demand shocks and firm's financial conditions.

JEL Codes: C83, J31, J41, L11.
Keywords: Wage setting, base wages, flexible wage component, survey data, financial performance.

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This work was supported by Czech National Bank Research Project No. D2/16. We thank M. Franta, J. Brůha, T. Lalinský, J. Šolc and participants of the CNB seminar for comments. All errors and omissions are ours. The views expressed in this paper are those of the authors and do not necessarily represent those of the Czech National Bank.

Nontechnical Summary

The aim of this paper is to identify the main drivers of wage adjustment (wage cuts, wage freezes and wage increases) during the 2010–2013 period using the combined database of the ESCB Wage Dynamics Network (WDN) wave III firm survey data and the firm-level financial data collected by the Czech Statistical Office (CZSO) for the sample of Czech firms.

We extend the findings of Babecký, Galuščák and Žigraiová (2017) by adding firm-specific financial variables to a set of general firm characteristics in order to explain wage dynamics. In particular, we relax the assumption of symmetry in wage adjustment by treating explicitly the cases of downward adjustment (wage cuts), unchanged wages (wage freezes) and upward adjustment (wage growth). Next, we augment the dataset with firm-level investment expenditures in order to control for the relationship between firm performance, captured by investment ratio, and wages. Last, we distinguish between contractual and flexible wage components and we test whether a firm's financial performance has the same impact on contractual (base) wages compared to the flexible wage component (bonuses and benefits).

We find that base wage increases are associated with higher firm cash flow and investment while no significant relationship was observed between increases in bonuses and benefits and firm cash flow and investment ratios. On the other hand, firms with lower cash flow ratio but not necessarily investment ratio are more likely to cut both base wages and flexible wage components.

Moreover, we confirm that economic environment is an important determinant of wage dynamics. Overall, the occurrence of negative demand shocks is associated with wage freezes and cuts, while positive demand shocks are related to wage growth.

Next, there are certain sectoral and firm-specific general characteristics that impact wage setting. In relation to the ownership structure of firms in the Czech Republic, we find that foreign-owned firms were less affected with wage cuts and tend to have higher probability of wage growth.

As for the flexible wage components, more labour-intensive firms are more likely to increase bonuses and benefits compared to base wage increases. Similarly, firms with increased sales on foreign markets are more likely to increase bonuses whereas the likelihood of base wage increases is lower in these firms. Flexible wage components also exhibit some sector-specific features, with firms operating in construction and services being less likely to increase bonuses and benefits.

Last but not least, we find no effect of unions on changes in flexible wage components. For this reason, firms are able to use bonuses and benefits more freely as an adjustment tool to shocks, if needed.

1. Introduction

Since the global economic and financial crisis, the literature has been paying increased attention to the interactions between finance and labour (see e.g. Boeri and Jimeno, 2016, for an overview of studies on this topic). In the situation when firms face financial constraints, and in the environment with labour market frictions, one of the consequences of negative shocks are employment cuts and raising unemployment (Monacelli et al., 2012). Employment cuts at the firm level could be also attributed to the destruction of the least production jobs following a credit crunch (Petrosky-Nadeau, 2013).

In the recent literature, firms' resilience to shocks has been identified to depend on the two key factors: (i) sound financial conditions and (ii) the ability to borrow from workers – for example, by adjusting wages – when the firm faces adverse shocks. Firm's ability to adjust wages, known also as "micro wage flexibility" is viewed as an important adjustment channel, which is able to reduce negative employment effects (Boeri and Jimeno, 2016).

Michelacci and Quadrini (2005, 2009) elaborate on the theoretical framework linking firm's financial conditions to wage policy, while Guiso, Pistaferri and Schivardi (2013) provide evidence that firms finance their operations by implicitly raising funds from workers. Since cuts in nominal wages are often difficult to implement due to labour law regulations, firms have more room to manoeuvre by freezing wages in the situation of negative demand and/or finance shocks.

In this paper we exploit a unique database containing detailed information on wage setting practices of Czech firms during 2010–2013 matched with firm-level financial statements over the same period. Thus we are able to examine a link between firms' financial conditions and wage policy, controlling for the economic environment in which the firms operate.

The labour market and economic environment part of the data comes from the Wage Dynamics Network (WDN) survey conducted within the European System of Central Banks Wage Dynamics Network in 2014 (Babecký, Galuščák and Žigraiová, 2015). One of the key findings of this survey is that a substantial share of Czech firms continued to hold wages frozen during 2010–2013. In 2010 wages were frozen in 20.2% of firms. Over the following years this percentage fell and in 2013 it equalled 14.8%. In those firms about 90% of workers experienced wage freezes in each year.

Table 1. The extent of wage freezes and cuts: *Over 2010–2013, did you freeze or cut base wages in a given year? Please indicate in which years.*

	Wages were **frozen** (unchanged in nominal terms)		Wages were **cut** (decreased in nominal terms)			Wages were neither frozen neither cut
	YES (% firms)	% Workers affected*	YES (% firms)	% Workers affected*	Average wage cut, %*	YES (% firms)
2010	20.2	92.4	3.4	64.1	18.9	76.3
2011	18.6	87.6	3.1	56.6	8.3	78.3
2012	17.6	92.2	3.0	59.9	10.2	79.3
2013	14.8	86.6	3.2	65.6	10.2	82.0

Note: * Percentage of workers affected and wage cuts are reported for those firms who answered YES.
Source: WDN survey, question c4_7; authors' calculations.

At the same time, according to the Bank lending surveys, in the post-crisis period Czech firms borrow less from banks and rely more on own and alternative forms of financing (CNB, 2017a,b). Using own funds at the expense of increasing wage compensation could be one of the options available, as argued by Guiso, Pistaferri and Schivardi (2013). Babecký, Galuščák and Žigraiová (2017) show that firm's financial conditions matter for the frequency of base wage changes. In particular, firms with the higher ratio of cash flow to total assets tend to change base wages more frequently. However, there is still an unexplored question of the direction of wage adjustment (and the eventual asymmetrical responses): what is the role played by financial conditions when the firm decides to increase wages as oppose to cut (or freeze) wage?

Another possibility to reduce labour costs when the firm needs to raise internal funds is to cut on bonuses and benefits – the so-called flexible wage components – which are easier to adjust compared to the contractual (base) wages. Even in the relatively flexible U.S. labour market, as compared to the European labour markets, Bewley (1999) finds that firms more easily use a reduction of bonuses compared to the base wages in the situation when the firm is affected by adverse shocks. Babecký et al. (2017) examine the shock-absorbing role of flexible wage components for a sample of 25 EU countries including the Czech Republic using data from the recent WDN survey. However, this rich cross-country database does not have information on firms' financial statements.

The interaction between the financial situation of the firm and its wage policy (i.e. the widespread use of wage freezes) deserves attention since it could mask several effects. First, a negative demand shock might lead to freezing wages as opposed to wage cuts. Second, by freezing wages firms might borrow from workers (Guiso, Pistaferri and Schivardi, 2013). This could be attributed to several factors, i.e. a distrust in other lending channels such as bank credit or a financial distress caused by high leverage of firms. The third reason underlying wage freezes is implicit contracting. Implicit contracts reflect the situation when firms choose not to decrease wages during the crisis, which translates into wage freezes at their crisis levels in the recovery period. This is also referred to as insurance within the firm – rigid wages provide certain insurance to employees (Guiso, Pistaferri and Schivardi, 2005; Kátay, 2016). For employees, this means to pay off their debt from the crisis years to the firm.

Consequently, in this paper we identify the main drivers of wage adjustment (wage cuts, wage freezes and wage increases) during the survey period 2010–2013 and we test whether adding financial variables to a set of general firm characteristics helps explaining wage dynamics. In doing so, we extend our recent analysis (Babecký, Galuščák and Žigraiová, 2017) in three ways. First, we relax the assumption of symmetry in wage adjustment, treating explicitly the cases of downward adjustment (wage cuts), unchanged wages (wage freezes) and upward adjustment (wage raises). Second, we augment the dataset with firm-level investment data, as there is a discussion for a trade-off between investment and wages. Third, we distinguish between contractual and flexible wage components and we test whether firm's financial performance has the same impact on contractual (base) wages compared to the flexible wage component (bonuses and benefits).

The results show that contractual (base) wages are more likely to grow in firms with the higher ratio of cash flow to total assets and in firms with the higher investment ratio. On the other hand, firms that decided to freeze or cut contractual (base) wages during the sample period 2010–2013 had lower cash flow to total assets ratio, but not necessarily the investment ratio. Thus, the results corroborate to the findings of Guiso, Pistaferri and Schivardi (2013) that in unfavourable time firms could finance their operations, such as investment expenditures, by implicitly raising funds from workers.

The impact of financial performance on flexible wage adjustment is broadly similar; yet there are some differences: cuts in bonuses and benefits are more sensitive to the financial conditions of the firm as compared to base wages, and also to the external environment in which the firms operate, in particular demand shocks. This is in line with the view from the literature that bonuses and benefits are easier to adjust (especially downward) compared to the contractual wages.

The rest of the paper is organised as follows. Section 2 provides an overview of literature on the role of financial conditions in wage setting, formulates testable research hypotheses and outlines the methodological framework. Section 3 describes the data. Section 4 provides the results on the impact of firm's financial performance and other characteristics on wage setting. The last section concludes.

2. Financial conditions and wage setting

2.1 Literature overview

The view that emerges from the financial literature is that small and fast growing firms face tighter financial constraints, either in the form of lower ability to raise funds or in the form of higher cost of funds (Cooley and Quadrini, 2001). It also appears that financially distressed firms (having high debt or low net worth) pay lower wages (Nickell and Nicolitsas, 1999; Hanka, 1998; Blanchflower, Oswald and Garrett, 1990). In addition, Gilchrist et al. (2017) find that financially constrained firms could find it optimal to increase prices during the financial crisis, due to financial frictions.

As for firms borrowing from their employees, there is both direct and indirect evidence. In some cases, firms borrow explicitly from their workers. For example, the widespread use of stock options and/or stock grants to ordinary workers—whose effort, when individually considered, is likely to have a negligible effect on the overall value of the firm—can hardly be justified as a way to provide better incentives to workers (Hall and Murphy, 2003). On the other hand, Oyer and Schaefer (2005) show that, if workers are sufficiently optimistic about their employers' prospects, stock options can be an efficient mean of compensation. In other words, despite demanding compensation for risk, optimistic employees might be willing to accept a large enough reduction in cash compensation to warrant using options as compensation. In other cases, the borrowing is implicit in the compensation structure offered to employees, as documented in Michelacci and Quadrini (2005). They confirm in their theoretical framework that due to financial market imperfections, workers' earnings also depend on the characteristics of their employers. In particular, wages tend to increase with the age and size of the firm.

Surplus from firm's operations has to be split between its investment opportunities and its stakeholders, according to managerial discretion and stakeholder bargaining power. Prasnikar and Svejnar (1998) find a strong trade-off between investment and wages. Some of the surplus may be retained by employees as higher wages or job security. This is harder if the surplus has been contractually promised to debtholders. If debtholders' claim is sufficiently large, employees might prefer to receive lower wages in order to reduce the risk of financial distress (Garvey and Gaston, 1997).

Ultimately, the relation of debt to wages is an empirical question, because theory has not yet produced a precise model of wage setting with debt. Debt reduces accessible cash, but should also raise employees' reservation wages due to the increased layoff risk. Thus, debt is likely to narrow the range of feasible wages, but it is not possible to say apriori whether the net result will be higher wages to provide a compensating differential for layoff risk, or lower wages due to discipline (Hanka, 1998).

Furthermore, it is well documented in the literature that average wages paid by foreign affiliates are higher than those paid by domestic-owned firms within the same industry (Lipsey and Sjöholm, 2004). This foreign-wage premium persists even after taking into account observable and unobservable differences in firm characteristics (Arnold and Javorcik, 2009). Empirical evidence suggests that foreign-owned firms in developing countries have greater collateral and financial resources than domestic companies that are subject to greater credit constraints (Lizal and Svejnar, 2002; Bas and Berthou, 2012). Moreover, foreign-owned firms are less risky and therefore banks are more prone to lend them relative to domestic firms.

2.2 Research hypotheses and methodological framework

Our main research hypotheses are the following: What is the impact of financial performance of the firm on its wage policy (wage cuts, freezes, raises)? How different is the impact of

firm's financial performance on the dynamics of base and flexible wages? What is the role played by specific firm and sectoral characteristics?

In line with the empirical evidence documented in the literature overview above, we link 2010–2013 period average wage changes at the firm level to a set of explanatory variables, also expressed as period averages (for the indicators of demand, productivity and financial performance) or as values in 2013 (for other firm-level and sectoral characteristics, which are slowly changing). The general model can be defined as follows:

$$\Delta wage_i = \alpha + \sum_j \beta_j * nonfin\ variables_i^j + \sum_k \gamma_k * fin\ variables_i^k \quad + \varepsilon_i \quad (1)$$

where the dependent variable is the change in wages per worker at the firm-level (base or contractual wage, and the flexible wage component), i is firm index, j is index of non-financial variables, and k is index of firm-level financial variables. The parameter β captures the impact of non-financial firm-level variables identified in the literature on wage setting, for example, demand development, size of the firm, foreign ownership, presence of collective pay agreements, and exposure to strong price competition.[1] The parameter γ identifies the effect of firm-level financial characteristics on wages. ε_i is the error term assumed to be white noise. Wage changes and non-financial variables are based on the WDN survey, while financial variables are taken from the balance sheet data.

The choice of the dependent variable as the period-average change in wages is driven by the design of the WDN survey, where firms were asked to report an overall change (more details on data are provided in the next section). Moreover, a number of non-financial variables, such as controls for demand development, are also available in the WDN survey as period-averages.

Based on the WDN survey, wage changes during 2010–2013 could be classified into the three categories: (i) cumulative wage decline (or the occurrence of wage cuts, according to the alternative measure), (ii) no change in wages (alternatively, the occurrence of wage freezes), and (iii) cumulative wage increase (alternatively, no occurrence of wage cuts or freezes). Thus, given the discrete nature of the wage data, we perform the estimation of Equation 1 with wage outcome dummy as the dependent variable using a binary probit model:

$$\Pr(Y_i = 1|X_i) = \Phi(X_i'\beta_i) \qquad i = 1, 2, \dots, N \quad (2)$$

where Y_i is a dummy variable capturing the occurrence of a particular outcome – wage decline (wage cut), no change (wage freeze), and wage raises (no cut, no freeze), X_i is a vector of firm-specific, non-financial and financial characteristics, Φ is the cumulative distribution function of the standard normal distribution, N is the number of firms and β_i is the vector of coefficients which capture the effect of the explanatory characteristics (both non-financial and financial) on the probability of observing the outcome.

[1] The setup of non-financial variables is similar to the one used in Babecký, Galuščák and Žigraiová (2017).

3. Data description

The data are summarised in Table 2. The main data source, which contains labour market and firm-specific variables, comes from the wave III survey of the ESCB Wage Dynamics Network (WDN) conducted in 2014 (see Babecký, Galuščák and Žigraiová, 2015 for details). The sample covers 1011 firms, selected as a stratified random sample from the business register, restricted to active firms in the business sector with 10 and more employees in manufacturing, construction, trade, and business services (excluding financial intermediation). Using employment-based weights, it is possible to obtain statistics representative of total employment in the selected industries of the business sector, which corresponds to 2127 thousand persons or equivalently 43% of total employment in the Czech economy. The survey questions refer to year 2013 (or 2010–2013 averages/changes) – see definitions in Table 2.

A complementary data set, which contains labour productivity and financial variables over 2010–2013, is based on the balance sheet and income statement information collected by the Czech Statistical Office (CZSO) and provided to the CNB. The CNB compiles the confidential data and aggregates them to the sectoral level using harmonised definitions and procedures within the ESCB Competitiveness Research Network (CompNet). For this research project, we followed the same harmonised definitions of variables as those adopted within the micro-aggregated CompNet database (Lopez-Garcia et al., 2015), but we used the original firm-level data and merged them with the WDN survey using unique firm identifies. As the result, about 97% of firms included in the WDN survey (985 firms out of 1011) have been matched with the balance sheet data. Notice that the actual number of firms used in our regression analysis is lower, varying between about 500 and 700 observations. This is due to availability of either survey answers (not all firms answered questions on wage setting) or balance sheet data over 2010–2013 (some indicators/years contain missing values).

As the dependent variable in our model, we use three alternative measures of wage changes:

(i) The occurrence of ***base wage cuts, freezes, and wage raises***, base on survey question "Over 2010–2013, did you freeze or cut base wages?". The advantage of this question is that the firms were asked explicitly whether they applied wage cuts and freezes during the survey period. The limitation is that there is no information on the overall wage change; for example, a firm may have applied a wage cut in one or several years (between 2010 and 2013), followed by a series of wage increases in other years.

(ii) Cumulative wage changes over 2010–2013, based upon the following survey question: "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". The list includes ***base wages or piece work rates*** as one of the options. Firms were asked to evaluate changes with a five-level scale: (a) strong decrease; (b) decrease; (c) no change; (d) increase; (e) strong increase. For the purpose of comparability with the first measure, we aggregate outcome into the three categories: wage decrease, no change, and wage increase. The advantage of this measure is that it provides information about a cumulative wage change during 2010–2013. Thus, we could link the cumulative wage change to the cumulative change in demand over the same period, available from the WDN survey. The limitation concerns the fact that following

the recovery of 2010 and 2011, in 2012 the Czech economy experienced the second recession, which lasted until 2013. Thus, the cumulative measure of wage development over 2010–2013 (as well as the cumulative measure of demand development) could mask heterogeneity during that period. Therefore, the first measure of wage changes, based on the occurrence of wage cuts and freezes, is also useful for the overall interpretation of the results: firms affected by recession could report no cumulative change in wages over 2010–2013 but, at the same time, they could have applied wage freezes and wage cuts (at last once during that period).

(iii) The third measure is based on the same survey question as the second one, only another response option is selected: a change in ***flexible wage components (bonuses, fringe benefits, etc.)***. This measure allows us to compare the dynamics of base and flexible wage components.

As for the right-hand side variables, we control for the characteristics important to wage setting and available from the WDN survey: firm size, sector, high-skilled dominant labour (as the firm's main occupational group), presence of collective pay agreement, firm's share of sales on foreign markets, exposure to strong price competition, ownership, and firm's exposure to demand shocks (strong decline, moderate decline, no change, moderate increase, or strong increase). Some variables, for example demand changes and price competitions, are available as period-averages, while other characteristics, which are not expected to have major changes during the survey period, are available as of 2013.

We complement the WDN survey dataset with labour productivity and financial performance indicators, extracted from the matched balance sheet data. To capture financial performance at the firm level, we follow the practice guidelines set in the Financial Module in CompNet: we use Cash Flow over Total Assets and the Investment Ratio (a change in the stock of fixed capital), which are the two key indicators of financial performance identified based on the review of empirical literature (Ferrando et al., 2015)[2].

Labour productivity is defined as the gross value added (GVA) per employee (E)[3]. Since the dependent variable captures a change in wages (or an absence of) during 2010–2013, we express labour productivity as the cumulative average growth rate over the same time period:

$$\Delta Labour\ productivity = \left(\frac{(GVA/E)_{2013}}{(GVA/E)_{2010}}\right)^{1/3} - 1$$

The indicator is calculated as the arithmetic mean and reflects the average yearly increase in productivity between 2010 and 2013.

Cash flow ratio and investment ratio, defined according to the harmonised definition within the CompNet exercise, are calculated as period averages over 2010–2013.

[2] Other indicators of financial performance also used in the literature are Profit Margin (earnings before interest and taxes over turnover) and Return on Assets, but for these indicators we do not have enough observations in the matched sample.

[3] Due to short time dimension (2010–2013) and low inflation during that period (not exceeding 2%), the difference between gross and real value added is small. Another reason to keep GVA in nominal terms is that wage changes at the firm level are also expressed in nominal terms.

Table 2. Overview of variables and data sources

Variables	Definition	Source
Dependent variable: survey-based wage measures		
(i) Δ *W_base_cf*	**Based on the occurrence of cuts & freezes in base wages:** Dummy variables equal to 1 if the firm reported that: - Base wages were **cut** (decreased in nominal terms) at least once during 2010–2013; - Base wages were **frozen** (unchanged in nominal terms) at least once during 2010–2013; - Base wages were neither cut nor frozen during 2010–2013.	WDN
(ii) Δ *W_base*	**Base on cumulative change in base wages:** Dummy variables equal to 1 if the firm reported a decrease (strong or moderate), no change or an increase (strong or moderate) in base wages or piece work rates during 2010–2013.	WDN
(iii) Δ *W_flexible*	**Base on cumulative change in flexible wage components:** Dummy variables equal to 1 if the firm reported a decrease (strong or moderate), no change, or an increase (strong or moderate) in flexible wages components (bonuses, fringe benefit, etc.) during 2010–2013.	WDN
Explanatory variables: survey-based		
Firm size dummies	Very small (10-19), small (20-49), medium (50-99), large (200+): at the end of 2013.	WDN
Sectoral dummies	Manufacturing, Construction, Trade, Business Services (CZ-NACE): at the end of 2013.	WDN
High-skilled dominant	A dummy equal to 1 if the major occupational group is the higher-skilled non-manual labour (ISCO-08: 1, 2, 3) or higher-skilled manual labour (ISCO-08: 6, 7, 8) at the end of 2013.	WDN
Collective agreement	A dummy equal to 1 if the firm applied a collective pay agreement bargained and signed inside of the firm and/or at a higher level in 2013.	WDN
Share of sales on foreign markets	Percentage of sales on foreign markets over total sales of the main product or service in 2013.	WDN
Strong price competition	A dummy equal to 1 if the firm characterises the degree of competition on the main product market as severe or very severe (2010–2013).	WDN
Share of labour costs in total costs	Percentage of firm's total costs (all operating expenses) that was due to labour costs in 2013.	WDN
Foreign ownership dummy	A dummy equal to 1 if the share of foreign ownership is higher than 50 percent in 2013.	WDN
Demand shock dummies	Dummy variables equal to 1 if the firm reported a strong decline, moderate decline, no change, moderate increase or strong increase in demand for its products/services during 2010–2013.	WDN
Explanatory variables : complemented from the balance sheet data		
Δ *Labour productivity*	Gross value added (sales less costs of bought in goods and services, excl. employee costs) divided by the number of employees (Cumulative average growth rate over 2010–2013).	CZSO
Cash flow ratio	Cash flow divided by total assets (average over 2010–2013).	CZSO
Investment ratio	(Change in capital + Depreciation) / Lagged capital (Average over 2010–2013).	CZSO

Note: *WDN:* firm-level data from the wave III survey of the Wage Dynamics Network conducted in 2014.
CZSO: firm-level balance sheet and income statement information collected by the Czech Statistical Office for the years 2002–2013 and compiled by the CNB following the harmonised definitions and procedures adopted within the ESCB Competitiveness Research Network (CompNet).

Determinants of firm performance: the role of demand development

One might ask a question as to which extent firm performance is driven by demand development. For example, a firm facing positive demand shocks is more likely to perform well compared to a firm hit by negative shocks. Table 3 shows correlations between demand shocks (the four dummy variables capturing the corresponding categories of demand development) and the three measures of firm performance. All signs are in accordance with intuition: positive demand shocks (moderate and strong demand increase) are positively correlated with better firm performance in terms of productivity growth, cash flow and investment. Conversely, negative demand shocks (moderate and strong demand decline) are negatively related to the considered indicators of firm performance. Most of the correlations shown in Table 3 are significant at the conventional statistical levels; however, their strength is rather weak: the highest correlation between demand shocks and firm performance is 0.17 in absolute terms (for the variables pair *strong demand decline* and *cash flow*). Thus, demand development has only a weak relation with firm performance.

Table 3 also shows that the two indicators of financial performance (cash flow and investment) are positively related with each other (the correlation coefficient is 0.14 and significant at 1%), while their link to productivity growth is close to zero and insignificant (the correlation coefficients of 0.02 and 0.03, correspondingly).

Table 3. Correlations between demand shocks and firm performance

Demand:	*Strong decline*	*Moderate decline*	*Moderate increase*	*Strong increase*	*Productivity growth*	*Cash flow ratio*	*Investment ratio*
Strong decline	1						
Moderate decline	-0.28***	1					
Moderate increase	-0.23***	-0.40***	1				
Strong increase	-0.07**	-0.12***	-0.10***	1			
Productivity growth	-0.08**	-0.08**	0.04	0.13***	1		
Cash flow ratio	-0.17***	-0.05	0.10***	0.09***	0.02	1	
Investment ratio	-0.12***	-0.10**	0.09**	0.08**	0.03	0.14***	1

Note: Pairwise correlation coefficients reported. *** significant at 1%, ** at 5%, * at 10%.

Table 4 complements the stylised facts between demand shocks and firm performance by an illustrative regression analysis, where firm performance (the three alternative indicators of) is regressed on demand shocks and a constant term. Overall, the explanatory power of such regressions is low, as indicated by the R-squared coefficients of about 0.03–0.04. The low regression fit also demonstrates the presence of substantial heterogeneity among the sample

firms: demand development alone is only able to explain about 3% to 4% of total variation in firm performance.

Table 4. Demand shocks and firm performance: a stylised regression

	(1) *Productivity growth*	(2) *Cash flow ratio*	(3) *Investment ratio*
Demand:			
Strong decline	-0.049***	-0.054***	-0.470***
	[0.02]	[0.01]	[0.11]
Moderate decline	-0.034**	-0.019**	-0.305***
	[0.01]	[0.01]	[0.10]
Moderate increase	-0.004	0.008	0.004
	[0.02]	[0.01]	[0.12]
Strong increase	0.097	0.044***	0.333
	[0.06]	[0.02]	[0.34]
Constant	0.043***	0.106***	0.662***
	[0.01]	[0.01]	[0.09]
Observations	763	858	827
R-squared	0.031	0.044	0.037

Note: OLS regression, *** significant at 1%, ** at 5%, * at 10%. Robust standard errors in brackets.

Concerning the effect of demand shocks, two observations could be made upon Table 4. First, negative demand shocks have more pronounced effects on firm performance compared to positive ones: the only significant effect of a demand increase is observed for cash flow (in the case of a strong demand increase), while negative shocks significantly affect all three indicators of firm performance.

Second, the effects of strong demand decline are larger in magnitude compared to moderate demand decline, as it follows from the absolute values of the regression coefficients. The highest impact of negative demand shocks is observed for cash flow (–0.054), which is more than double compared to the impact of a moderate demand decline (–0.019).

This analysis is obviously very illustrative, as there are many other factors explaining firm performance apart from demand shocks. The point of this exercise is to illustrate that there is no strong correlation between firm performance and demand development. Thus we could use in our subsequent analysis of wage setting the indicators of firm performance and demand altogether, as independent explanatory variables.

4. Results

We present regression results organised along three lines in accordance with the three alternative measures of wage changes: (1) the occurrence of base wages cuts, freezes and positive wage changes, (2) overall changes in base wages, and (3) overall changes in flexible wage components. Furthermore, the last part presents robustness checks.

4.1 Base wage cuts, freezes, and wage raises

Table 5 shows the estimates of factors explaining the occurrence of base wage cuts (columns 1–2), base wage freezes (columns 3–4) and base wage increases (columns 5–6) during the period 2010–2013. The results reveal that a demand change is an important factor in firm's wage setting, with the evidence of non-linearity and asymmetry. In particular, firm's wage setting is more sensitive (i) to negative demand shocks compared to positive ones, and (ii) to strong demand drops compared to moderate demand decreases. Thus, in face of negative demand shocks firms were more likely to freeze or cut wages, but positive demand development was not associated with base wage increases.

Financial performance turns out to be significant for wage cuts and wage raises. Firms with higher cash flow to assets ratio were less likely to cut wages and more likely to keep wages up (columns 2 and 6). Next, firms with higher investment ratio were also those firms that did not cut or freeze wages at all during 2010–2013 (column 6).

Regarding other characteristics, foreign-owned firms were less likely to cut wages (column 1). On the other hand, labour-intensive firms (as measured by the higher share of labour costs in total costs) were more likely to cut wages.

4.2 Base wage – cumulative changes

Table 6 presents the determinants of cumulative base wage changes (decrease, no change, increase) over 2010–2013. Again, demand changes turn out to be an important factor behind base wage changes. Negative demand shocks are associated with the higher probability of observing a decline in wages, similar to the previous case, but now positive demand shocks are related to wage increases, as one would expect from theory.

Similar to the case of base wage cuts, higher cash flow ratio is associated with the lower probability of observing a decline in base wages and – together with the investment ratio – higher probability of observing an increase in wages. In addition, productivity growth is another factor behind the probability of observing positive wage changes.

Foreign-owned firms are more likely to increase wages compared to the domestic-owned firms. The presence of collective agreement schemes (at the firm or sectoral level) is another factor associated with positive wage changes.

4.3 Flexible wage component – cumulative changes

As Table 7 indicates, flexible wage components exhibit similar dynamics to base wage changes with respect to the effect of positive and negative demand shocks. Thus, firms use both base and flexible wage components as an adjustment channel.

Nevertheless, bonuses and benefits tend to adjust downward more in reaction to negative demand shocks compared to base wages: marginal effects reported in columns 1–2 in Table 7 are by about 50% higher compared to the corresponding numbers in columns 1–2 in Table 6. On the other hand, in reaction to positive demand shocks, flexible wages react to a similar extent as base wages; marginal effects are even somewhat larger for base wages (see columns 4–5 in Table 7 versus Table 6).

Another difference between base and flexible wage adjustment is related to the share of labour costs in total costs. While the probability of raises in bonuses and benefits is significantly higher in labour-intensive firms (columns 5–6 in Table 7), the evidence is weak (not robust to the inclusion of financial variables) for base wages (columns 5–6 in Table 6). Also, positive results in terms of sales on foreign markets are transmitted into a higher probability of raising bonuses and benefits (columns 5–6, Table 7) and not immediately into the probability of base wage changes (columns 5–6 in Table 6).

Furthermore, flexible wages components, exhibit more pronounced sector-specific patterns compared to base wages. The probability of raising bonuses and benefits is lower, for example, for the sectors of construction and services (as compared to the reference group of manufacturing).

Finally, the effect of unions (collective agreement schemes) is not significant in the case of flexible wage components, while the presence of collective agreements was one of the significant determinants behind base wage setting. This reflects the situation that unions bargain primarily over base wages. Thus, firms could use bonuses and benefits more freely as an adjustment tool to shocks, when needed.

Table 5: Probit estimates – base wage changes during 2010–2013*

	Wage cuts (at least once)		**Wage freezes** (at least once)		**Wage raises** (no cuts, no freezes)	
Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Very small	-0.013	0.027	-0.052	-0.034	0.085	0.058
	[0.02]	[0.05]	[0.06]	[0.08]	[0.06]	[0.08]
Medium	-0.017	0.005	0.036	0.014	-0.025	-0.013
	[0.02]	[0.03]	[0.05]	[0.07]	[0.06]	[0.07]
Large	-0.057**	-0.033	-0.026	-0.042	0.066	0.077
	[0.02]	[0.03]	[0.06]	[0.07]	[0.06]	[0.07]
Construction	-0.013	-0.019	-0.065	-0.151**	0.074	0.140*
	[0.02]	[0.03]	[0.06]	[0.07]	[0.07]	[0.08]
Trade	-0.011	0.002	0.058	0.042	-0.024	-0.037
	[0.02]	[0.03]	[0.06]	[0.07]	[0.06]	[0.07]
Services	-0.047***	-0.033	0.040	0.070	0.025	-0.030
	[0.02]	[0.02]	[0.05]	[0.07]	[0.05]	[0.07]
High-skilled dominant	-0.037*	-0.023	-0.011	0.010	0.045	0.012
	[0.02]	[0.02]	[0.04]	[0.05]	[0.04]	[0.05]
Collective agreement	0.026	0.019	0.092**	0.062	-0.096**	-0.067
	[0.02]	[0.02]	[0.04]	[0.05]	[0.05]	[0.05]
Share of sales on foreign markets	0.015	0.030	0.041	0.097	-0.051	-0.129*
	[0.02]	[0.03]	[0.06]	[0.07]	[0.06]	[0.07]
Strong competition	0.032	0.038**	0.019	0.051	-0.056	-0.085
	[0.02]	[0.02]	[0.05]	[0.06]	[0.05]	[0.06]
Share of labour costs in total costs	0.099**	0.159***	0.120	0.172	-0.209**	-0.329***
	[0.04]	[0.05]	[0.08]	[0.11]	[0.09]	[0.11]
Foreign-owned firms	-0.032*	-0.028	-0.016	-0.039	0.043	0.060
	[0.02]	[0.02]	[0.04]	[0.04]	[0.04]	[0.05]
Strong demand decline	0.065*	0.014	0.355***	0.335***	-0.346***	-0.287***
	[0.05]	[0.04]	[0.07]	[0.08]	[0.07]	[0.08]
Demand decline	0.028	-0.011	0.130***	0.087	-0.133***	-0.067
	[0.03]	[0.02]	[0.05]	[0.06]	[0.05]	[0.06]
Demand increase	-0.017	-0.027	0.007	0.064	-0.005	-0.045
	[0.02]	[0.02]	[0.05]	[0.06]	[0.05]	[0.06]
Strong demand increase	-0.008	-0.004	-0.069	-0.007	0.097	0.043
	[0.04]	[0.05]	[0.09]	[0.11]	[0.09]	[0.12]
Productivity growth		0.001		-0.141		0.177
		[0.05]		[0.14]		[0.15]
Cash flow to assets		-0.194*		-0.364		0.465*
		[0.10]		[0.23]		[0.24]
Investment ratio		-0.015		-0.030		0.040*
		[0.01]		[0.02]		[0.02]
Observations	709	527	709	527	709	527
r2_p	0.099	0.126	0.064	0.0675	0.070	0.076

Note: Marginal effects reported, *** significant at 1%, ** at 5%, * at 10%. Robust standard errors in brackets.
*Based on survey question c4_7 "*Over 2010–2013, did you freeze or cut base wages?*"

Table 6: Probit estimates – *cumulative* base wage change over 2010–2013[*]

	Decrease		No change		Increase	
Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Very small	0.010	0.089	0.041	-0.056	-0.059	-0.037
	[0.03]	[0.07]	[0.07]	[0.09]	[0.07]	[0.10]
Medium	0.057	0.097*	-0.049	-0.052	-0.011	-0.045
	[0.04]	[0.05]	[0.06]	[0.07]	[0.06]	[0.08]
Large	0.024	0.052	-0.133**	-0.147*	0.108*	0.093
	[0.03]	[0.04]	[0.06]	[0.08]	[0.07]	[0.08]
Construction	0.054	0.052	-0.003	0.004	-0.093	-0.077
	[0.04]	[0.06]	[0.08]	[0.09]	[0.08]	[0.10]
Trade	-0.008	0.001	-0.006	-0.020	0.019	0.023
	[0.03]	[0.03]	[0.06]	[0.07]	[0.07]	[0.08]
Services	0.032	0.066*	0.026	-0.002	-0.075	-0.094
	[0.02]	[0.04]	[0.05]	[0.07]	[0.05]	[0.07]
High-skilled dominant	-0.005	0.008	0.003	-0.042	0.002	0.033
	[0.02]	[0.02]	[0.04]	[0.05]	[0.04]	[0.05]
Collective agreement	0.015	0.007	-0.103**	-0.139***	0.095*	0.151***
	[0.02]	[0.02]	[0.05]	[0.05]	[0.05]	[0.05]
Share of sales on foreign markets	-0.055*	-0.027	-0.017	0.003	0.065	0.015
	[0.03]	[0.04]	[0.07]	[0.08]	[0.07]	[0.08]
Strong competition	0.017	0.000	0.049	0.026	-0.066	-0.029
	[0.03]	[0.04]	[0.06]	[0.07]	[0.06]	[0.08]
Share of labour costs in total costs	0.051	0.047	-0.223**	-0.271**	0.163	0.230*
	[0.04]	[0.06]	[0.10]	[0.13]	[0.10]	[0.13]
Foreign-owned firms	-0.025	-0.020	-0.071	-0.100**	0.100**	0.124**
	[0.02]	[0.02]	[0.04]	[0.05]	[0.05]	[0.05]
Strong demand decline	0.212***	0.173**	0.082	0.102	-0.235***	-0.225***
	[0.07]	[0.08]	[0.07]	[0.08]	[0.07]	[0.08]
Demand decline	0.136***	0.118**	0.013	0.026	-0.118**	-0.119*
	[0.04]	[0.05]	[0.05]	[0.06]	[0.05]	[0.06]
Demand increase	0.076	0.091	-0.192***	-0.160***	0.158***	0.113*
	[0.05]	[0.06]	[0.05]	[0.06]	[0.06]	[0.07]
Strong demand increase	0.046		-0.328***	-0.302***	0.346***	0.361***
	[0.09]		[0.05]	[0.07]	[0.08]	[0.09]
Productivity growth		-0.015		-0.319*		0.351*
		[0.08]		[0.18]		[0.19]
Cash flow to assets		-0.214*		-0.386		0.671***
		[0.11]		[0.25]		[0.26]
Investment ratio		-0.005		-0.032		0.045**
		[0.01]		[0.02]		[0.02]
Observations	706	504	706	526	706	526
r2_p	0.118	0.111	0.084	0.106	0.124	0.155

Note: Marginal effects reported, *** significant at 1%, ** at 5%, * at 10%. Robust standard errors in brackets.
*Based on survey question c2_5a "*Please indicate how each one of the labour costs components has changed during 2010–2013: Base wages or piece work rates*."

Table 7: Probit estimates – flexible wage component, *cumulative* change over 2010–2013[*]

	Decrease		No change		Increase	
Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Very small	-0.026	-0.050	0.076	0.055	-0.062	-0.010
	[0.05]	[0.07]	[0.07]	[0.09]	[0.07]	[0.09]
Medium	0.024	0.017	-0.117**	-0.087	0.113*	0.082
	[0.05]	[0.06]	[0.05]	[0.07]	[0.06]	[0.08]
Large	-0.031	-0.034	-0.068	-0.046	0.109*	0.083
	[0.05]	[0.07]	[0.06]	[0.07]	[0.06]	[0.08]
Construction	0.061	0.039	0.093	0.092	-0.182***	-0.194**
	[0.07]	[0.08]	[0.08]	[0.09]	[0.07]	[0.08]
Trade	0.068	0.052	-0.054	-0.060	0.002	0.021
	[0.06]	[0.07]	[0.06]	[0.07]	[0.06]	[0.07]
Services	0.088*	0.102	0.060	0.050	-0.143***	-0.156**
	[0.05]	[0.06]	[0.05]	[0.07]	[0.05]	[0.06]
High-skilled dominant	0.006	0.024	0.026	0.061	-0.036	-0.092*
	[0.03]	[0.04]	[0.04]	[0.05]	[0.04]	[0.05]
Collective agreement	0.049	0.055	-0.043	-0.044	-0.000	0.005
	[0.04]	[0.05]	[0.05]	[0.05]	[0.05]	[0.05]
Share of sales on foreign markets	-0.057	-0.113	-0.096	-0.035	0.157**	0.150*
	[0.06]	[0.07]	[0.07]	[0.07]	[0.07]	[0.08]
Strong competition	0.105**	0.098*	-0.039	-0.018	-0.048	-0.060
	[0.04]	[0.06]	[0.06]	[0.07]	[0.06]	[0.07]
Share of labour costs in total costs	-0.021	-0.035	-0.196**	-0.227*	0.242**	0.294**
	[0.08]	[0.10]	[0.10]	[0.12]	[0.10]	[0.12]
Foreign-owned firms	0.032	0.072	0.038	-0.002	-0.067	-0.074
	[0.04]	[0.05]	[0.04]	[0.05]	[0.04]	[0.05]
Strong demand decline	0.357***	0.274***	-0.155***	-0.095	-0.185***	-0.168**
	[0.07]	[0.09]	[0.06]	[0.07]	[0.06]	[0.07]
Demand decline	0.198***	0.180***	-0.059	-0.036	-0.131***	-0.139**
	[0.05]	[0.06]	[0.05]	[0.06]	[0.05]	[0.06]
Demand increase	-0.033	-0.028	-0.092*	-0.073	0.125**	0.098
	[0.05]	[0.06]	[0.05]	[0.06]	[0.06]	[0.07]
Strong demand increase	-0.144**		-0.198***	-0.181**	0.328***	0.346***
	[0.06]		[0.07]	[0.09]	[0.10]	[0.11]
Productivity growth		-0.066		-0.097		0.152
		[0.14]		[0.16]		[0.19]
Cash flow to assets		-0.359*		0.086		0.242
		[0.21]		[0.23]		[0.24]
Investment ratio		-0.004		-0.039*		0.050**
		[0.02]		[0.02]		[0.02]
Observations	708	505	708	527	708	527
r2_p	0.129	0.107	0.043	0.034	0.116	0.125

Note: Marginal effects reported, *** significant at 1%, ** at 5%, * at 10%. Robust standard errors in brackets.
*Based on survey question c2_5b "*Please indicate how each one of the labour costs components has changed during 2010–2013: Flexible wage components (bonuses, fringe benefits, etc.)*"

4.4 Robustness checks

As robustness checks, we consider two additional specifications[4]. First, a statistically significant effect of labour costs in wage adjustment regressions raises a question whether it is a high share of (highly paid) skilled labour or other factors that are behind high labour costs. Therefore, we add the interaction term *High-skilled dominant x Share of labour costs in total costs* to the regressions. The results are presented in Tables A1–A3 in the Appendix. The effect of the interaction term is insignificant in most of the regressions and other coefficients remain similar. The only exception is the specification with no change in cumulative base wages (Table A2, columns 3–4). In that case a positive sign of the interaction term in both specifications (without and with financial variables) suggests that the probability of keeping cumulative base wages unchanged was higher in labour-intensive firms employing skilled labour. This effect, however, becomes insignificant when considering bonuses and benefits (Table A3, columns 3–4).

Such behaviour of base wages corroborates to the previous finding of relevance of the implicit contract theory among Czech firms employing mainly high-skilled labour (Babecký, Dybczak and Galuščák, 2008). This result was based upon the first wave WDN survey conducted in 2007 and covering the period of favourable economic development 2002–2006. One of the reasons for base wage rigidity was the practice of implicit contracts (agreements on wages) between a firm and workers, particularly relevant in Czech firms employing high-skilled labour. Thus, some elements of such practice could be traced for the period 2010–2013 as well, specifically for firms with the higher share of labour costs in total costs.

As the second robustness check, we consider a possibility that firms' decision to invest could be related to strong demand. The results of the specification with the added interaction term *Strong demand increase x Investment ratio* are presented in Tables B1–B3 in the Appendix. Looking at the effect on base wages (Tables B1–B2), one can notice a pronounced link of investment to the business cycle. Indeed, when the interaction term enters the regressions without financial variables (columns 1, 3 and 5), it is (i) negative and significant for wage cuts and freezes (Table B1) and unchanged cumulative wages (Table B2)[5], and (ii) positive and significant for wages raises. Once the financial variables are added (columns 2, 4 and 6) the effect of the interaction term becomes insignificant and other regression coefficients remain similar. To summarise, firms that experienced an increase in demand and investment had higher probability of base wage raises, respectively lower probability of base wage freezes and cuts.

Regarding the effect on flexible wage components (Table B3), a positive link of investment to the business cycle is observed for unchanged or increased bonuses: a negative coefficient at the interaction term for unchanged bonuses (columns 3–4) and a positive coefficient for an increase in bonuses (column 6). However, the surveyed firms were more likely to decrease

[4] We thank T. Lalinský for this suggestion.

[5] The interaction term was dropped from the regression in case of cumulative base wage decreases (Columns 1–2, Table B2) due to multicollinearity with other explanatory variables, in particular the demand dummies.

bonuses – at the margin – when they experienced and increase in demand and investment. This confirms some effect of substitution of base and flexible wage changes.

5. Conclusions

In this paper we examined a link between the financial performance of the firm and its wage policy, controlling for firm- and sector-specific characteristics as well for the environment in which the firms operate. Drawing on the example of Czech firms, we matched the firm-level data from the Wage Dynamics Network survey covering the period 2010–2013 with the balance sheet data. Wage changes were measured using three alternative indicators: (i) the occurrence of base wage freezes, cuts, and positive base wage changes; (ii) cumulative base wages changes; and (iii) cumulative flexible wage component changes during 2010–2013.

First, we found the economic environment is an important determinant of wage dynamics. Overall, the occurrence of negative demand shocks is associated with wage freezes and cuts, while positive demand shocks are related to the higher probability of wage raises.

Second, there are certain sectoral and firm-specific general characteristic important for wage setting. For example, the foreign-owned firms were less affected with wage cuts and tend to have higher probability of wage raises.

On the top of that, the financial performance characteristics are also an important determinant of wage setting. Firms in better financial conditions, in particular having higher cash flow to assets ratio, were less likely to cut wages and more likely to have positive wage changes over 2010–2013. This result extends our previous finding of a positive link between cash flow and the frequency of wage changes (Babecký, Galuščák and Žigraiová, 2017). When distinguishing between wage outcomes, higher cash flow increases the probability of positive base wage changes (no significant effects on bonuses and benefits), while firms with lower cash flow ratio are those that are more likely to cut both base wages and flexible wage components.

Next, firms that invested more had also higher probability of wage increases. For all three alternative measures of wage changes, an increase in investment is associated with higher probability of positive wage changes (including both base wages and flexible wage components). This finding contrasts with the investment-wage trade-off found by Prasnikar and Svejnar (1998) in the panel of Slovenian firms over the period 1991–1995. However, such investment-wage trade-off, consistent with the imperfect capital market (internal funds) hypothesis during the privatisation period in the transition country, does not seem to be any longer representative for the post-crisis macroeconomic environment in the Czech Republic, where for the vast majority of firms the availability of credit was of little to no relevance (Babecký, Galuščák and Žigraiová, 2015).

Furthermore, there is an evidence of asymmetric effects of financial variables on wage adjustment: firms that cut wages (base wages and flexible components) have lower financial performance in terms of cash flow, but not necessarily investment. On the other hand, base wage increases are typical to firms with the above-average both cash flow and investment.

Thus, in the situation of rigid base wages, adjustment in bonuses and benefits represents an alternative mechanism how firms could react to adverse shocks to reduce labour costs and to raise internal funds.

Given the features of the WDN survey (for example, the demand shocks are reported as averages over 2010–2013), the results are presented in terms of period averages as well. Thus, while there may be an apparent disconnect in the short-term adjustment (e.g. so-called "wageless recovery" – an absence of wage growth during the initial phase of the post-crisis business cycle), the period averages exhibit "standard" patterns. Although we do not have information on individual wage profiles of workers, the firm-level dynamics of wages is in line with the hypotheses of insurance within the firm (Guiso, Pistaferri and Schivardi, 2005) and borrowing from workers (Guiso, Pistaferri and Schivardi, 2013).

The obtained information on wage setting practices of Czech firms and a link between financial situation in the firm and wage setting could subsequently serve as an inspiration for macroeconomic modelling and macro-prudential analysis.

Our regression analysis is based on variables available at the firm-level. We do not include neither macroeconomic variables nor Bank Lending Survey variables since they are available on a country level only. Such variables could be important in a cross-country comparative framework, which is one of the directions for future research.

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Appendix A: Added interaction *high-skilled dominant x share of labour costs in total costs*

Table A1: Probit estimates – base wage changes during 2010–2013*

	Wage cuts (at least once)		**Wage freezes** (at least once)		**Wage raises** (no cuts, no freezes)	
Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Very small	-0.013	0.023	-0.053	-0.040	0.086	0.065
	[0.02]	[0.05]	[0.06]	[0.08]	[0.06]	[0.08]
Medium	-0.017	0.004	0.036	0.013	-0.025	-0.011
	[0.02]	[0.03]	[0.05]	[0.07]	[0.06]	[0.07]
Large	-0.057**	-0.035	-0.028	-0.047	0.068	0.084
	[0.02]	[0.03]	[0.06]	[0.07]	[0.06]	[0.07]
Construction	-0.014	-0.022	-0.066	-0.155**	0.077	0.147**
	[0.02]	[0.03]	[0.06]	[0.07]	[0.07]	[0.07]
Trade	-0.010	0.002	0.061	0.044	-0.026	-0.039
	[0.02]	[0.03]	[0.06]	[0.07]	[0.06]	[0.07]
Services	-0.047***	-0.034	0.040	0.070	0.025	-0.029
	[0.02]	[0.02]	[0.05]	[0.07]	[0.05]	[0.07]
High-skilled dominant	-0.019	0.005	0.015	0.062	0.013	-0.056
	[0.03]	[0.03]	[0.06]	[0.07]	[0.07]	[0.08]
Collective agreement	0.025	0.017	0.091**	0.062	-0.096**	-0.066
	[0.02]	[0.02]	[0.04]	[0.05]	[0.05]	[0.05]
Share of sales on foreign markets	0.015	0.029	0.041	0.098	-0.051	-0.130*
	[0.02]	[0.03]	[0.06]	[0.07]	[0.06]	[0.07]
Strong competition	0.030	0.036**	0.017	0.049	-0.053	-0.081
	[0.02]	[0.02]	[0.05]	[0.06]	[0.05]	[0.07]
Share of labour costs in total costs	0.124**	0.205***	0.170	0.281	-0.267*	-0.473**
	[0.06]	[0.07]	[0.13]	[0.17]	[0.14]	[0.19]
Foreign-owned firms	-0.032*	-0.028	-0.017	-0.040	0.043	0.060
	[0.02]	[0.02]	[0.04]	[0.04]	[0.04]	[0.05]
Strong demand decline	0.065	0.014	0.356***	0.335***	-0.348***	-0.288***
	[0.05]	[0.04]	[0.07]	[0.08]	[0.07]	[0.08]
Demand decline	0.029	-0.009	0.131***	0.089	-0.135***	-0.070
	[0.03]	[0.02]	[0.05]	[0.06]	[0.05]	[0.06]
Demand increase	-0.017	-0.028	0.007	0.062	-0.005	-0.043
	[0.02]	[0.02]	[0.05]	[0.06]	[0.05]	[0.06]
Strong demand increase	-0.007	-0.002	-0.067	-0.002	0.095	0.035
	[0.04]	[0.05]	[0.09]	[0.11]	[0.09]	[0.12]
High-skilled dominant	-0.045	-0.077	-0.082	-0.179	0.098	0.236
x Share of labour costs	[0.07]	[0.09]	[0.16]	[0.21]	[0.17]	[0.23]
Productivity growth		0.001		-0.145		0.183
		[0.05]		[0.14]		[0.15]
Cash flow to assets		-0.199**		-0.382*		0.486**
		[0.10]		[0.23]		[0.24]
Investment ratio		-0.015		-0.030		0.041*
		[0.01]		[0.02]		[0.02]
Observations	709	527	709	527	709	527
r2_p	0.100	0.128	0.064	0.067	0.070	0.078

Note: Marginal effects reported, *** significant at 1%, ** at 5%, * at 10%. Robust standard errors in brackets.
*Based on survey question c4_7 "*Over 2010–2013, did you freeze or cut base wages?*"

Table A2: Probit estimates – *cumulative* base wage change over 2010–2013*

	Decrease		No change		Increase	
Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Very small	0.011	0.088	0.042	-0.044	-0.060	-0.049
	[0.03]	[0.07]	[0.07]	[0.09]	[0.07]	[0.10]
Medium	0.058*	0.097*	-0.054	-0.052	-0.009	-0.046
	[0.04]	[0.05]	[0.06]	[0.07]	[0.06]	[0.08]
Large	0.024	0.051	-0.127**	-0.139*	0.102	0.084
	[0.03]	[0.04]	[0.06]	[0.08]	[0.07]	[0.08]
Construction	0.048	0.050	0.006	0.013	-0.099	-0.086
	[0.04]	[0.05]	[0.08]	[0.10]	[0.08]	[0.10]
Trade	-0.008	0.001	-0.017	-0.025	0.027	0.028
	[0.03]	[0.03]	[0.06]	[0.07]	[0.07]	[0.08]
Services	0.030	0.066*	0.027	-0.004	-0.076	-0.094
	[0.02]	[0.04]	[0.05]	[0.07]	[0.05]	[0.07]
High-skilled dominant	0.019	0.016	-0.125*	-0.156*	0.087	0.129
	[0.03]	[0.04]	[0.07]	[0.09]	[0.07]	[0.09]
Collective agreement	0.015	0.007	-0.103**	-0.139***	0.095*	0.152***
	[0.02]	[0.02]	[0.05]	[0.05]	[0.05]	[0.05]
Share of sales on foreign markets	-0.056*	-0.027	-0.016	0.003	0.066	0.016
	[0.03]	[0.04]	[0.07]	[0.08]	[0.07]	[0.08]
Strong competition	0.015	0.000	0.060	0.029	-0.074	-0.033
	[0.03]	[0.04]	[0.06]	[0.07]	[0.06]	[0.08]
Share of labour costs in total costs	0.092	0.063	-0.489***	-0.539***	0.335**	0.446**
	[0.06]	[0.09]	[0.15]	[0.19]	[0.15]	[0.20]
Foreign-owned firms	-0.025	-0.020	-0.070	-0.099**	0.099**	0.123**
	[0.02]	[0.02]	[0.04]	[0.05]	[0.05]	[0.05]
Strong demand decline	0.212***	0.173**	0.082	0.105	-0.233***	-0.227***
	[0.07]	[0.08]	[0.07]	[0.08]	[0.07]	[0.08]
Demand decline	0.135***	0.118**	0.012	0.025	-0.117**	-0.118*
	[0.04]	[0.05]	[0.05]	[0.06]	[0.05]	[0.06]
Demand increase	0.074	0.089	-0.192***	-0.156***	0.157***	0.108
	[0.05]	[0.06]	[0.05]	[0.06]	[0.06]	[0.07]
Strong demand increase	0.045		-0.331***	-0.306***	0.350***	0.365***
	[0.09]		[0.05]	[0.07]	[0.08]	[0.09]
High-skilled dominant x Share of labour costs	-0.073	-0.027	0.421**	0.408*	-0.279	-0.341
	[0.08]	[0.11]	[0.19]	[0.24]	[0.19]	[0.25]
Productivity growth		-0.016		-0.306*		0.341*
		[0.08]		[0.18]		[0.19]
Cash flow to assets		-0.215*		-0.367		0.661**
		[0.11]		[0.25]		[0.26]
Investment ratio		-0.005		-0.032		0.045**
		[0.01]		[0.02]		[0.02]
Observations	706	504	706	526	706	526
r2_p	0.120	0.111	0.089	0.110	0.126	0.157

Note: Marginal effects reported, *** significant at 1%, ** at 5%, * at 10%. Robust standard errors in brackets.
*Based on survey question c2_5a "*Please indicate how each one of the labour costs components has changed during 2010–2013: Base wages or piece work rates*."

Table A3: Probit estimates – flexible wage component, *cumulative* change over 2010–2013[*]

	Decrease		No change		Increase	
Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Very small	-0.026	-0.055	0.076	0.062	-0.060	-0.006
	[0.05]	[0.07]	[0.07]	[0.09]	[0.07]	[0.09]
Medium	0.024	0.019	-0.117**	-0.086	0.113*	0.083
	[0.05]	[0.06]	[0.05]	[0.07]	[0.06]	[0.08]
Large	-0.031	-0.037	-0.070	-0.041	0.113*	0.086
	[0.05]	[0.07]	[0.06]	[0.07]	[0.06]	[0.08]
Construction	0.060	0.030	0.092	0.097	-0.180***	-0.193**
	[0.07]	[0.08]	[0.08]	[0.09]	[0.07]	[0.08]
Trade	0.068	0.053	-0.052	-0.061	-0.001	0.020
	[0.06]	[0.07]	[0.06]	[0.06]	[0.06]	[0.07]
Services	0.088*	0.101	0.060	0.050	-0.143***	-0.156**
	[0.05]	[0.06]	[0.05]	[0.07]	[0.05]	[0.06]
High-skilled dominant	0.012	0.091	0.048	0.013	-0.074	-0.117
	[0.06]	[0.07]	[0.07]	[0.08]	[0.07]	[0.09]
Collective agreement	0.049	0.054	-0.043	-0.044	-0.001	0.005
	[0.04]	[0.05]	[0.05]	[0.05]	[0.05]	[0.05]
Share of sales on foreign markets	-0.057	-0.114	-0.095	-0.036	0.156**	0.150*
	[0.06]	[0.07]	[0.07]	[0.07]	[0.07]	[0.08]
Strong competition	0.104**	0.096*	-0.042	-0.016	-0.044	-0.059
	[0.04]	[0.06]	[0.06]	[0.07]	[0.06]	[0.07]
Share of labour costs in total costs	-0.008	0.113	-0.151	-0.340	0.170	0.240
	[0.11]	[0.15]	[0.15]	[0.21]	[0.16]	[0.19]
Foreign-owned firms	0.032	0.071	0.038	-0.002	-0.067	-0.074
	[0.04]	[0.05]	[0.04]	[0.05]	[0.04]	[0.05]
Strong demand decline	0.357***	0.274***	-0.154***	-0.095	-0.186***	-0.167**
	[0.07]	[0.09]	[0.06]	[0.07]	[0.06]	[0.07]
Demand decline	0.198***	0.183***	-0.059	-0.037	-0.132***	-0.140**
	[0.05]	[0.06]	[0.05]	[0.06]	[0.05]	[0.06]
Demand increase	-0.033	-0.031	-0.092*	-0.071	0.125**	0.099
	[0.05]	[0.06]	[0.05]	[0.06]	[0.06]	[0.07]
Strong demand increase	-0.144**		-0.196***	-0.184**	0.326***	0.344***
	[0.06]		[0.07]	[0.09]	[0.10]	[0.11]
High-skilled dominant	-0.021	-0.243	-0.074	0.176	0.121	0.088
x Share of labour costs	[0.15]	[0.20]	[0.19]	[0.24]	[0.19]	[0.23]
Productivity growth		-0.071		-0.089		0.155
		[0.14]		[0.16]		[0.19]
Cash flow to assets		-0.373*		0.100		0.249
		[0.20]		[0.23]		[0.24]
Investment ratio		-0.004		-0.039*		0.050**
		[0.02]		[0.02]		[0.02]
Observations	708	505	708	527	708	527
r2_p	0.129	0.109	0.043	0.035	0.116	0.125

Note: Marginal effects reported, *** significant at 1%, ** at 5%, * at 10%. Robust standard errors in brackets. *Based on survey question c2_5b "*Please indicate how each one of the labour costs components has changed during 2010–2013: Flexible wage components (bonuses, fringe benefits, etc.)*"

Appendix B: Added interaction *strong demand increase x investment ratio*

Table B1: Probit estimates – base wage changes during 2010–2013*

	Wage cuts (at least once)		**Wage freezes** (at least once)		**Wage raises** (no cuts, no freezes)	
Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Very small	0.001	0.027	-0.040	-0.035	0.071	0.059
	[0.03]	[0.05]	[0.07]	[0.08]	[0.07]	[0.08]
Medium	-0.018	0.005	0.025	0.015	-0.018	-0.014
	[0.02]	[0.03]	[0.06]	[0.07]	[0.06]	[0.07]
Large	-0.054*	-0.033	-0.019	-0.041	0.052	0.076
	[0.03]	[0.03]	[0.06]	[0.07]	[0.06]	[0.07]
Construction	-0.010	-0.019	-0.094	-0.150**	0.084	0.140*
	[0.03]	[0.03]	[0.07]	[0.07]	[0.07]	[0.08]
Trade	-0.002	0.002	0.051	0.041	-0.043	-0.036
	[0.03]	[0.03]	[0.06]	[0.07]	[0.07]	[0.07]
Services	-0.033*	-0.033	0.058	0.071	-0.009	-0.031
	[0.02]	[0.02]	[0.05]	[0.07]	[0.06]	[0.07]
High-skilled dominant	-0.028	-0.023	-0.015	0.010	0.031	0.013
	[0.02]	[0.02]	[0.04]	[0.05]	[0.04]	[0.05]
Collective agreement	0.028	0.018	0.077*	0.064	-0.086*	-0.068
	[0.02]	[0.02]	[0.05]	[0.05]	[0.05]	[0.05]
Share of sales on foreign markets	0.022	0.030	0.020	0.096	-0.036	-0.128*
	[0.03]	[0.03]	[0.06]	[0.07]	[0.07]	[0.07]
Strong competition	0.024	0.038**	-0.002	0.052	-0.030	-0.085
	[0.02]	[0.02]	[0.06]	[0.06]	[0.06]	[0.06]
Share of labour costs in total costs	0.127***	0.159***	0.140	0.168	-0.253**	-0.326***
	[0.04]	[0.05]	[0.10]	[0.11]	[0.10]	[0.11]
Foreign-owned firms	-0.033*	-0.028	-0.040	-0.041	0.065	0.061
	[0.02]	[0.02]	[0.04]	[0.04]	[0.04]	[0.05]
Strong demand decline	0.053	0.014	0.325***	0.336***	-0.299***	-0.288***
	[0.05]	[0.04]	[0.07]	[0.08]	[0.07]	[0.08]
Demand decline	0.015	-0.011	0.095*	0.088	-0.092*	-0.068
	[0.03]	[0.02]	[0.05]	[0.06]	[0.05]	[0.06]
Demand increase	-0.026	-0.027	0.014	0.064	0.000	-0.045
	[0.02]	[0.02]	[0.06]	[0.06]	[0.06]	[0.06]
Strong demand increase	0.007	-0.005	0.012	0.038	0.023	0.006
	[0.06]	[0.05]	[0.13]	[0.14]	[0.13]	[0.14]
Strong demand increase x Investment ratio	-0.023*	0.003	-0.123*	-0.078	0.128*	0.068
	[0.01]	[0.02]	[0.07]	[0.08]	[0.08]	[0.08]
Productivity growth		0.001		-0.141		0.177
		[0.05]		[0.14]		[0.15]
Cash flow to assets		-0.195*		-0.358		0.459*
		[0.10]		[0.23]		[0.24]
Investment ratio		-0.015		-0.025		0.037
		[0.01]		[0.02]		[0.02]
Observations	610	527	610	527	610	527
r2_p	0.093	0.126	0.054	0.068	0.059	0.0767

Note: Marginal effects reported, *** significant at 1%, ** at 5%, * at 10%. Robust standard errors in brackets.
*Based on survey question c4_7 "*Over 2010–2013, did you freeze or cut base wages?*"

Table B2: Probit estimates – *cumulative* base wage change over 2010–2013*

	Decrease		No change		Increase	
Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Very small	0.052	0.089	-0.025	-0.058	-0.033	-0.036
	[0.05]	[0.07]	[0.08]	[0.09]	[0.08]	[0.10]
Medium	0.080*	0.097*	-0.040	-0.051	-0.041	-0.046
	[0.04]	[0.05]	[0.06]	[0.07]	[0.07]	[0.08]
Large	0.039	0.052	-0.124*	-0.146*	0.084	0.092
	[0.04]	[0.04]	[0.07]	[0.07]	[0.07]	[0.08]
Construction	0.086	0.052	-0.035	0.004	-0.077	-0.078
	[0.05]	[0.06]	[0.08]	[0.09]	[0.09]	[0.10]
Trade	0.003	0.001	0.022	-0.021	-0.023	0.024
	[0.03]	[0.03]	[0.07]	[0.07]	[0.07]	[0.08]
Services	0.068**	0.066*	0.023	-0.001	-0.110*	-0.096
	[0.03]	[0.04]	[0.06]	[0.07]	[0.06]	[0.07]
High-skilled dominant	0.002	0.008	-0.015	-0.043	0.009	0.034
	[0.02]	[0.02]	[0.05]	[0.05]	[0.05]	[0.05]
Collective agreement	0.020	0.007	-0.110**	-0.135***	0.100*	0.147***
	[0.03]	[0.02]	[0.05]	[0.05]	[0.05]	[0.05]
Share of sales on foreign markets	-0.036	-0.027	0.002	0.004	0.028	0.015
	[0.04]	[0.04]	[0.07]	[0.08]	[0.07]	[0.08]
Strong competition	0.006	0.000	0.033	0.027	-0.039	-0.030
	[0.03]	[0.04]	[0.07]	[0.07]	[0.07]	[0.08]
Share of labour costs in total costs	0.050	0.047	-0.196*	-0.274**	0.147	0.234*
	[0.05]	[0.06]	[0.11]	[0.13]	[0.11]	[0.13]
Foreign-owned firms	-0.032	-0.020	-0.092**	-0.102**	0.134***	0.126**
	[0.02]	[0.02]	[0.04]	[0.05]	[0.05]	[0.05]
Strong demand decline	0.227***	0.173**	0.124*	0.104	-0.278***	-0.227***
	[0.08]	[0.08]	[0.07]	[0.08]	[0.07]	[0.08]
Demand decline	0.148***	0.118**	0.031	0.028	-0.140**	-0.121*
	[0.05]	[0.05]	[0.05]	[0.06]	[0.06]	[0.06]
Demand increase	0.104*	0.091	-0.151***	-0.158***	0.102*	0.112*
	[0.06]	[0.06]	[0.05]	[0.06]	[0.06]	[0.07]
Strong demand increase			-0.284***	-0.270***	0.333***	0.326***
			[0.08]	[0.09]	[0.11]	[0.12]
Strong demand increase x Investment ratio			-0.246*	-0.199	0.261**	0.188
			[0.13]	[0.14]	[0.13]	[0.14]
Productivity growth		-0.015		-0.317*		0.351*
		[0.08]		[0.18]		[0.19]
Cash flow to assets		-0.214*		-0.374		0.661**
		[0.11]		[0.25]		[0.26]
Investment ratio		-0.005		-0.028		0.041*
		[0.01]		[0.02]		[0.02]
Observations	584	504	608	526	608	526
r2_p	0.130	0.111	0.080	0.107	0.129	0.156

Note: Marginal effects reported, *** significant at 1%, ** at 5%, * at 10%. Robust standard errors in brackets.
*Based on survey question c2_5a "*Please indicate how each one of the labour costs components has changed during 2010–2013: Base wages or piece work rates*."

Table B3: Probit estimates – flexible wage component, *cumulative* change over 2010–2013[*]

	Decrease		No change		Increase	
Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Very small	-0.033	-0.050	0.054	0.056	-0.025	-0.010
	[0.06]	[0.07]	[0.08]	[0.09]	[0.08]	[0.09]
Medium	0.008	0.017	-0.084	-0.081	0.088	0.078
	[0.05]	[0.06]	[0.06]	[0.07]	[0.07]	[0.08]
Large	-0.039	-0.034	-0.047	-0.040	0.091	0.080
	[0.06]	[0.07]	[0.06]	[0.07]	[0.07]	[0.08]
Construction	0.075	0.039	0.087	0.093	-0.205***	-0.199**
	[0.07]	[0.08]	[0.08]	[0.09]	[0.07]	[0.09]
Trade	0.061	0.052	-0.056	-0.058	0.011	0.020
	[0.06]	[0.07]	[0.06]	[0.06]	[0.07]	[0.07]
Services	0.105**	0.102	0.037	0.051	-0.140***	-0.163***
	[0.05]	[0.06]	[0.06]	[0.07]	[0.05]	[0.06]
High-skilled dominant	-0.000	0.024	0.065	0.056	-0.080*	-0.090*
	[0.04]	[0.04]	[0.04]	[0.05]	[0.05]	[0.05]
Collective agreement	0.056	0.055	-0.016	-0.036	-0.024	-0.003
	[0.04]	[0.05]	[0.05]	[0.05]	[0.05]	[0.05]
Share of sales on foreign markets	-0.067	-0.113	-0.085	-0.029	0.174**	0.148*
	[0.06]	[0.07]	[0.07]	[0.07]	[0.07]	[0.08]
Strong competition	0.082*	0.098*	-0.025	-0.016	-0.043	-0.064
	[0.05]	[0.06]	[0.06]	[0.07]	[0.07]	[0.07]
Share of labour costs in total costs	-0.024	-0.035	-0.181*	-0.240**	0.226**	0.311**
	[0.09]	[0.10]	[0.10]	[0.12]	[0.11]	[0.12]
Foreign-owned firms	0.036	0.072	0.046	-0.010	-0.087*	-0.067
	[0.04]	[0.05]	[0.04]	[0.05]	[0.05]	[0.05]
Strong demand decline	0.372***	0.274***	-0.135**	-0.088	-0.211***	-0.174**
	[0.08]	[0.09]	[0.06]	[0.07]	[0.06]	[0.07]
Demand decline	0.199***	0.180***	-0.037	-0.030	-0.151***	-0.144**
	[0.05]	[0.06]	[0.05]	[0.06]	[0.05]	[0.06]
Demand increase	-0.020	-0.028	-0.084	-0.070	0.108*	0.098
	[0.06]	[0.06]	[0.05]	[0.06]	[0.06]	[0.07]
Strong demand increase	-0.211***		-0.111	-0.102	0.289**	0.244*
	[0.02]		[0.12]	[0.12]	[0.13]	[0.15]
Strong demand increase x Investment ratio	0.096**		-0.561**	-0.515**	0.054	0.456**
	[0.05]		[0.26]	[0.26]	[0.07]	[0.23]
Productivity growth		-0.066		-0.085		0.147
		[0.14]		[0.16]		[0.19]
Cash flow to assets		-0.359*		0.110		0.223
		[0.21]		[0.22]		[0.24]
Investment ratio		-0.004		-0.029		0.041*
		[0.02]		[0.02]		[0.02]
Observations	609	505	609	527	609	527
r2_p	0.131	0.107	0.041	0.040	0.119	0.129

Note: Marginal effects reported, *** significant at 1%, ** at 5%, * at 10%. Robust standard errors in brackets. *Based on survey question c2_5b "*Please indicate how each one of the labour costs components has changed during 2010–2013: Flexible wage components (bonuses, fringe benefits, etc.)*"