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Wage Dynamics and Financial Performance: Evidence from Czech Firms

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Abstract

This paper examines how the financial performance of a firm affects its wage policy. For this purpose, we match data on Czech firms from the Wage Dynamics Network survey covering the period 2010–2013 with balance sheet data. Controlling for a number of firm-specific characteristics and the environment in which firms operate, we find that financial performance matters for wage setting: contractual wages are more likely to grow in firms with a 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 a lower investment ratio. The flexible wage component exhibits a similar pattern, but is more sensitive to demand shocks and firms' financial conditions.

Abstrakt

Tento článek zkoumá, jak finanční výkonnost podniku ovlivňuje odměňování. Pro tento účel propojujeme data českých podniků získaných z šetření Wage Dynamics Network, které pokrývá období 2010–2013, s daty o rozvahách. Po zohlednění firemních charakteristik a prostředí, ve kterém podniky působí, zjišťujeme, že odměňování na finanční výkonnosti závisí: smluvní mzdy rostou pravděpodobněji v podnicích, které vykazují vyšší podíl hotovostních toků k aktivům, a v podnicích, které více investují. Naopak podniky, které v uvedeném období zmrazily nebo snížily smluvní mzdy, měly nižší podíl hotovostních toků k aktivům, ale ne nutně nižší podíl investic. Flexibilní složka mezd vykazuje podobné schéma, je však citlivější na poptávkové šoky a finanční poměry podniků.

JEL Codes: C83, J31, J41, L11.

Keywords: Base wages, financial performance, flexible wage component, survey data, wage setting.

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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 a combined database of ESCB Wage Dynamics Network (WDN) wave III firm survey data and firm-level financial data collected by the Czech Statistical Office (CZSO) for a 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 expenditure in order to control for the relationship between firm performance, captured by the 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 as on 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 is observed between increases in bonuses and benefits and firm cash flow and investment ratios. On the other hand, firms with a lower cash flow ratio, but not necessarily a lower investment ratio, are more likely to cut both base wages and flexible wage components.

Moreover, we confirm that 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 wage growth.

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

As for the flexible wage components, more labour-intensive firms are more likely to increase bonuses and benefits than to raise base wages. 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 a shock adjustment tool 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, for example, Boeri and Jimeno, 2016, for an overview of studies on this topic). In a situation where firms face financial constraints, and in an environment of labour market frictions, the consequences of negative shocks include employment cuts and rising unemployment (Monacelli et al., 2011). Employment cuts at the firm level can also be attributed to destruction of the least productive jobs following a credit crunch (Petrosky-Nadeau, 2013).

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

Michelacci and Quadrini (2005, 2009) elaborate on the theoretical framework linking firms' 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 a situation of negative demand and/or finance shocks.

In this paper we exploit a unique database containing detailed information on the wage-setting practices of Czech firms during 2010–2013 matched with firm-level financial statements over the same period. We are thus able to examine the link between firms' financial conditions and wage policy, controlling for the economic environment in which they 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 proportion 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, reaching 14.8% in 2013. 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 nor cut
	YES (% of firms)	% of workers affected	YES (% of firms)	% of workers affected	Average wage cut, % *	YES (% of 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 bank lending surveys, in the post-crisis period Czech firms have been borrowing less from banks and relying more on their own and alternative forms of financing (CNB, 2017a,b). Using internal funds at the cost 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 a firm's financial conditions matter for the frequency of base wage changes. In particular, firms with a 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 potential asymmetrical responses): what is the role played by financial conditions when a firm decides to increase wages as opposed to cutting (or freezing) them?

Another option for reducing labour costs when a firm needs to raise internal funds is to cut bonuses and benefits (flexible wage components), which are easier to adjust than contractual (base) wages. Even in the U.S. labour market, which is more flexible than its European counterparts, Bewley (1999) finds that firms more easily reduce bonuses than base wages when 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 a firm's financial situation 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 wage freezes rather than wage cuts. Second, by freezing wages firms might borrow from workers (Guiso, Pistaferri and Schivardi, 2013). This could be due to several factors, among them distrust in other lending channels such as bank credit and financial distress caused by high leverage of firms. The third reason underlying wage freezes is implicit contracting. Implicit contracts reflect the situation where firms choose not to reduce wages during a crisis, which translates to wages being frozen at their crisis levels in the recovery period. This is also referred to as insurance within the firm – rigid wages provide some insurance to employees (Guiso, Pistaferri and Schivardi, 2005; Kátay, 2016). For employees, this means paying 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 explain 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 discussion of a trade-off between investment and wages. Third, 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 as on the flexible wage component (bonuses and benefits).

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

The impact of financial performance on flexible wage adjustment is broadly similar, but there are some differences: as compared to base wages, cuts in bonuses and benefits are more sensitive to the financial conditions of the firm and also to the external environment in which 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) than contractual wages.

The rest of the paper is organised as follows. Section 2 provides an overview of the 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 a 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, in the form of either a lower ability to raise funds or a 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 will find it optimal to increase prices during a financial crisis, due to financial frictions.

There is both direct and indirect evidence of firms borrowing from their employees. 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 means 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.

The surplus arising from a firm's operations has to be split between investment and 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 a priori 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 the average wages paid by foreign affiliates are higher than those paid by domestically owned firms within the same industry (Lipsey and Sjöholm, 2004). This foreign-wage premium persists even after observable and unobservable differences in firm characteristics are taken into account (Arnold and Javorcik, 2009). Empirical evidence suggests that foreign-owned firms in developing countries have greater collateral and financial resources than domestic companies, which are subject to greater credit constraints (Lizal and Svejnar, 2002; Bas and Berthou, 2012). Moreover, foreign-owned firms are less risky, so banks are more likely to lend to them than to domestic firms.

2.2 Research Hypotheses and Methodological Framework

Our main research hypotheses are the following: What is the impact of the financial performance of a firm on its wage policy (wage cuts, freezes, raises)? How different are the impacts of a 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 (the base or contractual wage and the flexible wage component), i is the firm index, j is the index of non-financial variables and k is the 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 changes, firm size, 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 balance sheet data.

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

Based on the WDN survey, the wage changes during 2010–2013 can be classified into three categories: (i) a 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) a cumulative wage increase (alternatively, no occurrence of wage cuts or freezes). Thus, given the discrete nature of the wage data, we perform estimate Equation 1 with the wage outcome dummy as the dependent variable using a binary probit model:

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

where Y_i is a dummy variable capturing the occurrence of a particular outcome – wage decline (wage cut), no change (wage freeze) and wage raise (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.

3. Data Description

The data are summarised in Table 2. The main data source, which contains labour market and firm-specific variables, is 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 1,011 firms, selected as a stratified random sample from the business register, restricted to active firms in the business sector with 10 or 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 2,127,000 persons, or, equivalently, 43% of total employment in the Czech economy. The survey questions refer to 2013 (or 2010–2013 averages/changes) – see the definitions in Table 2.

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

The 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 identifiers. As a result, about 97% of the firms included in the WDN survey (985 firms out of 1,011) were matched with the balance sheet data. Note that the actual number of firms used in our regression analysis is lower, varying between about 500 and 700 observations. This is due to unavailability of either survey answers (not all firms answered the questions on wage setting) or balance sheet data over 2010–2013 (some indicators/years have missing values).

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

(i) The occurrence of ***base wage cuts, freezes and raises***, based on the 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 on 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 on a five-level scale: (a) strong decrease, (b) decrease, (c) no change, (d) increase, (e) strong increase. For the purposes of comparability with the first measure, we aggregate the outcomes into three categories: wage decrease, no change and wage increase. The advantage of this measure is that it provides information about the cumulative wage change during 2010–2013. We can thus link the cumulative wage change to the cumulative change in demand over the same period, available from the WDN survey. The limitation is that following the recovery of 2010 and 2011, in 2012 the Czech economy experienced a second recession, which lasted until 2013. The cumulative measure of wage change over 2010–2013 (as well as the cumulative measure of demand change) may thus mask heterogeneity during that period. Therefore, the first measure of wage change, based on the occurrence of wage cuts and freezes, is also useful for the overall interpretation of the results: firms affected by the recession may have reported no cumulative change in wages over 2010–2013 but, at the same time, they may have applied wage freezes and wage cuts (at least 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: change in ***flexible wage components (bonuses, fringe benefits, etc.)***. This measure allows us to compare the dynamics of the base and flexible components of wages.

As for the right-hand side variables, we control for characteristics that are important for wage setting and are 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 competition, are available as period averages, while other characteristics, which are not expected to show 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 (the change in the stock of fixed capital), which are the two key indicators of financial performance identified on the basis of a review of the empirical literature (Ferrando et al., 2015).[2]

Labour productivity is defined as gross value added (GVA) per employee (E).[3] Since the dependent variable captures the change (or absence thereof) in wages 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.

The cash flow ratio and the 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 the short time dimension (2010–2013) and low inflation (not exceeding 2%) during that period, 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 and 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*	**Based 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*	**Based 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 wage components (bonuses, fringe benefits, 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 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 the 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% 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 balance sheet data		
Δ Labour productivity	Gross value added (sales less costs of bought-in goods and services, excluding 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 in accordance with the harmonised definitions and procedures adopted within the ESCB Competitiveness Research Network (CompNet).

3.1 Determinants of Firm Performance: The Role of Demand Change

One might ask to what extent firm performance is driven by demand change. For example, a firm facing positive demand shocks is more likely to perform well than a firm hit by negative shocks. Table 3 shows the correlations between demand shocks (the four dummy variables capturing the corresponding categories of demand change) and three measures of firm performance. All signs are in accordance with intuition: positive demand shocks (moderate and strong demand increases) are positively correlated with better firm performance in terms of productivity growth, cash flow and investment. Conversely, negative demand shocks (moderate and strong demand declines) are negatively correlated with the indicators of firm performance considered. 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 change is only weakly correlated with firm performance.

Table 3 also shows that 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 (with 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 with an illustrative regression analysis where the three indicators of firm performance are regressed on demand shocks and a constant term. Overall, the explanatory power of these regressions is low, as indicated by 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 change alone is only able to explain about 3% to 4% of the 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 can be made from Table 4. First, negative demand shocks have more pronounced effects on firm performance than do 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 a strong demand decline are larger in magnitude than those of a moderate demand decline, as indicated by the absolute values of the regression coefficients. The largest impact of a strong negative demand shock is observed for cash flow (–0.054). It is more than double the figure for 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 change. In our subsequent analysis of wage setting, we can thus use the indicators of firm performance and demand together, as independent explanatory variables.

4. Results

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

4.1 Base Wage Cuts, Freezes and 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 demand changes are an important factor in wage setting by

firms, with evidence of non-linearity and asymmetry. In particular, firms' wage setting is more sensitive to (i) negative demand shocks than positive ones and (ii) strong demand drops than moderate demand decreases. Thus, in the face of negative demand shocks firms were more likely to freeze or cut wages, but positive demand changes were not associated with base wage increases.

Financial performance turns out to be significant for wage cuts and wage raises. Firms with a 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 a higher investment ratio were also ones 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 a 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 a higher probability of observing a decline in wages, similar to the previous case, but now positive demand shocks are associated with wage increases, as one would expect from the theory.

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

Foreign-owned firms are more likely to increase wages compared to domestically owned ones. 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. Firms thus 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 than do base wages: the marginal effects reported in columns 1–2 in Table 7 are about 50% larger than the corresponding figures given 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; the 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 relates 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 transmit to a higher probability of raising bonuses and benefits (columns 5–6 in Table 7) and not immediately to the probability of base wage changes (columns 5–6 in Table 6).

Furthermore, flexible wage 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 of base wage setting. This reflects the situation that unions bargain primarily over base wages. Firms could thus use bonuses and benefits more freely as a shock adjustment tool 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, the statistically significant effect of labour costs in the wage adjustment regressions raises the question of whether high labour costs are due to a high share of (highly paid) skilled labour or to other factors. We therefore 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 the 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 the previous finding of the relevance of 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 favourable economic period of 2002–2006. One of the reasons for base wage rigidity was the practice of implicit contracts (wage agreements) between a firm and its workers, which is particularly relevant in Czech firms employing high-skilled labour. Some elements of this practice could thus be traced for the period 2010–2013 as well, specifically among firms with a high share of labour costs in total costs.

As the second robustness check, we consider the possibility that firms' decisions to invest are 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 see 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 wage raises. Once the financial variables are added (columns 2, 4 and 6), the effect of the interaction term becomes insignificant and the other regression coefficients remain similar. To summarise, firms that experienced an increase in demand and investment had a higher probability of base wage raises or a 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: there is a negative coefficient on the interaction term for unchanged bonuses (columns 3–4) and a positive coefficient on that for an increase in bonuses (column 6). However, the surveyed firms were more likely to reduce bonuses – at the margin – when they experienced an increase in demand and investment. This confirms some substitution of base and flexible wage changes.

[4] We thank Tibor Lalinský for this suggestion.

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

5. Conclusions

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

First, we found that 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 a higher probability of wage raises.

Second, there are certain sectoral and firm-specific general characteristics that are important for wage setting. For example, foreign-owned firms are less affected by wage cuts and tend to have a higher probability of wage raises.

On top of that, financial performance characteristics are an important determinant of wage setting. Firms in better financial condition, in particular those having a 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 we distinguish between wage outcomes, higher cash flow increases the probability of positive base wage changes (and has no significant effects on bonuses and benefits), while firms with a lower cash flow ratio are more likely to cut both base wages and flexible wage components.

Next, firms that invested more also had a higher probability of wage increases. For all three measures of wage changes, an increase in investment is associated with a higher probability of positive wage changes (in both base wages and flexible wage components). This finding contrasts with the investment-wage trade-off found by Prasnikar and Svejnar (1998) in a 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 a transition country, no longer seems representative of the post-crisis macroeconomic environment in the Czech Republic, where, for the vast majority of firms, the availability of credit was of little or no relevance (Babecký, Galuščák and Žigraiová, 2015).

Furthermore, there is evidence of financial variables having asymmetric effects on wage adjustment: firms that cut wages (base wages and flexible components) have a lower financial performance in terms of cash flow, but not necessarily investment. On the other hand, base wage increases are typical of firms with both above-average cash flow and above-average investment. Thus, in a situation of rigid base wages, adjustment of bonuses and benefits represents an alternative mechanism whereby firms can react to adverse shocks to reduce labour costs and increase internal funds.

Given the features of the WDN survey (for example, demand shocks are reported as averages over 2010–2013), the results are presented in terms of period averages as well. So, while there is an apparent disconnect in the short-term adjustment (for instance a "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 the individual wage profiles of workers, the firm-level dynamics of wages are 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 information obtained on the wage-setting practices of Czech firms and the link between the financial situation in the firm and wage setting could serve as inspiration for macroeconomic modelling and macro-prudential analysis.

Our regression analysis is based on variables available at the firm level. We 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 potential direction 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	-0.073	-0.027	0.421**	0.408*	-0.279	-0.341
x Share of labour costs	[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.)*"

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