Received March 2005
Revised September 2006
Accepted September 2006

Who bears the burden of wage cuts? Evidence from Finland during the 1990s

Petri Böckerman
Labour Institute for Economic Research, Helsinki, Finland
Seppo Laaksonen
University of Tampere, Tampere, Finland and University of Helsinki, Helsinki, Finland, and
Jari Vainiomäki
University of Tampere, Tampere, Finland

Abstract

Purpose – This paper aims to explore the incidence of nominal and real wage cuts in the Finnish private sector during the 1990s.

Design/methodology/approach – Estimation of econometric models for the probability of wage cuts using individual-level wage survey data from the payroll records of the Finnish employers' organizations.

Findings – Centralized nominal wage freezes together with a positive inflation rate produced real wage cuts for a large proportion of workers during the worst recession years of the early 1990s. Hence, centralized bargaining shaped the adjustment. The share of nominal wage cuts does not increase with falling inflation, which is consistent with downward wage rigidities. Full-time workers have had a lower likelihood of wage cuts compared with part-time workers. Declines in wages have also been more common in small plants. There is an important transitory component in wage cuts.

Practical implications – Provides useful information about the adjustment of wages at the individual level.

Originality/value – Few papers have analysed individual and employer characteristics that account for wage cuts. The paper contributes to the literature on wage rigidity.

Keywords Finland, Pay policies, National economy, Private sector organizations

Paper type Research paper

This paper is part of two projects financed by The Finnish Work Environment Fund (Työsuojelurahasto): Wage rigidity and labour market impacts of inflation; and Labour market rules: industrial relations, collective bargaining and income policy in the 21st century. We are grateful to Steinar Holden, Reija Lilja, Jukka Pekkarinen, Kjell G. Salvanes, Kenneth Snellman and Roope Uusitalo for comments. An earlier version of this paper was presented at the EALE conference, Lisbon and we are grateful to the seminar audience for comments. We are grateful to Heikki Almgren, Auli Jaakkola and Ralf Ramm-Schmidt for providing help with the usage of the data and we thank two anonymous referees for valuable comments and suggestions that have greatly improved the paper. Paul A. Dillingham has kindly checked the language. The usual disclaimer applies.

International Journal of Manpower
Vol. 28 No. 2, 2007
pp. 100-121

0143-7720
DOI 10.1108/01437720710747947

1. Introduction

This paper contributes to the literature on wage rigidity by considering the incidence of wage cuts. The aim of this paper is to investigate the number of wage cuts in different segments of labour markets and, in particular, to shed light on individual and employer characteristics and the forms of remuneration that account for observed wage cuts[1]. By doing this, the paper complements the picture painted by the earlier survey studies on the factors that matter for wage cuts[2]. In terms of the nature of wage cuts, the amount of their persistence is an important issue for individuals. These questions can be addressed by using comprehensive micro-level data on wages.

The incidence of wage cuts in Finland during the 1990s is particularly interesting, because of the exceptional macroeconomic development. Finland suffered its worst economic crisis of the twentieth century not in the 1930s but in the early 1990s (e.g. Kiander and Vartia, 1996; Honkapohja and Koskela, 1999; Böckerman and Kiander, 2002). As a consequence of the unprecedented depression, output fell by 14 per cent in the years 1990-1993. The rate of unemployment surged correspondingly from 3 per cent to 17 per cent[3]. These indicators were much worse than those recorded during the great depression of the 1930s. Since 1994 the economy has recovered and unemployment has dropped steadily but remained high (at about 10 per cent) towards the end of the 1990s. This period provides an excellent environment in which to study the extent and incidence of wage cuts.

Despite the collapse in labour demand, there were no overall cuts in the aggregate nominal wages during 1990-1993 Finnish depression, according to commonly used earnings indices. There was, however, significant nominal wage moderation through the use of the instruments of the centralized bargaining system. Nominal wages were frozen by the collective agreements over the period 1992-1993. The rate of inflation was slower than expected and there was a continuation of a small but positive wage drift. This meant that aggregate real wages remained more or less unchanged in 1992-1994[4]. The macroeconomic pattern of non-adjustment can be contrasted to the micro-level dynamics of individual wages during this turbulent decade[5].

The paper proceeds as follows. Section 2 provides theoretical considerations. Section 3 contains information about the data. Section 4 includes a description of the heterogeneity of individual-level wage changes. Section 5 reports our estimation results. The last section concludes.

2. Theoretical considerations

There are two leading theories for downward nominal wage rigidity. These are fairness and contracts. The mutual resistance for wage cuts by employees and employers can arise from the fairness standards (e.g. Solow, 1990; Bewley, 1998; Fehr and Gächter, 2000; Akerlof, 2002). The fairness standards constitute direct obstacles to nominal wage declines. The fairness standards can be different for different groups of the labour force. For instance, fairness standards should be looser for young employees, owing to the short history of repeated interactions between the worker and the firm (e.g. Fehr and Goette, 2000). Hence, employers may not feel constrained by the fairness standards preventing wage cuts in relation to young employees that have not yet established their labour market positions within the firms.

Holden (1994) stresses that in the current European institutional setting, in contrast to the United States, nominal wage cuts require mutual consent between employees and employers, that is, unions or workers have to agree on wage cuts suggested by employers. This will have an effect on the bargaining positions of the parties involved. As a result, workers have a strategic advantage in the wage negotiations when they try to prevent cuts in nominal wages[6]. Holden (2004b) argues that the extent of downward nominal wage rigidity is positively related to the coverage of collective labour agreements and the strictness of the employment protection legislation[7]. In particular, employment protection is often weaker for temporary and part-time workers in two-tier labour markets.

The nominal rigidity of wage contracts may also be a measure to induce efficient firm-specific investments (e.g. MacLeod and Malcomson, 1993; Holden, 1999; Malcomson, 1997, 1998). Nominal wage cuts may terminate firm-specific investments because a decline in wages increases the likelihood that a worker will quit from the current match (e.g. Eckstein and Van den Berg, 2003). There is evidently less accumulated firm-specific investments for young employees. Hence, declines in nominal wages can be implemented for young employees without the nullification of sunk costs associated with these firm-specific investments.

Downward real wage rigidity emerges from union resistance or it can be based on efficiency wage considerations by employers. Union resistance against real wage cuts is highly relevant in the institutional context of European labour markets. This applies to Finland, because the union density is nowadays around 70 per cent (Böckerman and Uusitalo, 2006). Efficiency-wage theory implies that real wage cuts should be less likely for the groups of the labour force that are most important for the productivity of a firm, such as older, more experienced workers. The reason is that declines in real wages may yield an outflow of these key groups of workers and therefore hurt the productivity and the profitability of a firm (e.g. Yellen, 1984)[8].

We briefly discussed explanations for the resistance of wage cuts in terms of the age of a worker in this section. These theoretical explanations are relevant also with respect to other characteristics of individuals and firms, like gender, length of working hours and firm size. The importance of different motives for wage rigidity may, of course, vary across labour market segments. Furthermore, there may be other explanatory factors, such as institutional constraints (e.g. minimum wages), that affect our results regarding wage cuts. These issues are further discussed in connection with our empirical results when relevant.

3. The data

The data for this paper come directly from the payroll records of the Finnish employers' organizations, covering all employees of their member firms. The structure of this data is quite similar across the three sectors that we are using in this paper. It provides detailed information about wages and employees' individual characteristics (such as age and gender). The data used here, due to its origin in the employers' payroll records, is considered to be very accurate by its nature. Hence, the measurement error should not be a great problem in the data sources[9]. There are two major differences in this data across the sectors: the timing and the wage concept. The data for manual workers in manufacturing cover the last quarter of each year. In contrast, the data for

non-manual workers in manufacturing and private service sector workers cover one month of each year[10]. The hourly rate has been applied for manual workers in manufacturing, whereas the monthly rate for non-manual workers in manufacturing and private service sector workers.

There are two alternatives for measuring the hourly rate for manual workers in manufacturing. These are regular wage per hour and basic time wage per hour. We use them both in the following analysis. The regular wage per hour includes piece-rate paid and performance paid work in addition to straight time work, but the basic time wage per hour does not include these. Both measures exclude overtime pay and overtime hours, and shift work, evening, night and Sunday bonuses and bonuses based on working conditions. They include any firm-specific wages paid above the minimum wage scales determined in contracts, and any "personal bonus" paid. These are incorporated in the "wage rate per hour" that is each person's individual hourly wage rate used in remuneration for his/her time-work. As a result, there is room for wage cuts even if there are no changes in contract wages that are set by collective bargaining.

For non-manual workers in manufacturing, the monthly rate is defined as "the fixed basic monthly salary paid for regular working time". The fixed salary is based on the "demands" of the job or tasks performed and the contract-based wages determined for these "demand classes" of jobs, and on a person-specific component which is based on personal competence. For private service sector workers, the monthly wage rate is defined as the "personal wages paid for regular working time". It includes such personal and "task"-specific bonuses which are paid at the same amount each month. This monthly wage excludes compensation for working conditions and shift work like the measures for manual manufacturing workers. Note, however, that this monthly wage is not simply a "minimum" salary based on contracted wage scales, but includes a significant person-specific component.

The wage changes used in our analyses are constructed for job stayers, that is, only workers who have the same employer and the same occupation during the two consecutive years are included[11]. It is clear that most of the burden of overall adjustment fell on those workers who lost their jobs during the depression. Displaced workers often suffer permanent wage losses (e.g. Kletzer, 1998). For this reason, the magnitude of wage cuts experienced in the economy is underestimated by focusing on job stayers, but it is not possible to investigate displaced workers with the data used in this paper[12]. Moreover, in order to control for the variation arising from changing working hours for non-manual manufacturing and service sector workers' monthly wages, it is required that the "regular weekly hours" are the same in both years.

4. Heterogeneity in wage changes

It is a general presumption that centralized collective bargaining, which applies to most years in our data period, leads to compression in both wage levels and wage changes. There is evidence for this for Finland, but it is also true that there is still considerable heterogeneity in wage changes even with centralized bargains[13]. One indication of this heterogeneity is the differences in the incidence of nominal wage cuts, cf. Table I. For non-manual workers in manufacturing and for the service sector workers, nominal wage cuts are rather rare, in spite of the sharp downturn of the

	Nominal wage			Real wage		
	Manufacturing manual workers hourly pay	Manufacturing non-manual workers monthly pay	Services monthly pay	Manufacturing manual workers hourly pay	Manufacturing mon-manual workers monthly pay	Services monthly pay
1990-1991	16.9	2.0	2.4	60.1	47.8	20.8
1991-1992	36.4	2.7	5.4	69.5	87.2	81.5
1992-1993	20.6	5.4	3.9	57.8	74.4	83.1
1993-1994	8.4	1.4	4.7	11.8	14.5	69.8
1994-1995	5.0	1.2	2.7	6.5	2.3	4.2
1995-1996	10.4	3.3	2.8	12.3	4.8	4.0
1996-1997	23.3	2.7	4.8	48.2	61.3	74.3
1997-1998	11.4	1.3	3.4	18.7	6.4	5.7
1998-1999	11.4	3.5	3.9	17.5	7.6	6.1
1999-2000	6.8	1.6	3.4	33.7	34.9	38.6

Table I.
Proportion of workers who have experienced negative wage changes

economy, with annual incidence of nominal wage cuts in the range from 1 to 5 per cent. In contrast, nominal wage cuts are much more frequent for manual workers in the manufacturing sector, the incidence reaching 36 per cent in 1991-1992, and above 20 per cent in 1992-1993 and 1996-1997.

The number of negative nominal wage changes for job stayers is not particularly high in the Finnish case in normal times. The proportion of negative wage changes in Table I for manual workers in manufacturing has been around 7-11 per cent in normal business cycle conditions during the late 1990s, which is clearly lower than similar proportion in the UK (Nickell and Quintini, 2003, report 17-22 per cent proportion of wage cuts during the late 1990s). It is clear that these comparisons between countries are complicated among others by different studies using different types of data (survey vs administrative), using different wage concepts (hourly wage vs total earnings), including different forms of compensation (base wage, fringes, overtime) and having differing amounts of measurement error. However, the Nickell and Quintini (2003) study is close to ours in some important respects which improves comparability: both studies use administrative data from payroll records that are less affected by measurement error than survey data and examine hourly wages excluding overtime pay. The number of nominal wage cuts in Finland seems to be in the middle range in comparison with other European countries that are reported by Dessy (2005) using the European Community Household Panel (ECHP). Using proportions of wage cuts in hourly wages reported for 14 countries, there are five countries with smaller proportions than Finland and seven countries with larger proportions. The average share of wage cuts for Finland reported in Dessy (2005) is 28.4 per cent, while the smallest share among all countries is 16.8 per cent and the largest share is 36.6 per cent.

The share of workers experiencing real wage cuts behaves remarkably similarly across sectors, being very high (60-80 per cent) during the depression years of 1991-1993[14]. The pattern arises from a large number of nominal wage increases that lie between zero and the inflation rate. This holds in particular for the non-manual and service sector workers, which explains the larger difference between the shares of real and nominal wage declines for these groups. There was a period of brief economic

slowdown that started in 1996. The bargaining system responded to this by postponing wage rises in 1997, which is shown especially in the substantial number of real wage cuts from 1996 to 1997.

5. Explaining the incidence of wage cuts

We use Probit models to analyse the prevalence of wage rigidity, because we are only interested in the incidence of wage cuts in this paper, not their magnitude, or the wage increases, or any other related issues. The models include as explanatory variables individual characteristics (such as age, experience, working hours, region and gender), employer characteristics (size, female share and industry), and the form of remuneration (as lagged share of performance pay and change in it). All variables are defined in the Appendix.

To make tables easier to read, we report marginal effects instead of parameter estimates. All models include indicators for years and industries to control for the effects of macroeconomic and industry specific factors affecting the probability of wage cuts. Some of the models also include the interaction terms of the year and industry dummies to additionally allow for industry variation in time effects and/or variation over time in industry effects. The estimated year effects from the models for nominal wage cuts are reported in Table II. These year effects are statistically significantly different from the reference year and mostly from each others, so there is significant variation over time in the likelihood of wage cuts. The estimated year effects reveal the same broad pattern as the observed share of nominal wage cuts in Table I (columns 1-3). Hence, the changes in the composition of the workforce with respect to characteristics included in the model do not explain the broad time-series pattern of wage reductions. We further explained the estimated marginal effects for the years with inflation and unemployment by using models in which we pooled the sectors. Nominal wage reductions are not related to inflation. Inflation has a coefficient of 0.008 with a *t*-statistics of 0.68 when explaining the year effects with inflation alone.

			The estimated year effects		
	Inflation (%)	Unemployment (%)	Manual workers	Non-manual workers	Services
1991	4.1	6.6	0.112	0.013	−0.013
1992	2.5	11.7	0.348	0.026	0.018
1993	2.1	16.3	0.182	0.064	0.005
1994	1.1	16.6	0.022	0.006	0.008
1995	1.0	15.4	−0.039	−0.002	−0.007
1996	0.6	14.6	0.044	0.015	−0.005
1997	1.2	12.7	0.215	0.014	0.012
1998	1.4	11.4	0.063	−0.003	−0.002
1999	1.2	10.2	0.064	0.018	0.004
2000	3.3	9.8	Reference	Reference	Reference

Notes: Inflation is the annual change in the cost-of-living index by Statistics Finland. Unemployment is the unemployment rate from the Labour Force Survey by Statistics Finland. The year effects for manual manufacturing workers are taken from model 3 of Table III. The year effects for non-manual manufacturing workers are taken from model 3 of Table V. The year effects for the service sector workers are taken from model 3 of Table V

Table II. Macroeconomic indicators and the estimated year effects from Probit models for the incidence of nominal wage cuts

This result survives when the year effects are explained by both inflation and unemployment. Unemployment is not statistically significant in the model either. The pattern is consistent with the findings by Christofides and Stengos (2003), according to which the probability of downward nominal wage rigidity increases substantially during low-inflation periods. Wage flexibility implies that there should be more wage cuts when inflation is low. However, if downward nominal or real wage rigidity prevents an increasing proportion of these cuts from realizing when inflation falls, then inflation and the share of wage cuts may be uncorrelated, which we find[15].

The share of nominal and real wage cuts among job stayers broken down by industry in each sector shows that both the level and time series patterns of the shares of wage declines are quite similar across industries[16]. This reflects that the time series pattern of wage cuts is not related to industry-specific factors and/or changes in the industry structure of employment. Accordingly, the time pattern of nominal wage cuts is very similar in Tables I-II and most likely reflects macroeconomic effects common to all industries. The quantitative magnitude of the estimated industry effects is small compared with the year effects despite the fact that they tend to be statistically significant. Hence, seven out of eight of the industry effects are statistically significant in the service sector. The same figures are 21 out of 25 and 33 out of 40 for manual and non-manual manufacturing workers, respectively. For manual manufacturing workers the largest industry effects are around one third of the magnitude of the largest year effects. For non-manual manufacturing workers almost all of the industry effects are very small compared with the year effects. Their role seems to be somewhat more important in the service sector. The remaining question that we focus on is the concentration of wage cuts on workers with certain characteristics (Tables III-VI)[17].

The role of workers' ages is mixed. For manual workers in manufacturing, nominal wage declines have been less common for young workers, which is in conflict with the notions based on fairness as an obstacle for nominal wage declines. Nominal wage declines are also less common for aged workers. Hence, nominal wage declines have been most common for the prime-age workers (36 to 54 years of age), which is the reference group for the estimated age effects. The same pattern applies to non-manual manufacturing workers.

Instead of fairness considerations, less common nominal wage declines for young workers may be explained by human capital theory, which implies that young workers tend to experience more rapid wage increases than older workers[18]. This principle is formalized in seniority-based wage scales adopted by the Finnish manufacturing companies and stipulated in collective labour agreements. In addition, wages for young workers in manufacturing are likely to be close to the minimum wages stipulated in the collective labour agreements. It may indicate that there fails to be room for nominal wage cuts for young workers. In general, the minimum wages were not cut during the depression. However, the minimum wages were temporarily cut for young workers and for the long-term unemployed in the years 1995-1996. This policy was agreed by the central organizations for employees and employers. Saari (1996) has shown that employers hardly used this opportunity to recruit young workers below the minimum wages that prevailed before the experiment. A further explanation for the smaller number of wage cuts among young employees is that there might be a selection bias owing to the fact that we focus on job stayers. Perhaps young employees run a higher

Table III.
Probit models for nominal wage cuts of manual workers in manufacturing (dependent variable indicates decline in nominal wage between t and $t-1$)

	Manual workers regular hourly (total) pay						Manual workers basic time wage per hour					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
Lag decline	−0.047	−(52.11)	−0.045	−(50.54)			−0.051	−(48.06)	−0.050	−(46.67)		
Young (≤25)	−0.011	−(5.95)	−0.010	−(5.51)	−0.011	−(7.13)	−0.015	−(7.32)	−0.015	−(6.80)	−0.016	−(9.31)
Adult (26-35)	0.000	−(0.43)	0.000	(0.13)	0.000	−(0.42)	−0.002	−(2.34)	−0.002	−(1.64)	−0.002	−(2.43)
Old (>55)	−0.003	−(2.41)	−0.003	−(2.18)	−0.004	−(2.87)	−0.001	−(0.76)	−0.001	−(0.60)	−0.003	−(1.96)
Experience ≤2	dropped	dropped	dropped	dropped	−0.030	−(15.68)	dropped	dropped	dropped	dropped	−0.028	−(13.48)
Experience 3-4	−0.011	−(7.06)	−0.011	−(7.10)	−0.007	−(5.47)	−0.010	−(6.00)	−0.011	−(6.27)	−0.010	−(7.12)
Experience 5-7	−0.001	−(0.76)	0.000	−(0.10)	0.001	(1.22)	−0.001	−(1.09)	−0.002	−(1.22)	−0.001	−(1.16)
Weekly hours <30	0.021	(22.28)	0.020	(21.63)	0.023	(28.92)	0.019	(16.60)	0.017	(14.75)	0.020	(20.49)
Weekly hours >40	0.003	(2.76)	0.002	(2.04)	0.003	(3.57)	−0.002	−(1.98)	−0.004	−(3.46)	−0.002	−(1.98)
Overtime work	−0.014	−(18.69)	−0.014	−(19.04)	−0.015	−(22.55)	−0.006	−(6.74)	−0.006	−(6.29)	−0.007	−(9.12)
Urban area	0.008	(9.97)	0.008	(9.79)	0.008	(10.41)	0.008	(8.36)	0.008	(8.09)	0.007	(8.64)
Small firm (<20)	0.031	(9.14)	0.031	(9.13)	0.026	(9.19)	0.035	(10.03)	0.033	(9.44)	0.030	(10.39)
Large firm (>100)	−0.021	−(19.53)	−0.021	−(19.68)	−0.021	−(22.43)	−0.009	−(7.80)	−0.009	−(8.21)	−0.009	−(9.30)
Female	−0.035	−(18.66)	−0.037	−(19.58)	−0.040	−(23.27)	−0.022	−(8.76)	−0.024	−(9.26)	−0.026	−(11.38)
Fem share (> med)	0.016	(17.44)	0.019	(20.32)	0.014	(16.93)	0.007	(6.14)	0.009	(7.79)	0.010	(10.29)
Fem *Femsh inter.	0.042	(17.85)	0.045	(18.76)	0.045	(20.61)	0.024	(7.83)	0.026	(8.46)	0.025	(9.21)
Industry change	−0.017	−(0.25)	−0.056	−(3.49)	−0.059	−(3.77)	−0.106	−(7.58)	−0.061	−(2.39)	−0.070	−(2.90)
ΔPerf.pay share	−0.120	−(69.11)	−0.122	−(69.86)	−0.133	−(88.30)	0.064	(28.68)	0.063	(27.42)	0.054	(29.11)
Lag Perf.pay share	0.081	(97.76)	0.081	(97.80)	0.084	(112.43)	0.161	(132.58)	0.162	(131.42)	0.159	(151.50)
Year *Industry	Yes		No		No		Yes		No		No	
Year *Ind.change	Yes		No		No		Yes		No		No	
Number of obs.	941039		941048		1160377		560467		560677		735621	
Pseudo R^2	0.135		0.122		0.114		0.171		0.155		0.141	
Log-likelihood	−351205.2		−356411.8		441972.3		−193813.7		−197608.1		−260954.4	
Obs. P	0.155		0.155		0.154		0.147		0.147		0.144	
Pred. P	0.123		0.126		0.127		0.106		0.110		0.111	

Notes: The marginal effects and z-values in parentheses are reported (z corresponds to the test of the underlying coefficient being 0 and is approximately standard normal distributed). All models include year and industry dummies. Base groups (omitted indicators) are prime aged (36-55), experience > 7 years, weekly hours 30-40, no overtime hours, non-urban area, medium-sized firm (20-100 employees), male, female share less than median share, no industry change. Experience ≤2 group dropped because it is impossible in models including lagged decline as an explanatory variable (requires three observations)

Table IV.
Probit models for real wage cuts of manual workers in manufacturing (dependent variable indicates decline in real wage between t and $t-1$)

	Manual workers regular hourly (total) pay						Manual workers basic time wage per hour					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
Lag decline	−0.084	−(69.84)	−0.085	−(71.08)			−0.084	−(50.25)	−0.086	−(51.98)		
Young (≤25)	−0.056	−(20.48)	−0.054	−(19.81)	−0.058	−(26.25)	−0.076	−(22.35)	−0.073	−(21.30)	−0.079	−(28.84)
Adult (26-35)	−0.023	−(17.74)	−0.022	−(16.71)	−0.025	−(20.98)	−0.036	−(20.91)	−0.034	−(19.65)	−0.036	−(23.93)
Old (>55)	0.005	(2.67)	0.005	(2.38)	0.007	(3.60)	0.011	(4.20)	0.011	(4.06)	0.011	(4.68)
Experience ≤2	dropped	dropped	dropped	dropped	−0.113	−(40.92)	dropped	dropped	dropped	dropped	−0.120	−(36.12)
Experience 3-4	−0.050	−(22.14)	−0.050	−(21.99)	−0.047	−(24.02)	−0.058	−(20.49)	−0.060	−(20.97)	−0.055	−(23.15)
Experience 5-7	−0.021	−(12.00)	−0.019	−(11.00)	−0.015	−(9.96)	−0.021	−(9.55)	−0.021	−(9.47)	−0.018	−(9.14)
Weekly hours <30	0.018	(13.30)	0.025	(19.02)	0.030	(25.23)	0.015	(8.00)	0.016	(8.76)	0.023	(14.70)
Weekly hours >40	0.001	(0.74)	0.002	(1.60)	0.001	(0.90)	−0.005	−(2.55)	−0.004	−(2.34)	−0.004	−(2.24)
Overtime work	−0.026	−(23.74)	−0.026	−(24.38)	−0.028	−(28.13)	−0.022	−(15.29)	−0.023	−(15.87)	−0.027	−(21.15)
Urban area	0.006	(5.00)	0.005	(4.38)	0.005	(4.52)	0.007	(4.89)	0.006	(3.83)	0.005	(3.57)
Small firm (<20)	0.043	(8.39)	0.043	(8.71)	0.053	(12.39)	0.036	(6.37)	0.032	(5.95)	0.048	(10.47)
Large firm (>100)	−0.033	−(20.97)	−0.034	−(21.69)	−0.037	−(26.27)	−0.030	−(16.39)	−0.031	−(17.30)	−0.036	−(22.45)
Female	−0.036	−(13.72)	−0.040	−(14.91)	−0.042	−(16.52)	−0.027	−(6.97)	−0.029	−(7.41)	−0.029	−(8.39)
Fem share (> med)	0.025	(18.54)	0.027	(20.32)	0.028	(22.58)	−0.002	−(0.86)	0.000	(0.20)	0.010	(6.23)
Fem *Femsh inter.	0.034	(10.83)	0.038	(12.08)	0.031	(10.74)	0.023	(5.16)	0.026	(5.83)	0.019	(4.85)
Industry change	−0.045	−(0.56)	−0.126	−(4.65)	−0.131	−(4.58)	−0.162	−(2.15)	−0.102	−(2.17)	−0.117	−(2.43)
ΔPerf.pay share	−0.211	−(80.82)	−0.212	−(81.26)	−0.242	−(103.13)	0.028	(7.30)	0.024	(5.99)	0.018	(5.50)
Lag Perf.pay share	0.029	(24.21)	0.028	(23.89)	0.023	(20.97)	0.071	(34.89)	0.067	(32.69)	0.045	(25.06)
Year *Industry	Yes		No		No		Yes		No		No	
Year *Ind.change	Yes		No		No		Yes		No		No	
Number of obs.	941037		941048		1160377		560467		560677		735621	
Pseudo R^2	0.226		0.209		0.208		0.291		0.274		0.253	
Log-likelihood	−457789.4		−467893.4		−593485.8		−252885.7		−258909.3		−358732.6	
Obs. P	0.322		0.322		0.347		0.333		0.333		0.358	
Pred. P	0.279		0.282		0.308		0.276		0.282		0.312	

Notes: as in Table III

Table V. Probit models for nominal wage cuts of service sector workers and non-manual workers in manufacturing (dependent variable indicates decline in nominal wage between t and $t-1$)

	Service sector workers monthly pay						Non-manual workers (manufacturing) monthly pay					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
Lag decline	0.040	(39.88)	0.041	(39.86)			0.003	(5.89)	0.003	(4.70)		
Young (≤25)	0.009	(8.14)	0.010	(8.46)	0.009	(10.75)	−0.007	−(5.96)	−0.008	−(6.24)	−0.008	−(9.67)
Adult (26-35)	0.000	(0.27)	0.000	(0.13)	0.000	−(0.14)	−0.004	−(10.94)	−0.004	−(10.76)	−0.004	−(11.98)
Old (>55)	−0.003	−(4.88)	−0.003	−(4.48)	−0.003	−(5.10)	0.002	(4.92)	0.002	(4.58)	0.002	(3.69)
Tenure ≤2	0.008	(9.67)	0.008	(9.98)	0.011	(18.56)	−0.002	−(5.03)	−0.003	−(6.38)	−0.004	−(10.03)
Tenure 3-4	0.002	(2.83)	0.001	(2.27)	0.003	(4.96)	−0.002	−(3.87)	−0.003	−(7 − 04)	−0.003	−(6.80)
Tenure 5-7	0.002	(2.80)	0.001	(2.42)	0.002	(4.22)	−0.001	−(2.59)	−0.001	−(3.41)	−0.001	−(2.72)
Weekly hours <30[a]	0.043	(31.40)	0.043	(31.21)	0.071	(56.32)	0.010	(9.90)	0.011	(10.21)	0.010	(10.66)
Urban area	−0.005	−(10.28)	−0.005	−(10.17)	−0.005	−(12.93)	0.001	(2.74)	0.000	(1.33)	0.000	−(0.32)
Small firm (<20)	0.005	(6.63)	0.005	(6.83)	0.005	(7.71)	0.003	(5.55)	0.003	(5.27)	0.004	(9.02)
Large firm (>100)	−0.005	−(8.28)	−0.005	−(8.66)	−0.005	−(10.49)	−0.005	−(14.49)	−0.004	−(12.17)	−0.004	−(11.76)
Female	−0.011	−(19.08)	−0.011	−(19.00)	−0.011	−(21.60)	−0.004	−(8.77)	−0.004	−(7.81)	−0.004	−(9.79)
Fem share (> med)	0.005	(5.35)	0.005	(5.40)	0.006	(7.14)	0.001	(1.58)	0.000	(0.32)	0.000	(0.57)
Fem*Femsh inter.	0.006	(5.79)	0.006	(5.64)	0.006	(7.20)	0.003	(4.78)	0.003	(4.65)	0.003	(4.90)
Unskilled	0.005	(10.79)	0.005	(10.37)	0.004	(10.64)	−0.001	−(3.17)	−0.001	−(3.02)	−0.001	−(4.37)
Industry change	−0.025	−(4.93)	0.016	(13.45)	0.014	(12.18)	−0.010	−(1.31)	−0.013	−(18.30)	−0.013	−(18.63)
ΔPerf.pay share	0.189	(39.39)	0.194	(39.78)	0.204	(51.25)	0.195	(71.96)	0.230	(76.54)	0.253	(98.03)
Lag Perf.pay share	0.007	(2.01)	0.008	(2.50)	0.016	(5.72)	0.051	(26.83)	0.052	(24.10)	0.053	(27.41)
Year*Industry	Yes		No		No		Yes		No		No	
Year*Ind.change	Yes		No		No		Yes		No		No	
Number of obs.	774914		774914		994539		650709		655653		858772	
Pseudo R^2	0.057		0.050		0.055		0.208		0.137		0.131	
Log-likelihood	−115439.9		−116203.4		−151372.4		−61348.2		−66980.6		−86327.8	
Obs. P	0.037		0.037		0.038		0.026		0.025		0.025	
Pred. P	0.031		0.032		0.032		0.013		0.015		0.015	

Notes: the marginal effects (and z-values) are reported. All models include year and industry dummies. Base groups (omitted indicators) are prime aged (36-55), tenure > 7 years, weekly hours over 30 (35 for non-manuals), no overtime hours, non-urban area, medium-sized firm (20-100 employees), male, female share less than median share, skilled worker (more than basic education), no industry change; [a] the cut-off point is 35 hours for non-manuals

Table VI.
Probit models for real wage cuts of service sector workers and non-manual workers in manufacturing (dependent variable indicates decline in real wage between *t* and *t*-1)

	Dependent variable: real wage decline											
	Service sector workers monthly pay						Non-manual workers (manufacturing) monthly pay					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
Lag decline	−0.066	−(31.74)	−0.063	−(31.80)			−0.053	−(29.56)	−0.055	−(30.11)		
Young (≤25)	−0.167	−(46.60)	−0.163	−(45.77)	−0.146	−(56.17)	−0.131	−(27.39)	−0.146	−(28.04)	−0.154	−(46.02)
Adult (26-35)	−0.117	−(66.34)	−0.116	−(66.64)	−0.101	−(69.81)	−0.099	−(63.48)	−0.099	−(60.19)	−0.095	−(68.52)
Old (>55)	0.062	(22.71)	0.062	(23.02)	0.046	(19.76)	0.059	(24.31)	0.059	(23.78)	0.051	(23.22)
Tenure ≤2	−0.055	−(20.06)	−0.053	−(19.30)	−0.039	−(20.12)	−0.052	−(23.43)	−0.053	−(22.56)	−0.049	−(27.74)
Tenure 3-4	−0.051	−(23.33)	−0.042	−(19.42)	−0.030	−(16.05)	−0.037	−(18.42)	−0.044	−(21.16)	−0.030	−(16.24)
Tenure 5-7	−0.043	−(20.60)	−0.042	−(20.25)	−0.031	−(17.64)	−0.015	−(7.70)	−0.014	−(6.86)	−0.006	−(3.29)
Weekly hours <30	0.093	(20.61)	0.063	(14.38)	0.072	(20.56)	0.030	(6.67)	0.033	(7.01)	0.010	(2.48)
Urban area	−0.001	−(0.68)	−0.002	−(1.47)	0.008	(5.69)	0.020	(14.24)	0.021	(14.59)	0.022	(18.32)
Small firm (<20)	0.019	(6.49)	0.017	(5.92)	0.016	(7.04)	0.013	(5.15)	0.014	(5.48)	0.017	(8.02)
Large firm (>100)	−0.026	−(12.80)	−0.031	−(15.30)	−0.033	−(20.31)	−0.040	−(25.22)	−0.036	−(22.54)	−0.028	−(20.80)
Female	−0.019	−(9.18)	−0.017	−(8.23)	−0.031	−(18.24)	−0.010	−(4.99)	−0.007	−(3.28)	−0.004	−(1.92)
Fem share (> med)	0.009	(2.82)	0.003	(0.96)	−0.002	−(0.67)	0.003	(1.78)	−0.001	−(0.47)	0.004	(2.67)
Fem*Femsh inter.	−0.015	−(4.06)	−0.015	−(4.25)	−0.013	−(4.39)	−0.006	−(2.20)	−0.005	−(1.83)	−0.009	−(3.70)
Unskilled	0.024	(14.77)	0.020	(12.85)	0.011	(8.09)	0.002	(0.87)	0.000	(0.07)	−0.008	−(5.15)
Industry change	−0.026	−(2.00)	−0.092	−(23.86)	−0.080	−(21.85)	0.080	(2.16)	−0.119	−(18.93)	−0.115	−(19.17)
ΔPerf.pay share	0.537	(25.34)	0.524	(24.83)	0.483	(29.01)	0.695	(40.62)	0.757	(42.91)	0.794	(52.18)
Lag Perf.pay share	0.026	(2.07)	0.054	(4.31)	0.180	(18.27)	−0.118	−(10.02)	−0.128	−(10.47)	−0.046	−(4.28)
Year*Industry	Yes		No		No		Yes		No		No	
Year*Ind.change	Yes		No		No		Yes		No		No	
Number of obs.	774914		774914		994539		654268		655653		858772	
Pseudo R^2	0.466		0.446		0.410		0.446		0.406		0.362	
Log-likelihood	−283245.0	−293766.0	−395805.5	−228872.9	−245802.9	−346964.6						
Obs. P	0.435		0.435		0.404		0.323		0.326		0.329	
Pred. P	0.359		0.361		0.335		0.214		0.244		0.250	

Notes: same as in Table V

risk of being laid off instead of having their wage cut, or perhaps they are also more likely to quit for a new job if their wage is cut.

Real wage declines for young manual and non-manual workers in manufacturing are also substantially less common than for prime-aged employees. In contrast to declines in nominal wages, cuts in real wages are slightly more common for the aged manual manufacturing workers. The pattern is the same, but stronger for non-manual manufacturing workers. Hence, nominal wage increases for aged manual manufacturing workers tend to be more often above zero, but at the same time below the current rate of inflation, compared with other age groups. This is consistent with nominal wage rigidity as an obstacle to nominal wage cuts for aged manual employees, although their real wages may be cut. However, in quantitative terms these effects for older workers are quite small in manufacturing.

In the service sector nominal wage declines are more common for young workers. However, real wage cuts for young workers are substantially less likely, compared with prime-aged and older workers, as in manufacturing. Hence, in services nominal wage declines are more common for young workers, but nominal pay increases that are below inflation are relatively less common for young workers compared with prime-aged and older workers. In contrast, declines in real wages are substantially more common for aged workers. Taken together, the group of aged employees constitutes the most flexible part of the workforce in terms of downward real wage adjustment in both the manufacturing and service sectors.

Tenure is an important attribute of a worker, because the variable captures the length of repeated interaction between the worker and the firm. It should matter a lot for the strictness of fairness standards and firm-specific investment effects. Nominal and real wage declines are less common for less experienced manual workers that have a looser attachment to manufacturing plants[19]. The findings for non-manual workers in manufacturing are mixed, because nominal wage cuts are less common for newcomers, but real wage cuts are actually more common for them. In general, these observations are not consistent with the notions based on fairness, but they most likely reflect the same factors as for age above. Nominal wage declines are more common for the service sector workers that have a short tenure, whereas cuts in real wages are less common. All in all, long attachment to the same firm does not guarantee a shield against negative real wage changes.

Gender seems to matter for wage cuts. Both nominal and real wage declines are slightly less common for females. The labour supply responses for females are more flexible in terms of hours and numbers (e.g. Killingsworth and Heckman, 1986), which may imply that employers are more reluctant to cut their wages. On the other hand, nominal wage declines are more common for manual workers in manufacturing plants that have a large share of females. The same pattern emerges for the service sector, but fails to apply to non-manual manufacturing workers. One explanation is that a high female share proxies low capital intensity of a plant that is associated with more overall need for the adjustment of labour costs. Capital-skill complementarity would then explain the different result for non-manuals, i.e. their wage cost is less important in less capital-intensive (high female share) plants and therefore face less pressure for wage cuts. In addition, in manufacturing nominal and real wage cuts are more common for those females that are employed in female-dominated plants. The pattern fails to

extend to non-manual manufacturing workers. These effects for the female-dominated service sector are smaller and mixed for real and nominal wages.

Cuts in nominal and real wages are less common for workers that perform a great number of weekly working hours. These particular employees constitute the firm insiders that are more often shielded from wage cuts. This pattern is consistent with the efficiency-wage explanation and the fairness standards as an obstacle to wage cuts. A version of the efficiency-wage theory based on the worker turnover suggests that wage declines are avoided for the firm insiders, because they are more important for the productivity and the profitability of a firm compared with the part-time workers. Hence, full-time workers have a stronger bargaining position to prevent a wage cut, and firms are more afraid of a reduction in their productivity. The fairness standards can also be more tight for the firm insiders. Additional results (not reported) that involved interactions of the explanatory variables with the years revealed that the influence of the hours of work on the incidence of wage cuts was strongest during the great depression of the early 1990s. For instance, reductions in real wages were over 10 per cent more likely for manual workers in manufacturing who worked less than 30 hours in 1994. The pattern extends to non-manual workers in manufacturing and the service sector.

Overtime constitutes an essential part of the adjustment of the total hours of work in manufacturing. For manual workers in manufacturing, there is strong evidence that workers who work overtime hours are less likely to experience a nominal wage cut. Hence, other components of wages are less volatile in firms where overtime hours are used. The reason may be that overtime hours provide firms possibilities to adjust labour costs, so there is less need for wage cuts. Overtime dummy may also proxy for the high level of production in a plant, which implies less pressure for wage cuts. We also estimated models in which overtime dummy is included both in levels and in changes for manual manufacturing workers. They both have statistically significant negative effects, but the coefficient of overtime dummy in levels remains almost unchanged[20].

Regional unemployment disparities are sharp in Finland[21]. For this reason, the geographical pattern of wage cuts is interesting. Nominal wage declines for manual and non-manual workers in manufacturing have been slightly more common in urban areas. This pattern is not consistent with the stylised fact that urban areas are, in general, characterized by lower levels of the unemployment rate[22]. Hence, there should be fewer pressures for wage cuts in the manufacturing plants that are located in those regions. An explanation for the pattern that wage cuts are more common in manufacturing in urban areas may be that these regional labour markets are more dynamic in the sense that temporary pay rises are followed by temporary declines in wages. This suggests that wages are more volatile in regions with stronger outside effects in the form of competition for workers. However, in the service sector declines in nominal wages are less common in urban areas, but in real wages this effect is insignificant.

Nominal and real wage cuts are more common in small plants[23]. The size effect is robust across sectors. This is in disagreement with the notions based on fairness as an obstacle to nominal wage declines, because fairness standards should be stricter in small plants, because there is more need for repeated personal interactions in small

plants between the employer and employees. However, the size of a plant can matter for wage cuts for several other reasons. There is more need for wage cuts in small plants, because they face more volatility from product markets and for that reason there is more need for the adjustment of labour costs among small plants (e.g. Caves, 1998). An alternative explanation is that there is almost always a low hierarchy in small firms compared with large companies with a greater number of supervisor levels and separate establishments, which facilitates a more efficient and detailed flow of information in small plants. As a consequence of this, workers are more informed about the financial situation of a firm and they are therefore more willing to make sacrifices in terms of wage cuts in order to preserve the continuity of a firm's operations. Hence, greater loyalty in small firms between the workforce and the employer can make it easier to cut wages in order to save jobs. In addition, it is possible that the effective bargaining power of trade unions is somewhat weaker in small firms[24]. As a result, trade unions are less able to resist wage cuts in small firms that concern firm-specific wage components, which do not compromise the minimum standards stipulated in collective labour agreements.

Manual workers' regular wage consists of several components that depend on the employer's performance. An increase in the performance-related pay share decreases the likelihood of wage cuts for manual workers in manufacturing when using a regular wage per hour. In contrast, this effect is positive for cuts in the basic time wage per hour. To explain these effects and the difference between cuts in time and regular (total) wages three factors should be noted. First, the performance-related pay rates are higher than the pay rates for time pay. Hence, a decline in the regular hourly wage is less likely when the share of these wage components with the higher average rates increases. That is the negative effect for regular wage reflects changes in the composition of the regular wage used in defining the dependent variable. Second, an increase in performance-related pay may reflect that business is good (demand is high), making the firm more interested in increasing output through the use of performance-related pay. Third, workers may supply more performance-related hours in order to compensate for the effects of declines in basic time wages on total income. This creates a positive correlation between declines in basic time wages and the performance pay share, as found in the model for time wages in contrast to the negative effect on regular wage (in Tables III-IV). This also explains the positive effect of change in performance pay share for non-manual and service sector workers, whose monthly wage measure does not include performance-based pay, similar to basic time wages for manual workers.

When regular wage per hour is used to define wage cuts, both nominal and real wage reductions are more likely for those workers that have higher (lagged) share of performance-related pay components in their total pay. Hence, those employees that have a great deal of volatile components in their regular wage have a substantially higher likelihood of experiencing nominal and real wage decline. The same effect, however, holds also for basic time wages for manual workers and for monthly wages for non-manual and service sector workers, which do not include performance-related pay components. This could reflect less resistance to cuts in basic wage from workers who do lots of performance paid work, because they can more easily compensate for income losses by increasing their effort in performance paid work.

Unskilled workers have a higher incidence of nominal and real wage cuts in the service sector[25]. An explanation for this is that the firm-specific investments might be more important for skilled workers. As a result, there is more need for contracts that prevent wage cuts to induce efficient firm-specific investments. As workers with basic education also had the lowest net rate of change in employment during these years, one may conclude that unskilled workers carried the heaviest burden of adjustment in both prices and quantities. In contrast, for non-manual manufacturing workers there is some evidence for a small negative or insignificant effect of education on wage cuts, so overall we find that education effects on wage cuts are quite small and different across sectors.

An important attribute of wage cuts is their persistence. The negative welfare effects of wage reductions in terms of lost labour income for persons experiencing wage cuts are magnified if wage declines are strongly persistent in time. Persistence in wage cuts here means that a person experiencing a wage cut in the previous year ("Lag decline" variable) is more likely to experience a new wage cut in this year. That is, there are cumulative declines in the wage level. On the other hand, wage cuts may be transitory in the sense that a previous wage cut reduces the likelihood of a new wage cut. In this case the wage cut is either a one-off change in wage level, or the wage increases the next year. We find empirical evidence for a transitory component in nominal and real wage declines. For instance, a decline in nominal wage is 5 per cent less common for a manual manufacturing worker who has experienced a nominal wage cut during the previous year, other things being equal. Interestingly, by using the Canadian contract data, Christofides and Stengos (2003) also find that wage cuts are less likely if an agent has already been subjected to such a reduction in the past. In contrast, there is some persistence in nominal wage declines for non-manual manufacturing workers and stronger persistence for service sector workers, but nominal wage cuts are also rarer in these sectors. However, the effect of lagged decline on the likelihood of real wage decline is again negative for non-manual manufacturing workers and for service sector workers, similar to manual workers, so we find evidence for an important transitory component in the likelihood of real wage cuts for all sectors[26].

6. Conclusions

The sharp downturn of the Finnish economy in the early 1990s led to frequent nominal wage cuts for manual workers in the manufacturing sector, with annual incidence of wage cuts in the range from 17 to 36 per cent in the first three years of the 1990s. In contrast, nominal wage cuts were much less frequent for workers in the service sector and non-manual workers in the manufacturing sector, with annual incidence of wage cuts in the range from 2 to 5 per cent.

Nominal wage moderation with the positive inflation rate during the great depression of the early 1990s made it possible to implement real wage cuts for a large proportion of employees without implementing aggregate nominal wage cuts by the collective labour agreements. In this sense, centralized bargaining shaped the adjustment. An analysis of macroeconomic indicators reveals that the share of nominal wage reductions was not related to inflation, which is consistent with downward nominal or real wage rigidities preventing wage cuts when inflation is low.

There are some important individual-level factors that have a common influence on the incidence of wage reductions across the sectors. In particular, full-time workers have a lower likelihood of nominal and real wage decline. For instance, the service sector workers that work less than 30 hours weekly are around 4 per cent more likely to experience a nominal wage cut, other things being equal. The effect is even larger for real wage reductions, which are around 9 per cent more likely for part-time workers compared with full-time workers. For manuals and non-manuals in manufacturing these effects are in the range of 1-3 per cent. Moreover, nominal and real wage cuts tend to be more common in small plants, where there is perhaps more need for the adjustment of labour costs due to product market effects. Depending on the sector real wage cuts are around 5-8 per cent more likely in small firms compared with large firms. For nominal wage cuts this firm size effect is about 1-5 per cent.

The persistence of wage cuts shows interesting differences across the sectors. Nominal wage declines are more transitory within the sectors in which they are more common. Hence, nominal wage declines were more common for manual workers in manufacturing during the 1990s, but they were more transitory. In contrast, for non-manual workers in manufacturing and for the service sector workers, declines in nominal wages were less common by their frequency, but they were somewhat more persistent than for manual workers.

Notes

1. Kramarz (2001), Palenzuela *et al.* (2003) and Holden (2004a) provide surveys of the literature. For examples using different approaches to analyse the extent of nominal and real wage rigidity in the labour market, see McLaughlin (1994), Card and Hyslop (1996), Altonji and Devereux (1999), Fehr and Goette (2000), and Dickens *et al.* (2006). Christofides and Stengos (2001) test the symmetry of wage-change distributions for individuals drawn from the US Panel Study of Income Dynamics, while Christofides and Stengos (2003) analyse the factors that influence the likelihood of nominal and real wage reductions in the Canadian contract data.
2. Agell and Lundborg (2003) provide Swedish evidence based on survey data for the view that there has not been increase in wage cuts in Sweden despite the rise in the unemployment rate during the 1990s. Campbell III and Kamlani (1997) provide US survey evidence on the reasons for wage rigidity based on a sample of 184 firms. Franz and Pfeiffer (2006) present results for Germany.
3. Koskela and Uusitalo (2006) provide a discussion of the Finnish unemployment problem in the European context.
4. There was an attempt by the social partners to cut nominal labour costs by 7 per cent in 1991 in order to avoid currency depreciation. (The proposition to cut labour costs by 7 per cent included 3 per cent cut in nominal wages and 4 per cent transfer of pension contributions from employers to employees). However, this attempt failed because two major trade unions delayed their support for the pact and the restlessness of the financial markets forced the Bank of Finland to abandon the fixed exchange rate in November 1991. After that episode the labour market organizations did not accept any cuts in nominal wages, but agreed, for the first time since the Second World War, to a two-year social pact without any nominal pay rises.
5. The earlier Finnish studies of wage rigidity have usually applied aggregate data (e.g. Pehkonen, 1999). An empirical investigation by Vartiainen (2000) that uses data on manual workers in Finnish manufacturing is an exception to this pattern.

6. During the 1990s selected provisions were added to the Finnish collective agreements which have made it possible to agree locally about certain issues like daily working hours. Under the current law, these local agreements are legally acceptable only if their terms exceed those agreed in contracts at the national level. Hence, the minimum conditions cannot be repealed by the conduct of local negotiations.
7. Unfortunately, investigation into these issues is not possible with the data from the Finnish employers' payroll records that we are using in this paper. In addition, labour market institutions have been stable in Finland during the 1990s.
8. Danthine and Kurmann (2006) have recently analysed wage rigidity in efficiency wage models.
9. Smith (2000) and Dickens *et al.* (2006) provide a discussion about the measurement error in wage changes.
10. The data cover the situation during one month of each year for non-manual (salaried) manufacturing workers (August before 1995 and October in and after 1995) and the private service sector workers (September before 1993 and December in and after 1993).
11. The inclusion of movers across plants and occupations yields an increase in the dispersion of wage changes, because there are no restrictions for the wage changes of job movers.
12. The reason is that employers' payroll records do not include any information on reasons of job termination or unemployment spells. For data confidentiality reasons, it is not possible to link employers' payroll records to other data sources that contain information on spells of unemployment.
13. See Uusitalo and Vartiainen (2005) for wage structure in Finland and Böckerman *et al.* (2006) for wage change distributions.
14. Real wage change is based on actual inflation measured as the annual change in the cost-of-living index by Statistics Finland. Regarding expected inflation, there is no widely accepted indicator for expected inflation based on surveys in Finland covering the whole period. The fact that real wage declines are so pervasive in low-inflation periods is also documented for the Canadian contract data in Christofides and Stengos (2003).
15. Alternatively, it may be difficult to detect a correlation between the incidence of wage cuts and inflation empirically, because annual variation in inflation measured by consumer price index may not correspond well with annual growth in median nominal wages, e.g. due to changes in import prices.
16. These figures are reported in a working paper version.
17. The panel-property of the individual-level data with random effects turned out to be statistically insignificant in the determination of wage declines, so we report ordinary Probit results only.
18. A part of this process is that young employees move quite rapidly from trainee positions to regular full-time jobs within manufacturing companies.
19. Unfortunately, tenure is not available in the data for manual manufacturing workers. For this reason, we are forced to use experience as a proxy variable for tenure in this sector.
20. This specification can in principle distinguish between the fact that lagged overtime provides room for wage adjustment without wage cuts, while the change in overtime indicates that the firm goes well and there is less need for wage cuts. Our wage measure does not include overtime work, so the change in overtime dummy does not reflect composition effects from overtime premium. We estimated these specifications using model (2) for regular hourly pay in Tables III and IV. The marginal effects (z-values) for nominal wage cuts were -0.013 (13.8) for lagged overtime and -0.017 (20.5) for change in overtime. For real wage cuts the effects were respectively -0.031 (21.9) and -0.029 (23.4).

21. For instance, the unemployment rate varied from 6.3 (in Uusimaa) to 19.4 (in Kainuu) in the year 2000 according to the Labour Force Survey by Statistics Finland.
22. Christofides and Stengos (2003) report that an increase in the regional unemployment rate yields a decline in the likelihood of a wage increase.
23. Agell and Bennmarker (2002), and Ekberg (2004) show that wage reductions are more frequent in small firms in Sweden.
24. Union density is lower in small firms in Finland (Böckerman and Uusitalo, 2006).
25. The education variable is not available in the data for manual manufacturing workers. Unfortunately, for data confidentiality reasons, it is not possible link the data from Finnish employers' payroll records for manual manufacturing workers to the Finnish educational register maintained by Statistics Finland in order to obtain an educational level for these particular individuals. However, it can be argued that education is not important in the incidence of wage cuts across individuals in manufacturing owing to more homogeneity of the labour force in formal education. In contrast, the Finnish private service sector is more heterogeneous in terms of the education requirements of workers, because it contains firms ranging from pharmacies with academic education requirements to restaurants with few requirements for formal education.
26. In future work it would be interesting to analyse whether individuals who took a nominal wage cut in one year have a weaker evolution of wages say five years later. If not, then one could argue that the wage cut had a transitory effect on wage level. The problem with this long-term analysis is the attrition of workers that experience a wage cut, because a decline in wage most likely increases workers' likelihood to quit from the present job. However, we are observing workers only when they are employed in a particular sector and we cannot follow them beyond that, so we are unable to do that analysis properly in the present paper.

References

Agell, J. and Bennmarker, H. (2002), "Wage policy and endogenous wage rigidity: a representative view from the inside", working paper no. 751, CESifo, Munich, available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id = 329440

Agell, J. and Lundborg, P. (2003), "Survey evidence on wage rigidity and unemployment: Sweden in the 1990s", *Scandinavian Journal of Economics*, Vol. 105 No. 1, pp. 15-29.

Akerlof, G. (2002), "Behavioral macroeconomics and macroeconomic behaviour", *The American Economic Review*, Vol. 92 No. 3, pp. 411-33.

Altonji, J.G. and Devereux, P.J. (1999), "The extent and consequences of downward nominal wage rigidity", working paper no. 7236, National Bureau of Economic Research, Cambridge, MA.

Bewley, T.F. (1998), "Why not cut pay?", *European Economic Review*, Vol. 42 Nos 3-5, pp. 459-90.

Böckerman, P. and Kiander, J. (2002), "Labour markets in Finland during the great depressions of the twentieth century", *Scandinavian Economic History Review*, Vol. 50 No. 2, pp. 55-70.

Böckerman, P. and Uusitalo, R. (2006), "Erosion of the Ghent system and union membership decline: lessons from Finland", *British Journal of Industrial Relations*, Vol. 44 No. 2, pp. 283-303.

Böckerman, P., Laaksonen, S. and Vainiomäki, J. (2006), "Micro-level evidence on wage rigidities in Finland", discussion paper no. 219, Labour Institute for Economic Research, Helsinki.

Campbell, C.M. III and Kamlani, K.S. (1997), "The reasons for wage rigidity: evidence from a survey of firms", *The Quarterly Journal of Economics*, Vol. 112 No. 3, pp. 759-89.

Card, D. and Hyslop, D. (1996), "Does inflation grease the wheels of the labor market?", working paper no. 5538, National Bureau of Economic Research, Cambridge, MA.

Caves, R.E. (1998), "Industrial organization and new findings on the turnover and mobility of firms", *Journal of Economic Literature*, Vol. 36 No. 4, pp. 1947-82.

Christofides, L.N. and Stengos, T. (2001), "A non-parametric test of the symmetry of the PSID wage-change distribution", *Economics Letters*, Vol. 71 No. 3, pp. 363-8.

Christofides, L.N. and Stengos, T. (2003), "Wage rigidity in Canadian collective bargaining", *Industrial and Labor Relations Review*, Vol. 56 No. 3, pp. 429-48.

Danthine, J.-P. and Kurmann, A. (2006), "Efficiency wages revisited: the internal reference perspective", *Economics Letters*, Vol. 90 No. 2, pp. 278-84.

Dessy, O. (2005), "Nominal wage rigidity in Europe: estimates and institutional causes", working paper no. 2005-09, Università degli Studi di Milano, Milan.

Dickens, W.T., Goette, L., Groshen, E.L., Holden, S., Messina, J., Schweitzer, M.E., Turunen, J. and Ward, M. (2006), "The interaction of labor markets and inflation: analysis of micro data from the International Wage Flexibility Project", *Proceedings of the Federal Reserve Bank of San Francisco Conference on Labor Markets and the Macroeconomy*, available at: www.frbsf.org/economics/conferences/0603/ilmi.pdf

Eckstein, Z. and Van den Berg, G. (2003), "Empirical labor search: a survey", discussion paper no. 929, IZA, Bonn.

Ekberg, J. (2004), "Essays in empirical labor economics", Dissertations in Economics no. 2004:2, Department of Economics, Stockholm University, Stockholm.

Fehr, E. and Gächter, S. (2000), "Fairness and retaliation: the economics of reciprocity", *Journal of Economic Perspectives*, Vol. 14 No. 3, pp. 159-81.

Fehr, E. and Goette, L. (2000), "Robustness and real consequences of nominal wage rigidity", working paper series no. 44, Institute for Empirical Research in Economics, University of Zurich, Zurich.

Franz, W. and Pfeiffer, F. (2006), "Reasons for wage rigidity in Germany", *Labour: Review of Labour Economics and Industrial Relations*, Vol. 20 No. 2, pp. 255-84.

Holden, S. (1994), "Wage bargaining and nominal rigidities", *European Economic Review*, Vol. 38 No. 5, pp. 1021-39.

Holden, S. (1999), "Renegotiation and the efficiency of investments", *Rand Journal of Economics*, Vol. 30 No. 1, pp. 106-19.

Holden, S. (2004a), "Wage formation under low inflation", in Piekkola, H. and Snellman, K. (Eds), *Collective Bargaining and Wage Formation: Performance and Challenges*, Physica-Verlag, Heidelberg, pp. 39-57.

Holden, S. (2004b), "The costs of price stability – downward nominal wage rigidity in Europe", *Economica*, Vol. 71 No. 282, pp. 183-208.

Honkapohja, S. and Koskela, E. (1999), "The economic crisis of the 1990s in Finland", *Economic Policy*, Vol. 14, pp. 400-36.

Kiander, J. and Vartia, P. (1996), "The great depression of the 1990s in Finland", *Finnish Economic Papers*, Vol. 9 No. 2, pp. 72-88.

Killingsworth, M.R. and Heckman, J.J. (1986), "Female labor supply: a survey", in Ashenfelter, O.C. and Layard, R. (Eds), *Handbook of Labor Economics*, Vol. 1, North-Holland, Amsterdam, pp. 103-204.

Kletzer, L.G. (1998), "Job displacement", *Journal of Economic Perspectives*, Vol. 12 No. 1, pp. 115-36.

Koskela, E. and Uusitalo, R. (2006), "The unintended convergence: how the Finnish unemployment reached the European level", in Werding, M. (Ed.), *Structural Unemployment in Europe: Reasons and Remedies*, The MIT Press, Cambridge, MA, pp. 159-85.

Kramarz, F. (2001), "Rigid wages: what have we learned from microeconometric studies?", in Drèze, J. (Ed.), *Advances in Macroeconomic Theory*, Oxford University Press, Oxford, pp. 194-216.

McLaughlin, K.J. (1994), "Rigid wages?", *Journal of Monetary Economics*, Vol. 34 No. 3, pp. 383-414.

MacLeod, W.B. and Malcomson, J.M. (1993), "Investment, hold-up, and the form of market contracts", *The American Economic Review*, Vol. 83 No. 4, pp. 343-54.

Malcomson, J.M. (1997), "Contracts, hold-up, and labor markets", *Journal of Economic Literature*, Vol. 35 No. 4, pp. 1916-57.

Malcomson, J.M. (1998), "Individual employment contracts", in Ashenfelter, O. and Card, D. (Eds), *Handbook of Labor Economics*, Vol. 3B, North-Holland, Amsterdam, pp. 2291-372.

Nickell, S. and Quintini, G. (2003), "Nominal wage rigidity and the rate of inflation", *The Economic Journal*, Vol. 113 No. 490, pp. 762-81.

Palenzuela, D.R., Camba-Méndez, G. and García, J.Á. (2003), "Relevant economic issues concerning the optimal rate of inflation", working paper no. 278, European Central Bank, Frankfurt am Main.

Pehkonen, J. (1999), "Wage formation in Finland, 1960-1994", *Finnish Economic Papers*, Vol. 12 No. 2, pp. 82-93.

Saari, E. (1996), "Joustoilla työtä? Työsopimuslain poikkeus ja sopimus nuorten työllistymisedellytysten parantamiseksi – helpottuiko pitkäaikaistyöttömien ja nuorten työhön pääsy" (in Finnish), Policy Studies No. 139, The Ministry of Labour, Helsinki.

Smith, J.C. (2000), "Nominal wage rigidity in the United Kingdom", *The Economic Journal*, Vol. 110 No. 462, pp. C176-95.

Solow, R. (1990), *The Labor Market as a Social Institution*, Basil Blackwell, Cambridge.

Uusitalo, R. and Vartiainen, J. (2005), "Finland: firm factors in wages and wage changes", available at: www.fief.se/staff/juhana/finland_uusitalo_vartiainen.pdf

Vartiainen, J. (2000), "Palkkarakenne ja työurat paneeliaineiston valossa", study no. 78, Labour Institute for Economic Research, Helsinki.

Yellen, J.L. (1984), "Efficiency wage models of unemployment", *The American Economic Review*, Vol. 74 No. 2, pp. 200-5.

Further reading

Layard, R., Nickell, S. and Jackman, R. (1991), *Unemployment: Macroeconomic Performance and the Labour Market*, Oxford University Press, Oxford.

Vartiainen, J. (1998), *The Labour Market in Finland: Institutions and Outcomes*, Publications series 1998/2, Prime Minister's Office, Helsinki.

Appendix

Data: description of the individual and firm-level variables. All variables are from year t with the exception of the variables that capture lagged performance pay share and the lagged decline in wage. Those variables are from year $t - 1$.

Variable	Definition/measurement
Decline (dependent variable)	Individual has experienced a decline in wage from year t-1 to year $t = 1$, otherwise 0. This is defined separately for nominal and real wage cuts
Lag decline	Individual has experienced a decline in wage in the previous year = 1, otherwise 0
Young (≤ 25)	Age of an individual is less than or equal to 25 = 1, otherwise 0
Adult (26-35)	Age of an individual is between 26-35 = 1, otherwise 0
Old (>55)	Age of an individual is older than 55 = 1, otherwise 0
Experience ≤ 2	Experience of an individual is less than or equal to 2 years (for manual manufacturing workers) = 1, otherwise 0
Experience 3-4	Experience of an individual is between 3-4 years (for manual manufacturing workers) = 1, otherwise 0
Experience 5-7	Experience of an individual is between 5-7 years (for manual manufacturing workers) = 1, otherwise 0
Tenure ≤ 2	Tenure of an individual with the current employer is less than or equal to 2 years (for non-manual manufacturing workers and the service sector workers) = 1, otherwise 0
Tenure 3-4	Tenure of an individual with the current employer is between 3-4 years (for non-manual manufacturing workers and the service sector workers) = 1, otherwise 0
Tenure 5-7	Tenure of an individual with the current employer is between 5-7 years (for non-manual manufacturing workers and the service sector workers) = 1, otherwise 0
Weekly hours <30	Weekly working hours are less than 30 hours = 1, otherwise 0 (cut off point is 35 hours for non-manuals)
Weekly hours >40	Weekly working hours are more than 40 hours = 1, otherwise 0
Overtime work	Manual manufacturing worker has worked paid overtime = 1, otherwise 0
Urban area	Individual is living in a high price level urban area in Southern Finland = 1, otherwise 0
Small firm (<20)	Individual is working in a small firm that employs fewer than 20 employees = 1, otherwise 0
Large firm (>100)	Individual is working in a large firm that employs more than 100 employees = 1, otherwise 0
Female	1 = female, 0 = male
Fem share (> med)	Share of females in a firm is more than median share in that particular industry and year = 1, otherwise 0
Fem*Femsh inter.	Individual is a female working in an above median female-share firm in that particular industry and year = 1, otherwise 0
Unskilled	Individual has basic education only = 1, otherwise 0 (for non-manual manufacturing workers and service sector workers only)
Industry change	Individual's employer firm's industry changes from previous year = 1, otherwise 0
ΔPerf.pay share	Change in performance pay share. Performance pay includes compensation based on piece rates and/or other forms of remuneration that depend on individual's performance
Lag Perf.pay share	Lagged performance pay share
Industries	Dummies based on the collective agreement that the person is subject to. These are close to industries
Years	Dummies for years of observation from 1991 to 2000

Table AI.

About the authors

Petri Böckerman is economist and Senior Researcher at the Labour Institute for Economic Research in Helsinki, Finland. He has graduated from Helsinki School Economics and is doing empirical work in the field of labour economics. Petri Böckerman is the corresponding author and can be contacted at: petri.bockerman@labour.fi

Seppo Laaksonen is Professor of Statistics at University of Helsinki and research fellow at University of Tampere. He holds PhD degree from University of Jyväskylä. Currently he is also contributing for Statistics Finland and for the European Social Survey network. Previously he has worked at Eurostat, University of Southampton and Finnish Research and Development Centre for Welfare and Health. His two main research fields are empirical microeconometrics with labour market applications and survey methodology with focus on multinational survey design and analysis.

Jari Vainiomäki is Professor of Economics at the Department of Economics and Accounting, University of Tampere, Finland. He graduated as PhD in London School of Economics. He is doing empirical research mainly in the field of labour economics.