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Abstract

Workers and firms resist nominal wage cuts. This paper addresses the question of whether such wage rigidity implies rigidities in labour costs. Firm wage bills contain a number of other elements that may be easier to adjust than base wages in the face of economic shocks. 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 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. These alternative margins are more commonly used among those firms that are subject to downward nominal wage rigidities, suggesting some degree of substitutability between wage flexibility and alternative margins. We also show how the margins of adjustment chosen are affected by firm and worker characteristics.

Keywords: nominal and real wage rigidity, firm survey, European Union
JEL codes: J30, C81, P5

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1. Introduction

Wages of incumbent workers are seldom cut, even in the face of large negative shocks. During the last few years, a growing body of literature using micro data has documented the importance of wage rigidities in several countries and over a range of time periods. In the US, clear signs of resistance to nominal wage cuts are found in all studies (see among others Kahn, 1997; Altonji and Devereux, 2000, and Lebow et al. 2003). Most recently, a comprehensive cross-country study was carried out in the context of the International Wage Flexibility Project (Dickens et al. 2007, 2008). The European evidence points towards varying degrees of downward nominal wage rigidity, and an important resistance to real wage cuts depending on the country.

Understanding the relative flexibility of labour costs is of utmost importance for a better understanding of the working of the macroeconomy. From a monetary policy perspective, the adjustment of marginal costs to economic shocks is fundamental to determine the slope of the Philips curve in New Keynesian Models (Galí and Gertler, 1999). From a labour perspective, understanding the links between wage rigidities and unemployment was emphasized by Layard et al. (1991), and most of the empirical micro literature on wage rigidities retained this subject as the main motivation for the analysis.[1] However, even if wages are rigid, does such wage rigidity necessarily imply rigid labour cost structures? Firms have other margins of adjustment beyond base wages to manage their wage bills, including the adjustment of flexible pay components such as bonuses or fringe benefits, the adjustment of labour cost via re-organization of production, or using labour turnover as a tool to adjust labour costs to changes in economic activity.

This paper broadens the discussion of the relative rigidity of wages to include the flexibility of alternative adjustment mechanisms that involve the use of labour inputs. Using unique survey information, we identify the following labour cost-saving strategies reported by the majority of national surveys in our sample: 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; and encourage early retirement to replace high wage employees by entrants with lower wages. Using this information, the paper makes three contributions to the literature. First, we document comparable information on labour cost adjustment practices beyond base wages for a large set of EU countries and sectors. This allows us to discuss the relative

[1] See Goette et al. (2007) and the reference therein.

importance of each alternative strategy across countries characterized by different sets of laws and institutions governing their labour markets. Second, we examine the characteristics of firms and the environments in which they operate that determine the relative importance of each type of labour cost adjustment mechanism. Finally, we show how the use of these adjustment practices can be related to the recent firms' experience regarding nominal wage rigidity, as well as to the extent of wage indexation operating in the firm.

In order to address these questions, we use a novel firm-level survey that contains detailed qualitative information for a large number of firms in 12 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 and coordinated by the European Central Bank. The most important advantage of using qualitative information from a firm survey refers to the possibility of addressing a broad set of adjustment practices, most of which are typically not observable even in the richest matched employer-employee datasets.

Our survey shows that firms fairly commonly use strategies to reduce labour costs without reducing base wages – 61% of the firms' managers said they had used at least one alternative margin of adjustment in the recent past, and 53% had used at least one of the six margins explicitly identified in the survey. Their use of each margin is related to several firm characteristics such as the relative size or skills distribution, as well as several indicators of the economic environment in which they operate. Firms in more competitive environments tend to use some of these strategies more heavily. Similarly, the degree and characteristics of union involvement in the wage setting process shape the need and ability of firms at the time of using the different margins.

The paper is organised as follows. Section 2 describes the main characteristics of the survey and the sample used in the paper. Section 3 describes the alternative compensation channels that firms may use to reduce labour costs and the frequency with which they are used in different countries and sectors. Section 4 relates the choice of cost reduction methods to firm characteristics and attributes of the economic environment in which they operate. Section 5 looks at the relationship between these alternative margins of cost-cutting strategies and the recent firm experience of nominal wage rigidity and indexation mechanisms. Section 6 concludes.

2. Survey Design and Sample Characteristics

The firm survey was conducted between the second half of 2007 and the first quarter of 2008 in 16 European Union countries, 12 of which included the questions on alternative margins of labour cost adjustment analysed here: Belgium, Czech Republic, Estonia, France, Greece, Hungary, Ireland, Italy, Lithuania, Poland, Portugal and Slovenia.[2] The survey was carried out by the National Central Banks and all countries used as the basis for the survey a harmonised questionnaire, which was developed in the context of the Eurosystem Wage Dynamics Network, a research network analysing wage and labour cost dynamics. The collection of information varied across countries, the survey being conducted in most cases by traditional mail, but also phone and face-to-face interviews were used. The survey was directed at the company's CEO, or to senior human resources management.

The harmonized questionnaire contained a core set of questions, referring to general firm characteristics, and the firms' price and wage setting strategies that were included in all counties' questionnaires.[3] An enlarged questionnaire, including the relevant questions for this study, was sent to 12 countries. This harmonised questionnaire was further adapted by some countries to account for specific country characteristic and different institutional frameworks, but it retained its comparability in all the dimensions covered in this paper.

The sample frame in each country was based on firms with at least 5 employees. The sectors covered are manufacturing, energy, construction, market services, non-market services, trade and financial intermediation; there are however differences in the sectoral coverage of individual countries. The sample covers around 15300 firms representing around 47.5 million employees.[4] A description of the distribution of the sample by country, sector and size (for the 12 countries used in the paper) is provided in Appendix 2.

In order to make the results representative of the total population the sample statistics presented in the following sections use employment adjusted weights. For each firm/observation these weights indicate the number of employees each observation represents in the population. They can be roughly calculated as the population employment divided by

[2] Luxembourg is also conducting the survey and the data will be made available to the network's researchers at a later stage.
[3] Firms were instructed to answer the wage setting questions with reference to their main occupational group and the price setting questions with reference to the main product.
[4] Appendix 1 provides detailed information on the survey characteristics.

the number of firms (in each stratum), in the realized sample. [5] For a detailed description on the construction of weights see Appendix 3.[6]

3. Non-wage cost-cutting strategies

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 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). 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 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, 2005).

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 or are set at the discretion of the employer. Private pension schemes, bonuses and benefits belong to this category. 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. Additionally, firms might use labour turnover or internal reorganization as a tool to address labour cost flexibility. They might replace voluntary or involuntary resignations or retirements of high tenure (and hence high wage) workers for younger workers that are willing to work at a lower wage. Similarly, they might limit the extent of promotions or use working shifts as a cost cutting strategy during an economic downturn

[5] Strata refer to the sampling categories in which the population of firms are divided in order to do the sampling. For most of the cases they are defined by sector and size, i.e. one sampling category can be firms with 5-19 employees in the manufacturing.

[6] The employment adjusted weights account for the across strata unequal probabilities of receiving, and responding to the questionnaire as well as for the number of employees by firm in the population in each stratum (average firm size).

In our survey, we asked firms' managers directly about their use of these alternative policies in the recent past. Concretely, we identified the following main strategies to cut labour costs (other than wages) reported by the majority of national surveys (see question 18 Appendix 4) by asking: *Has any of the following strategies ever been used in your firm to reduce labour costs?* Firms were allowed to choose as many options as they wished, among the following list:

- 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.

Summary statistics of the percentage of firms (weighted by employment) that use at least one of the first six strategies listed above are presented in Table 1. It clearly indicates that firms make extensive use of non-wage cost cutting strategies in Europe, albeit there is substantial variability across countries. While in Lithuania all workers have seen how at least one of the strategies have affected their labour relations, in Portugal the percentage of affected workers falls to 40%. On average, 63% of the workers in our sample have been affected, while differences in the incidence of these adjustment mechanisms across Euro-area and non-Euro area countries are not particularly relevant.

Perhaps the first and most striking feature of Table 1 is that the prevalence of individual strategies varies quite substantially across countries. The reduction of bonus payments is the most common method used by firms outside the Euro Area: in the Czech Republic (32%), Estonia (40%), Lithuania (41%) and Poland (24%). The western European countries appear less likely to use bonuses in order to reduce costs with the exception of Italy, where almost a quarter of firms report using this method. Labour turnover instead seems to be an important element of adjustment in Western Europe. Hiring new employees at lower rates than those who left the company are the most important adjustment mechanism in Belgium (26%), France (39%), Italy (46%) and to some extent Portugal, where it affects 16% of the employees. Similarly, while using early retirement as an adjustment tool is never the main method of adjustment, it is fairly commonly used in these countries. In Belgium (19%),

France (30%) and Italy (20%), the average use of early retirement is above the total mean (16.5%).

A third group of countries shows substantial flexibility of the internal organization of firms. This is the case for instance of Hungary, where more than 73% of the workers in our sample have affected by at least one of the following strategies: shift changes and the slowing down of promotions, as an attempt set forth by their employers to cut labour costs. This is also the case in Italy, where 50% of employees have been affected by at least one of these practices. The strategy least used by firms is the reduction of benefits. This may come as a surprise, and suggests that benefits are somewhat less flexible than bonuses (affecting 15% of workers in total against 23% in the case of bonuses).

In addition to the variation across countries, we find that the choice of strategies also tends to differ across sectors (Table 2). 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 2, where France was the only country with a significant proportion of firms to use this strategy. The use of the alternative strategies was lowest in non-market services.

Table 1: Labour cost adjustment strategies - Country-level statistics

Country	Reduce bonuses	Reduce benefits	Change shifts	Slow promotions	Cheaper hires	Early retirement	Use at least one strategy
Belgium	0.184	0.079	0.072	0.150	0.264	0.189	0.460
Czech Republic	0.322	0.075	0.111	0.019	0.087	0.089	0.679
Estonia	0.402	0.205	0.211	0.062	0.162	0.026	0.936
France	0.147	0.061	n.a	0.154	0.390	0.303	0.586
Greece [(a)]	0.204	0.124	n.a	n.a	n.a	n.a	0.835
Hungary	0.227	0.119	0.383	0.351	0.265	0.102	0.672
Ireland	0.169	0.078	0.160	0.094	0.370	0.098	0.909
Italy	0.256	0.218	0.260	0.340	0.456	0.202	0.712
Lithuania	0.410	0.250	0.199	0.106	0.179	0.027	1.000
Poland	0.236	0.163	0.124	0.128	0.237	0.109	0.505
Portugal	0.137	0.084	0.107	0.140	0.162	0.000	0.395
Slovenia	0.135	0.128	0.091	0.189	0.158	0.089	0.575
Total	0.226	0.147	0.191	0.206	0.323	0.165	0.631
Euro area	0.205	0.146	0.212	0.246	0.387	0.203	0.645
Non-euro area	0.267	0.149	0.163	0.134	0.207	0.097	0.604

Notes: proportion of firms that use given strategy, weighted by employment. [(a)] In Greece the question was formulated in a different way. Therefore, the last column refers to the proportion of firms that have reduced bonuses, non-pay benefits, overtime hours, number of employees and have engaged in restructuring (the former three option replaced the change in shifts, slow promotion, cheaper hires and early retirement options).

Table 2: Labour cost adjustment strategies - Proportion of firms by sector

	Reduce bonuses	Reduce benefits	Change shifts	Slow promotions	Cheaper hires	Early retirement	Use at least one strategy
Manufacturing	0.209	0.135	0.189	0.204	0.319	0.177	0.615
Energy	0.301	0.216	0.040	0.127	0.182	0.253	0.667
Construction	0.210	0.149	0.113	0.130	0.166	0.058	0.521
Trade	0.250	0.173	0.220	0.216	0.374	0.109	0.648
Market services	0.233	0.147	0.212	0.219	0.330	0.189	0.662
Financial intermediation	0.300	0.149	0.050	0.229	0.365	0.294	0.620
Non-market services	0.096	0.045	0.118	0.118	0.183	0.041	0.426

Notes: proportion of firms that use given strategy, weighted by employment

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.[7] This leads us to ask if certain combinations of the strategies are more likely to be used than others.

Table 3 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 (0.28). 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 (0.23), 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 3: Correlations between labour cost reduction strategies

	Reduce bonuses	Reduce benefits	Change shifts	Slow promotions	Cheaper hires	Early retirement
Reduce bonuses	1					
Reduce benefits	0.2793	1				
Change shifts	0.1073	0.1327	1			
Slow promotions	0.141	0.1901	0.3175	1		
Cheaper hires	0.1318	0.1432	0.1329	0.2133	1	
Early retirement	0.1299	0.1426	0.1376	0.2048	0.2342	1

4. The choice among cost-cutting strategies

Why are firms using some of these strategies and others not? Our survey can provide some guidance regarding the determinants of engaging in non-base wage labour cost-cutting strategies, as well as on the factors behind the choice of each of the six strategies outlined above.

[7] 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.

We start by analysing in more detail the determinants of using *any* of the six labour cost adjustment strategies proposed by the survey. We consider a set of firm characteristics such as the structure of its labour force: share of high and low skilled blue and white collars, the share of workers holding a temporary versus an open ended contract, indicators of firm size, and the share of labour costs in total costs. We also consider two different indicators of product market competition. Our first indicator is labelled as "perceived competition", and ranks the degree of competition according to the manager's answers to a direct question: "to what extent does your firm experience competition for its main product" in four categories: severe, strong, weak, no competition. The second indicator is labelled as "implied competition", and responds to the managers answers to the following question: "suppose that the main competitor for your firm's main product decreases its prices; how likely is your firm to react by decreasing its own price?" Depending on whether price responses are very likely, likely, not likely or not at all, we rank again the degree of perceived competition in four categories: severe, strong, weak and no competition, where the former is linked to the answers "very likely" and the latter to the managers who respond "not at all". Similarly, we consider two different sets of indicators of union activity. First, we asked managers regarding the percentage of workers that were covered by collective agreements. We label this variable "coverage". Second, we asked managers about the predominant wage setting that applies to their firms, which allow us to differentiate four categories: individual negotiations, firm level agreements with unions, sectoral/national wage bargaining agreements, both (firm level and sectoral/national agreements)

Table 4 highlights the relationship between firm characteristics and the tendency to rely on alternative strategies for labour cost adjustment. The analysis is based on the results of probit regressions, where the dependent variable is 1 if the firm has used at least one of the alternative labour cost adjustment strategies and 0 otherwise. Importantly, all the specifications include country fixed effects, which eliminate possible biases due to idiosyncrasies in the country questionnaires (e.g. due to language differences in the formulation of the questions). Similarly, all specifications include sectoral dummies.

Perhaps not surprisingly, we find that larger firms make more extensive use of alternative margins of labour cost cutting strategies. According to the estimates presented in Column 1 of Table 4, in large firms (above 200 employees) the probability of using alternative strategies increases by 23 percentage points with respect to the baseline category (firms below 20 employees). The positive relation between firm size and the use of cost cutting strategies is monotonically increasing and highly significant across all specifications. We also find that firms which have a higher share of labour costs in total costs have a tendency to use labour

cost cutting strategies more heavily, which is reassuring. Perhaps less straightforward is that, within sectors and countries, firms with a higher share of white collars use these alternative margins more extensively. This is especially significant if we differentiate between low skilled blue and white collars. In all but one of our specifications we find a significantly negative statistical relationship indicating that a higher share of low skilled blue collars reduces the probability of engaging in alternative margins of labour cost-cutting strategies.

Columns 1 and 2 in Table 4 present our alternative indicators of product market competition. Their message is broadly consistent, indicating a positive association between the use of alternative margins and the intensity of competition. If we consider the indicator of perceived competition, the relationship is clearly monotonically increasing, with weak competition increasing the use of alternative margins by 9 percentage points (pp) with respect to no competition, strong competition by 12pp and severe competition by 15pp. The relationship is non-monotonic but positive and significant with the indicator of "implied competition". In this case we find that firms operating in strong or severe competition environments are unambiguously related to a more intense use of alternative margins that firms facing no, or weak competition. The impact of competition is reinforced by the positive and statistically significant association between the share of exports and the use of alternative margins, since firms operating in international markets are expected to face even higher competitive pressures.

Columns 3 and 4 in Table 4 consider the role of wage setting and its influence on the use of alternative margins. In column 3, we find that firms characterised by a higher union coverage are more likely to use alternative margins of labour cost adjustment. This might indicate that unions exert pressure on firms that results in rigid wage structures. As a result, firms try to overcome such restrictions by acting on other margins. We will explore this hypothesis further in the next section. Note that our variable for union coverage is available for a restricted set of firms. Hence, its inclusion results in losing almost 15% of the sample. However, the impact of unionization is confirmed in column 4, where we replace the indicator of union coverage by three dummies that characterize the type of union contracts applying to the firm: firm level, sectoral/national level, both. Table A4 in the Appendix 2 shows the distribution by country of this variable. We find that any sort of union involvement in wage negotiations results in a higher likelihood of using alternative adjustment mechanisms with respect to firms that are mainly characterized by individual negotiations. Perhaps surprisingly, we do not find significant differences between the three levels of wage negotiations outlined above.

Table 4: Alternative margins of labour cost adjustment: probit regressions

Dependent variable equals one if at least one alternative margin is used				
	(1)	(2)	(3)	(4)
Low skilled blue collar (%)	-0.046*	-0.052*	-0.060**	-0.042
	(0.099)	(0.055)	(0.044)	(0.136)
High skilled blue collar (%)	-0.021	-0.010	-0.031	-0.019
	(0.500)	(0.745)	(0.343)	(0.541)
Low skilled white collar (%)	0.024	0.042	0.019	0.025
	(0.532)	(0.274)	(0.646)	(0.531)
Exporting firm	0.027**	0.032**	0.027*	0.028**
	(0.046)	(0.015)	(0.068)	(0.039)
Share of labour costs	0.060*	0.097***	0.068**	0.075**
	(0.056)	(0.002)	(0.044)	(0.017)
Temporary workers (%)	0.005	-0.013	0.024	0.009
	(0.874)	(0.708)	(0.508)	(0.794)
Size=20-49	0.109***	0.113***	0.079***	0.106***
	(0.000)	(0.000)	(0.000)	(0.000)
Size=50-199	0.171***	0.182***	0.132***	0.162***
	(0.000)	(0.000)	(0.000)	(0.000)
Size=200+	0.228***	0.238***	0.168***	0.210***
	(0.000)	(0.000)	(0.000)	(0.000)
Implied competition - weak		0.019		
		(0.454)		
Implied competition – strong		0.090***		
		(0.000)		
Implied competition - severe		0.076***		
		(0.004)		
Perceived competition - weak	0.088**		0.112***	0.098**
	(0.032)		(0.009)	(0.017)
Perceived competition – strong	0.124***		0.149***	0.135***
	(0.001)		(0.000)	(0.000)
Perceived competition - severe	0.150***		0.171***	0.159***
	(0.000)		(0.000)	(0.000)
Coverage			0.051***	
			(0.001)	
Only outside agreement				0.057***
				(0.007)
Only firm agreement				0.072***
				(0.003)
Firm and outside agreement				0.065**
				(0.013)
Observations	7738	7979	6623	7634

Notes: Robust p values in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Marginal effects are reported. Regressions include country and sector fixed effects

We move next to the analysis of the determinants of the six labour cost adjustment strategies proposed by the survey considered separately. Table 5 presents the estimates of probit

regressions for the likelihood of using each strategy, including our preferred set of regressors: firm characteristics, the indicator of perceived competition, and three separate dummies characterizing the bargaining environment dominating wage negotiations. Some of the effects identified in Table 4 go in essentially the same way for all of the margins. Firm size is a clear example, being positively related to the probability of using each individual margin.

Worker characteristics, on the other hand, have different effects on the likelihood of choosing each of these margins. Firms with higher percentages of blue-collar workers are less likely to use bonus and benefit reduction than those with a high proportion of high-skilled white-collar workers, probably reflecting greater use of flexible pay components among the latter group. The choice of slowing promotions is also negatively related to the percentage of low-skilled blue-collar workers, suggesting that white collar workers are more frequently involved in tournaments for promotions. Such competitions can be slowed down by firms during downturns or periods of restructuring. On the other hand, firms using a higher proportion of blue-collar workers are significantly more likely to use changes in shifts if they want to reduce costs. This is easy to rationalize if we think that shift work is more common among blue than white collar workers. Firms using temporary workers are associated with a greater probability of the firm choosing to reduce benefits as a cost cutting strategy. Perhaps surprisingly, we do not find significant differences in the use of bonuses among temporary and permanent workers. Not surprisingly instead, early retirement is a tool more commonly used among firms with a greater proportion of workers with open-ended contracts.

As regards product market competition, we find that the effects outlined above are mainly driven by three margins: the reduction in benefits, the replacement of voluntary leavers with the recruitment of new employees at lower wages and changes in shift assignments. Some competition is associated with a significant increase in the first two strategies, while changing shifts is only pushed as an alternative adjustment mechanism by severe competition. Finally, we looked at the differentiated impact of wage bargaining regimes on the alternative margins under consideration. As before, the presence of unions in the wage setting process is associated with a more intensive use of all margins with the exception of bonus reductions. This suggests that unions might limit not only the flexibility of base wages, as suggested by previous literature, but also the use of flexible pay components. With the exception of changes in shifts, we tend to find that the presence of agreements at the firm level is in general associated with a more intensive use of each margin of adjustment. Using early retirement to replace high wage workers with new entrants at lower wages is a good example of this pattern. Outside agreements are associated with a 4.2pp increase in the use of this tool, while in firms with predominantly firm-level agreements the use of this adjustment

mechanism increases by 7.4pp with respect to firms who bargain with workers individually. Having instead a firm and a sectoral/national level agreement applying jointly reinforces this effect, up to 9.8pp with respect to individual negotiations. The only exception regards changes in shift assignments. In this case, outside agreements increase their use by 5pp, and this is reinforced by the joint occurrence of firm and higher level agreements. However, firms that apply firm level agreements only do not use this strategy differently than firms characterized by individual negotiations

Table 5: Alternative margins of labour cost adjustment: probit regressions

Dependent variable equals one if the respective margin is used						
	Reduce bonuses	Reduce benefits	Change shifts	Slow promotions	Cheaper hires	Early retirement
Low skilled blue collar (%)	-0.040*	-0.035**	0.069***	-0.066***	-0.021	0.034
	(0.051)	(0.017)	(0.002)	(0.000)	(0.378)	(0.113)
High skilled blue collar (%)	-0.034	-0.060***	0.051**	-0.016	0.011	0.029
	(0.151)	(0.000)	(0.046)	(0.445)	(0.671)	(0.249)
Low skilled white collar (%)	0.036	-0.027	0.024	0.028	-0.035	0.091***
	(0.217)	(0.206)	(0.462)	(0.307)	(0.311)	(0.002)
Exporting firm	0.021**	0.010	-0.007	-0.003	0.017	-0.008
	(0.044)	(0.175)	(0.518)	(0.756)	(0.132)	(0.398)
Share of labour costs	0.048**	0.009	-0.023	0.045**	0.055**	0.004
	(0.044)	(0.624)	(0.364)	(0.032)	(0.035)	(0.864)
Only outside agreement	0.028	0.025*	0.052***	-0.021	0.015	0.042**
	(0.110)	(0.052)	(0.007)	(0.177)	(0.417)	(0.033)
Only firm agreement	0.011	0.033**	0.015	0.016	0.038*	0.074***
	(0.536)	(0.013)	(0.412)	(0.328)	(0.068)	(0.000)
Firm and outside agreement	0.025	0.041**	0.085***	-0.011	0.011	0.098***
	(0.233)	(0.018)	(0.003)	(0.588)	(0.614)	(0.000)
Temporary workers (%)	0.007	0.032*	0.062**	0.024	0.031	-0.066**
	(0.784)	(0.070)	(0.021)	(0.300)	(0.286)	(0.015)
Size=20-49	0.046***	0.023**	0.049***	0.047***	0.097***	0.058***
	(0.002)	(0.040)	(0.002)	(0.001)	(0.000)	(0.000)
Size=50-199	0.068***	0.035***	0.080***	0.071***	0.109***	0.068***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Size=200+	0.097***	0.050***	0.070***	0.090***	0.156***	0.148***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Perceived comp – weak	0.033	0.052*	0.032	0.005	0.118***	-0.012
	(0.330)	(0.064)	(0.356)	(0.870)	(0.006)	(0.666)
Perceived comp – strong	0.045	0.045**	0.030	0.029	0.115***	-0.034
	(0.127)	(0.045)	(0.313)	(0.268)	(0.002)	(0.181)
Perceived comp – severe	0.038	0.053**	0.065**	0.035	0.138***	-0.001
	(0.206)	(0.023)	(0.036)	(0.180)	(0.000)	(0.982)
Observations	7634	7634	5689	7306	7306	6148

Notes: Robust p values in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Marginal effects are reported. Regressions include country and sector fixed effects

5. Wage Rigidity and Alternative Margins

Are firms subject to wage rigidity more likely to use the alternative margins of adjustment? In the previous section we have found that firms are more likely to use these alternative channels of labour costs adjustments if unions are present in wage setting. In parallel, there is an ample literature now (Dickens et al., 2007, Holden and Wulfsberg, 2008 and Babecký et al., 2009, the latter using this dataset) suggesting a prominent role of unions in the determination of downward (nominal or real) wage rigidity. Hence, it is natural to ask in our framework if firms more subject to some form of wage rigidity are more likely to use any of these alternative margins of adjustment.

Our survey allows constructing three different measures of wage rigidity. We asked directly the managers of firms if they ever cut or froze wages during the previous five years. Following the identifying assumption in some of the micro literature of downward nominal wage rigidity (see for instance Nickell and Quintini, 2003), we regard firms that froze wages at any point during this interval as showing evidence of nominal wage rigidity. Most likely this reflects downward nominal wage rigidity, since an analysis of more than 360 yearly wage change distributions for individuals who stayed in the same job in a large number of countries suggests that 'menu costs' are not an important element of wage setting (Dickens et al., 2007). However, our data does not allow disentangling symmetric from asymmetric nominal wage rigidity, so we cannot rule out that some of these wage freezes reflect pure menu costs. Nonetheless, they constitute a symptom of rigid wage structures. An important element to take into account is that this measure refers to the previous five years. Since the survey was conducted between the end of 2007 and the beginning of 2008, in most cases the firms are responding about the incidence of wage freezes in an upswing, or period of relatively favourable conditions. Hence, we are most likely under-estimating the incidence of downward nominal wage rigidity. In this case, to the extent that the latent association between downward nominal wage rigidity and the use of alternative margins of labour cost adjustment is positive, our estimates would be a lower bound of the true impact.

We also 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 was with respect to past or expected inflation. Using information from these questions, we consider two different definitions of wage indexation, which we view as a particular form of real wage rigidity. We consider firms to apply a “strict

indexation rule" if they have an automatic link between wages and past or expected inflation, i.e. those who apply automatic wage indexation. Alternatively, we consider firms to apply an "formal and informal indexation rule" if they link or take into account inflation at the time of setting wages.

Table 6 shows that indexation is much more prevalent in our data (17% of firms are affected by strict indexation rules, while 35% apply some form of formal or informal indexation) than wage freezes (only 9% of firms are affected), which is consistent with other evidence on wage rigidity in most continental European countries, as opposed to the US and the UK (see e.g. Dickens et al., 2008). Wage freezes appear more common than average in the Czech Republic, Estonia, Lithuania and the Netherlands. They are considerably rarer than average in Spain, France, Hungary, Italy and Slovenia. Indexation mechanisms are especially prevalent in Belgium, Spain and Slovenia, and much less so in Italy, Estonia and Poland. Overall, we find that the non-euro member states of the EU are almost twice as likely to experience wage freezes compared to the euro area member states, but that the reverse is true for pure indexation mechanisms.

Table 6: Wage freezes and indexation mechanisms

Country	Wage freezes	Pure Indexation	Formal or informal indexation
Austria	0.133	0.098	0.221
Belgium	0.118	0.982	0.982
Czech Republic	0.265	0.117	0.590
Estonia	0.217	0.044	0.538
Spain	0.024	0.548	0.707
France	0.071	0.096	0.322
Greece	0.125	0.200	0.426
Hungary	0.059	0.112	0.315
Ireland	0.087	0.095	0.318
Italy	0.039	0.017	0.058
Lithuania	0.199	0.108	0.486
Netherlands	0.232	N/A	N/A
Poland	0.100	0.069	0.3067
Portugal	0.150	0.090	0.509
Slovenia	0.029	0.235	0.605
Total	0.096	0.167	0.352
Euro area	0.082	0.201	0.376
Non-euro area	0.134	0.085	0.343

Note: Proportion of firms having frozen wages over the past five years and applying an automatic indexation mechanism, employment-weighted averages

Our next set of regressions examines the relationship between wage rigidities and the different margins of adjustment analysed above. First, we run probit regressions of the likelihood of using each of the margins separately, as well as the likelihood of using any of the margins including measures of wage freezes and pure indexation mechanisms. A second set of regressions uses the same set of dependent variables and includes among the covariates again our measure of wage freezes and the extended (formal plus informal) measure of indexation. In all specifications we retain the basic set of control variables including country and sector fixed effects, the three indicators of labour force characteristics, firm size dummies, the share of temporary contracts and labour costs in total costs, indicators of perceived competition, and a set of dummies characterizing the bargaining arrangement most prevalent in the firm.

Table 7 presents the results for wage freezes and strict indexation rules, and indicates a clear positive association between nominal wage rigidity on the likelihood of using some alternative margin of adjustment. Having experienced a wage freeze during the preceding five years increases the likelihood of using alternative margins of labour cost cutting by 23pp. The effect is significant at the 1% level. This effect is relatively large, especially taking into account that it represents a lower bound of the true relationship between the two variables. Quite surprisingly, we find that firms applying a strict indexation rule are less likely to use some of the cost-cutting strategies. The marginal effect is much smaller in this case (-4pp) than in the case of wage freezes, and only significant at the 10% level. One possible explanation for this finding is that the same factors that drive formal wage indexation mechanisms at the firm level limit the use of alternative cost-cutting strategies. It should be noted however than when we replace the strict indexation rules for our indicator of “formal and informal” indexation (Table 8) always find that the marginal effect is small, and not statistically different from cero.

When we move at the analysis of each margin considered separately, we find that nominal wage rigidity applies across the board. The marginal effects in Table 7 range from 15pp in the case of slowing down the promotions to 4pp in the case of using early retirement to replace high wage workers with new entrants at lower wages. In all cases the marginal effects are statistically significant at the 1% level, and are virtually unchanged if we replace the indicator of strict indexation for formal/informal indexation in Table 8. An interesting feature of our regressions is that we control in all cases for the impact of unions including our usual set of dummy variables for the different types of predominant wage bargaining regimes. The marginal effects of the union activity dummies remain significant, and are not substantially altered by the inclusion of the indicators of nominal and real rigidity. Similarly, we have

experimented excluding the dummies for unions from the regressions and the marginal effect of nominal rigidity and indexation we obtain are very similar.[8] Nothing changes either if we include or exclude in alternative specifications the indicator of union coverage. This suggests that, contrary to our initial expectations, the indicators of wage rigidity are capturing constraints at the time of wage setting that are not sufficiently explained by our indicators of unionization. Attending to the marginal effects of nominal wage freezes, these constraints seem even more important than those imposed by the wage setting environment.

Table 7: Alternative margins of labour cost adjustment and wage rigidities

Dependent variable equals one if the respective margin is used							
	Some margin	Reduce bonuses	Reduce benefits	Change shifts	Slow promotions	Cheaper hires	Early retirement
Low skilled blue collar (%)	-0.022	-0.025	-0.030**	0.074***	-0.061***	-0.017	0.034
	(0.448)	(0.246)	(0.047)	(0.001)	(0.001)	(0.478)	(0.115)
High skilled blue collar (%)	-0.010	-0.029	-0.062***	0.054**	-0.012	0.007	0.027
	(0.757)	(0.232)	(0.000)	(0.035)	(0.574)	(0.797)	(0.283)
Low skilled white collar (%)	0.045	0.054*	-0.020	0.027	0.031	-0.032	0.092***
	(0.261)	(0.068)	(0.350)	(0.406)	(0.250)	(0.361)	(0.002)
Exporting firm	0.025*	0.022**	0.009	-0.010	-0.006	0.011	-0.007
	(0.080)	(0.044)	(0.227)	(0.399)	(0.554)	(0.362)	(0.413)
Share of labour costs	0.066**	0.042*	0.008	-0.024	0.034	0.055**	0.006
	(0.040)	(0.083)	(0.664)	(0.352)	(0.102)	(0.038)	(0.779)
Nominal wage rigidity	0.227***	0.126***	0.062***	0.074***	0.153***	0.110***	0.039***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.007)
Strict Indexation	-0.039*	-0.033**	-0.019*	-0.041**	-0.053***	0.000	0.002
	(0.057)	(0.038)	(0.086)	(0.020)	(0.000)	(0.980)	(0.882)
Only outside agreement	0.057***	0.028	0.027**	0.049**	-0.022	0.013	0.044**
	(0.008)	(0.110)	(0.042)	(0.011)	(0.142)	(0.472)	(0.021)
Only firm agreement	0.077***	0.012	0.036***	0.020	0.018	0.037*	0.075***
	(0.002)	(0.497)	(0.008)	(0.278)	(0.277)	(0.079)	(0.000)
Firm and outside agreement	0.075***	0.032	0.032*	0.093***	-0.009	0.013	0.104***
	(0.005)	(0.139)	(0.068)	(0.002)	(0.637)	(0.575)	(0.000)
Temporary workers (%)	0.020	0.011	0.029	0.058**	0.023	0.037	-0.062**
	(0.559)	(0.681)	(0.102)	(0.033)	(0.311)	(0.204)	(0.020)
Size=20-49	0.096***	0.042***	0.023**	0.044***	0.046***	0.096***	0.055***
	(0.000)	(0.005)	(0.035)	(0.008)	(0.001)	(0.000)	(0.000)
Size=50-199	0.154***	0.057***	0.034***	0.075***	0.070***	0.108***	0.071***
	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)
Size=200+	0.210***	0.092***	0.053***	0.067***	0.092***	0.160***	0.147***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Perceived comp - weak	0.097**	0.031	0.055*	0.029	0.004	0.113***	-0.010
	(0.021)	(0.365)	(0.052)	(0.398)	(0.877)	(0.009)	(0.712)
Perceived comp – strong	0.130***	0.041	0.043*	0.029	0.026	0.111***	-0.034
	(0.001)	(0.171)	(0.056)	(0.337)	(0.310)	(0.002)	(0.170)
Perceived comp - severe	0.148***	0.027	0.048**	0.060*	0.024	0.132***	0.000
	(0.000)	(0.367)	(0.040)	(0.054)	(0.359)	(0.000)	(0.988)

[8] Detailed results are presented in Tables A5 and A6 in Appendix 5.

Observations	7302	7302	7302	5579	7006	7006	5870

Notes: Robust p values in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Marginal effects are reported. Regressions include country and sector fixed effects

Table 8: Alternative margins of labour cost adjustment and wage rigidities: formal and informal indexation rules

Dependent variable equals one if the respective margin is used							
	Some margin	Reduce bonuses	Reduce benefits	Change shifts	Slow promot.	Cheaper hires	Early retire.
Low skilled blue collar (%)	-0.020	-0.024	-0.031**	0.074***	-0.061***	-0.016	0.033
	(0.488)	(0.250)	(0.042)	(0.001)	(0.001)	(0.506)	(0.122)
High skilled blue collar (%)	-0.009	-0.028	-0.062***	0.054**	-0.012	0.008	0.027
	(0.776)	(0.242)	(0.000)	(0.035)	(0.558)	(0.769)	(0.286)
Low skilled white collar (%)	0.047	0.055*	-0.020	0.028	0.033	-0.031	0.091***
	(0.247)	(0.064)	(0.349)	(0.389)	(0.226)	(0.373)	(0.002)
Exporting firm	0.024*	0.022**	0.010	-0.010	-0.005	0.011	-0.007
	(0.081)	(0.040)	(0.224)	(0.411)	(0.579)	(0.359)	(0.411)
Share of labour costs	0.067**	0.041*	0.006	-0.025	0.036*	0.055**	0.005
	(0.037)	(0.089)	(0.725)	(0.331)	(0.092)	(0.038)	(0.816)
Nominal wage rigidity	0.230***	0.131***	0.063***	0.077***	0.159***	0.112***	0.038***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.008)
Formal/informal indexation	0.004	-0.001	-0.008	-0.007	-0.010	0.008	-0.002
	(0.740)	(0.897)	(0.258)	(0.518)	(0.276)	(0.486)	(0.833)
Only outside agreement	0.057***	0.028	0.026**	0.049**	-0.023	0.013	0.044**
	(0.009)	(0.116)	(0.045)	(0.012)	(0.137)	(0.477)	(0.021)
Only firm agreement	0.075***	0.011	0.036***	0.019	0.016	0.037*	0.076***
	(0.002)	(0.525)	(0.008)	(0.302)	(0.332)	(0.082)	(0.000)
Firm and outside agreement	0.074***	0.032	0.032*	0.091***	-0.010	0.013	0.105***
	(0.006)	(0.150)	(0.070)	(0.002)	(0.597)	(0.561)	(0.000)
Temporary workers (%)	0.021	0.012	0.028	0.059**	0.023	0.038	-0.063**
	(0.548)	(0.656)	(0.105)	(0.031)	(0.313)	(0.198)	(0.020)
Size=20-49	0.096***	0.042***	0.023**	0.044***	0.045***	0.096***	0.055***
	(0.000)	(0.005)	(0.037)	(0.008)	(0.002)	(0.000)	(0.000)
Size=50-199	0.154***	0.057***	0.035***	0.076***	0.071***	0.107***	0.071***
	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)
Size=200+	0.210***	0.091***	0.054***	0.067***	0.094***	0.159***	0.147***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Perceived comp - weak	0.095**	0.029	0.054*	0.027	0.003	0.112***	-0.009
	(0.024)	(0.388)	(0.055)	(0.430)	(0.929)	(0.009)	(0.723)
Perceived comp – strong	0.128***	0.039	0.043*	0.027	0.024	0.110***	-0.033
	(0.001)	(0.186)	(0.059)	(0.379)	(0.353)	(0.002)	(0.173)
Perceived comp - severe	0.147***	0.026	0.048**	0.058*	0.022	0.132***	0.000
	(0.000)	(0.383)	(0.043)	(0.061)	(0.391)	(0.000)	(0.988)
Observations	7308	7308	7308	5581	7012	7012	5876

Notes: Robust p values in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Marginal effects are reported. Regressions include country and sector fixed effects

6. Conclusions

We have examined the importance and determinants of six alternative strategies firms might use to cut their labour costs when business conditions are bad, using a large and quite rich survey of European firms from 12 EU countries. These strategies are: 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; and encourage early retirement to replace high wage employees by entrants with lower wages.

We found substantial heterogeneity in the use of each of these strategies across countries and firms, depending on firm characteristics and labour market institutions. Not surprisingly, larger firms show greater margin of manoeuvre with respect to using any of these strategies in order to adjust labour costs. Similarly, different indicators of the severity of competition suggest that firms in more competitive environments are more likely to engage in several of these strategies. Perhaps less obviously, we found that the presence of unions in wage setting is associated with a greater use of most of the strategies. A plausible explanation is that unions limit the flexibility of wages, pushing firms towards alternative labour cost cutting strategies. However, when we controlled for different indicators of wage rigidity (either nominal wage rigidity or alternative definitions of wage indexation) the impact of unionization on the use of these different margins subsists. Moreover, we find that firms subject to nominal wage rigidities are much more likely to use each of these six alternative cost-cutting strategies. This indicates that there is some degree of substitutability between wage flexibility and the flexibility of other labour cost components, and that this substitutability is not limited by the presence of unions.

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Appendix 1: Survey characteristics

Country	Sectors covered	Fims' size	Sample	Number of responding firms (response rate)	How was the survey carried out
Austria	Manufacturing , Energy, Construction, Trade, Market services, Financial Intermediation	≥5	3500	557 (16%)	External company: traditional mail
Belgium	Manufacturing , Energy, Construction, Trade, Market services, Financial Intermediation	≥5	4100	1431 (35%)	NBB: traditional mail
Czech Republic	Manufacturing , Construction, Trade, Market services	≥20	1591	399 (25%)	CNB branches: internet
Estonia	Manufacturing , Construction, Trade, Market services	≥5	1400	366 (26%)	External company: internet
France	Manufacturing , Trade, Market services, Non-market services	≥5	6500	2029 (31%)	Local branches: phone, mail and face to face
Germany	Manufacturing , Market services, Non-market services	All	4600	1832 (40%)	IFO: traditional mail
Greece	Manufacturing , Trade, Market services, Non-market services	All	5000	429 (9%)	External company: traditional mail
Hungary	Manufacturing , Energy,Construction, Trade, Market services, Financial Intermediation	≥5	3785	2006 (53%)	External company: face to face interviews

Country	Sectors covered	Fims' size	Sample	Number of responding firms (response rate)	How was the survey carried out
Ireland	Manufacturing , Energy, Construction, Trade, Market services, Financial Intermediation, Non-market services	≥5	4000	985 (25%)	External company: traditional mail, phone
Italy	Manufacturing , Trade, Market services, Financial Intermediation	≥5	4000	953 (24%)	External company: internet
Lithuania	Manufacturing , Energy, Construction, Trade, Market services, Financial Intermediation,	All	2810	343 (12%)	External company: phone, mail and face to face
Netherlands	Manufacturing , Construction, Trade, Market services, Financial Intermediation,	≥5	2116	1068 (50%)	External company: internet
Poland	Manufacturing , Energy, Construction, Trade, Market services, Financial Intermediation	All	1600	1161 (73%)	National Bank of Poland branches: traditional mail
Portugal	Manufacturing , Energy, Construction, Trade, Market services, Financial Intermediation, Non-market services	≥5	5000	1436 (29%)	Banco de Portugal: traditional mail, internet
Slovenia	Manufacturing , Energy, Construction, Trade, Market services, Financial Intermediation	≥5	3000	666 (22%)	Banka Slovenije: traditional mail and Internet
Spain	Manufacturing , Energy, Trade, Market services	All	3000	1835 (61%)	External company: Mail, phone, fax, internet

Appendix 2: Sample characteristics

Table A1:Country composition of the sample		
Country	Number of observations	Percent of total
Belgium	1,431	12.01
Czech Republic	399	3.35
Estonia	366	3.07
France	2,029	17.02
Greece	402	3.37
Hungary	2,006	16.83
Ireland	985	8.26
Italy	953	8
Lithuania	337	2.83
Poland	908	7.62
Portugal	1,436	12.05
Slovenia	666	5.59
Non euro area	4,016	33.7
Euro area	7,902	66.3
Total	**11,918**	**100**

Table A2: Sectoral composition of the sample		
Sector	Number of firms	Percent of total
Manufacturing	5,057	42.66
Energy	107	0.9
Construction	932	7.86
Trade	2,277	19.21
Market services	3,064	25.85
Financial intermediation	225	1.9
Non-market services	192	1.62
Total	11,854	100

Table A3: Size composition of the sample		
Size	Number of firms	Percent of total
5-19	2,895	24.29
20-49	2,829	23.74
50-199	3,793	31.83
200+	2,401	20.15
Total	11,918	100

Table A4: Type of union contracts (% of firms)

	Only outside agreement	Only firm agreement	Both agreements
Belgium	0.641	0.015 (N)	0.337
Czech Republic	0.024	0.363 (D)	0.151
Estonia	0.017	0.087 (D)	0.017
France	0.413	0.001 (D)	0.585
Greece	0.726	0.076 (N)	0.133
Hungary	0.000	0.190 (D)	0.000
Ireland	0.407	0.036 (N)	0.278
Italy	0.568	0.001 (N)	0.428
Lithuania	0.005	0.234 (D)	0.003
Poland	0.015	0.182 (D)	0.032
Portugal	0.517	0.030 (N)	0.069
Slovenia	0.743	0.257 (N)	0.000
Euro area	0.535	0.016 .	0.402
Non euro area	0.014	0.216 .	0.046
Total	0.352	0.086 .	0.276

Note: Figures are employment-weighted and re-scaled to exclude non-responses. Total and euro country aggregates exclude Germany. Country-level institutional information from Du Caju et al. (2008) between brackets: firm-level agreements: D = company level is dominant in the country, N = company level is not dominant in the country.

Appendix 3: Employment adjusted sampling weight

Formally the employment adjusted sampling weight is the product of three individual weights:

$$w_l = w_1 w_2 w_3$$

w_1: adjusts for the unequal probability of firms being included in the intended sample i.e. probability of receiving a questionnaire

$$w_1 = \left(N_h \middle/ n_h^* \right)$$

N_h : Population of firms within each stratum

n_h^* : Intended gross sample of firms within each stratum

w_2: adjusts for non response

$$w_2 = \left(n_h^* \middle/ n_h \right)$$

n_h : Realized sample of firms within each stratum, i.e. the actual number of firms that receive and reply to the questionnaire

The product of w_1 and w_2, which differ by construction across strata is equal to $w_1 w_2 = \left(N_h \middle/ n_h \right)$, corrects for the unequal probability of firms being included in the realized sample.

w_3: adjusts for differences in the average firm size (in the population) across different strata

$$w_3 = \left(L_h \middle/ N_h \right)$$

L_h: is population employment in each stratum

By combining the expressions for w_1, w_2 and w_3, we obtain the following expression for the employment adjusted weight: $w_l = \left(L_h \middle/ n_h \right)$. Therefore, the employment adjusted weight is equal to the population employment in each stratum divided by the number of firms, in each stratum, in the realized sample.

Appendix 4: Questions used for the creation of the variables

Question 6 *– Does your firm have a policy that adapts changes in base wages to inflation?*

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

No □
Yes □

Question 7 *– If "yes" in question 6, please select the options that best reflects the policy followed:*

Wage changes are automatically linked to:
- past inflation □
- expected inflation □

Although there is no formal rule, wage changes take into account:
- past inflation □
- expected inflation □

Question 14 *– Over the last five years, has the base wage of some employees in your firm ever been frozen?*

Definition of freeze in base wage - base wage in nominal terms remains unchanged from a pay negotiation to the next.

- No □
- Yes (indicate for what percentage of your employees) _____%

Question 18 *–Has any of the following strategies ever been used in your firm to reduce labour costs?*

Please choose as many options as apply to your firm.

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

Appendix 5:

Table A5: Alternative margins of labour cost adjustment and wage rigidities

Dependent variable equals one if the respective margin is used							
	Some margin	Reduce bonuses	Reduce benefits	Change shifts	Slow promotions	Cheaper hires	Early retire.
Low skilled blue collar (%)	-0.027	-0.027	-0.033**	0.075***	-0.058***	-0.021	0.028
	(0.348)	(0.200)	(0.028)	(0.001)	(0.002)	(0.365)	(0.181)
High skilled blue collar (%)	-0.012	-0.031	-0.061***	0.058**	-0.011	0.005	0.027
	(0.714)	(0.200)	(0.000)	(0.023)	(0.593)	(0.859)	(0.270)
Low skilled white collar (%)	0.045	0.050*	-0.022	0.027	0.034	-0.029	0.095***
	(0.256)	(0.087)	(0.293)	(0.400)	(0.211)	(0.405)	(0.001)
Exporting firm	0.023*	0.020*	0.008	-0.012	-0.005	0.010	-0.008
	(0.097)	(0.058)	(0.279)	(0.302)	(0.623)	(0.384)	(0.364)
Share of labour costs	0.053*	0.036	0.006	-0.028	0.032	0.049*	0.003
	(0.099)	(0.125)	(0.714)	(0.259)	(0.126)	(0.059)	(0.877)
Nominal wage rigidity	0.227***	0.126***	0.061***	0.074***	0.152***	0.111***	0.039***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.007)
Strict Indexation	-0.035*	-0.032**	-0.019	-0.039**	-0.053***	0.006	0.005
	(0.092)	(0.042)	(0.102)	(0.025)	(0.000)	(0.754)	(0.726)
Temporary workers (%)	0.015	0.012	0.024	0.056**	0.024	0.033	-0.074***
	(0.671)	(0.640)	(0.166)	(0.038)	(0.296)	(0.263)	(0.006)
Size=20-49	0.100***	0.044***	0.024**	0.046***	0.046***	0.100***	0.062***
	(0.000)	(0.003)	(0.027)	(0.004)	(0.001)	(0.000)	(0.000)
Size=50-199	0.164***	0.061***	0.038***	0.081***	0.070***	0.115***	0.089***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size=200+	0.230***	0.101***	0.062***	0.077***	0.098***	0.173***	0.189***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Perceived comp - weak	0.084**	0.026	0.050*	0.026	0.001	0.109**	-0.019
	(0.044)	(0.446)	(0.069)	(0.444)	(0.976)	(0.011)	(0.462)
Perceived comp – strong	0.117***	0.035	0.039*	0.026	0.022	0.106***	-0.045*
	(0.002)	(0.235)	(0.084)	(0.381)	(0.379)	(0.003)	(0.064)
Perceived comp - severe	0.137***	0.022	0.045*	0.059*	0.020	0.128***	-0.010
	(0.000)	(0.450)	(0.052)	(0.055)	(0.446)	(0.001)	(0.676)
Observations	7394	7394	7394	5639	7098	7098	5945

Notes: Robust p values in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Marginal effects are reported. Regressions include country and sector fixed effects

Table A6: Alternative margins of labour cost adjustment and wage rigidities: formal and informal indexation rules

Dependent variable equals one if the respective margin is used							
	Some margin	Reduce bonuses	Reduce benefits	Change shifts	Slow promotions	Cheaper hires	Early retire.
Low skilled blue collar (%)	-0.025	-0.027	-0.033**	0.074***	-0.058***	-0.020	0.028
	(0.386)	(0.204)	(0.025)	(0.001)	(0.002)	(0.395)	(0.191)
High skilled blue collar (%)	-0.011	-0.030	-0.061***	0.058**	-0.012	0.006	0.027
	(0.733)	(0.207)	(0.000)	(0.024)	(0.573)	(0.829)	(0.271)
Low skilled white collar (%)	0.046	0.051*	-0.022	0.028	0.035	-0.028	0.094***
	(0.245)	(0.083)	(0.292)	(0.386)	(0.193)	(0.416)	(0.001)
Exporting firm	0.023*	0.021*	0.008	-0.012	-0.004	0.010	-0.008
	(0.098)	(0.053)	(0.276)	(0.314)	(0.656)	(0.384)	(0.362)
Share of labour costs	0.054*	0.036	0.005	-0.030	0.033	0.050*	0.002
	(0.091)	(0.132)	(0.774)	(0.241)	(0.117)	(0.058)	(0.914)
Nominal wage rigidity	0.231***	0.130***	0.062***	0.078***	0.158***	0.111***	0.038***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.008)
Formal/ informal indexation	0.005	-0.001	-0.007	-0.008	-0.011	0.010	-0.000
	(0.673)	(0.892)	(0.289)	(0.468)	(0.208)	(0.365)	(0.994)
Temporary workers (%)	0.015	0.013	0.024	0.057**	0.024	0.033	-0.075***
	(0.654)	(0.614)	(0.170)	(0.036)	(0.295)	(0.254)	(0.006)
Size=20-49	0.099***	0.044***	0.024**	0.046***	0.045***	0.099***	0.062***
	(0.000)	(0.003)	(0.029)	(0.004)	(0.001)	(0.000)	(0.000)
Size=50-199	0.164***	0.061***	0.039***	0.081***	0.071***	0.114***	0.089***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size=200+	0.230***	0.100***	0.063***	0.077***	0.100***	0.171***	0.189***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Perceived comp - weak	0.082**	0.024	0.050*	0.024	-0.001	0.108**	-0.018
	(0.049)	(0.470)	(0.073)	(0.475)	(0.977)	(0.012)	(0.470)
Perceived comp – strong	0.116***	0.034	0.038*	0.024	0.021	0.106***	-0.045*
	(0.003)	(0.252)	(0.088)	(0.422)	(0.421)	(0.003)	(0.065)
Perceived comp - severe	0.136***	0.022	0.045*	0.057*	0.018	0.127***	-0.010
	(0.000)	(0.468)	(0.055)	(0.062)	(0.476)	(0.001)	(0.674)
Observations	7400	7400	7400	5641	7104	7104	5951

Notes: Robust p values in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Marginal effects are reported. Regressions include country and sector fixed effects

Appendix 6: Variable definitions

Proportion of low skilled blue collar employees.

Proportion of high skilled blue collar employees.

Proportion of low skilled white collar employees.

Perceived comp – weak etc: Self defined competition capturing firms' perception regarding the intensity of product market competition.

Implied comp – weak etc: implied competition. Inferred from the question on whether firms follow the price changes of their competitions.

Exporting firm: Dummy taking the value of firms report having revenues from exporting activity.

Share of labour cost: Proportion of total costs that are due to labour costs

Proportion of temporary workers

Nominal wage rigidity: Downward nominal wage rigidity-whether firms have frozen wages in the last five years.

Strict indexation: whether firms' wages are automatically linked to past or expected inflation.

Formal /informal indexation: whether firms' wages are automatically or informally linked to past or expected inflation.

Only outside agreement: Firms apply only an agreement concluded outside the firm.

Only firm agreement: Firms apply only an agreement concluded within the firm.

Firm and outside agreement: Firm apply both firm and outside agreement

Coverage: Indicates the proportion of workers covered by collective bargaining contract(s)