

Downward Wage Rigidity and Alternative Margins of Adjustment: Survey Evidence from European Firms

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PRELIMINARY

Abstract

It has been well established that the nominal wages of individual workers are very rarely cut. This paper presents new evidence from a unique survey of firms across Europe on the prevalence of downward wage rigidity in both real and nominal terms. Furthermore, we broaden the analysis beyond the issue of flexibility in base wages by examining the use of alternative margins of labour cost adjustment at the firm level. We find that, even in the face of strong downward rigidities in base wages, firms make frequent use of other, more flexible, components of compensation to adjust the cost of labour. Changes in bonuses, non-pay benefits and slowing down promotions are some of the potential margins firms use to reduce costs. We also show how the margins of adjustment chosen are affected by firm and worker characteristics.

Keywords: downward nominal and real wage rigidity, firm survey, European Union

JEL codes: J30, C81, P5

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1. Introduction

During the last few years, a growing body of literature has established that individual wages are seldom cut. This research has documented the importance of downward nominal wage rigidities in several countries and over a range of time periods. The earlier literature, mostly studying the US, focused on the reluctance of workers and firms to receive nominal wage cuts. Recently, the International Wage Flexibility Project (IWFP), a major cross-country research network relying on administrative and household surveys covering 16 countries, has illustrated the importance of downward rigidities in both nominal and real wages (Dickens et al., 2007). Once this set of facts has been established, the key question is if these rigidities are really binding and in particular, do firms have other margins of adjustment they can use to circumvent rigidities in wage setting? (see Kramarz, 2001). This paper constitutes a first attempt in answering these questions.

This paper contributes to the existing literature in two important dimensions. First, we provide a detailed analysis of the prevalence of nominal and real rigidities in a large number of countries. We use a novel major firm level survey that contains detailed qualitative information for 15 EU countries. The survey was carried out within the framework of the Wage Dynamics Network, a research network sponsored by a consortium of Central Banks of the EU coordinated by the European Central Bank. In addition to most of the economies of the Euro Area, our data cover five Eastern European economies for which previous evidence on the prevalence of different types of wage rigidities is not available. This unique survey allows us to examine the firm-level determinants of real and nominal wage rigidities from a new perspective. Using firm survey data has several advantages. Most importantly, it allows us to examine the relevance of some firm characteristics (e.g. the importance of firm level collective agreements vs. more centralised wage setting structures) usually unobservable in large administrative and household data. Firm surveys also have the advantage of avoiding measurement error problems typically encountered in household surveys, a fact that has received considerable attention in the wage rigidity literature relying on individual data (Dickens and Goette, 2006).

The second dimension in which we add to the existing literature is by evaluating alternative channels of labour cost adjustments, assessing their relationship with downward nominal and real wage rigidities and studying the characteristics of firms, sectors and countries where they operate. We identify the following cost-saving strategies reported by the majority of national surveys: reduce or eliminate bonus payments; reduce non-pay benefits; change shift assignments or shift premia; slow or freeze rate at which promotions are filled; recruit new

employees at lower wage level than those who left voluntarily; encourage early retirement to replace high wage employees by entrants with lower wages. Our survey shows that firms fairly commonly use strategies to reduce labour costs without reducing base wages – 58% of firms said they had used at least one alternative margin of adjustment in the recent past, and 50% had used at least one of the six margins explicitly identified in the survey. We investigate what types of firms are more prone to use each of these strategies, and how these characteristics interact with the labour markets in which they operate. Finally, we study the interactions between these saving strategies and the extent of downward nominal wage rigidity (DNWR) and downward real wage rigidity (DRWR) measured at the firm level.

The rest of the paper is organised as follows. Section 2 discusses the main characteristics of the survey and presents some summary statistics. Section 3 concentrates on the evidence regarding downward nominal and real wage rigidity and examines their main driving factors. Section 4 moves to the analysis of the alternative channels of adjustment firms may have if flexibility of base wages is restricted. Section 5 concludes.

2. Survey Design and Sample Characteristics

The survey was conducted in the second half of 2007 in 15 European Union countries.¹ All countries used as the basis for the survey a harmonised questionnaire including questions relating to firm wage setting practices. However some countries opted for shorter versions of this questionnaire, while others extended it in several dimensions. The results in this paper are mainly based on data from 11 of the countries, all of which included the questions on alternative margins of labour cost adjustment that we wish to focus on.²

The sample frame in each country was based on firms with at least 5 employees and the sectors covered were manufacturing, energy, construction, business services, trade and financial intermediation.

¹ The 15 countries are: Austria, Belgium, Czech Republic, Estonia, Germany, Greece, France, Ireland, Italy, Netherlands, Poland, Portugal, Slovenia and Spain. Data from the surveys conducted in Lithuania and Luxembourg may be added at a later stage.

² Austria, Germany, Netherlands and Spain did not include the questions on alternative margins. Data on downward real rigidity is missing for Belgium, Netherlands and Germany.

3. Evidence of downward wage rigidity

Eliciting information about the extent of downward nominal wage rigidity (DNWR) is relatively easily implemented in a survey of firms. Our survey asked if firms have ever cut or frozen wages during the past five years. Firms that froze, rather than cut, wages at any point are regarded as showing evidence of DNWR. Therefore, we define our indicator of DNWR as a dummy taken the value of 1 if the firm has frozen wages any time during the last five years. It is more difficult to construct a control group where DNWR is not binding. Our data oblige us to assume that firms that did not freeze wages during the previous five years are not subject to DNWR, although in principle they might be (e.g. they experienced a productivity boom and did not need to cut wages, but if wage cuts were scheduled the firm might not be able to put them in place). Since the question in the survey asked for wage freezes during the last 5 years, we expect the contamination of our control group to be minimal. We should note that the prevalence of wage cuts in the sample is extremely rare. Only 398 of the 14.122 (2.82%) respondents declared wages were ever cut during the previous five years, and 90 of these firms declared to have also freeze wages during the period, hence showing signs of DNWR

The question of downward real wage rigidity (DRWR) is perhaps more difficult to address with a survey. We asked firms if they had a policy that linked wage changes to inflation. Firms that replied yes to this question were further asked if the link with inflation was automatic or discretionary and whether the link is with past or expected inflation. Using information from these questions, we consider a firm as subject to DRWR if there is an *automatic* link between wages and past or expected inflation. Note that this is a very narrow concept of real wage rigidity. The IWFP has established that in many cases wages are downwardly rigid but the focal point is different from expected or realised inflation (probably having to do with negotiated centralised wages).

We move now to present summary statistics on the extent of DNWR and DRWR. Table 1 shows that DRWR is much more prevalent in our data (14.2% of firms are affected) than DNWR (only 10.4% of firms are affected), which is consistent with other evidence on downward wage rigidity in most continental European countries, as opposed to the US and the UK (see e.g. Dickens et al., 2008).

There are sizeable differences between EU countries as regards downward wage rigidity (DWR). DNWR appears stronger than average in the Czech Republic, Estonia and the

Netherlands. It is considerably smaller than average in Spain, France, Italy and Slovenia. DRWR is especially prevalent in Spain and Slovenia, and less so in Italy, Estonia and Poland. Note that Belgium does not have a reported measure for DRWR as it has an institutionalised automatic indexation mechanism that applies to all firms falling under the jurisdiction of a so-called "joint committee", i.e. the sectoral bargaining unit were wage negotiations take place. In our sample, 98% of Belgian firms belong to one of the more than 100 joint committees. In order to avoid possible confusion from survey respondents, the question regarding DRWR was excluded from the Belgium survey.

Table 1: Downward nominal and real wage rigidity across countries
Proportion of firms by country

	DNWR	DRWR
Austria	0.089	0.119
Belgium	0.058	N/A ^{a)}
Czech Republic	0.259	0.113
Estonia	0.211	0.047
Spain	0.021	0.544
France	0.026	0.096
Greece	0.115	0.199
Hungary	0.064	0.117
Ireland	0.079	0.087
Italy	0.038	0.017
Netherlands	0.211	N/A
Poland	0.096	0.067
Portugal	0.151	0.083
Slovenia	0.033	0.215
<i>Total</i>	0.142	0.104

Note: ^{a)} In the Belgium questionnaire, the question regarding DRWR was not included to avoid confusion by the respondents. DRWR as defined here affects all firms belonging to the competence field of a joint committee in Belgium, which applies to 98% of the firms in our sample.

Table 2 shows that DWR, defined as above, differs across sectors and the size distribution of firms. It appears that DNWR affects more large firms and firms in the business services sector and that DRWR is more important for small firms and firms in construction and trade.

All in all, country effects and, to a lesser extent, size effects seem to matter more for DWR than the sectoral dimension in the data (see table A1 in Appendix 1). This leads to national

labour market institutions being a natural suspect for the cause of differences between countries, and is consistent with findings from individual wage data reported by Messina et al (2008). In the existing literature, the centralisation of wage setting and the degree of collective bargaining coverage have been related to the extent of downward wage rigidity. Dickens et al. (2008) have investigated this relationship at the country level, while Du Caju et al. (2008a) and Messina et al. (2008) have done so at the sector level. Our next set of regressions examines this issue with survey data.

Using the information collected by Du Caju et al. (2008b), we define 8 countries of our sample as countries with a high degree of collective agreement coverage. These countries are Austria, Belgium, France, Greece, Hungary, Italy, Portugal and Slovenia. Based on the same source we distinguish 7 countries where the firm level is the dominant level for wage determination. These are France, the Czech Republic, Denmark, Estonia, Hungary, Poland and Lithuania. Using this information, we move now to the analysis of the determinants of DNWR and DRWR. We start by examining the role of national-level institutions, and move next to study the impact of firm level characteristics. Since our dependent variables are dichotomous, all the analysis throughout the paper is done using standard Probit techniques. In the tables we present marginal effects, which allow for an immediate interpretation.

Table 2: Downward nominal and real wage rigidity across sectors and firms
Proportion of firms by category

Sector	DNWR	DRWR
Manufacturing	0.083	0.158
Energy	0.075	0.102
Construction	0.081	0.177
Trade	0.090	0.172
Business Services	0.097	0.142
Financial Intermediation	0.083	0.158
Firm size, all sectors		
5-19	0.072	0.187
20-49	0.079	0.148
50-199	0.096	0.139
200+	0.089	0.182

Note: Results are obtained pooling all observations across countries in the survey. This results in XXX observations.

Table 3 shows that decentralised bargaining has a negative impact on a country's level of DRWR and DNWR. A high degree of collective bargaining coverage increases DRWR in a country, while decentralised bargaining helps gaining real wage flexibility. The role of collective bargaining coverage is more complex regarding DNWR. If country controls are dropped, collective bargaining coverage tends to decrease DNWR, perhaps implying that unions increase the attention to real-wage bargaining rather than to nominal wages. Similarly, the role of decentralised bargaining is inconclusive, switching signs depending on country fixed effects are included in the regression or not. In general, dropping country dummies lowers the explanatory power of the equations and increases the effect of the institutional characteristics.

Table 3: DWR and country institutions. Probit Regressions. Marginal Effects

	DNWR	DNWR	DRWR	DRWR
High collective bargaining coverage	0.036 (0.098)	-0.338*** (0.036)	0.175* (0.093)	0.286*** (0.035)
Decentralised Bargaining at the firm level	0.580*** (0.099)	-0.251*** (0.036)	-0.303** (0.128)	-0.382*** (0.032)
Constant	-1.457*** (0.071)	-1.174*** (0.051)	-1.393*** (0.068)	-0.977*** (0.048)
Country effects	yes	no	yes	no
Sector effects	yes	yes	yes	yes
Size effects	yes	yes	yes	yes
Pseudo R2	0.088	0.011	0.180	0.043
N	14296	14296	11944	11944

Note: Robust standard errors in Parenthesis. * p<0.1, ** p<0.05, *** p<0.01

The lack of robustness of previous results is not surprising, given that variability is limited because we used measures of centralisation and bargaining at the country level. However, one of the advantages of our survey is that it contains institutional information regarding the wage setting system measured at the firm level. Our survey asks firms what proportion of their workforce is covered by a collective agreement, if the firm applies an outside collective agreement and if it applies a collective agreement at the firm level. Given the importance of the national institutional environment in which firms operate, we maintain the institutional determinants outlined above in the analysis. Following Rycx et al. (2008), we adopt the idea that the consequences of these firm-level characteristics depend on the national institutional environment. To do this we interact the firm-level variables with country-level indicators. As such we distinguish firms that apply a firm-level contract in an otherwise centralised country, i.e. a country where bargaining at the national level exists and firm level bargaining is not dominant. Similarly, we can also obtain information on the effects for different types of

rigidities from firms applying an outside collective agreement in countries where the dominant wage bargaining is at the firm level.

Table 4 shows that DNWR declines with the number of workers covered by a collective wage agreements, although the magnitude of the estimated effect is relatively small in economic terms. The existence of firm-level collective agreements in countries with significant nationally centralised bargaining decreases DRWR, while the application of outside collective agreements by firms in countries where the level of negotiation is predominantly the firm raises DRWR. These national bargaining characteristics again appear to be less relevant for nominal wage rigidity.

In general, the impact of these firm-level bargaining characteristics on DWR remains once we control for other firm characteristics that could have an effect on wage rigidity. Results are shown in Table 5.

**Table 4: DWR, bargaining coverage and bargaining level
Marginal Effects from Probit Regressions**

	DNWR	DNWR	DNWR	DRWR	DRWR	DRWR
Firm level coverage	-0.002** (0.001)	-0.001** (0.001)	-0.002** (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Outside Agreement	-0.086 (0.093)	-0.090 (0.093)	-0.108 (0.092)	-0.408*** (0.149)	-0.401*** (0.148)	-0.394*** (0.147)
Firm-level agreement	0.052 (0.066)	0.070 (0.065)	0.075 (0.064)	0.060 (0.055)	0.040 (0.053)	0.040 (0.053)
Firm level agreement in centralised country	-0.011 (0.124)	-0.018 (0.123)	-0.049 (0.123)	-0.301* (0.166)	-0.283* (0.165)	-0.276* (0.164)
Outside level agreement in decentralised country	-0.080 (0.155)	-0.093 (0.153)	-0.090 (0.154)	0.529*** (0.187)	0.497*** (0.184)	0.499*** (0.183)
Constant	-1.134*** (0.126)	-1.052*** (0.116)	-1.101*** (0.112)	-0.900*** (0.179)	-0.911*** (0.173)	-0.876*** (0.171)
Country effects	yes	Yes	yes	Yes	yes	Yes
Sector effects	yes	Yes	no	Yes	yes	No
Size effects	yes	No	no	Yes	no	No
Pseudo R2	0.105	0.104	0.101	0.193	0.187	0.186
N	9119	9260	9284	7899	8041	8066

Note: Robust standard errors in Parenthesis. * p<0.1, ** p<0.05, *** p<0.01

The impact of the workforce composition on DWR has been investigated by Campbell (1997), Du Caju et al. (2008a) and Messina et al. (2008). They all report lower DWR for blue-collar workers as opposed to white-collar workers, consistent with the shirking model of Shapiro and Stiglitz (1984) and with the turnover model of Stiglitz (1974). The theoretical idea behind this finding is that white-collars are more difficult to monitor and to replace,

which makes firms more reluctant to cut their (nominal or real) wages. Our survey distinguishes between high-skilled and low-skilled workers within the groups of blue and white collars. Taking the low-skilled blue-collar workers as a base group, Table 5 shows that a high proportion of high-skilled blue collars and low-skilled white-collars has a negative impact on DRWR. Rigidity is higher for the low-skilled blue-collars, probably because they have wages that are closer to some (often collectively agreed) minimum wages.

Table 5: DWR and firm bargaining, controlling for firm characteristics
Marginal Effects from Probit Regressions

	DNWR	DNWR	DNWR	DRWR	DRWR	DRWR
Firm level coverage	-0.002** (0.001)	-0.001* (0.001)	-0.001** (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Outside Agreement	-0.084 (0.101)	-0.084 (0.101)	-0.083 (0.101)	-0.439*** (0.160)	-0.430*** (0.160)	-0.424*** (0.160)
Firm-level agreement	0.093 (0.071)	0.104 (0.070)	0.109 (0.070)	0.044 (0.060)	0.033 (0.059)	0.037 (0.058)
Firm level agreement in centralised country	-0.043 (0.134)	-0.038 (0.133)	-0.061 (0.132)	-0.268 (0.178)	-0.268 (0.178)	-0.264 (0.177)
Outside level agreement in decentralised country	-0.081 (0.164)	-0.090 (0.162)	-0.114 (0.162)	0.535*** (0.202)	0.503** (0.200)	0.508** (0.200)
Share of high-skilled blue collars	0.139 (0.088)	0.123 (0.087)	0.099 (0.086)	-0.353*** (0.074)	-0.347*** (0.073)	-0.344*** (0.073)
Share of low-skilled white collars	-0.032 (0.136)	-0.049 (0.135)	-0.099 (0.131)	-0.392*** (0.116)	-0.382*** (0.115)	-0.374*** (0.113)
Share of high-skilled white collars	0.172 (0.112)	0.144 (0.110)	0.098 (0.108)	-0.195* (0.106)	-0.158 (0.103)	-0.145 (0.100)
Share of labour costs in total costs	0.003** (0.001)	0.003** (0.001)	0.002** (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Share of sales on domestic market	-0.000 (0.001)	0.000 (0.001)	0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Constant	-1.337*** (0.164)	-1.217*** (0.153)	-1.290*** (0.150)	-0.597*** (0.204)	-0.653*** (0.199)	-0.638*** (0.196)
Country effects	yes	yes	yes	yes	yes	yes
Sector effects	yes	yes	no	yes	yes	no
Size effects	yes	no	no	yes	no	no
Pseudo R2	0.122	0.120	0.117	0.207	0.205	0.203
N	7794	7862	7884	6913	6981	7003

Note: Robust standard errors in Parenthesis. * p<0.1, ** p<0.05, *** p<0.01

The analysis of DNWR and DRWR is further extended by including more firm characteristics such as firm size, competition and exporting activity. The results are shown in Table 6. Size and competition appear to be important determinants of DNWR. The reference category is small firms (5-19 employees) and it is apparent that for larger firms (with 50-199 and 200 and more employees) the probability of observing DNWR increases. Efficiency wage theories may lie behind this finding. More specifically, in larger firms employees cannot be easily

monitored; therefore employers prefer to pay an efficiency wage premium to the employees in order to avoid shirking (e.g. Agell and Bennmærker, 2007).

Table 6: The determinants of DNWR and DRWR. Firm size, Competition and Export Orientation. Marginal Effects from Probit Regressions

	(1)	(2)	(3)	(4)
	DNWR	DRWR	DNWR	DRWR
Share of low skilled blue collars	-0.271*** (0.082)	0.013 (0.092)	-0.271*** (0.082)	0.003 (0.092)
Share of high skilled blue collars	-0.170 (0.094)	0.097 (0.104)	-0.168 (0.094)	0.094 (0.103)
Share of low skilled white collars	-0.285* (0.121)	-0.219 (0.133)	-0.286* (0.121)	-0.219 (0.133)
Share of permanent part-time employees	0.166 (0.111)	-0.094 (0.131)	0.164 (0.111)	-0.101 (0.132)
Share of temporary employees	-0.310** (0.114)	-0.057 (0.114)	-0.311** (0.114)	-0.056 (0.114)
Outside agreement	-0.088 (0.052)	0.077 (0.062)	-0.089 (0.052)	0.075 (0.062)
Firm level agreement	-0.011 (0.050)	0.137** (0.050)	-0.013 (0.050)	0.135** (0.050)
Exporting activity dummy	-0.009 (0.055)	-0.023 (0.058)		
Severe or strong competition	0.151* (0.061)	-0.003 (0.065)	0.152* (0.061)	0.002 (0.066)
Share of labour costs in total costs	0.002* (0.001)	0.002 (0.001)	0.002* (0.001)	0.001 (0.001)
20-49 employees	0.088 (0.061)	0.035 (0.063)	0.087 (0.061)	0.042 (0.063)
50-199 employees	0.203*** (0.058)	-0.044 (0.063)	0.205*** (0.058)	-0.031 (0.063)
200 employees and more	0.179* (0.069)	-0.036 (0.071)	0.185** (0.070)	-0.019 (0.071)
exports between 0 and 30% of total revenue			0.005 (0.053)	-0.068 (0.055)
exports between 30 and 50% of total revenue			-0.077 (0.088)	-0.176 (0.091)
exports between 50 and 80% of total revenue			0.041 (0.079)	0.024 (0.080)
exports more than 80% of total revenue			-0.071 (0.070)	-0.129 (0.074)
Constant	-0.824*** (0.128)	-1.779*** (0.168)	-0.811*** (0.132)	-0.950*** (0.149)
Pseudo R2	0.090	0.033	0.090	0.034
N	8120	7367	8120	7367

Note: All specifications include sector and country fixed effects. Robust standard errors in Parentheses.

* p<0.1, ** p<0.05, *** p<0.01

The incidence of severe or strong competition appears to be positively related to the probability of observing DNWR. One would expect that wage cuts are more acceptable by employees in a highly competitive environment where the firm's profits are not large. Employers, however, appear to be reluctant to cut wages even if they face strong competition, possibly due to their concern that this would cause problems such as reduced effort or quits of the best employees that could reduce profits even further. Finally, it is quite surprising to find that the exporting activity of firms does not appear to be a significant factor in the determination of nominal and real wage rigidities. This is true even when a nonlinear impact of exporting activity is accounted for in columns 3 and 4.

4. Other Margins of Adjustment

Having shown that DWR affects a large fraction of firms in Europe, we turn to the other margins of labour cost adjustment that firms could use. Apart from a decrease in base wages, firms could use alternative ways of reducing labour costs when faced by negative exogenous shocks, for example by cutting bonuses and benefits, encouraging earlier retirement and hiring workers at lower wages, etc. Non-wage labour costs are generally defined as “those categories of the enterprise's total labour costs comprising other than direct compensation” (Chen and Funke, 2003). Non-wage labour costs can be then divided into two broad categories, those statutory and non-statutory. Statutory non-wage labour costs, for example, employer's social security contributions, are imposed by law; a firm cannot change them with respect to a particular worker. Non-statutory non-wage labour costs are either determined by the collective agreements (pension schemes) or are set at the discretion of the employer (bonuses and benefits).³ Hence, firms have a certain freedom in using non-statutory non-wage labour costs (or at least a part of them) to adjust to shocks. It is non-statutory labour costs “addressable” at the firm-level that we intend to study from the survey data.

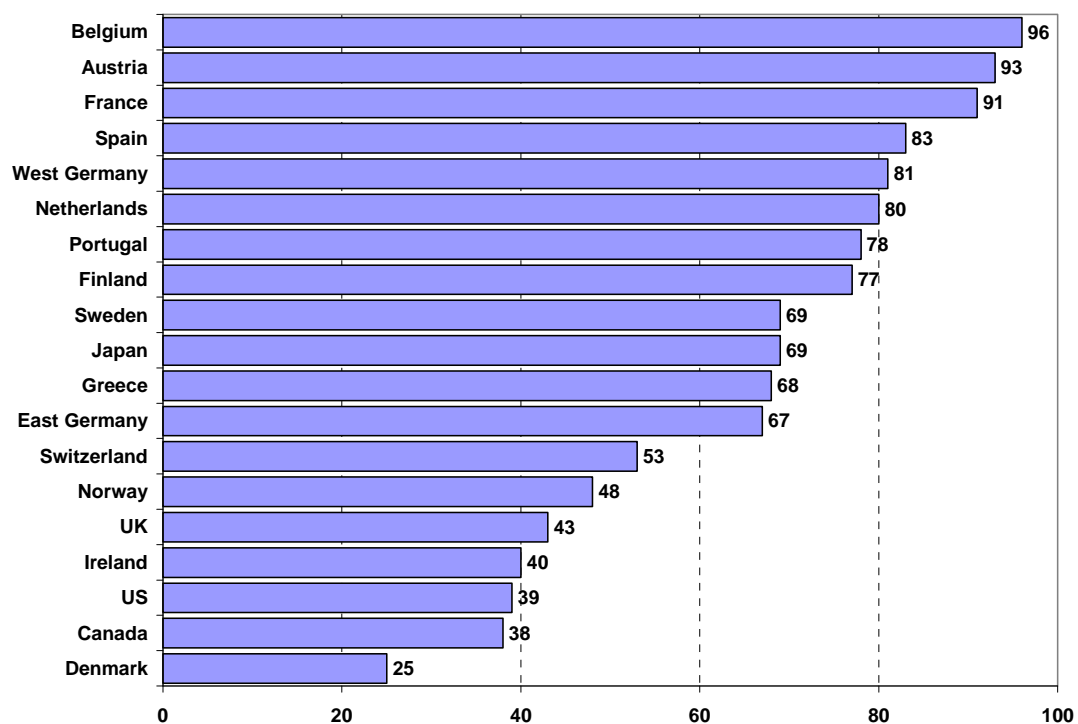
Non-wage labour costs gain attention in a policy debate due to two main reasons. First, non-wage labour costs represent a substantial (and rising) part in total compensation (see, e.g. Oyer, 2005; Chen and Funke, 2003). Figure 1 illustrates that in 2001 the ratio of non-wage labour costs to direct wages in manufacturing varied from 25% for Denmark to 96% for Belgium. Concerning the evolution over time, this ratio has grown; for example in West-Germany from 57% in 1972 to 81% in 2001 (Chen and Funke, 2003). Since firms are primarily concerned with total compensation per employee, an assessment of flexibility of non-wage labour costs is as important as evaluation of the degree of wage flexibility (Lebow and Saks, 2003). Second, in an environment of sticky prices and wages, non-wage labour

³ See Chen and Funke (2003, 2005) for more details on classifying non-wage labour costs.

costs become an important adjustment tool to exogenous shocks, allowing dampening of the effects of negative demand shocks on the firm's employment (Chen and Funke, 2003).

The literature on non-wage labour costs is relatively scarce; possibly due to a lack of the adequate empirical data. Hammermesh (1989), Hammermesh and Pfann (1996) opened a discussion on the structure of adjustment costs and their implications for employment and productivity fluctuations. Taking the example of Germany, Funke (2003) reports that a reduction of non-wage labour costs (first of all sickness benefits) was one of the top priorities of the "Agenda 2010" designed by the Schroder's government in the earlier 2000s to address the high unemployment problem. Funke finds a negative relationship between (high) non-wage labour costs and firm's demand for labour. However, when it comes to changing non-wage labour costs in practice, there are certain political difficulties – see Eichhorst and Kaiser (2006) for a critical assessment of the German labour market reform.

Figure 1: Ratio of non-wage labour costs to direct hourly wages in manufacturing, in % (2001)



Source: Chen and Funke (2003), Table 3, "International Comparison of Hourly Wages in the Manufacturing Industry".

While there are many studies documenting downward wage rigidities, there has been almost no comparison of wage and non-wage components of total labour costs. This is extremely relevant, since when a broader measure of total labour cost is used, this indicator might indicate more flexibility than nominal wages alone. For example, in a recent assessment of

downward nominal wage flexibility in Poland, Brzoza-Brzezina and Socha (2006) use total compensation per employer and they do not find evidence of wage rigidity, as opposed to the previous studies that focused on the basic wage component. However, due to a lack of comparable data, it is not possible to draw robust conclusions at the link between the extent of wage flexibility and the indicator used (basic wage versus total compensation). To our knowledge, there is no single study assessing strategies to cut labour costs across EU countries.

Hence, our contribution to the literature on non-wage labour cost is twofold. First, we document non-wage adjustment practices for a large set of EU countries. We present unique evidence on the composition of non-wage labour costs. Second, we examine which types of firms and workers are more affected by each type of non-wage flexibility. The corresponding part of our survey focuses on non-wage labour cost adjustment practices within firms. We identify the following main strategies to cut labour costs (other than wages) reported by the majority of national surveys:

- Reduce or eliminate bonus payments;
- Reduce or eliminate non-pay benefits;
- Change shift assignments or shift premia;
- Slow or freeze rate at which promotions are filled;
- Recruit new employees at lower wage level than those who left voluntarily;
- Encourage early retirement to replace high wage employees by entrants with lower wages;
- Use other strategies.

Table 7 shows the proportion of firms in each country that reported using the various cost reduction strategies. The prevalence of individual strategies varies quite substantially across countries. The reduction of bonus payments is the most common method used in the Czech Republic and Estonia and is the second highest factor for Poland. The western European countries appear less likely to use bonuses to reduce costs with the exception of Italy where almost a quarter of firms report using this method. Hiring new employees at lower rates than those who left the company or encouraging early retirement are the most commonly used methods in Belgium, France and Italy.

**Table 7: Labour Cost Reduction Strategies
Proportion of Firms by Country**

	Reduce bonuses	Reduce benefits	Change shifts	Slow promotions	Cheaper hires	Early retirement	Other strategies
Belgium	0.12	0.07	0.07	0.12	0.25	0.12	N/A
Czech R.	0.31	0.08	0.11	0.02	0.09	0.09	0.50
Estonia	0.39	0.20	0.20	0.05	0.16	0.03	0.29
France	0.13	0.05	N/A	0.16	0.38	0.30	N/A
Greece	0.19	0.11	N/A	N/A	N/A	N/A	0.85
Hungary	0.23	0.11	0.37	0.34	0.23	0.09	0.00
Ireland	0.15	0.06	0.13	0.07	0.32	0.06	0.44
Italy	0.24	0.19	0.24	0.32	0.43	0.15	0.03
Poland	0.22	0.16	0.12	0.12	0.24	0.08	0.02
Portugal	0.14	0.08	0.10	0.14	0.17	0.00	N/A
Slovenia	0.11	0.10	0.07	0.14	0.12	0.06	0.19

Note: The rows do not sum to 1 as firms may have used more than one (or none) of the strategies above.

In addition to the variation across countries, we find that strategies also tend to differ across sectors (Table 8). The use of cheaper hires to replace workers who leave the firm is the dominant strategy in most sectors. Firms in manufacturing report a relatively even spread across the different strategies. Energy and financial intermediation are the most likely to target bonuses and benefits when trying to reduce costs. Early retirement is the least likely strategy to be followed: this is similar to the pattern in Table 7, where France was the only country with a significant proportion of firms to use this strategy.

Table 8: Labour Cost Reduction Strategies. Proportion of Firms by Sector

	Reduce bonuses	Reduce benefits	Change shifts	Slow prom.	Cheaper hires	Early retir.	Other strategies
Manufacturing	0.18	0.09	0.13	0.17	0.28	0.16	0.09
Energy	0.25	0.27	0.15	0.19	0.31	0.13	0.08
Construction	0.16	0.09	0.13	0.15	0.17	0.06	0.10
Trade	0.18	0.10	0.17	0.17	0.24	0.07	0.14
Business Services	0.19	0.10	0.14	0.18	0.25	0.09	0.13
Financial Interm.	0.23	0.14	0.13	0.18	0.24	0.11	0.16

Note: The rows do not sum to 1 as firms may have used more than one (or none) of the strategies above.

The cost reduction strategies are obviously not mutually exclusive and we find that firms will relatively frequently use more than one of the methods. Half of the firms in the sample reported having used non-base-wage cost reductions at some point. Of these firms, slightly less than half (49%) used one margin of adjustment only; 30% used a combination of two methods and 14% used a combination of three. The remaining 8% used more than three of the six methods identified.⁴ This leads us to ask if certain combinations of the strategies are more likely to be used than others. Table 9 reports correlation coefficients for the pairings of different strategies. As might be expected due to their complementary nature, reductions in benefits and bonuses have one of the highest correlations (0.3). Cheaper hires to replace workers who left voluntarily and encouragement of early retirement to create vacancies for lower-paid, more junior staff is another pairing with a high correlation, suggesting that some firms are using turnover to reduce labour costs. Finally, a third strategic combination regards the use of the company's internal wage structure, with changes in shift patterns and slowing of promotions making up the third pair of strategies with the highest correlations.

Table 9: Correlations between Labour Cost Reduction Strategies

	Reduce bonuses	Reduce benefits	Change shifts	Slow promot.	Cheaper hires	Early retirement
Reduce bonuses	1.00					
Reduce benefits	0.30	1.00				
Change shifts	0.12	0.15	1.00			
Slow promotions	0.16	0.19	0.30	1.00		
Cheaper hires	0.13	0.13	0.10	0.20	1.00	
Early retirement	0.09	0.09	0.06	0.15	0.30	1.00

Next, we will analyse in more detail the relations between choice of any particular strategy and various relevant variables. The following analysis is based on the results of probit regressions, where the dependent variable for each strategy is 1 if the firm has used that particular strategy and 0 otherwise. The complete overview of the regression results on the basis of the pooled dataset is given in the tables in Appendix 2. The following discussion includes excerpts from this table.

⁴ It may be important to note that the question asked if these methods had “ever been used”. Therefore firms reporting more than one did not necessarily use the methods simultaneously.

Table 10 highlights the relationship between various firm characteristics and the tendency to rely on a particular strategy for labour cost adjustment. The most significant relationship for most of the strategies is with firm size. For each of the non-base-wage cost reductions, the larger firms are more likely to use the strategy than smaller firms. To an extent this may be because more complex pay systems in larger firms give them greater flexibility to reduce costs without having to cut wages.

**Table 10: Firm Characteristics and Cost Reduction Strategies
Marginal Effects from Probit Regressions**

	(1)	(2)	(3)	(4)	(5)	(6)
	Reduce bonuses	Reduce benefits	Change shifts	Slow promotions	Cheaper hires	Early retirement
Low skilled blue collar	-0.049 (0.188)	-0.025 (0.271)	0.090 (0.160)	-0.059*** (0.003)	-0.018 (0.780)	0.032 (0.109)
High skilled blue collar	-0.028 (0.500)	-0.058** (0.015)	0.101* (0.056)	-0.022 (0.458)	0.056 (0.267)	0.030 (0.299)
Low skilled white collar	0.040 (0.219)	0.007 (0.761)	0.054 (0.232)	0.053*** (0.001)	0.002 (0.948)	0.103*** (0.001)
Part-time employment	-0.018 (0.354)	0.015 (0.666)	-0.045 (0.481)	-0.070*** (0.000)	0.029 (0.459)	-0.097*** (0.005)
Temporary Employment	-0.018 (0.561)	0.041 (0.159)	0.051** (0.011)	0.016 (0.492)	0.039 (0.158)	-0.045 (0.153)
% of labour in total cost	0.066*** (0.009)	0.014 (0.448)	0.014 (0.762)	0.058*** (0.003)	0.070** (0.029)	0.051 (0.254)
20 – 49 employees	0.048** (0.021)	0.012 (0.329)	0.021 (0.247)	0.050* (0.057)	0.102*** (0.000)	0.045* (0.067)
50 – 199 Employees	0.069*** (0.000)	0.025*** (0.002)	0.053*** (0.007)	0.059** (0.034)	0.113*** (0.001)	0.069** (0.048)
200 + Employees	0.107*** (0.001)	0.051*** (0.007)	0.063*** (0.006)	0.088** (0.041)	0.184*** (0.000)	0.188*** (0.001)
Observations	6618	6618	5125	6370	6370	5418

Note: Robust p values in parentheses. *** Denotes significance at 1%, ** at 5% and * at 10%. Additional control variables are characteristics of the operating environment, sector and country dummies (see Appendix 2).

In addition, Table 10 includes some characteristics of the workforce as explanatory variables for the choice of the different cost strategies: the skill composition (low skilled and high skilled, blue collar and white collar) and contract type (permanent part-time and temporary staff relative to permanent full-time employees) are the descriptors used in the analysis. No strong patterns related to the skill composition are detectable on the basis of the regression results. The coefficients for different skill categories are insignificant for most of the regressions. The only labour cost adjustment strategy that exhibits significant differences across more than one skill categories is the slowdown in the rate at which promotions are filled. In comparison to the control group (high-skilled blue collars), the tendency to use this

strategy is higher among firms hiring mostly low skilled white collar workers and lower among firms hiring mostly low skilled blue collar workers.

Companies with a larger share of part-time employees are less likely to use strategies 4 and 6 (slowdown in the rate promotions are filled and encouraging early retirement). Firms hiring temporary staff have a higher tendency to employ strategy 3 (changes in shift arrangements). Finally, as could be expected, the share of labour cost in total cost is positively related with the likelihood of using alternative labour cost adjustment strategies (relevant coefficients are positive and significant for strategies 1, 4 and 5).

Table 11 presents an overview of the regression coefficients for the explanatory variables characterising the environment in which a particular firm is operating. These characteristics include coverage by collective agreements, the level of reported competition in the product market, the labour turnover rate, openness to trade and a dummy variable indicating that a firm is operating in a new EU member state (equals one for Czech Republic, Estonia, Hungary, Poland and Slovenia).

The regression results imply that companies which operate in a more competitive environments are more likely to employ non-base-wage labour cost adjustment strategies. The survey included two measures of competitive environment – perceived competition (direct assessment) and implied competition (based on how likely the company is to alter the price of the main product when a main competitor does). On the basis to the answers to these questions, we generate four dummy variables indicating different levels of competition (severe, strong, weak and no competition). As shown in Table 11, coefficient estimates for the dummy variables of weak or non-existent competition are predominantly negative and significant in approximately half of the regressions, implying that firms operating in less competitive environment are less likely to employ alternative strategies of labour cost adjustment. We report the coefficient estimates for regressions where the second measure (implied competition) is used, since this question is present in more country surveys than the alternative version. However, both measures yield a similar result – higher competition is associated with a larger tendency to use non-base-wage labor cost adjustment strategies.

Collective bargaining contracts are associated with a higher probability to employ non-base-wage cost reduction strategies. This link is more significant for firm-level bargaining contracts than for higher-level bargaining contracts, implying probably that the former type of contracts give more margin of manoeuvre to companies. The estimated coefficients for both types of bargaining contracts are presented in Table 11. The coefficient estimates are positive

and significant in four regressions out of six for the dummy variables of firm-level bargaining contract, whereas the marginal effects are weakly significant and positive for only two regressions in the case of the dummy variable indicating the existence of a higher-level bargaining contract.

**Table 11: Firm Operating Environment and Cost Reduction Strategies.
Marginal Effects from Probit Regressions**

	(1)	(2)	(3)	(4)	(5)	(6)
	Reduce	Reduce	Change	Slow	Cheaper	Early
	bonuses	benefits	shifts	promo.	hires	retirement
Outside firm agreement	0.033 (0.279)	0.018* (0.065)	0.040* (0.079)	-0.021* (0.071)	0.007 (0.794)	0.036 (0.253)
Firm level bargaining	-0.019 (0.236)	0.016*** (0.001)	0.041** (0.036)	0.039* (0.052)	0.022** (0.011)	0.021 (0.308)
% revenues in domestic mkt	-0.020 (0.454)	-0.020 (0.158)	-0.003 (0.883)	-0.020* (0.071)	-0.007 (0.740)	0.006 (0.791)
Labour turnover	0.020 (0.264)	-0.010 (0.553)	0.035*** (0.000)	0.002 (0.885)	0.037** (0.038)	-0.056*** (0.000)
CEE country	0.047*** (0.004)	0.038*** (0.000)	-0.043*** (0.000)	-0.004 (0.727)	-0.096*** (0.000)	-0.069*** (0.001)
High competition	0.029* (0.057)	0.008 (0.432)	-0.014 (0.272)	-0.001 (0.949)	0.004 (0.786)	-0.006 (0.611)
Weak competition	-0.014 (0.448)	-0.013 (0.174)	-0.033** (0.013)	-0.002 (0.907)	-0.018 (0.328)	-0.028*** (0.000)
No competition	0.005 (0.751)	-0.025*** (0.009)	-0.051*** (0.000)	-0.043** (0.012)	-0.013 (0.484)	-0.022 (0.207)
Observations	7038	7038	5371	6762	6762	5795

Note: Robust p values in parentheses. *** Denotes significance at 1%, ** at 5% and * at 10%. Additional control variables are characteristics of the operating environment, sector and country dummies (see Appendix 2).

On the basis of the regressions, it appears that firms with higher labour turnover rates are more likely to use strategies change shift assignments and use cheaper hires and less likely to use strategy early retirement. The reason for the higher tendency to use strategy cheaper hires to replace quitting workers is that high labour turnover rate facilitates the replacement of high-earning leavers by entrants with lower wages, but this leaves the negative coefficient in the early retirement equation with a somewhat puzzling result

There are significant differences in the reliance on alternative labour cost adjustment strategies between firms operating in Central and Eastern European and Western European countries (CEE and WE respectively). Firms in CEE countries are more likely to reduce bonuses and reduce non-pay benefits. Companies in WE countries rely more on other four strategies remaining: changing shift arrangements, slowing the rate of promotions, recruiting

new employees at lower wages and encouraging early retirement. (Detailed regressions results are shown in Appendices 3 to 5.)

The fact that CEE countries are more likely to reduce bonuses is in accordance with another cross-country pattern: on average, CEE countries have a larger share of bonuses in total pay (See Table 12 below). The only “outlier” in this respect is Portugal, where bonuses form almost half of the total wage bill, a fact that has been highlighted elsewhere (Messina et al., 2008) and is consistent with an extremely rigid base wage structure in this country. More extensive use of bonuses in CEE countries could be related to a larger tendency in general to rely on flexible remuneration methods in these countries. As illustrated in Table 12, companies in CEE countries are more likely to remunerate on a piece-rate or hourly basis, whereas in WE countries the dominant form of remuneration is monthly wage.

Table 12: Remuneration principles

Country	Average share of bonuses in total wage bill	Share of firms paying hourly wages	Share of firms using piece-rate remuneration	Share of firms paying monthly wages
Portugal	0.496	0.083	0.001	0.909
Czech Republic	0.200	0.419	0.194	0.369
Slovenia	0.184	0.356	0.027	0.591
Poland	0.157	0.251	0.095	0.628
Estonia	0.136	0.309	0.260	0.385
Ireland	0.117	N/A	N/A	N/A
France	0.114	N/A	N/A	N/A
Hungary	0.103	0.338	0.048	0.563
Austria	0.084	0.242	0.009	0.563
Greece	0.083	0.013	0.010	0.691
Belgium	0.078	N/A	N/A	N/A
Netherlands	0.075	0.122	0.001	0.832
Italy	0.060	0.338	0.006	0.650
Spain	0.035	N/A	N/A	N/A

Note: Sample statistics from the survey, not weighted

The stronger reliance in WE countries on the last two labor cost adjustment strategies that we cover (hiring new workers at a lower cost, encouraging early retirement) might be related to the differences in the tenure-related wage structure. WE countries are more likely to rise pay when tenure increases (See Table 13 below), which indicates that the companies in WE countries reward longer stay with the company more than their Eastern European counterparts do. Also, the age-earnings profiles are flatter in CEE countries. The flattening of the age-earnings profile of an average worker was the result of extensive structural changes these countries experienced during the transition period, which favoured people with recently obtained education (i.e. younger people) with the adequate skills for the new economy (see Lamo and Messina, 2008 for an analysis of the Estonian case). Both of the above-mentioned

patterns – steeper age-earning profiles and larger tenure-related returns in WE countries – give WE firms more scope to employ changes in shift assignments and the slowing down of promotions in order to adjust downward labour cost.

Table 13: Share of companies which alter wages due to increase in tenure with at least biannual frequency

Poland	0.153
Hungary	0.229
Estonia	0.243
Spain	0.303
Belgium	0.381
Czech Republic	0.389
Portugal	0.447
France	0.609
Austria	0.611
Ireland	0.688
Slovenia	0.742
Italy	0.826
Greece	1.000
Netherlands	-

Note: Sample statistics from the survey, not weighted

The main institutional difference related to the operation of the labour markets in CEE and WE countries is the level of coverage by collective agreements. As the cross-country shares of collective bargaining coverage presented in Table 14 illustrate, WE countries tend to be highly covered, whereas CEE countries usually have low coverage levels. (The two notable exceptions in the set of countries included in this study are Ireland and Slovenia, the former having low coverage and the latter having high coverage by collective agreements). The above-mentioned differences between WE and CEE countries in the employment of alternative labour cost adjustment strategies could stem from the higher level of unionisation in WE countries. To control for this possibility, we included in the regressions the control variables characterising the extent of coverage and the level of centralisation in collective bargaining, as well as an interaction variable indicating the existence of a firm-level bargaining contract in a centralised country. In addition, regressions include firm-level variables controlling for the existence of a firm-level union agreements or outside determined bargaining contracts were included. The inclusion of this set of control variables does not render the coefficient estimates for CEE countries' dummy variable insignificant, which implies that the above-described differences in the usage of labor cost adjustment strategies between CEE and WE stem from other sources (possible those discussed above) besides differences in institutional environment.

Table 14: Collective bargaining coverage

Country	Share of employees covered by collective bargaining agreements	Share of firms having collective bargaining agreement	Share of firms having firm-level bargaining agreement	Share of firms having higher level bargaining agreement
Slovenia	N/A	1.000	0.193	0.795
Spain	0.968	1.000	0.176	1.000
Austria	0.965	0.982	0.219	0.976
Italy	0.927	0.994	0.410	0.993
Portugal	0.898	0.971	0.901	0.594
Greece	0.896	0.915	0.236	0.858
Belgium	0.857	0.989	0.262	0.983
France	0.650	0.999	0.568	0.985
Netherlands	0.598	0.677	0.160	0.517
Czech R.	0.497	0.534	0.508	0.176
Ireland	0.354	0.595	0.240	0.526
Hungary	0.331	0.351	0.322	0.087
Poland	0.144	0.186	0.172	0.037
Estonia	0.070	0.098	0.079	0.030

Note: Sample statistics, not weighted

Our next set of regressions aims at relating DNWR and DRWR with the different margins of adjustment analysed above. We run the same specifications included in Table 11, adding DNWR and DRWR to the set of controls. The results are presented in Table 15. Each column refers to the likelihood of following one of the 6 cost-saving strategies already discussed. In the first part of the table we only include the main effects of DNWR and DRWR, while the second part of the table introduces interaction terms of these two variables with the predominant wage bargaining framework at the firm in order to capture different behaviour depending on the wage setting process. Let us first concentrate on the first part of the table. According to these estimates, there is a clear tendency for firms subject to DNWR to follow any of the 6 strategies highlighted in the paper. The effects are large in magnitude and always statistically significant at the 1% level of testing. For example, being subject to DNWR increases the probability of using bonuses to reduce labour costs by 15.5%. Interestingly, DRWR appears to have the opposite effect in four of our cost-saving strategies: reduction of bonuses, reduction of benefits, change shift assignments and slowing promotions. In all four cases higher DRWR is associated with less use of these margins of adjustment. The effects are smaller in magnitude, but statistically significant at the 5% level.

**Table 15: The effects of DNWR and DRWR in other Margins of Adjustment.
Marginal Effects from Probit Regressions**

	(1)	(2)	(3)	(4)	(5)	(6)
	Reduce Bonuses	Reduce Benefits	Change Shifts	Slow Prom.	Cheaper Hires	Early Retir.
Excluding interaction terms:						
DNWR	0.155*** (0.000)	0.079*** (0.000)	0.088*** (0.000)	0.187*** (0.000)	0.121*** (0.000)	0.062*** (0.001)
DRWR	-0.036** (0.035)	-0.026** (0.042)	-0.044** (0.023)	-0.052*** (0.001)	0.011 (0.577)	0.010 (0.498)
Observations	6618	6618	5125	6370	6370	5418
Including interactions with wage bargaining institutions:						
DNWR	0.151*** (0.000)	0.105*** (0.000)	0.067*** (0.009)	0.170*** (0.000)	0.142*** (0.000)	0.052** (0.043)
DNWR*Outside Agreement	-0.015 (0.648)	-0.032 (0.146)	0.054 (0.170)	0.030 (0.393)	-0.057 (0.161)	-0.040 (0.182)
DNWR*Firm Agreement	0.021 (0.529)	-0.009 (0.686)	-0.001 (0.982)	-0.000 (0.990)	0.016 (0.714)	0.061 (0.111)
DRWR	-0.036 (0.209)	-0.061*** (0.004)	-0.059** (0.037)	-0.041 (0.126)	0.077** (0.034)	0.015 (0.608)
DRWR*Outside Agreement	0.005 (0.896)	0.103*** (0.006)	0.046 (0.315)	-0.027 (0.422)	-0.049 (0.203)	0.040 (0.237)
DRWR*Firm Agreement	-0.006 (0.877)	0.006 (0.826)	0.003 (0.941)	-0.001 (0.988)	-0.069* (0.063)	-0.049** (0.041)
Observations	6618	6618	5125	6370	6370	5418

Note: The table includes two sets of regressions per column. In the upper part only the main effects of DNWR and DRWR are included. The lower part includes also interactions of DNWR and DRWR with the presence of collective bargaining agreements either signed at the firm level or outside the firm. All the specifications include the percentage of high skilled blue collar workers, the percentage of low skilled white collar workers, the percentage of high skilled white collar workers, dummy for the presence of collective agreement signed outside the firm, dummy for collective firm level agreement, the percentage of revenue generated in the domestic market, the percentage of the employees employed on a part-time bases, the percentage of employees holding temporary contracts, the percentage of labour costs in total costs, labour turnover, 3 competition dummies, Eastern Europe dummy, 5 sectoral dummies, 3 firm-size dummies and country dummies. Robust standard errors in parenthesis. ***, **, * denote statistical significance at the 1%, 5%, and 10% levels respectively.

We find that firms facing more DNWR (DRWR) are more (less) likely to use non-wage cost saving strategies. The question arises then about the sources of these sharp differences in the response to the two types of rigidities. We speculate that the bargaining level might be related to such differences. To shed some light into this hypothesis, the second part of Table 15 presents interaction terms between each type of rigidity and whether firms apply collective

agreements signed at the firm level or at a higher level of aggregation (e.g. sectoral, occupational, regional or national). The impact of DNWR is almost identical when including the interactions. None of the interaction terms is statistically significant, and the main effects remain positive and statistically significant at the 1% level. The introduction of the interaction terms has, on the contrary, important effects in the reading of the results regarding DRWR. The impact of DRWR on the reduction of bonuses keeps its negative sign, although it is now not significant at standard levels of testing. With regards to the use of reduction of benefits as a cost-saving strategy, we find now that the negative sign for firms applying no collective agreements (main effect) is turned positive when the firm follows a contract bargained outside the firm. This might indicate that these firms are in greater need of finding a way to circumvent the lack of wage flexibility. On the contrary, the use of turnover (either in the form of cheaper hires for voluntary quits, or the use of early retirement) as a way of reducing wage costs seems to be a prerogative of firms not applying collective bargaining (although the effect is only significant in the case of cheaper hires). Having firm level collective bargaining reduces the capacity of using any of these two channels among those firms that exhibit real wage flexibility.

5. Conclusions

From the information provided in the survey we can safely conclude that firms very seldom cut wages. On the other hand, a substantial proportion of firms report that they have frozen wages or that there is an automatic link between their wages and inflation. This leads us to the conclusion that downward wage rigidities, both nominal and real are prevalent. Formal evidence indicates that country effects appear to be significant determinants of downward rigidities and that institutional differences between countries may lie behind this finding. Workforce composition also appears to play a significant role, whereas firm size and product market competition appear to be solely related to downward nominal wage rigidity.

A very interesting part of the survey relates to the other margins that firms use to reduce labour costs, given that wage cuts are not usual. Reduction in bonuses, new hires with lower wages and early retirement schemes are some of the alternative strategies that firms have at their disposal. We find that firms that are subject to downward nominal wage rigidity are more likely to use any of these strategies, suggesting that when nominal wages are downward rigid firms have the possibility to partially circumvent this constraint. However, our preliminary evidence suggests that firms subject to downward real wage rigidities have less capacity to use these alternative margins. This might indicate that the same factors behind the rigidity of real wages might be impeding also adjustment using other non-labour costs.

Moreover, the evidence again indicates that there are meaningful country and sectoral variations in relation to the choice of the alternative margins of adjustment and that these margins are not mutually exclusive. The choice of the strategy may also depend on workforce composition and some firm characteristics. Large firms are more likely to cut bonuses and other types of non-wage labour costs. Moreover, the involvement of the firm in collective bargaining as well as the degree of centralisation in wage setting also influence the choice of the different margins of adjustment in complex ways.

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Annexes

Appendix 1. Cross-country analysis of downward wage rigidities

The cross-country analysis is less clear-cut. (Tables A1-A2). Regarding DNWR, the variables that were significant in the pooled analysis become insignificant. Only size appears to be significant in some cases. As to exporting activity it is still insignificant, except for the case of France (when nonlinearities are considered) and Estonia (when a dummy variable is introduced).

The same conclusions hold when DRWR is considered (Tables A3-A4). Size appears to be significant in some cases while exporting activity appears to have significant nonlinear effects in the case of France and Portugal. As to the sign of the impact of exporting activity, the results are inconclusive; the impact is negative for France and positive for Portugal. Competition variable becomes significant only in the case of France.

Table A1: Wage Freezes and Firm/Worker Characteristics

	<i>CZ</i>	<i>EE</i>	<i>FR</i>	<i>GR</i>	<i>IE</i>	<i>HU</i>	<i>NL</i>	<i>PL</i>	<i>PT</i>	<i>SI</i>
Share of low skilled blue col.	-0.396 (0.352)	0.236 (0.528)	-0.425 (0.313)	-0.474 (0.430)	-0.355 (0.285)	-0.172 (0.208)	-0.193 (0.176)	0.023 (0.235)	-0.405* (0.198)	-0.431 (0.454)
Share of high skilled blue col.	-0.683 (0.590)	0.175 (0.531)	-0.470 (0.372)	-1.106* (0.448)	-0.441 (0.332)	-0.790* (0.317)	0.021 (0.264)	0.134 (0.267)	0.002 (0.180)	-0.347 (0.528)
Share of low skilled white col.	-1.209 (0.623)	0.195 (0.735)	-0.699 (0.614)	-0.661 (0.359)	-0.537 (0.406)	-0.069 (0.307)	-0.057 (0.297)	-0.355 (0.289)	-0.268 (0.294)	0.438 (0.457)
Share of per. part-time empl.	-1.047 (0.605)	0.480 (0.659)	-0.513 (0.584)	0.085 (0.857)	0.273 (0.350)	0.215 (0.175)	0.192 (0.215)	0.732 (0.465)	-0.551 (0.634)	2.291* (1.151)
Share of temporary employees	-0.432 (0.496)	0.128 (1.166)	-0.567 (0.654)	-0.680 (0.460)	1.030* (0.525)	-0.238 (0.330)	-0.352 (0.391)	0.015 (0.219)	-0.569** (0.221)	0.189 (0.442)
Outside agreement	-0.196 (0.216)			-0.381 (0.265)	-0.119 (0.147)	-0.272 (0.215)	-0.044 (0.120)	0.445 (0.267)	0.069 (0.092)	
Firm level agreement	-0.197 (0.160)	0.058 (0.356)	0.454** (0.165)	-0.215 (0.230)	-0.044 (0.169)	-0.143 (0.106)	0.085 (0.160)	0.162 (0.175)	0.116 (0.151)	0.229 (0.214)
Exporting activity dummy	-0.485** (0.176)	0.032 (0.197)	-0.062 (0.195)	0.043 (0.256)	-0.008 (0.203)	0.162 (0.137)	0.018 (0.152)	0.136 (0.191)	-0.041 (0.117)	-0.180 (0.251)
Severe or strong competition	0.039 (0.259)	-0.109 (0.233)	0.353 (0.289)	0.186 (0.381)	-0.005 (0.182)	0.178 (0.166)	0.240* (0.116)	0.301 (0.213)	-0.065 (0.144)	0.138 (0.247)
20-49 employees	-0.143 (0.217)	0.306 (0.234)	-0.384 (0.229)	0.083 (0.223)	-0.258 (0.192)	-0.061 (0.169)	0.221 (0.130)	0.345* (0.161)	0.183 (0.161)	-0.766 (0.397)
50-199 employees		0.459* (0.227)	-0.565* (0.238)	0.012 (0.239)	0.204 (0.177)	-0.020 (0.168)	0.407*** (0.120)	0.152 (0.157)	0.352* (0.142)	-0.024 (0.276)
200 employees and more	-0.062 (0.169)	0.591 (0.377)	-0.549* (0.253)	-0.482 (0.362)	0.043 (0.230)	0.201 (0.196)	0.162 (0.171)	-0.123 (0.251)	0.318* (0.157)	0.053 (0.259)
Electricity, gas, water						-0.320 (0.462)			0.252 (0.523)	-0.125 (0.583)
Construction	-0.447 (0.284)	-0.204 (0.277)			-0.671 (0.350)	0.121 (0.183)	-0.302 (0.185)	0.095 (0.207)	-0.165 (0.146)	-0.387 (0.342)
Trade	-0.290 (0.263)	-0.365 (0.263)		-0.163 (0.243)	-0.478* (0.212)	0.106 (0.136)	-0.162 (0.148)	0.002 (0.173)	-0.023 (0.141)	-0.815* (0.352)
Business services	-0.064 (0.222)	-0.021 (0.209)	0.049 (0.185)	-0.300 (0.254)	-0.354 (0.190)	-0.167 (0.139)	0.183 (0.140)	-0.033 (0.179)	-0.075 (0.119)	-0.469 (0.261)
Financial intermediation					-0.183	-0.110	-0.675**	0.310		-0.210

Constant	0.285 (0.445)	-1.119* (0.511)	-1.701*** (0.404)	-0.351 (0.496)	(0.311) -0.791** (0.306)	(0.344) -1.462*** (0.291)	(0.261) -1.048*** (0.218)	(0.334) -1.803*** (0.309)	-1.077*** (0.273)	(0.512) -1.336*** (0.400)
Pseudo R2	0.043	0.036	0.058	0.053	0.042	0.032	0.043	0.033	0.032	0.091
N	382.000	315.000	1582.000	355.000	825.000	1727.000	938.000	849.000	1266.000	620.000

Table A2: Wage Freezes and Firm/Worker Characteristics (Nonlinearities in exporting activity)

	<i>CZ</i>	<i>EE</i>	<i>FR</i>	<i>GR</i>	<i>IE</i>	<i>HU</i>	<i>NL</i>	<i>PL</i>	<i>PT</i>	<i>SI</i>
Share of low skilled blue col.	-0.422 (0.353)	0.133 (0.534)	-0.362 (0.307)	-0.395 (0.441)	-0.346 (0.293)	-0.196 (0.214)	-0.208 (0.176)	0.024 (0.235)	-0.417* (0.198)	-0.442 (0.440)
Share of high skilled blue col.	-0.653 (0.590)	0.094 (0.533)	-0.314 (0.367)	-0.955* (0.440)	-0.401 (0.341)	-0.780* (0.324)	0.021 (0.265)	0.132 (0.267)	-0.005 (0.181)	-0.477 (0.558)
Share of low skilled white col.	-1.179 (0.626)	0.050 (0.744)	-0.556 (0.620)	-0.578 (0.358)	-0.578 (0.403)	-0.090 (0.307)	-0.059 (0.296)	-0.369 (0.298)	-0.268 (0.296)	0.403 (0.475)
Share of perm. part-time empl	-1.011 (0.598)	0.409 (0.659)	-0.430 (0.579)	0.158 (0.833)	0.297 (0.353)	0.216 (0.176)	0.165 (0.217)	0.743 (0.460)	-0.560 (0.642)	2.355* (1.128)
Share of temporary employees	-0.410 (0.496)	0.150 (1.155)	-0.526 (0.627)	-0.415 (0.486)	1.086* (0.522)	-0.251 (0.321)	-0.367 (0.391)	0.031 (0.219)	-0.563* (0.220)	0.250 (0.454)
Outside agreement	-0.191 (0.214)			-0.356 (0.271)	-0.127 (0.145)	-0.296 (0.215)	-0.060 (0.121)	0.432 (0.267)	0.062 (0.092)	
Firm level agreement	-0.191 (0.159)	0.080 (0.353)	0.469** (0.163)	-0.201 (0.235)	-0.021 (0.170)	-0.171 (0.107)	0.077 (0.160)	0.165 (0.174)	0.111 (0.152)	0.227 (0.215)
export revenue 0-30pc	0.053 (0.205)	-0.415 (0.237)	0.410* (0.171)	-0.078 (0.213)	0.136 (0.184)	-0.104 (0.144)	-0.103 (0.118)	-0.113 (0.182)	-0.086 (0.126)	0.428 (0.233)
export revenue 30-50pc	-0.269 (0.291)	-0.247 (0.322)	0.484* (0.231)	-0.047 (0.366)	0.301 (0.362)	-0.532* (0.256)	0.055 (0.215)	-0.168 (0.317)	-0.004 (0.202)	-0.192 (0.448)
export revenue 50-80pc	-0.368 (0.264)	0.030 (0.273)	0.198 (0.254)	0.548 (0.358)	0.206 (0.310)	0.246 (0.172)	-0.085 (0.200)	0.289 (0.249)	-0.142 (0.187)	-0.120 (0.374)
export revenue more than 80pc	-0.473 (0.250)	-0.225 (0.264)	0.274 (0.281)	-0.688 (0.457)	-0.100 (0.230)	-0.156 (0.181)	-0.121 (0.198)	-0.162 (0.279)	0.005 (0.139)	0.064 (0.307)

Severe or strong competition	0.069 (0.265)	-0.059 (0.231)	0.369 (0.291)	0.252 (0.385)	-0.010 (0.181)	0.169 (0.167)	0.243* (0.116)	0.293 (0.212)	-0.052 (0.146)	0.105 (0.240)
20-49 employees		0.356 (0.237)	-0.443 (0.232)	0.075 (0.221)	-0.270 (0.190)	-0.055 (0.171)	0.236 (0.131)	0.333* (0.167)	0.193 (0.161)	-0.777* (0.386)
50-199 employees	0.140 (0.220)	0.499* (0.232)	-0.646** (0.246)	0.007 (0.244)	0.196 (0.182)	0.009 (0.170)	0.424*** (0.121)	0.157 (0.160)	0.358* (0.144)	0.003 (0.273)
200 employees and more	0.076 (0.220)	0.598 (0.376)	-0.669** (0.253)	-0.529 (0.356)	0.042 (0.238)	0.248 (0.200)	0.184 (0.172)	-0.120 (0.257)	0.317* (0.160)	0.065 (0.259)
Electricity, gas, water						-0.455 (0.457)			0.254 (0.528)	0.047 (0.602)
Construction	-0.471 (0.307)	-0.330 (0.294)			-0.666 (0.350)	0.023 (0.187)	-0.355 (0.194)	0.038 (0.218)	-0.181 (0.149)	-0.259 (0.348)
Trade	-0.298 (0.276)	-0.431 (0.274)		-0.144 (0.253)	-0.485* (0.209)	0.022 (0.142)	-0.188 (0.152)	-0.034 (0.171)	-0.029 (0.143)	-0.868* (0.368)
Business services	-0.057 (0.231)	-0.072 (0.211)	0.125 (0.182)	-0.286 (0.255)	-0.376* (0.183)	-0.249 (0.145)	0.143 (0.142)	-0.080 (0.181)	-0.084 (0.120)	-0.417 (0.268)
Financial intermediation					-0.183 (0.311)	-0.232 (0.357)	-0.721** (0.266)	0.257 (0.332)		-0.200 (0.543)
Constant	0.125 (0.459)	-0.916 (0.538)	-2.009*** (0.385)	-0.477 (0.480)	-0.816** (0.314)	-1.330*** (0.292)	-0.963*** (0.230)	-1.728*** (0.315)	-1.055*** (0.272)	-1.497*** (0.406)
Pseudo R2	0.041	0.048	0.075	0.075	0.046	0.041	0.044	0.038	0.033	0.110
N	382.000	315.000	1582.000	355.000	825.000	1727.000	938.000	849.000	1266.000	620.000

Table A3: DRWR and Firm/Worker Characteristics

	<i>CZ</i>	<i>EE</i>	<i>FR</i>	<i>GR</i>	<i>IE</i>	<i>PL</i>	<i>PT</i>	<i>SI</i>
Share of low skilled blue col.	-0.254 (0.420)	-0.550 (0.694)	0.345 (0.249)	-0.067 (0.476)	-0.118 (0.277)	-0.328 (0.266)	0.314 (0.243)	-0.029 (0.279)
Share of high skilled blue col.	-0.433 (0.990)	0.257 (0.652)	0.103 (0.286)	0.430 (0.451)	-1.141** (0.387)	0.308 (0.281)	0.248 (0.234)	0.139 (0.362)
Share of low skilled white col.	-0.502 (0.840)	0.001 (1.145)	-0.510 (0.403)	0.333 (0.312)	-0.481 (0.376)	0.172 (0.323)	-0.435 (0.458)	-0.374 (0.390)
Share of per. part-time empl.	0.401 (0.773)	-0.459 (0.891)	-0.093 (0.312)	1.152 (0.674)	-0.591 (0.374)	0.583 (0.569)	0.102 (0.564)	1.917* (0.939)
Share of temporary employees	0.511 (0.577)	1.153 (1.301)	0.161 (0.321)	-0.723 (0.419)	-1.341* (0.645)	-0.377 (0.282)	-0.030 (0.210)	0.399 (0.290)
Outside agreement	0.154 (0.243)			0.421 (0.390)	0.155 (0.152)	-0.078 (0.410)	0.041 (0.119)	
Firm level agreement	0.314 (0.196)	0.668 (0.379)	0.114 (0.095)	-0.036 (0.218)	0.551*** (0.153)	-0.035 (0.185)	-0.141 (0.178)	0.139 (0.147)
Exporting activity dummy	0.363 (0.217)	-0.260 (0.352)	-0.124 (0.128)	0.351 (0.231)	-0.041 (0.220)	0.161 (0.219)	0.097 (0.152)	-0.105 (0.152)
Is price competition severe or strong, 0=no, 1=yes	0.261 (0.329)	-0.536 (0.317)	-0.292* (0.136)	0.311 (0.404)	0.049 (0.207)	-0.195 (0.199)	-0.009 (0.182)	0.152 (0.171)
20-49 employees	-0.023 (0.254)		0.016 (0.158)	0.054 (0.207)	-0.029 (0.170)	0.049 (0.184)	0.040 (0.177)	0.174 (0.159)
50-199 employees		-0.054 (0.282)	-0.069 (0.161)	0.079 (0.225)	-0.077 (0.199)	-0.122 (0.198)	-0.169 (0.157)	-0.313 (0.204)
200 employees and more	-0.150 (0.209)		-0.230 (0.177)	-1.134* (0.483)	0.343 (0.211)	0.362 (0.222)	-0.188 (0.180)	0.290 (0.170)
Electricity, gas, water								0.737* (0.356)
Construction	0.446 (0.322)	-0.280 (0.416)			-0.220 (0.355)	0.025 (0.242)	0.175 (0.162)	-0.368 (0.238)
Trade	-0.134 (0.383)	-0.258 (0.438)	0.672*** (0.194)	-0.225 (0.247)	0.480* (0.241)	-0.144 (0.203)	-0.209 (0.181)	0.084 (0.176)
Business services	0.394	0.185	0.015	-0.261	0.367	0.099	0.113	0.011

	(0.250)	(0.334)	(0.112)	(0.262)	(0.227)	(0.201)	(0.146)	(0.162)
Financial intermediation					0.205	-0.015		0.672
					(0.329)	(0.369)		(0.347)
Electricity, gas, water								0.737*
								(0.356)
Constant	-1.668**	-0.994	-1.193***	-1.624**	-1.544***	-1.294***	-1.468***	1.080***
	(0.571)	(0.598)	(0.273)	(0.588)	(0.349)	(0.319)	(0.309)	(0.286)
RseudoR2	0.040	0.085	0.027	0.079	0.083	0.040	0.025	0.052
N	375.000	242.000	1792.000	328.000	820.000	832.000	1233.000	620.000

Table A4: DRWR and Firm/Worker Characteristics (Nonlinearities in export activity)

	<i>CZ</i>	<i>EE</i>	<i>FR</i>	<i>GR</i>	<i>IE</i>	<i>PL</i>	<i>PT</i>	<i>SI</i>
Share of low skilled blue collars	-0.256	-0.378	0.298	-0.074	-0.078	-0.335	0.346	-0.062
	(0.430)	(0.700)	(0.252)	(0.469)	(0.284)	(0.264)	(0.243)	(0.276)
Share of high skilled blue collars	-0.390	0.400	0.039	0.405	-1.183**	0.294	0.307	0.156
	(1.045)	(0.682)	(0.286)	(0.456)	(0.396)	(0.278)	(0.227)	(0.359)
Share of low skilled white col.	-0.513	0.210	-0.569	0.341	-0.483	0.124	-0.362	-0.281
	(0.856)	(1.180)	(0.403)	(0.312)	(0.370)	(0.328)	(0.439)	(0.386)
Share of perm. part-time empl.	0.335	-0.455	-0.167	1.098	-0.577	0.619	0.154	1.788
	(0.835)	(0.904)	(0.313)	(0.677)	(0.373)	(0.570)	(0.563)	(0.945)
Share of temporary employees	0.313	1.341	0.163	-0.763	-1.318*	-0.375	-0.021	0.396
	(0.560)	(1.353)	(0.317)	(0.428)	(0.634)	(0.283)	(0.211)	(0.288)
Outside agreement	0.211			0.393	0.164	-0.132	0.058	
	(0.245)			(0.390)	(0.154)	(0.420)	(0.120)	
Firm level agreement	0.307	0.726	0.125	-0.048	0.567***	-0.018	-0.139	0.148
	(0.196)	(0.386)	(0.095)	(0.220)	(0.150)	(0.187)	(0.178)	(0.148)
export revenue 0-30pc	-0.452	0.131	-0.243*	0.027	0.163	-0.144	0.107	-0.254
	(0.268)	(0.319)	(0.108)	(0.199)	(0.186)	(0.186)	(0.159)	(0.149)
export revenue 30-50pc	-0.523	0.056	-0.237	-0.248	-0.306	-0.669	-0.285	-0.331
	(0.386)	(0.437)	(0.163)	(0.354)	(0.491)	(0.408)	(0.322)	(0.246)
export revenue 50-80pc	0.252	0.094	-0.061	0.154	-0.270	0.300	0.489*	-0.083
	(0.302)	(0.485)	(0.142)	(0.391)	(0.353)	(0.279)	(0.199)	(0.226)
export revenue more than 80pc	-0.166	-0.592	-0.450*	0.390	0.242	-0.474	0.130	-0.319
	(0.313)	(0.480)	(0.208)	(0.290)	(0.242)	(0.322)	(0.182)	(0.189)

Severe or strong competition	0.320 (0.333)	-0.517 (0.326)	-0.282* (0.135)	0.273 (0.401)	0.058 (0.210)	-0.204 (0.199)	-0.043 (0.184)	0.168 (0.170)
20-49 employees	-0.124 (0.258)		0.033 (0.158)	0.049 (0.208)	-0.040 (0.173)	0.037 (0.189)	0.037 (0.180)	0.226 (0.162)
50-199 employees		-0.066 (0.256)	-0.039 (0.162)	0.085 (0.224)	-0.117 (0.201)	-0.120 (0.201)	-0.195 (0.161)	-0.289 (0.206)
200 employees and more	-0.162 (0.209)		-0.194 (0.180)	-1.107* (0.480)	0.298 (0.212)	0.424 (0.228)	-0.231 (0.180)	0.318 (0.173)
Electricity, gas, water Construction	0.217 (0.326)	-0.259 (0.437)			-0.108 (0.364)	-0.105 (0.249)	0.249 (0.172)	-0.478* (0.242)
Trade	-0.288 (0.432)	-0.276 (0.438)	0.584** (0.198)	-0.250 (0.252)	0.567* (0.243)	-0.238 (0.200)	-0.143 (0.187)	0.071 (0.176)
Business services	0.306 (0.252)	0.235 (0.344)	-0.018 (0.115)	-0.253 (0.264)	0.476* (0.228)	0.008 (0.200)	0.176 (0.147)	-0.034 (0.164)
Financial intermediation					0.302 (0.329)	-0.115 (0.366)		0.591 (0.348)
Constant	-1.375* (0.637)	-1.195 (0.648)	-1.076*** (0.279)	-1.534* (0.598)	-1.690*** (0.369)	-1.139*** (0.324)	-1.569*** (0.306)	-0.956** (0.292)
Pseudo R2	0.061	0.099	0.034	0.081	0.089	0.054	0.036	0.058
N	375.000	242.000	1792.000	328.000	820.000	832.000	1233.000	620.000

Appendix 2
Alternative methods of labour cost adjustment
(separate regressions on each method, pooled sample)

COEFFICIENT	(1)	(2)	(3)	(4)	(5)	(6)
	Reduce bonuses	Reduce benefits	Change shifts	Slow promotions	Cheaper hires	Early retirement
DNWR	0.154*** (0.000)	0.079*** (0.000)	0.088*** (0.000)	0.186*** (0.000)	0.121*** (0.000)	0.060*** (0.000)
DRWR	-0.037** (0.018)	-0.026 (0.111)	-0.045* (0.092)	-0.053*** (0.000)	0.012 (0.649)	0.008 (0.451)
Low skilled blue collar	-0.049 (0.188)	-0.025 (0.271)	0.090 (0.160)	-0.059*** (0.003)	-0.018 (0.780)	0.032 (0.109)
High skilled blue collar	-0.028 (0.500)	-0.058** (0.015)	0.101* (0.056)	-0.022 (0.458)	0.056 (0.267)	0.030 (0.299)
Low skilled white collar	0.040 (0.219)	0.007 (0.761)	0.054 (0.232)	0.053*** (0.001)	0.002 (0.948)	0.103*** (0.001)
Higher level collective agreement	0.033 (0.279)	0.018* (0.065)	0.040* (0.079)	-0.021* (0.071)	0.007 (0.794)	0.036 (0.253)
Firm level collective agreement	-0.019 (0.236)	0.016*** (0.001)	0.041** (0.036)	0.039* (0.052)	0.022** (0.011)	0.021 (0.308)
Share of revenues generated in domestic market	-0.020 (0.454)	-0.020 (0.158)	-0.003 (0.883)	-0.020* (0.071)	-0.007 (0.740)	0.006 (0.791)
Share of part-time employees	-0.018 (0.354)	0.015 (0.666)	-0.045 (0.481)	-0.070*** (0.000)	0.029 (0.459)	-0.097*** (0.005)
Share of temporary employees	-0.018 (0.561)	0.041 (0.159)	0.051** (0.011)	0.016 (0.492)	0.039 (0.158)	-0.045 (0.153)
Share of labour cost in total cost	0.066*** (0.009)	0.014 (0.448)	0.014 (0.762)	0.058*** (0.003)	0.070** (0.029)	0.051 (0.254)
Labour turnover rate	0.020 (0.264)	-0.010 (0.553)	0.035*** (0.000)	0.002 (0.885)	0.037** (0.038)	-0.056*** (0.000)
CEE country	0.047*** (0.004)	0.038*** (0.000)	- 0.043*** (0.000)	-0.004 (0.727)	- 0.096*** (0.000)	-0.069*** (0.001)
High Level of Collective Bargaining Coverage	- 0.080*** (0.000)	-0.008 (0.180)	-0.036** (0.014)	0.105*** (0.000)	- 0.153*** (0.000)	0.009 (0.680)
Dominance of centralised bargaining	- 0.137*** (0.000)	- 0.079*** (0.000)	- 0.112*** (0.000)	0.068*** (0.000)	0.108*** (0.000)	-0.022** (0.025)
Firm level collective agreement*Dominance of centralised	0.075* (0.000)	0.004 (0.000)	0.020 (0.000)	0.019 (0.000)	-0.018 (0.000)	0.110*** (0.000)

bargaining						
	(0.060)	(0.787)	(0.384)	(0.524)	(0.183)	(0.000)
Strong competition	0.029*	0.008	-0.014	-0.001	0.004	-0.006
	(0.057)	(0.432)	(0.272)	(0.949)	(0.786)	(0.611)
Weak competition	-0.014	-0.013	-0.033**	-0.002	-0.018	-0.028***
	(0.448)	(0.174)	(0.013)	(0.907)	(0.328)	(0.000)
No competition	0.005	-	-	-0.043**	-0.013	-0.022
	(0.751)	(0.009)	(0.000)	(0.012)	(0.484)	(0.207)
Energy	0.015	0.228***	-0.028	-0.064**	0.161**	-0.072***
	(0.760)	(0.000)	(0.387)	(0.016)	(0.021)	(0.000)
Construction	-0.004	0.000	-0.021	0.043***	-0.037*	-0.009
	(0.868)	(0.987)	(0.628)	(0.006)	(0.088)	(0.731)
Trade	0.007	0.007	0.042	0.002	0.036	-0.008
	(0.681)	(0.389)	(0.116)	(0.941)	(0.127)	(0.540)
Business services	0.007	0.024*	0.042**	0.012	-0.025	-0.032*
	(0.698)	(0.059)	(0.036)	(0.382)	(0.388)	(0.085)
Financial intermediation	0.020	0.013	0.030	-0.003	0.020	0.019
	(0.650)	(0.515)	(0.281)	(0.908)	(0.829)	(0.132)
20 – 49 employees	0.048**	0.012	0.021	0.050*	0.102***	0.045*
	(0.021)	(0.329)	(0.247)	(0.057)	(0.000)	(0.067)
50 – 199 employees	0.069***	0.025***	0.053***	0.059**	0.113***	0.069**
	(0.000)	(0.002)	(0.007)	(0.034)	(0.001)	(0.048)
200 + employees	0.107***	0.051***	0.063***	0.088**	0.184***	0.188***
	(0.001)	(0.007)	(0.006)	(0.041)	(0.000)	(0.001)
Czech Republic	-	-	-	-0.121***	-	0.035
	0.072***	0.087***	0.114***		0.153***	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.222)
France	-	-		0.083***	0.299***	0.153***
	0.077***	0.097***				
	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
Greece	0.117***	0.050***				
	(0.000)	(0.000)				
Hungary	-	-	0.153***	0.428***	0.082***	0.132***
	0.087***	0.063***				
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Poland	-	-	-	0.170***	0.130***	0.135***
	0.089***	0.039***	0.058***			
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Portugal	-	-	-			
	0.080***	0.067***	0.144***			
	(0.000)	(0.000)	(0.000)			
Italy				0.265***	0.340***	
				(0.000)	(0.000)	
Observations	6618	6618	5125	6370	6370	5418

Probit regressions, marginal effects reported. Robust P-values in parentheses.

*** Denotes significance at 1%, ** at 5% and * at 10%.

Appendix 3. Reliance on alternative methods of labor cost adjustment

Dependent variable: a dummy variable that equals one if at least one of the alternative methods is used

COEFFICIENT	Pooled sample	Eastern Europe	Western Europe
DNWR	0.270*** (0.000)	0.261*** (0.000)	0.285*** (0.000)
DRWR	-0.038* (0.071)	-0.042 (0.195)	-0.037 (0.235)
Low skilled blue collar	-0.032 (0.427)	0.031 (0.431)	-0.083 (0.277)
High skilled blue collar	0.028 (0.501)	0.105* (0.054)	-0.024 (0.721)
Low skilled white collar	0.104* (0.066)	0.068 (0.359)	0.146* (0.097)
Higher level collective agreement	0.031 (0.177)	-0.017 (0.579)	0.045 (0.159)
Firm level collective agreement	0.044 (0.181)	0.106*** (0.000)	-0.004 (0.824)
Share of revenues generated in domestic market	-0.036 (0.267)	0.019 (0.245)	-0.090** (0.031)
Share of part-time employees	-0.082* (0.091)	-0.095 (0.145)	-0.067 (0.541)
Share of temporary employees	0.017 (0.696)	0.001 (0.989)	0.064 (0.475)
Share of labour cost in total cost	0.127** (0.010)	0.183*** (0.000)	0.083 (0.336)
Labour turnover rate	0.011 (0.500)	-0.006 (0.703)	0.034** (0.017)
CEE country	-0.018 (0.322)		
High Level of Collective Bargaining Coverage	-0.045*** (0.002)		
Dominance of centralised bargaining	0.136*** (0.000)		
Firm level collective agreement*Dominance of centralised bargaining	0.041 (0.243)	-0.045 (0.395)	0.054*** (0.002)
Strong competition	0.011 (0.766)	0.052 (0.463)	-0.027 (0.401)
Weak competition	-0.047 (0.215)	-0.042 (0.566)	-0.050 (0.254)
No competition	-0.077* (0.063)	-0.051 (0.550)	-0.094* (0.084)
Energy	0.091 (0.326)	0.112 (0.295)	-0.238 (0.509)

Construction	-0.029 (0.141)	-0.050** (0.047)	-0.007 (0.576)
Trade	0.051*** (0.000)	0.059*** (0.005)	0.046*** (0.000)
Business services	0.029 (0.210)	0.049** (0.024)	0.013 (0.739)
Financial intermediation	0.076 (0.143)	0.141* (0.059)	-0.025 (0.538)
20 – 49 employees	0.108*** (0.000)	0.103** (0.030)	0.107*** (0.000)
50 – 199 employees	0.163*** (0.000)	0.132*** (0.003)	0.178*** (0.000)
200 + employees	0.223*** (0.000)	0.237** (0.019)	0.208*** (0.000)
Estonia	0.342*** (0.000)		
France	0.243*** (0.000)		0.087*** (0.000)
Hungary	0.317*** (0.000)	-0.093*** (0.000)	
Italy	0.305*** (0.000)		0.149*** (0.000)
Poland	0.175*** (0.000)	-0.261*** (0.000)	
Czech R.		-0.431*** (0.000)	
Slovenia		-0.305*** (0.000)	
Portugal			-0.170*** (0.000)
Observations	6383	2991	3392

Robust p values in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix 4
Alternative methods of labour cost adjustment
(separate regressions on each method, Central and Eastern Europe)

	(1)	(2)	(3)	(4)	(5)	(6)
COEFFICIENT	Reduce bonuses	Reduce benefits	Change shifts	Slow promotions	Cheaper hires	Early retirement
DNWR	0.157*** (0.000)	0.092*** (0.000)	0.089*** (0.000)	0.184*** (0.000)	0.129*** (0.000)	0.053*** (0.001)
DRWR	-0.017 (0.510)	-0.042** (0.033)	-0.061** (0.014)	-0.044** (0.030)	0.034 (0.174)	-0.003 (0.833)
Low skilled blue collar	0.038 (0.281)	0.030 (0.283)	0.008 (0.804)	-0.042 (0.148)	0.092*** (0.006)	0.014 (0.510)
High skilled blue collar	0.089** (0.045)	-0.010 (0.780)	0.037 (0.377)	0.013 (0.713)	0.121*** (0.003)	0.015 (0.555)
Low skilled white collar	0.088* (0.078)	0.056 (0.128)	0.032 (0.469)	0.032 (0.413)	0.022 (0.636)	0.024 (0.399)
Higher level collective agreement	0.098*** (0.004)	0.022 (0.423)	-0.019 (0.537)	-0.045 (0.106)	-0.037 (0.229)	-0.003 (0.881)
Firm level collective agreement	-0.058*** (0.005)	0.030* (0.085)	0.078*** (0.000)	0.061*** (0.001)	0.030 (0.125)	0.018 (0.114)
Share of revenues generated in domestic market	0.041 (0.133)	-0.018 (0.405)	-0.001 (0.979)	-0.003 (0.915)	0.015 (0.566)	-0.003 (0.856)
Share of part-time employees	-0.023 (0.591)	0.049 (0.137)	-0.108*** (0.007)	-0.070** (0.044)	0.052 (0.180)	-0.075*** (0.002)
Share of temporary employees	-0.037 (0.396)	0.084*** (0.007)	0.035 (0.405)	0.020 (0.563)	0.029 (0.456)	-0.058** (0.031)
Share of labour cost in total cost	0.092** (0.024)	0.011 (0.721)	0.017 (0.663)	0.065* (0.056)	0.076** (0.043)	0.079*** (0.000)
Labour turnover rate	0.026 (0.339)	-0.025 (0.249)	0.036 (0.167)	-0.012 (0.617)	-0.003 (0.917)	-0.027 (0.102)
Firm level collective agreement*Dominance of centralised bargaining	0.219*** (0.004)	0.006 (0.895)	-0.045 (0.441)	-0.013 (0.801)	-0.054 (0.310)	0.051 (0.207)
Strong competition	0.054** (0.012)	0.028* (0.096)	-0.005 (0.805)	0.024 (0.202)	0.020 (0.333)	0.014 (0.230)
Weak competition	-0.010 (0.679)	-0.020 (0.275)	-0.032 (0.152)	0.021 (0.315)	0.009 (0.686)	-0.019 (0.169)
No competition	0.016 (0.706)	-0.011 (0.731)	-0.043 (0.204)	-0.005 (0.875)	0.000 (0.993)	-0.014 (0.522)
Energy	-0.012 (0.879)	0.268*** (0.000)	-0.007 (0.927)	-0.060 (0.288)	0.162** (0.035)	-0.038 (0.283)
Construction	-0.018 (0.544)	0.007 (0.777)	-0.017 (0.559)	0.060** (0.034)	-0.036 (0.183)	-0.007 (0.660)
Trade	-0.006 (0.804)	0.007 (0.720)	0.038* (0.100)	0.029 (0.153)	0.018 (0.421)	-0.000 (0.978)

Business services	-0.008	0.031*	0.048**	0.023	-0.034	-0.011
	(0.709)	(0.093)	(0.033)	(0.266)	(0.108)	(0.396)
Financial intermediation	-0.010	-0.001	0.063	0.035	0.054	0.008
	(0.853)	(0.990)	(0.231)	(0.431)	(0.293)	(0.769)
20 – 49 employees	0.083***	0.019	0.022	0.070***	0.063***	0.043**
	(0.001)	(0.324)	(0.354)	(0.002)	(0.009)	(0.015)
50 – 199 employees	0.109***	0.033*	0.030	0.069***	0.047**	0.042**
	(0.000)	(0.080)	(0.200)	(0.002)	(0.045)	(0.017)
200 + employees	0.195***	0.058**	0.051*	0.098***	0.123***	0.134***
	(0.000)	(0.013)	(0.080)	(0.000)	(0.000)	(0.000)
Czech R.	-0.084***	-0.115***	-0.129***	-0.124***	-0.129***	0.033
	(0.009)	(0.000)	(0.000)	(0.002)	(0.000)	(0.259)
Hungary	-0.100***	-0.089***	0.153***	0.347***	0.059*	0.092***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.058)	(0.001)
Poland	-0.093***	-0.052**	-0.076**	0.154***	0.106***	0.103***
	(0.001)	(0.015)	(0.011)	(0.000)	(0.002)	(0.001)
Slovenia	-0.237***	-0.097***	-0.104**	0.243***	-0.013	0.030
	(0.000)	(0.001)	(0.012)	(0.000)	(0.783)	(0.402)
Observations	2991	2991	2991	2991	2991	2991

Robust p values in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix 5
Alternative methods of labour cost adjustment
(separate regressions on each method, Western Europe)

	(1)	(2)	(3)	(4)	(5)	(6)
COEFFICIENT	Reduce bonuses	Reduce benefits	Change shifts	Slow promotions	Cheaper hires	Early retirement
DNWR	0.145*** (0.000)	0.070*** (0.000)	0.104*** (0.000)	0.188*** (0.000)	0.104*** (0.002)	0.047 (0.276)
DRWR	-0.047** (0.036)	-0.007 (0.672)	-0.025 (0.417)	-0.059** (0.017)	-0.010 (0.747)	0.041 (0.181)
Low skilled blue collar	-0.113*** (0.000)	-0.065*** (0.001)	0.209*** (0.000)	-0.063** (0.031)	-0.113*** (0.004)	0.039 (0.377)
High skilled blue collar	-0.096*** (0.001)	-0.084*** (0.000)	0.181*** (0.000)	-0.044 (0.171)	0.008 (0.851)	0.054 (0.320)
Low skilled white collar	0.007 (0.850)	-0.023 (0.369)	0.111** (0.026)	0.072* (0.089)	-0.001 (0.980)	0.215*** (0.001)
Higher level collective agreement	0.028 (0.144)	0.018 (0.176)	0.044** (0.025)	0.005 (0.817)	0.037 (0.180)	0.156*** (0.000)
Firm level collective agreement	0.000 (0.980)	0.006 (0.640)	-0.003 (0.897)	0.023 (0.152)	0.020 (0.327)	0.029* (0.096)
Share of revenues generated in domestic market	-0.053** (0.011)	-0.024 (0.137)	-0.017 (0.482)	-0.039* (0.073)	-0.028 (0.323)	0.016 (0.520)
Share of part-time employees	-0.027 (0.589)	-0.041 (0.310)	0.117** (0.024)	-0.067 (0.235)	-0.022 (0.729)	-0.112* (0.097)
Share of temporary employees	-0.005 (0.911)	0.001 (0.977)	0.088** (0.032)	0.030 (0.478)	0.064 (0.246)	0.027 (0.675)
Share of labour cost in total cost	0.045 (0.172)	0.011 (0.647)	0.013 (0.699)	0.042 (0.230)	0.057 (0.197)	-0.004 (0.933)
Labour turnover rate	0.015 (0.471)	0.005 (0.706)	0.025 (0.253)	0.021 (0.332)	0.071** (0.010)	-0.101*** (0.003)
Firm level collective agreement*Dominance of centralised bargaining	0.025 (0.490)	0.004 (0.888)	0.034 (0.434)	-0.011 (0.828)	-0.037 (0.467)	0.046 (0.393)
Strong competition	0.003 (0.880)	-0.011 (0.367)	-0.013 (0.476)	-0.016 (0.365)	-0.013 (0.579)	-0.041* (0.065)
Weak competition	-0.021 (0.253)	-0.012 (0.352)	-0.019 (0.341)	-0.015 (0.430)	-0.039 (0.109)	-0.038* (0.093)
No competition	-0.003 (0.908)	-0.032* (0.077)	-0.045* (0.077)	-0.063** (0.014)	-0.020 (0.595)	-0.031 (0.374)
Construction	-0.020 (0.570)	-0.027 (0.250)	-0.017 (0.598)	0.014 (0.686)	-0.056 (0.226)	-0.031 (0.664)
Trade	0.019 (0.378)	0.005 (0.728)	0.022 (0.311)	-0.032 (0.146)	0.062** (0.036)	-0.030 (0.316)
Business services	0.018 (0.324)	0.018 (0.213)	0.002 (0.919)	0.008 (0.662)	-0.012 (0.618)	-0.055** (0.012)

Financial intermediation	0.097	0.038	-0.081	-0.059	-0.019	0.110
	(0.127)	(0.408)	(0.205)	(0.321)	(0.804)	(0.256)
20 – 49 employees	0.022	0.001	0.026	0.015	0.146***	0.037
	(0.308)	(0.929)	(0.342)	(0.557)	(0.000)	(0.280)
50 – 199 employees	0.036*	0.012	0.101***	0.034	0.173***	0.097***
	(0.090)	(0.445)	(0.000)	(0.157)	(0.000)	(0.003)
200 + employees	0.042*	0.039**	0.107***	0.065**	0.235***	0.241***
	(0.069)	(0.030)	(0.001)	(0.015)	(0.000)	(0.000)
France	0.007	-0.030		0.106***	-0.006	0.173***
	(0.791)	(0.136)		(0.003)	(0.870)	(0.000)
Greece	0.019	0.019				
	(0.561)	(0.417)				
Italy	0.081***	0.097***	0.084***	0.295***	-0.000	
	(0.006)	(0.000)	(0.006)	(0.000)	(0.991)	
Portugal	-0.010	0.014	-0.061**	0.049	-0.273***	
	(0.723)	(0.526)	(0.049)	(0.171)	(0.000)	
Energy Sector					-0.046	
					(0.863)	
High Level of Collective Bargaining Coverage						-0.043
						(0.313)
Observations	3635	3635	2141	3387	3392	2434

Robust p values in parentheses
*** p<0.01, ** p<0.05, * p<0.1