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Petri Böckerman
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Who bear the burden of wage cuts? Evidence from Finland during the 1990s*

Petri Böckerman**, Seppo Laaksonen*** and Jari Vainiomäki****

ABSTRACT

This paper focuses on the share and incidence of nominal and real wages cuts in the Finnish private sector. It complements other analyses of downward wage rigidities especially by looking for individual and employer characteristics that might explain the likelihood of observing an individual's wage cut. The examinations are based on Probit models that include individual characteristics, employer characteristics, and the form of remuneration as explanatory variables. We find relatively few individual or employer characteristics that have a strong and common influence on the likelihood of wage decline across the different segments of labour markets. However, the full-time workers have had a lower likelihood of nominal and real wage declines during the 1990s compared with part-time workers. Declines in wages have also been more common in small plants/firms. In addition, nominal wage declines have been more transitory by their nature within the segments of the Finnish labour markets in which they are more common. Overall, the frequency of nominal wage declines has been fairly low for manufacturing non-manuals and service sector workers but somewhat higher for manual workers in manufacturing. However, nominal wage moderation together with a positive inflation rate produced real wage cuts for a large proportion of employees during the worst recession years of the early 1990s.

JEL Classification: J31

Key words: micro-level, wages, adjustment

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** Labour Institute for Economic Research, Pitkänsillanranta 3A, 00530 Helsinki, Finland. E-mail: petri.bockerman@labour.fi
*** University of Tampere, E-mail: seppo.laaksonen@stat.fi
**** University of Tampere, E-mail: jari.vainiomaki@uta.fi

I. Introduction

This study considers the incidence of wage cuts across individuals. Wage changes in labour markets without frictions for adjustment can be described by the mean change. In practice, the mean change is not able to capture all relevant aspects in wage changes. The reason is that wage distributions fail to be symmetric around the mean change that fluctuates over time, because there are obstacles for wage changes. The aim of this study 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 wage cuts. In this respect, there may be characteristics that have a similar influence on the likelihood of wage cuts in different segments of labour markets. 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 micro-level data on wages.

The incidence of wage cuts in Finland during the 1990s is interesting.[1] The prominent reason for this is that the economic experience has been dramatic by any reasonable standards. Finland suffered its worst recession of the twentieth century not in the 1930s but in the early 1990s (see, for example, Kiander and Vartia 1996; Honkapohja and Koskela 1999; Böckerman and Kiander 2002). As a consequence of the slump, output fell by 10% in the years 1991-1993. The rate of unemployment surged correspondingly from

[1] Vartiainen (1998) contains a description of the Finnish labour markets. Koskela and Uusitalo (2003) provides a discussion of the Finnish unemployment problem in the European context.

3.5% to almost 20%. These indicators were much worse than those recorded during the great depression of the 1930s. Since 1994 the economy has recovered.

Despite the collapse in labour demand, there were no overall cuts in the aggregate nominal wages during the great slump according to commonly used earnings indices. There was, however, significant nominal wage moderation through the use of the instruments of the centralized bargaining system at the same time. Nominal wages were frozen by the collective agreements over the period 1992-1993. However, 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. This macroeconomic pattern of non-adjustment can be contrasted to the micro-level dynamics of individual wages during this turbulent decade.[2]

The rest of the study is organized as follows. The second section provides brief theoretical considerations on the incidence of wage cuts across individuals. The third section contains information about the data. The fourth section includes a description of the heterogeneity of individual-level wage changes by documenting the amount of negative wage changes. The fifth section reports the estimation results. These estimations

[2] The previous Finnish studies have usually applied aggregate data (see, for example, Pehkonen 1999). An empirical investigation by Vartiainen (2000) that applies data on manual workers in Finnish manufacturing is an exception to this pattern. Kramarz (2001) provides a survey of the literature that has focused on the micro-level adjustment of nominal wages. Agell and Lundborg (2003) provide Swedish evidence based on survey data for the perspective that there has not been increase in wage cuts in Sweden despite the rise in the unemployment rate during the 1990s. Christofides and Stengos (2003) investigate the factors that have an influence on the likelihood of pay increases with Canadian individual-level wage data. However, they focus on macro-economic variables. They observe, among other things, that an increase in the regional unemployment rate yields a decline in the likelihood of a wage increase for individuals.

provide information about the factors that did have an influence on the incidence of the burden of adjustment in terms of wage cuts across individuals. The last section concludes.

II. Theoretical considerations

Efficiency wages and fairness standards are the most prominent explanations for the lack of wage cuts. An established version of the efficiency-wage theory states that real wage cuts should be less likely for the categories of the labour force that are most important for the productivity of a firm. The reason is that declines in real wages may yield outflow of these key categories of workers and therefore hurt the productivity and the profitability of a firm (see, for example, Yellen 1984). The mutual resistance for wage cuts by employees and employers can also arise from the fairness standards (see, for example, Solow 1990; Fehr and Gächter 2000; Akerlof 2002; Bewley 2002). The fairness standards constitute obstacles directly to nominal wage declines as well as real wages. Fairness standards should be looser, for instance, for young employees, owing to a short history of repeated interactions between the worker and the firm (see, for example, Fehr and Goette 2000). This means that employers may not feel to be constrained by the fairness standards in order to impose wage cuts for young employees that have not yet established their labour market positions within the firms. Another argument is related to the stylized feature that a decline in wages increases the likelihood that a worker will quit from the current match. However, there is less accumulated firm-specific investments for young employees (see, for example, Holden 1984; Malcomson 1997; 1998). Declines in wages can therefore be implemented for young employees without nullification of sunk costs associated with these firm-specific investments.

These theoretical explanations are also relevant to other characteristics of individuals and firms, like experience, 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, that affect our results for wage cuts. These issues are further discussed in connection with empirical results.

III. The data

The data of this study comes directly from the payroll records of the Finnish employers' organizations, covering all employees of their member firms[3]. The structure of this data is quite similar across sectors. 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. This means that measurement error should not be a great problem in this data.[4] However, there are two major differences in this data across the segments of the Finnish economy: the timing and the wage concept. The data for manual workers in manufacturing covers the last quarter of each year. In contrast, the data for non-manual workers in manufacturing covers one month of each year and the same feature extends to data that covers the private service sector. In addition, the applied wage concept differs across segments. The "average hourly wage for regular hours" measure for manual workers in manufacturing is widely held as the most appropriate wage measure, as it gives the average earnings per hour during regular working time excluding separate bonuses for overtime, shift work or

[3] The data therefore covers almost comprehensively all workers in manufacturing and services in Finland.

working conditions. For non-manual workers in manufacturing and for the service sector workers the applied wage concept is the "regular monthly wage". 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.[5] 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 same in both years.

IV. Heterogeneity in wage changes

The descriptive statistics on wage declines is provided in Tables 1-2. There has been a great deal of heterogeneity in the adjustment of nominal wages across individuals during the 1990s in terms of the incidence of nominal wage decreases. In manufacturing there is evidently substantially more indication of nominal wage rigidity for non-manual workers than for manual workers. Thus, there have been few negative nominal wage changes for non-manual workers in manufacturing, even during the great slump of the early 1990s (although there were somewhat more negative wage changes after the worst recession years in 1993). This pattern is in sharp contrast to the adjustment of nominal wages for manual workers in manufacturing during the recession years, when the share of workers with negative wage changes was 17% in 1990-1991, 36% in 1991-1992 and 21% in 1992-1993. However, in normal times the number of negative nominal wage changes for

[4] Smith (2000) provides a discussion about the measurement error in wage changes.
[5] The inclusion of movers across plants and occupations yields an increase in the dispersion of wage changes. This feature is as expected due to the fact that there are no limitations for wage changes of job movers in the institutional context of the Finnish labour markets. These results are available from the authors.

job-stayers is not particularly high in the Finnish case. The proportion of negative wage changes in Table 1 (for manual workers in manufacturing) has been around 5-10% in normal business cycle conditions, which is about half of the similar proportion in the UK (see Nickell and Quintini 2001).

TABLES 1-2 AROUND HERE

The share of nominal wage declines for job stayers in the service sector is small compared with manual workers in manufacturing but similar to non-manual workers in manufacturing. The share of real wage declines behaves more similarly across sectors, being very high (60-80%) during the recession years of 1991-1993. This arises from a large number of 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 shares of real and nominal wage declines for these groups.

The frequency of nominal and real wage cuts broken down by industry in each sector is presented in Figures 1 to 3. Although there are some differences between industries, the overall picture is that both the level and time series patterns of the shares of wage declines are quite similar across industries (with somewhat more differences in nominal wages in the service sector). This implies that the time series pattern of wage cuts is not related to industry specific factors and/or changes in industry structure of employment.

FIGURES 1-3 AROUND HERE

The average nominal wage decline for those workers that experience a wage decline has been higher in the service sector compared with manual and non-manual workers in manufacturing. The same applies for average real wage declines comparing service sector and non-manuals, but not for manuals. Note that the average real wage decline is smaller than the average nominal wage decline, because the former contains a large number of small real declines.

V. Explaining the incidence of wage cuts

Since we focus on the prevalence of nominal wage rigidity, we examine the existence of wage cuts rather than the size of wage declines. Hence, we use the Probit models to evaluate the factors that have contributed to the likelihood of wage declines for job stayers during the 1990s. The models include 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) (see Appendix 1).[6] The estimation results for wage declines covering manufacturing and the private service sector are reported in Tables 3-6[7]. These models also include the year dummies that are not reported in order to save space, because they reveal the same broad pattern as the tables of the earlier section. This means that the background characteristics included do not explain the time-series pattern of wage declines.

[6] The explanatory variables are from year t with the exception of the variables that captures lagged performance pay share and the lagged decline in wage. Those variables are from year t-1.

[7] The panel-property of the individual-level data with random effects turned out to be statistically insignicant in the determination of wage declines, so we report ordinary Probit results only.

TABLES 3-6 AROUND HERE

The role of workers' age in the determination of wage declines during the 1990s is mixed. For manual workers in manufacturing, nominal wage declines have been less common for the population of young employees during the 1990s, 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 employees. This means that nominal wage declines have been more common for the prime-age workers (36 to 54 years of age), which is the reference group for the estimated age effects. This pattern is in disagreement with a number of popular notions about labour markets. The reason for the feature that nominal wage declines are less common for young employees is probably the fact that the payment system adopted by the Finnish manufacturing companies implies that there is usually a rather steep increase in the earnings profile for employees during their early years. For instance, young employees move quite rapidly from trainee positions to regular full-time jobs within manufacturing companies. In addition, wages for young employees in manufacturing are likely to be close to the minimum wages stipulated in the current collective agreements. This same pattern of adjustment applies to non-manual manufacturing workers. Thus, there fails to be room for nominal wage cuts for young employees in the institutional framework of the Finnish labour markets.

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. Thus, 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 feature 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 declines for young workers are substantially less likely compared with prime-aged and older workers, as in manufacturing. This pattern means that 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 to prime-aged and older workers. In contrast, declines in real wages are substantially more common for aged workers. In general these results indicate that the population of aged employees constitutes the most flexible part of labour force in terms of downward real wage adjustment both in manufacturing and service sectors.

Experience provides an indicator of the attachment of workers to labour markets. Nominal and real wage declines are less common for less experienced manual workers that have a looser attachment to manufacturing plants. 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. These findings 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 provide a shield against negative real wage changes.

Gender seems to matter for the incidence of wage declines. Both nominal and real wage declines are slightly less common for females. The reason for this is probably the fact that the labour supply responses for females are more flexible in terms of hours and numbers, implying less need for wage cuts. Nominal wage declines are more common for manual workers in manufacturing plants that have a large share of females. The same pattern applies to the service sector, but fails to apply to non-manual manufacturing workers. A possible explanation of this pattern is the low capital intensity of a plant that is associated with a high female share, which means that there is more overall need for the adjustment of labour costs. However, in manufacturing there is evidence that nominal and real wage declines 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 in this respect.

The hours of work play an important role in the incidence of wage declines. Declines in nominal and real wages are less common for employees that perform a great number of weekly working hours. These employees constitute the firm insiders that are largely 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. The fairness standards can also be more tight for the firm insiders. Additional estimation results that involved interactions of the explanatory variables with the years revealed that the influence of hours of work on the incidence of wage cuts across individuals was especially strong during the great slump of the early 1990s.[8] For instance, contractions in real wages were over 10% more likely for manual workers in manufacturing that work less than 30 hours in 1994. In other words, nominal and real wage cuts have been more likely among part-time workers. The pattern extends to non-manual workers in manufacturing and the service sector. This means that there are certain common elements in the incidence of the burden of wage cuts across sectors.

Overtime constitutes an important part of the adjustment of the total hours of work in manufacturing. Thus, for manual workers in manufacturing, there is strong evidence for the perspective that an increase in paid overtime hours yields a decrease in the likelihood of nominal wage decline. The reason is most likely that overtime captures the profitability of a plant that is not available in the wage records by employers. In other words, an increase in the profits of a plant means that there is more need for paid overtime and there fails to be a need for nominal wage cuts at the same time.[9]

[8] These results are not shown in tables, but they are available upon request.

[9] This conclusion is based on the fact that overtime premia are high in Finland. The (minimum) premium for daily overtime is 50% for the first two hours and 100% for each following hour. The premium for weekly overtime is 50%, irrespective of the number of hours.

Regional disparities are sharp in Finland. The geographical pattern of wage cuts is therefore interesting. Nominal wage declines for manual and non-manual workers in manufacturing have been slightly more common in urban areas during the 1990s. This particular pattern is not consistent with the stylized feature that urban areas are, in broad terms, characterized by the lower level of the unemployment rate compared with the rest of the Finnish regions. Thus, there should be fewer pressures for wage cuts in the population of manufacturing plants that are located in those regions. An explanation for the pattern that wage declines are more common in manufacturing in urban areas may be that these regional labour markets are more dynamic by their nature in the sense that temporary pay rises are followed by temporary declines in wages. 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. The size effect is robust across sectors. The size of a plant measured by the number of employees can matter for wage cuts for several 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 (see, for example, Caves 1998). An additional explanation for the fact that wage declines are more common in small firms is that there is almost always a low hierarchy in small firms compared with large companies with a great number of separate establishments, which facilitates a more efficient and detailed flow of information about the position of firms in the population of small firms. 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. However, the pattern that wage cuts are more common in small plants 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 due to the fact that there is more need for repeated personal interactions in small plants between employer and employees.

The regular wage of workers consists of several components that have a different exposure to the performance of an employer. For manual and non-manual workers in manufacturing, the lagged performance-related pay share variable gets a positive sign and the effect is substantial by its magnitude. This means that those employees that have a great deal of volatile components in their regular wage have a substantially higher likelihood to experience nominal and real wage decline. The same pattern exists for the service sector workers. In contrast, the variable that captures the change in the performance-related pay share decreases the likelihood of a wage decline for manual workers in manufacturing. There are at least two explanations for this pattern. First, the performance-related pay rates are higher than the pay rates for time pay. Thus, a decline in the regular hourly wage is less likely as the share of these wage components with the higher average rates increases. Second, manual workers in manufacturing may supply more performance-related hours in order to resist declines in time wages. This reduces the likelihood of declines in total wages, but creates a positive correlation between declines in 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 3-4). The findings for non-manual manufacturing workers and for service sector workers reveal the opposite

pattern. A possible explanation for this is that service sector workers are not able to resist declines in wages by increasing the supply of performance-related hours.

Unskilled workers have a higher likelihood of nominal and real wage decline in the service sector.[10] This means that education is somewhat helpful in avoiding wage decline. Efficiency-wages may explain this pattern. Nominal and real wage cuts are not easily implemented for skilled workers, because they are more important for the productivity and the profitability of a firm compared with unskilled workers. There is therefore some evidence for the perspective that unskilled workers carried the heaviest burden of depression in both prices and quantities, because the net rate of employment change was the most negative for the employees with basic education only during the great slump of the early 1990s. However, for non-manual manufacturing workers there is some evidence for a small negative or insignificant effect of education on wage cuts. All in all, education effects are quite small and different across sectors.

An important feature of wage declines is their persistence for individuals. The negative welfare effects of wage declines in terms of lost labour income are highlighted if wage declines are strongly persistent in time. We find empirical evidence for a transitory component in nominal and real wage declines. For instance, in the case of nominal wages a decline in a wage is 5% less common for a manual worker who has experienced a

[10] This particular variable is not available for manual manufacturing workers. However, it can be argued that education is not important in the incidence of wage cuts across individuals in manufacturing owing to the homogeneity of the labour force. In contrast, the Finnish private service sector is more heterogenous in terms of education requirements of workers, because it contains firms from pharmacies with academic education requirements to restaurants with few requirements for formal education.

nominal wage cut during the previous year, other things being equal. In contrast, there is some persistence in nominal wage declines for non-manual manufacturing workers, but the share of workers experiencing nominal wage cuts is small in this segment. Nominal wage declines for service sector workers show stronger persistence, but nominal wage cuts are quite rare also in this sector. 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. Thus, we find evidence for an important transitory component in the likelihood of real wage decline for all sectors and worker groups.

VI. Conclusions

There has been a great deal of heterogeneity in wage cuts for job stayers in Finland during the 1990s. The frequency of nominal wage declines has been highest for manual workers in manufacturing. In contrast, there has been a substantially lower number of negative nominal wage changes for non-manual workers in manufacturing and for service sector workers. Nominal wage moderation with the positive inflation rate during the great slump 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 agreements. In this sense, centralized bargaining shaped the adjustment.

There are relatively few factors that have a common influence on the likelihood of wage decline across the segments of the Finnish economy. However, the hours of work and the

size of a plant/firm play a similar role in the incidence of wage cuts. Full-time workers, who constitute the firm insiders, have a lower likelihood of nominal and real wage decline. Moreover, nominal and real wage declines 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. There is some evidence for nominal wage rigidity to play a role in nominal wage cuts. For example, nominal wage increases among the population of aged manual employees in manufacturing tend to be constrained above zero, but at the same time they may be less than the current rate of inflation producing declines in real wages.

The persistence of wage cuts shows interesting differences across the segments of the Finnish labour markets. Nominal wage declines are more transitory by their nature within the segments in which they are more common. In other words, nominal wage declines have been more common for manual workers in manufacturing during the 1990s, but they have been more transitory by their nature. In contrast, for non-manual workers in manufacturing and for service sector workers, declines in nominal wages have been less common by their frequency, but they have been more persistent than for manual workers.

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Table 1. Proportion of employees that have experienced negative wage changes across sectors of the Finnish economy during the 1990s.

	Nominal wage			*Real Wage*		
	Manufacturing	Manufacturing	Services	Manufacturing	Manufacturing	Services
	Manual workers Hourly pay	Non-manual workers Monthly pay	Monthly pay	Manual workers Hourly pay	Non-manual workers Monthly pay	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 2. The average wage decline for those employees that have experienced negative wage changes across sectors of the Finnish economy during the 1990s.

	Nominal wage			*Real Wage*		
	Manufacturing	Manufacturing	Services	Manufacturing	Manufacturing	Services
	Manual workers Hourly pay	Non-manual workers Monthly pay	Monthly pay	Manual workers Hourly pay	Non-manual workers Monthly pay	Monthly pay
1990-1991	-5.4	-8.2	-15.4	-4.0	-2.1	-3.5
1991-1992	-3.5	-7.2	-8.6	-3.9	-2.6	-2.8
1992-1993	-3.8	-6.6	-12.0	-2.9	-2.2	-2.6
1993-1994	-5.7	-9.3	-11.8	-5.0	-1.7	-1.9
1994-1995	-5.8	-19.3	-13.5	-5.3	-11.6	-9.6
1995-1996	-5.0	-6.7	-13.4	-4.8	-5.2	-10.0
1996-1997	-2.9	-9.2	-9.7	-2.4	-1.6	-1.8
1997-1998	-4.6	-10.1	-10.7	-3.9	-3.4	-7.6
1998-1999	-4.7	-7.7	-11.2	-4.0	-4.6	-8.2
1999-2000	-5.2	-11.6	-12.8	-2.5	-1.2	-2.0

Table 3. 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 Hourly pay for time work					
	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)
∆Perf.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 t-values) are reported. 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 4. 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 Hourly pay for time work					
	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)
∆Perf.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 3.

Table 5. 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*	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)
∆Perf.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 t-values) are reported. All models include year and industry dummies. Base groups (omitted indicators) are prime aged (36-55), tenure/experience > 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.

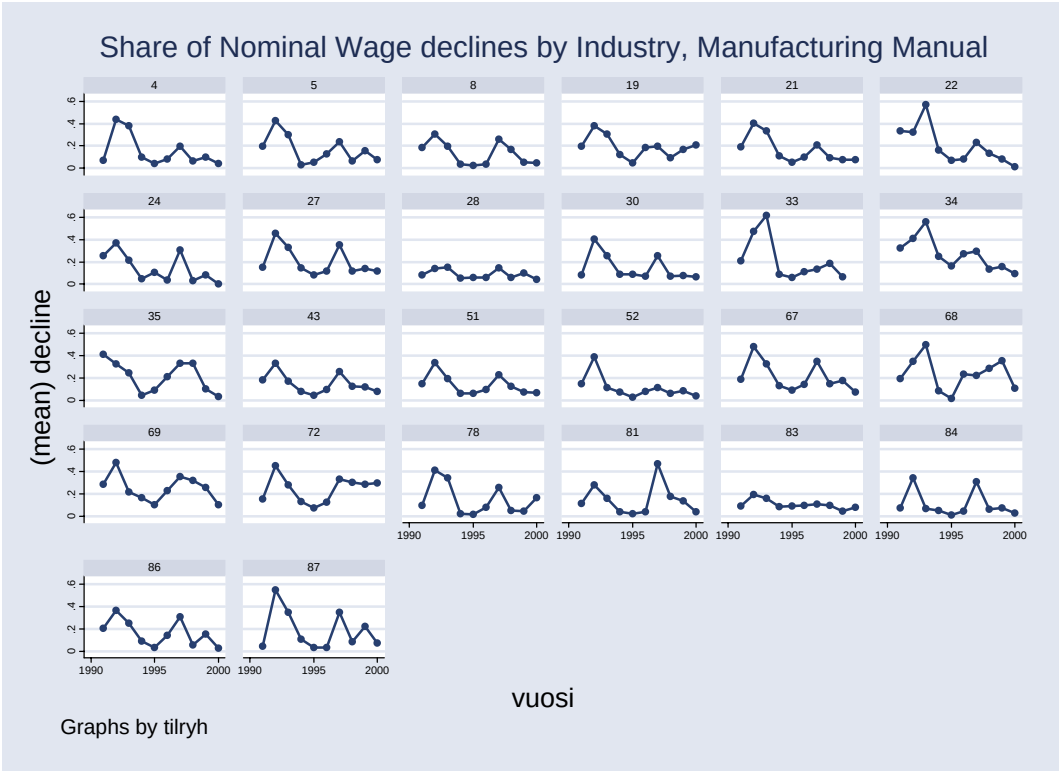
* The cut off point is 35 hours for non-manuals.

Table 6. 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)
∆Perf.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 5.

Figure 1. Share of Nominal and Real Wage Declines for Manufacturing Manual Workers
(regular hourly total pay)



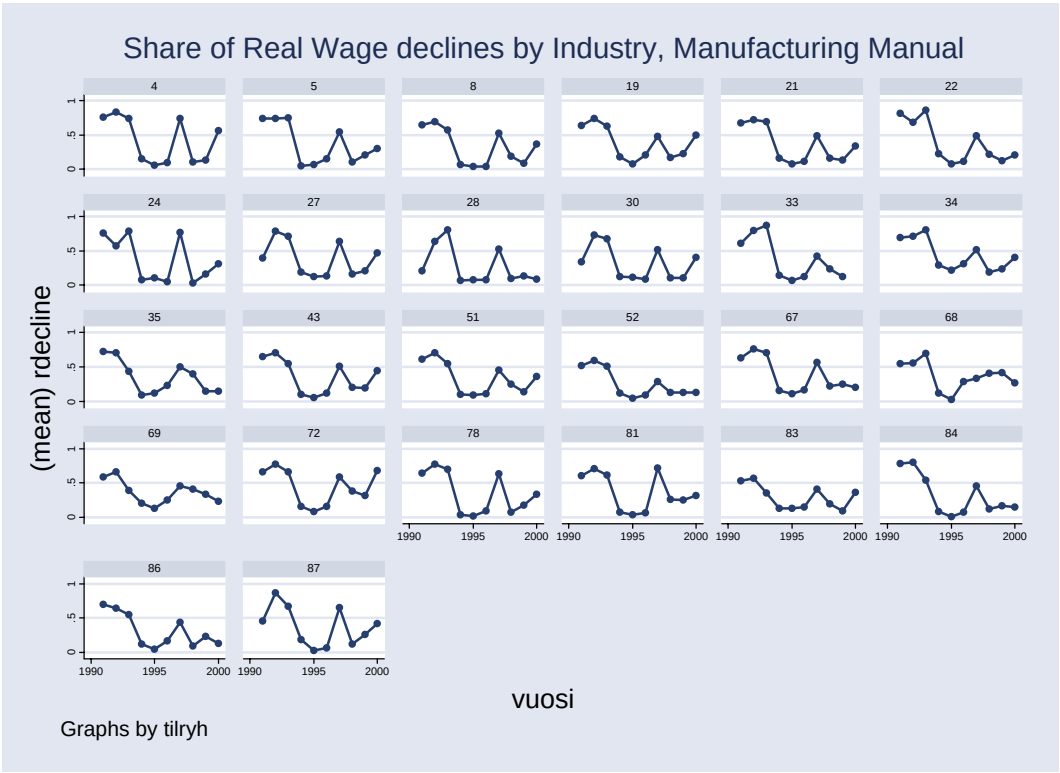
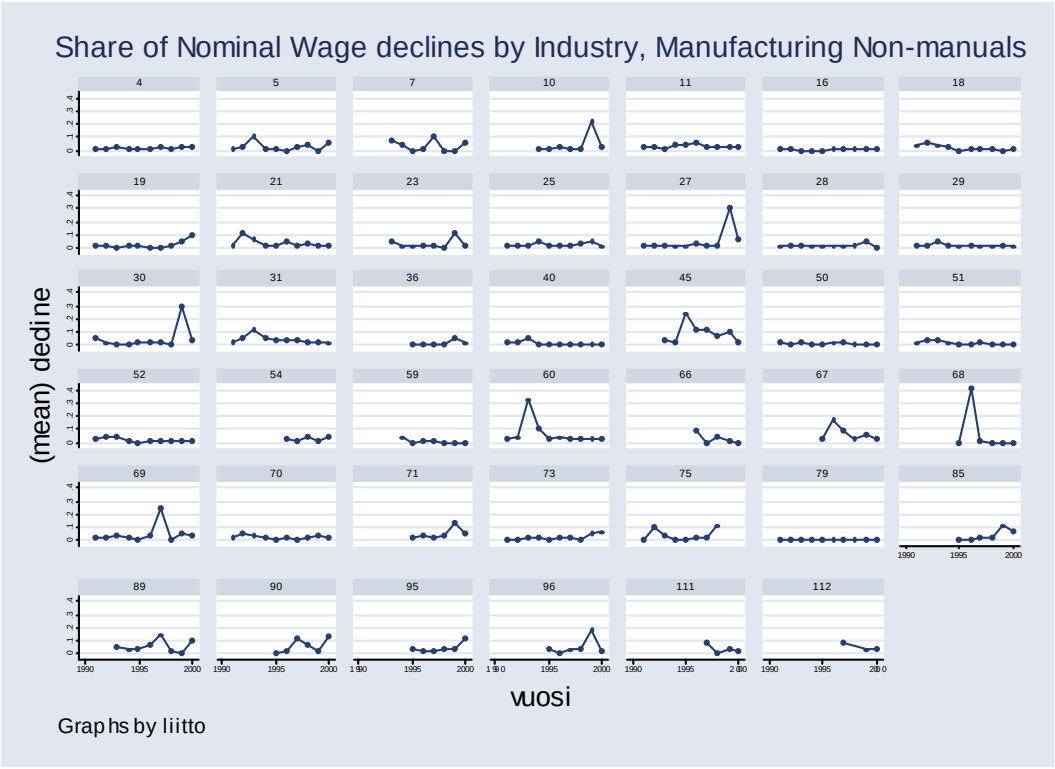


Figure 2. Share of Nominal and Real Wage Declines for Manufacturing Non-Manual Workers
(requlars monthly pay)



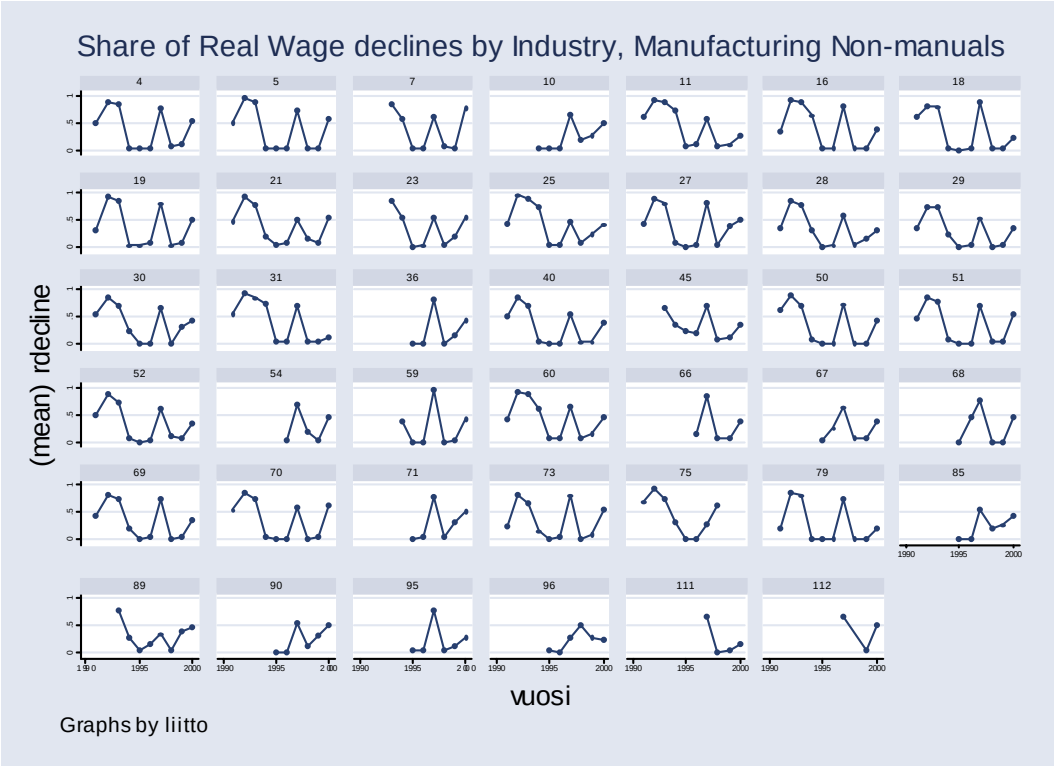
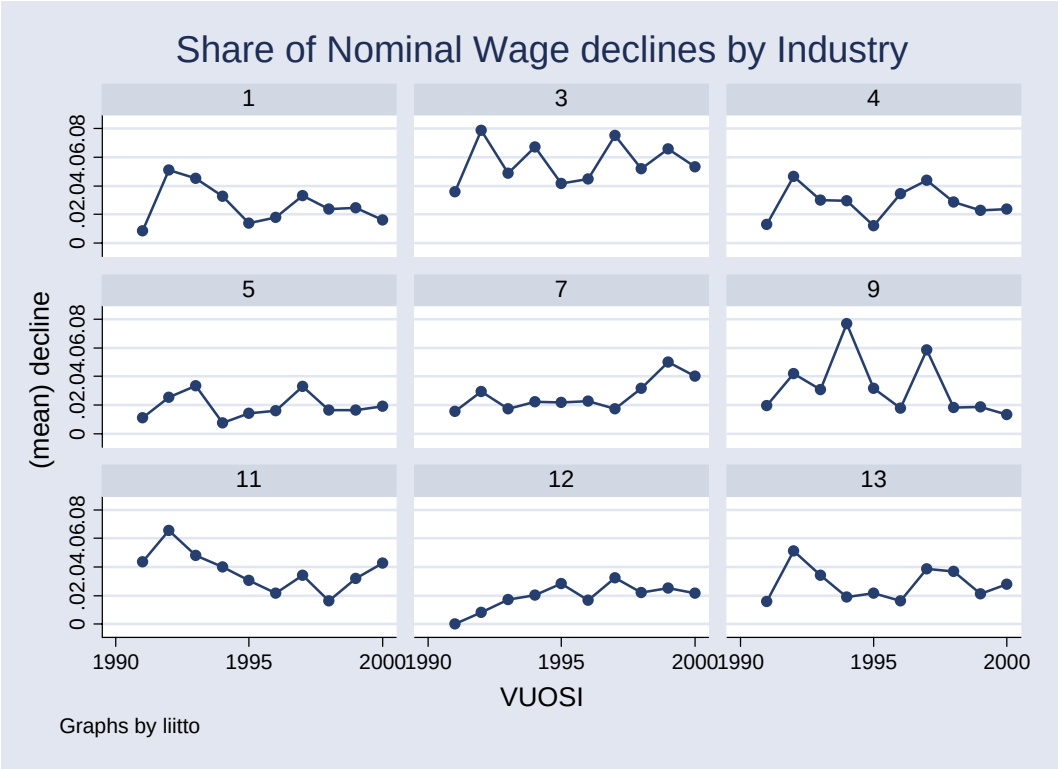
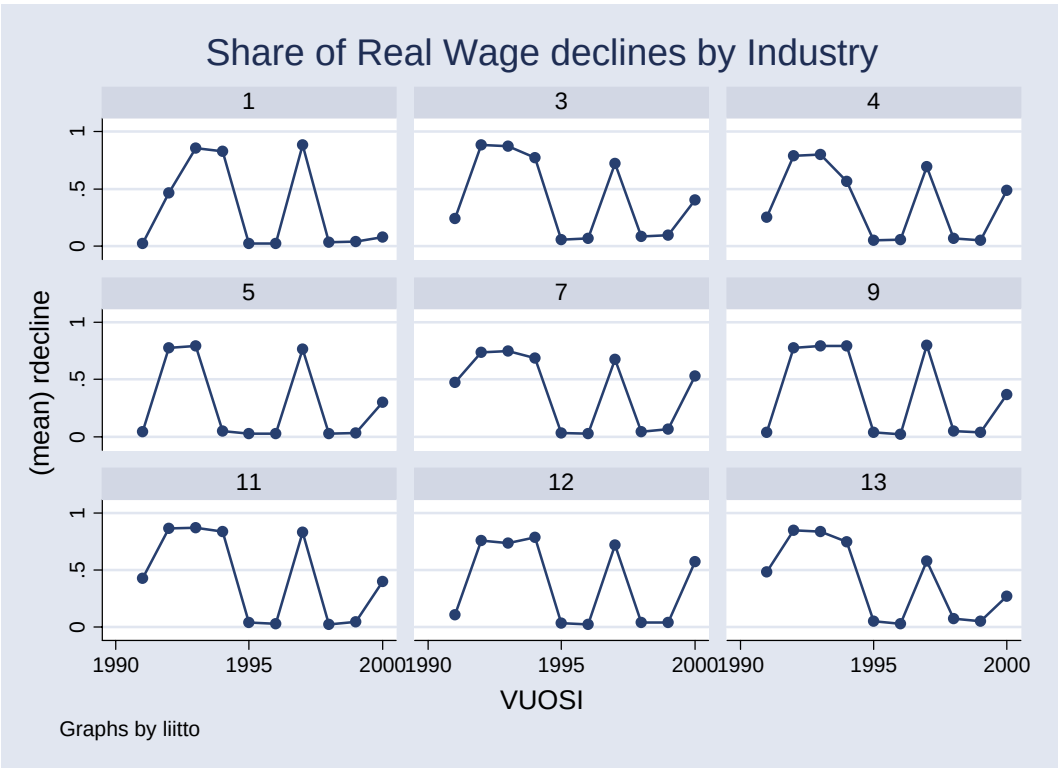


Figure 3. Share of Nominal and Real Wage Declines for Private Service Sector Workers
(regular monthly pay)





Appendix 1. Description of the variables.

Variable	Definition/measurement
Lag decline	Individual has experienced a decline in wage in 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 within manufacturing industries is less than or equal to 2 years =1, otherwise 0
Experience 3-4	Experience of an individual within manufacturing industries is between 3-4 years=1, otherwise 0
Experience 5-7	Experience of an individual within manufacturing industries is between 5-7 years=1, otherwise 0
Tenure ≤2	Tenure of an individual with the current employer in the service sector is less than or equal to 2 years =1, otherwise 0
Tenure 3-4	Tenure of an individual with the current employer in the service sector is between 3-4 years =1, otherwise 0
Tenure 5-7	Tenure of an individual with the current employer in the service sector is between 5-7 years =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 less 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
∆Perf.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
INDUSTRY	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