# Micro-level evidence on wage rigidities in Finland

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# 219

# MICRO-LEVEL EVIDENCE ON WAGE RIGIDITIES IN FINLAND*

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* This study reports and discusses the estimation results for Finland regarding the prevalence of micro-level wage rigidities in the project "Wage rigidity and labour market effects of inflation" (Palkkajäykkyys ja inflaation työmarkkinavaikutukset) financed by The Finnish Work Environment Fund (Työsuojelurahasto). This study is the Finnish contribution to the International Wage Flexibility Project led by William T. Dickens (The Brookings Institution) and Erica L. Groshen (The Federal Reserve Bank of New York). Dickens et al. (2006) report the results from all 13 countries that are involved in the International Wage Flexibility Project. We are grateful to The Finnish Work Environment Fund for finance and Heikki Almgren, Auli Jaakkola and Ralf Ramm-Schmidt for their help with the usage of wage surveys of Finnish employers' associations. The usual disclaimer applies.

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**Tiivistelmä:**

Tutkimuksessa tarkastellaan palkkojen nimellistä ja reaalista jäykkyyttä alaspäin Suomessa käyttäen yksilötason aineistoja työntekijöiden ja toimihenkilöiden palkoista vuosilta 1985–2001. Tulokset osoittavat, että palkoissa oli 1990-luvulla joustavuutta makrotaloudellisessa mielessä. Erityisesti 1990-luvun alun ankaran laman aikana reaalipalkkojen jäykkyys alaspäin heikkeni ja suuri osa työntekijöistä koki reaalipalkan alenemisen. Yksilötason palkanmuutosten perusteella palkat ovat kuitenkin Suomessa kiistatta jäykkiä alaspäin. Kansainvälisen vertailun valossa Suomi kuuluu korkean reaalisen jäykkyyden maihin eurooppalaisittainkin tarkasteltuna. Lamavuosien jälkeen palkkojen reaalijäykkyys on palannut takaisin korkealle tasolle, vaikka työttömyys on pysynyt korkeana.

**Abstract:**

This paper analyses the flexibility of the Finnish labour markets from the microeconomic perspective by focusing on individual-level wage changes for job stayers. The study covers the private sector workers by using three separate data sets obtained from payroll records of employers' associations. Two main conclusions from wage formation emerge. First, there has been macroeconomic flexibility in the labour market. Real wage rigidity declined during the early 1990's recession and a large proportion of workers experienced real wage cuts. We also find that average wage changes respond negatively to an increase in unemployment. Second, the evidence based on individual-level wage change distributions show that especially real wages are definitely rigid in Finland in international comparison. In addition, the evidence points out that individual-level wage changes have regained the high levels of real rigidity during the late 1990s that prevailed in the 1980s, despite the continued high (but declining) level of unemployment.

CONTENTS

## 1. Introduction

Deflation or low inflation may be problematic for the adjustment of the labour market.[1] The downward rigidity of nominal wages at the individual level of the economy may lead to higher wage pressure during an episode of low inflation. The downward rigidity of nominal wages implies that the downward adjustment of real wages is more limited during low inflation, which could lead to higher wage pressure and equilibrium unemployment (e.g. Akerlof, Dickens and Perry 1996; 2000 and Holden 2004).[2] As Holden (2002) has stressed, this feature is in contrast with the macroeconomic models based on nominal overlapping wage contracts in which the rate of inflation *per se* is irrelevant for the rigidity in real wages.

Several studies have reported evidence for the feature that there are seldom cuts in nominal wages of employees. One reason for this is that there are substantial costs associated with the modification and the renegotiation of current employment terms (see Malcomson 1997). In addition, fairness standards and implicit contracts may constitute obstacles for nominal wage cuts.[3] The evolution of the Finnish economy during the past few decades provides a good opportunity to investigate these issues in detail. This emerges from the recent changes in the inflation pattern owing to profound changes in the monetary framework and economic activity. These underlying fluctuations are helpful in identifying the effects of inflation and macroeconomic conditions on the adjustment of the labour market. An important additional point is that a severe disruption in aggregate economic activity, like the early 1990's recession in Finland, can loosen traditional fairness standards in the labour market.

Finland has traditionally been a high-inflation country, where the rapid rate of wage and price inflation was compensated by the frequent devaluations of currency in order to regain competitiveness in export sectors. However, this pattern of macro-level adjustment of a small open economy turned around when the Bank of Finland adopted inflation targeting after the great slump of the early 1990s and the country joined to the third stage of Economic and Monetary Union (EMU) in 1999. In particular, in February 1993 the Bank of Finland adopted a target rate of 2% *per annum* for the core inflation rate to be attained by 1995. The same target was upheld by the European Central Bank (ECB). This target was low given the

inflation history of three previous decades. The average inflation in Finland was 4.9% during the 1960s, 11.4% during the 1970s, and 6.8% during the 1980s (Figure 1.1; upper panel).

Furthermore, there was a severe disruption in aggregate economy activity during the great slump of the early 1990s that caused, in addition to disinflation, an unprecedented increase in unemployment. The unemployment rate increased in three years (1991-1993) to almost 20% from an average around 5% during 1980s (Figure 1.1; lower panel). Finland suffered its worst recession of the twentieth century not in the 1930s but in the early 1990s (e.g. Böckerman and Kiander 2002). Other Nordic countries and the United Kingdom had similar unemployment patterns and many other qualitative similarities in their economic development. Deregulation of financial markets lead to over-lending by banks, which caused an unsustainable boom in consumption, investment spending and asset prices before the collapse. The depth of Finland's recession in the early 1990s was however unique in the context of the OECD countries. An exogenous factor that partially explains this is the almost complete and long lasting disappearance of the trade with the Soviet Union in 1990-1991, which constituted about 20% of the Finnish exports. The reasons behind the great Finnish depression of the early 1990s have been aptly described as "bad luck, bad banking, and bad policies".[4] The active labour market policy in Finland has not been as ambitious as in Sweden, but it was still effective enough to eliminate the long-term unemployment almost entirely during the 1980s (e.g. Machin and Manning 1999). The good employment record of the 1980s was therefore abruptly ruined at the beginning of the 1990s by a radical change from almost full employment to mass unemployment. It is worth remembering that Finland's unemployment rate was always lower than the European Union average before the great slump of the early 1990s. It is possible that this major shock to unemployment caused changes in the way labour markets work and affect the strictness of constraints to downward rigidity of wages.

These different episodes in terms of the rate of inflation and unemployment during the past couple of decades provide a good background to study the relationships between wage rigidities, inflation and unemployment. Our purpose in this paper is to examine the existence and the importance of nominal and real rigidity of wages through the use of individual-level micro data and the methods launched in the recent literature (e.g. Kramarz 2001 provides an extensive survey of this literature from the point of view of methods). Dickens and Goette (2005) have further developed those methods for the International Wage Flexibility Project.

Micro data allows us to explicitly take into account the heterogeneity in the adjustment of individual wages, in contrast to macro (time series) studies which focus solely on average wage changes.

Our analysis focuses on the rigidity of base wages, which does not include performance-based elements of compensation. We also limit to wage changes for persons who are remaining in the same job, so we exclude flexibility related to changes in jobs within a firm or between firms. Wage rigidity can be useful for restructuring, because it may foster reallocation of resources between firms (Hibbs and Locking 2000), but we do not analyse these advantages vs. disadvantages related to wage flexibility. It is clear that most of the burden of overall adjustment falls on those workers who lose their jobs during recessions. Displaced workers often suffer permanent wage losses, so the magnitude of wage cuts experienced in the economy is underestimated by focusing on job stayers. With these limitations in mind we attempt to document the amount and development of nominal and real wage rigidities in Finnish manufacturing and private service sectors, and provide a brief international comparison.

The paper is organised as follows. Section 2 discusses different concepts of wage rigidity and presents a summary of the relevant empirical literature. Section 3 introduces our data on individual-level wage changes. We have in total three data sets available, which make it possible to investigate the adjustment of the private sector in detail. Section 4 contains a description of wage change histograms and reports results for the amount and the incidence of wage cuts. Section 5 reports results for the sand and grease effects of inflation on the labour market based on the methodology proposed by Groshen and Schweitzer (1999). Section 6 describes the methods developed by Dickens and Goette (2005) for the International Wage Flexibility Project for analysing the amount of nominal and real wage rigidities based on wage change distributions. Section 7 documents our results of distributional analysis of wage changes for Finland. At the end of the section, estimation results on the macroeconomic sensitivity of wage changes to unemployment are reported. The last section concludes and Appendix 2 includes a description of wage-setting institutions in Finland.

## 2. Definitions and research of wage rigidity

There are at least four different strands of research on wage rigidities. First, there is an old macroeconomic tradition. Bruno and Sachs (1985) provide early results on nominal and real rigidity based on aggregate time-series evidence. Bruno and Sachs (1985) argue that real wages are flexible in the United States, but rigid in Europe. The opposite is true for nominal wages, which are more rigid in the United States than in Europe. It is important to note that the definitions for nominal and real rigidity are not the same as the ones in the more recent literature that is based on micro-level data. Bruno and Sachs (1985) define nominal wage flexibility as a response of nominal wages with respect to the rate of inflation. Real wage flexibility refers to a response of real wages with respect to the unemployment rate. Later, for instance, Layard, Nickell and Jackman (1991) have applied these concepts for a number of OECD countries including Finland. Nominal wage rigidity appears to be higher in Finland (along with U.S. and Canada) than in most of the countries included, but real wage rigidity is on the average level among those countries. The earlier empirical research on the adjustment of wages in Finland has almost exclusively followed this line of research and applied macro-economic aggregate data on average wage changes. Pehkonen (1991; 1999) provides examples of this strand of the literature. The aggregate studies have discovered, for instance, that a 1-percentage point increase in the unemployment rate tends to yield a 1-2% decline in the level of real wages.

Second, in more recent research based on the concept of the wage curve by Blanchflower and Oswald (1995; 2005), it has been typical to argue that there are no major differences in the flexibility of labour markets in terms of real wages across countries. These studies combine micro-level data on wages with the regional unemployment rates in order to estimate the elasticity of individual-level wages to an increase in the regional unemployment rate. Faggio and Nickell (2005) is a recent contribution in this line of research for UK. They find that wage flexibility to labour market conditions has increased since mid 1980's, which is partly explained by the decline in national pay bargaining. Finnish studies on wage curve (e.g. Pekkarinen 2001) have established that the elasticity of real wage level with respect to the regional unemployment rate in Finland is -0.1%, which is a common finding for other countries in the literature.

Third, many studies have used surveys of employers to examine factors that support resistance to wage cuts. For instance, Campbell III and Kamlani (1997) provide U.S. survey evidence on the reasons for wage rigidity based on a sample of 184 firms. Bewley (1998) provides evidence on wage rigidities based on interviews that are targeted to managers. Franz and Pfeiffer (2006) present results for Germany. In general, the results reported in these studies support the idea that employers are not willing to cut wages, because they fear that it will lead to the erosion of working morale, adverse selection in worker turnover or increases in turnover costs. In particular, Agell and Lundborg (2003) report that the amount of wage cuts has not increased in Sweden despite the rise in the unemployment rate during the 1990s based on survey data for Sweden. Agell and Bennmarker (2002) however report that, when facing underbidding in wages or working conditions from outsiders, employers almost always reject these offers. As reasons for not accepting underbidding, employers report that it is 'against firm's personnel policy' or 'creates conflicts' more often than 'union resistance' or 'against existing contracts'. Alho et al. (2003) examine various aspects of collective bargaining in Finland using a survey that was targeted to the representatives of employers and employees. It shows that over half of the Finnish employers think that the current collective bargaining does not provide enough opportunities for wage flexibility. Not surprisingly, employees hold opposite views. However, there is also evidence in this survey that workers would prefer a combination of wage cuts and employment adjustment to pure employment adjustment with rigid wages when faced with a need to cut labour costs in a recession (see Vainiomäki 2005 for this interpretation). Therefore, it seems that even in unionized labour markets like in Sweden or Finland also other reasons are important for wage rigidity in addition to simple union or worker resistance.

Fourth, there is a strand of literature that uses micro-level data in order to estimate the extent of nominal and real rigidities in the labour market. This approach that takes advantage of individual-level wage change distributions has gained a lot of ground in more recent years. There have been several different methodological approaches in this literature on micro-level rigidity of wages. Descriptive accounts focus on the lack of wage cuts and the sweep-up of wage cuts to wage freezes due to downward nominal or real wage rigidity. Non-parametric methods based on the symmetry assumption of the counterfactual wage change distribution attempt to measure the share of wage changes that is affected by wage rigidity. Further studies attempt to estimate parameters describing the extent of downward wage rigidity, using

parametric assumptions about the distribution of wage changes. There has not been any deep consensus about the prevalence of nominal and real wage rigidities in the labour market, although many studies include evidence consistent with downward wage rigidities. One reason for differences in the results is that measurement error in wages contaminates wage changes and thereby biases numbers of wage cuts (upwards) and wage freezes (downwards). Because the extent of measurement error varies between studies and they may account for its effects differently, they end up with different views on the importance of wage rigidities. Kramarz (2001) and Holden (2004) provide comprehensive surveys of this literature. For examples using different approaches, see McLaughlin (1994), Card and Hyslop (1996), Kahn (1997), Altonji and Devereux (1999), Fehr and Goette (2000), Smith (2000), Nickell and Quintini (2003), and Christofides and Stengos (2003).

To our knowledge there are only two earlier empirical studies of the micro-level wage rigidities in Finland. Vartiainen (2000) investigated the nominal adjustment of wages from 1980 to 1995 by using the same individual-level data source for manual workers in manufacturing as in this study. He discovered, based on the distributions of nominal wage changes across individuals, that nominal wage reductions are quite common for Finnish manufacturing workers. In particular, about a third of all manual manufacturing workers experienced a decline in their nominal wages during the depression of the early 1990s. However, Vartiainen (2000) does not restrict the analysis to job stayers, which has usually been the case in other studies investigating the magnitude of nominal wage adjustment at the individual-level. Hence, a certain amount of the nominal adjustment observed by Vartiainen (2000) is most likely produced by the turnover of workers, which is in Finland at about the same level as in other industrialized countries (Ilmakunnas and Maliranta 2003). His Probit-estimations indicate that reductions in nominal wages are more common for young workers and women and in small plants. Snellman (2004) focuses on nominal pay cuts for manufacturing manual and non-manual (salaried) workers and finds that they tend to concentrate to certain plants.

## 3. The data

The data for this study comes from 'wage surveys' of two Finnish employers' associations. Manufacturing sector manual (hourly paid) and non-manual (salaried, monthly paid) workers are covered by separate surveys conducted by TT (*Teollisuus ja työnantajat*). Private service sector workers are covered by a survey from PT (*Palvelutyönantajat*). TT (the central organization for the manufacturing sector employers) and PT (the central organization for the service sector employers) merged in spring 2004. The new employers' association is called the Confederation of Finnish Industries (*Elinkeinoelämän keskusliitto*). The wage surveys are still conducted separately for each sector. The wage information in these surveys originates directly from the payroll records of companies, so they can be characterized as administrative or register based data. Therefore, these data are usually considered to be very accurate by their nature, and the sources of measurement error in surveys of individual workers, like recall or rounding error, are not expected to be a great problem in these data. However, our results in this study point to some other sources of error in measuring the hourly wage rate for manual workers as discussed below.

The survey frame of the data consists of the member firms of both associations in each reference period. Although the survey is mandatory for firms with over 30 employees (the limit varies somewhat by industry), some non-response will occur. This is concentrated on smaller firms that are also less often members of the associations. The coverage of the TT data is better than that of PT, since service firms are smaller on average. The firm coverage is still good, although some variation has occurred during the years. For example, some firms have changed their membership from TT to PT or *vice versa,* and mergers and splits and other types of firm restructuring has happened. Also, due to privatization some new sub-sectors have joined to these private-sector associations. This has been more common in services. In order to keep the target population more stable, we have excluded some sub-sectors from the data. To identify employers in TT data there are firm codes and 'response-unit' codes. There has been a brake in the firm coding system during our observation period, but the response unit codes are consistent over time, so we use those to identify the employer of individuals. The response-unit usually refers to an establishment of a firm. In the service sector only the firm code exists in the data, so we use it.

Our data are well representative at employee/worker level, since these TT/PT firms have rather good systems for collecting wage data. However, there are missing or erroneous identity codes for individuals, and hence some individuals may be excluded from wage change data. In the early 1980s these problems were so prevalent in TT data that we have dropped those years altogether from our analyses, but during later years these problems are rare. These data had not been used for research purposes before this study, so some checking of data quality was necessary on a number of details. We have tried to improve the data quality afterwards when it was possible using clarifying information from the data owners.

The structure of these data is quite similar across sectors. They provide detailed information about wages and working time, and some information about employees' individual characteristics (such as age and gender). However, there are two major differences in these data sets across the sectors: the timing of observations and the wage concept. For manual manufacturing workers the data covers the situation during the last quarter of each year, but 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). This change-over causes no major problems for our analysis of downward rigidities because the observation month is delayed and there is a point of normal contractual wage increase between the two observations (otherwise we might overestimate downward rigidity). We might also underestimate the rigidity by lengthening the observation interval if more than the usual one or two annual contract wage rises fell on the interval. However, this is not the case for either sector. The observation interval changes only by two or three months, so the change-over years should be comparable to other years.

The wage concept differs across sectors. *Hourly rate* has been applied for manual workers in manufacturing, whereas *monthly rate (salary)* for non-manual workers in manufacturing and for service sector workers. The monthly rate for non-manual workers in manufacturing is defined as '*the fixed basic monthly salary paid for regular working time*'. This fixed salary is based on the 'demands' of the job or tasks performed in it and the contract based wages determined for these 'demand classes' of jobs, and an additional person specific component based on personal competence. Respectively, in services the monthly rate is defined as the '*personal wages paid for regular working time'*, which is very close to the former definition. It includes such *personal and 'task' specific bonuses* (merit pay), which are paid at the *same amount in each month*. These monthly wages exclude such components of wages, which are

chancing naturally or are not part of the 'basic wage' of a person. Excluded are among others overtime pay, shift work, evening or Sunday bonuses, fringe benefits, and performance based payments, commissions, 'profit sharing' and similar payments. It should be noted, that this monthly wage is not simply a 'minimum' salary based on contracted wage scales, but includes a person-specific component. Furthermore, firms and local unions can agree on firm specific wages that exceed the minimum requirements of national contracts. Such firm specific arrangements can also be reduced by mutual consent of the firm and local union. In principle, these person and firm specific components in wages therefore provide possibilities for both upward and downward flexibility in wages even without cuts in contracted minimum wages.

For measuring hourly rate for manufacturing manual workers there are two options: the wage per hour for regular working time, or the wage per hour for straight time work (time-rate). We use the time-rate, because it is a better measure of the person's 'basic' wage. The regular-time measure includes compensation from all types pay, that is, time-rate, piece-rate and performance based pay. Therefore, it can change if the structure of hours of work performed as time work, piece rate work or performance work has changed. Such wage changes reflect changes in person's effort of work which is problematic for the purposes of studying downward rigidity of wages. A wage cut arising from less hours or less effort in piece-rate work is probably not what is meant by flexible wages, rather it refers to changes in the 'basic wage' of persons. We therefore use the hourly wage measure for time-rate work. It is *calculated by dividing the wage bill for time-rate hours by hours worked on time-rate* during the fourth quarter of each year. This hourly wage measure therefore excludes piece-rate and performance work, overtime pay (and hours), and shift work, evening, night and Sunday bonuses, as well as bonuses based on working conditions. However, it includes any firm specific wages paid above minimum contracts, and any 'personal bonus' incorporated in each person's individual 'wage rate per hour' that is used in remuneration for his/her time-work. In some industries the average magnitude and distribution of such personal bonuses is governed in the contracts, but in others they are more informal. Again, these person and firm specific components in wages provide possibilities for both upward and downward wage changes, and deviations from the wage changes in centrally negotiated contracts.

A drawback of using the time-rate hourly wage is that it leads to the omission of some individuals from the data, who are 100% paid on piece rate or performance pay. This may lead to non-random selection. The straight time hourly wage can also be based on few hours,

but it is not clear that this should produce any problems as such, as long as the wage bill and hours data are otherwise accurate. However, there may be problems in allocating hours and corresponding wage components for a particular quarter. This induces potential measurement error for hourly wages in manufacturing. In later analysis, we find that the measurement error in wage changes for hourly-paid manual workers is significantly larger than for monthly-paid non-manual and the service sector workers.

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. It is standard in micro-level studies of wage rigidity to restrict to wage changes of persons who remain in the same job. Wage changes related to job promotions or demotions and employer switches reflect changes in job tasks, working conditions and location amenities, which would contaminate measurement of wage rigidity.[8] Moreover, in order to control for the variation arising from changing working hours for non-manual and service sector workers' monthly wages, it is required that the "regular weekly hours" are the same in both years.

## 4. Description of the micro-level adjustment of wages

### 4.1. The distribution of wage changes

The downward rigidity of nominal or real wages manifests in the distribution of wage changes in a specific manner. Downward nominal wage rigidity (DNWR) means that a negative wage change (wage cut) is not observed for a person affected by DNWR. Such a person faces a wage freeze (zero wage change), instead. If DNWR is prevalent, i.e. affecting a large share of workers who would obtain wage cuts without wage rigidity, then the share of observations below zero is reduced and they are piled up to zero. In the wage change distribution there will be missing mass below zero and a spike at zero. If the wage change distribution would be symmetric without DNWR it will become asymmetric (skewed to right), because of nominal wage rigidity. Histograms of wage changes are therefore useful in looking for signs of wage rigidity (see Figure 4.1 for an illustration of the effects of rigidities on wage change distribution).

Downward real wage rigidity (DRWR) affects the wage change distribution analogically; with real wage cuts swept up to expected inflation. Therefore, missing mass below expected inflation and concentration of observations to expected inflation are symptoms of DRWR. A complication is that expected inflation of wage setters is not known. Furthermore, to the extent that expected inflation vary across firms and individuals, observations pile up to an interval around the mean of expected inflation, the wideness of this interval reflecting the dispersion of inflation expectations in wage setting. In practice, real wage rigidity can be evaluated using observed inflation bearing in mind that the observations may not concentrate exactly to observed inflation to the extent that there were expectation errors in a particular year.

Centralized and extensive collective bargains cause also concentration of wage changes in the distribution to the location of contracted wage increase, to the extent that it is binding for a large share of workers. Industry-based agreements can induce several spikes or a wider area of concentration to the wage change distributions. In contrast, centralized income policy agreements with wide coverage are likely to cause only one notable point of concentration to the wage change distribution. (Appendix 2 contains a description of wage formation

institutions and negotiated contracts in Finland over the period of investigation of wage rigidities.)

In the estimation of wage rigidities (later in this paper), it is assumed for computational reasons that the underlying true wage change distribution is discrete (Dickens and Goette 2005). The log wage change can take one of 76 values ranging from –0.245 to 0.495 in steps of 0.01 or it can take the value zero. Very large and small wage changes are eliminated to scale down the effect of outliers. For extreme negative and positive wage changes, these groups contain often few or no observations, because wage change distributions are usually concentrated. We present the observed wage change distributions in Figures 4.2-4.4 using the same classification of the data as in the estimation of wage rigidities. In practice, these distributions are 'histograms' of wage changes with each bar representing the share of observations falling to the one percentage point interval around the class midpoint, except the zero 'bin' which is a very narrow range around zero; wage change being within the interval (-0.017%, 0.017%).

Figures 4.2a-4.2c present bar charts ('histograms') of the distributions of nominal wage changes of hourly wages for manual manufacturing workers for each year from 1986 to 2000. Figures 4.3a-4.3c and 4.4a-4.4b present the distributions for monthly salaries of non-manual manufacturing and service sector workers, respectively. Actual inflation is shown with a black bar and contract wage increase with a grey bar. When contract wage increase and actual inflation fall on the same one percentage point interval, the bar is shown as black. The contract wage increases are the percentage wage changes implied by contracts signed in each bargaining round as reported in Marjanen (2002) and they can be different for the three sectors.

The bar charts for all sectors show that there tends to be a peak in the distribution of nominal wage changes near the level of nominal wage increase stipulated by current collective agreements. The share of observations below the contact wage rise also seems less than in a symmetric distribution, that is, there is a cut-off in the distribution at the contract wage rise or somewhere near it, and missing mass below that point. In most years actual inflation is quite close to the contract wage rise, so it is difficult to separate the effect of real wage rigidity from the effect of contracts on wage changes. Usually the contract wage rise seems to determine the concentration of observations more than inflation. These features are consistent with the

notion that the final impact of the wage bargaining depends mainly on general wage increase that is agreed upon in the binding collective agreement, and it might be dubbed as contract wage rigidity. Alternatively, these features indicate that the (centralized) bargaining institutions are the means that effectively produce real wage rigidity in wage setting. However, they may also be means to secure concerted wage moderation as discussed in the next section on wage cuts.

There is not much evidence for nominal wage rigidity in wage setting in Finland in the sense that there seems to be no spikes at *zero* wage change during normal times in the distributions for manual workers, and only very small spikes for non-manual and service sector workers in some years. These small zero spikes could also be created by so-called menu costs that constitute obstacles for very small nominal wage changes both upward and downward. However, during the severe recession years there was essentially a wage 'freeze' in 1992 and 1993 due to a centrally bargained extension of the previously prevailing contracts. This centralized wage freeze creates the large increase in the frequency of zero nominal wage changes in these particular years (more prominent for non-manual and service sector workers; for service sector this freeze also continued to 1994). The timing of contract starting date contributes to the large fraction of zero wage changes in 1997. The new contract started in 1.1.1998, so there were no contractual wage increases during 1997. It might even be conjectured that any wage changes observed in 1997 must be due to other factors than contractual pay rises, which makes this year's distribution an interesting comparison point for other years.

However, the distributions for the non-manual manufacturing and service sector workers are highly asymmetric (or missing) below zero nominal wage change suggesting the possible presence of downward nominal wage rigidity in these sectors. It should be noted though, that the lack of nominal wage cuts can also be induced by real rigidity. The lack of or small zero spikes indicates that this is mostly the case in Finland.

There have been four industry-based contracts during our data period, in 1988, 1994, 1995 and 2000. It is not strikingly evident from the histograms that wage change distributions in these years have been very different from the histograms in surrounding years with centralized contracts, but there seems to be some tendency that the support of the mode of

wage changes is wider. This is consistent with somewhat more variation across industries in the 'average' wage change in years of industrial contracts.

In the 1980's the distributions of wage changes for non-manual workers are somewhat different compared with manual manufacturing workers in the sense that there are indications of more than a single peak in the distributions. This most likely reflects that there were different subgroups of workers within non-manuals with their own contracts leading to different average wage changes for these groups. The data also includes higher level non-manuals for whom individual wage contracts are in use. For both manual and non-manual manufacturing workers it is also notable that after the early 1990s recession the wage change distributions seem in general different from those before the recession in that the distributions have become more concentrated during the late 1990's.

### 4.2. The amount of wage cuts and the rate of inflation

Despite the overwhelming role of collective agreements, there is a great deal of heterogeneity in the adjustment of nominal wages at the individual-level as indicated by the dispersion of distributions each year. There are also some workers experiencing nominal or real wage cuts in each year. The amount of wage decreases is a crude measure of flexibility of individual-level wage changes. Considering the frequency of nominal wage decreases there is evidently substantially more indication of wage rigidities for non-manual manufacturing workers and for the private service sector workers (Table 4.1). The share of non-manual and service sector workers experiencing nominal wage cuts has been low, around 1-5%, even during the great slump of the early 1990s. This pattern is in contrast to the adjustment of nominal wages for manual workers during the recession years 1991-1993, when the share of workers with negative wage changes increased to 17%-36%. However, in normal times the number of nominal wage cuts for job stayers is not particularly high even for manual workers. The share of negative wage changes for manuals has been around 5–11 % in normal conditions, which is about half of the similar proportion in the UK (see Nickell and Quintini, 2003).

The share of real wage declines behaves more similarly across sectors, being very high during the recession years of 1991-1993 (58-87% depending on sector and year; see Table 4.1). 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. This means that nominal wage moderation by collective agreements and a positive inflation rate during the early 1990s recession made it possible to implement real wage cuts for a large proportion of employees without implementing nominal wage cuts. In this sense, centralized bargaining made the adjustment of the labour market to the severe shock possible by relaxing the real wage rigidity constraint during the early 1990s recession. Hence, the Finnish experience is consistent with the idea that wage rigidities can be at least somewhat relaxed under extreme distress of employers and threat to employment. However, it seems that the nominal wage rigidity formed the ultimate constraint for this adjustment.

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 (Table 4.2). The same applies for average real wage declines comparing service sector and non-manuals, but not always for manuals. The average real wage decline is smaller than the average nominal wage decline, because the former contains a large number of small real wage declines.

In order to analyse the real consequences of downward nominal wage rigidity and inflation Nickell and Quintini (2003) regress the share of negative real wage change on the inflation rate and selected control variables for changes in the median and dispersion of the real wage change distribution. Their results using UK New Earnings Survey over the period 1976-1999 show that an increase in the rate of inflation produces an increase in the share of workers that experience negative real wage change. This result is in line with the notion stressed in the literature that downward nominal rigidity and low inflation together prevent the necessary downward adjustment in real wages. However, Nickell and Quintini (2003) argue that their estimated effect of inflation is not large enough to be a strong argument for raising the long-run inflation target.

Manual manufacturing workers is the segment of the Finnish labour market that is most promising for the Nickell and Quintini (2003) type regressions. First, there is a reasonable amount of negative wage changes. Second, these wage changes are available for the whole period of investigation, which is necessary to have enough variation in inflation. The baseline model reveals that the rate of inflation is not statistically significant in explaining the share of

workers that have experienced negative real wage changes (Table 4.3). This is not surprising, because the tabulation of wage cuts in Table 4.1 shows that the proportion of negative real wage changes was substantial in Finnish manufacturing during the early 1990s recession when inflation was declining. Hence, our result could be an anomaly related to the recession and associated disinflation. When we include an indicator for the years 1991-1993 the relationship between inflation and the share of workers that experience negative real wage change is statistically significant at 10 % level. The quantitative magnitude of our result about the impact of inflation on the share of workers experiencing negative real wage changes is about twice as large as that reported by Nickell and Quintini (2003) for the UK.

### 4.3. The incidence of wage cuts at the individual level

The Probit models can be used to evaluate the factors that have contributed to the likelihood of wage declines for job stayers in different segments of the Finnish labour markets during the 1990s.[9] These 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) as explanatory variables for the probability of the individual worker experiencing a wage cut.

The results reveal that there are relatively few factors that have a common influence on the likelihood of wage decline across the segments of the Finnish labour markets. However, the hours of work and the size of a plant/firm play a similar role in all sectors in explaining 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.

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 at the same time. 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.

## 5. The sand and grease effects of inflation

### 5.1. The methodology proposed by Groshen and Schweitzer

Groshen and Schweitzer (1999) identify the sand and the grease effects of inflation on the labour market, based on a model of wage formation adopted in large U.S. firms, as follows. The identification procedure assumes that in the first stage of wage formation firms form inflation expectations and decide on the change in aggregate wages in their firms. The so-called sand effect of inflation comes from the fact that there can be errors in inflation expectations by firms, which lead to inappropriate real wages and misallocation of resources. These errors are more severe in a regime of high (and therefore more fluctuating) inflation. The sand effect of inflation implies an increase in dispersion of wage changes across firms in a given occupation as there is an increase in the rate of inflation. Empirically the sand effect of inflation is captured by the firm dummies in a regression of wage changes.

In the second stage of wage formation, the change in aggregate wages is allocated across occupations (or jobs) within firms. In practice, the second stage of wage formation can be done, for example, in different divisions of the firms. The so-called grease effect of inflation emerges from the stylized feature that an increase in the rate of inflation helps to decrease real wages in declining occupations within firms in the presence of downward nominal wage rigidity. The grease effect of inflation implies an increase in dispersion of wage changes across occupations in a given firm as there is an increase in the rate of inflation. The grease effect of inflation is captured by the occupation dummies in the wage change regression.

Empirically the sand and grease effects are examined by first regressing wage changes of individuals on occupation and firm dummies for each year separately, controlling for the region effects. The time series for the standard deviations of the firm and occupation effects are then regressed on inflation in order to look for the sand and grease effects of inflation. It is expected that both sand and grease effects increase with inflation. In practice, these effects are likely to saturate when inflation increases further, which is empirically captured by including a quadratic term of inflation in the sand and grease regressions below.

## 5.2. ANOVA models for wage changes

The first stage ANOVA-regressions of individual wage changes on occupation, firm and region dummies are presented in Table 5.1.[10] In practice, these models pool all years and include occupation, firm and region dummies interacted with year as explanatory variables, so that occupation and firm effects are estimated separately for each year. Occupation and employer effects are statistically significant in all sectors. This means that occupation and employer variations in wage changes are distinguishable from each other over the period as required by the identification of sand and grease effects. The models account for 27-31% of the variation of wage changes in different sectors. This is almost the same as the 27% share in Groshen and Schweitzer (1999).

Wage changes common to all job-cells in each year and region (region*year effect) explain about 14-18% of observed variation of wage changes. Variation of wage changes across firms accounts for 30-40% of the variation explained by the model and 8-12% of the total variation. This employer effect is stronger than the occupation effect, which constitutes only about 2-5% of explained variation in wage changes. Hence, the employer effect dominates the adjustment of wages in the Finnish labour market. The higher share of occupation effect for manual workers is probably due to more detailed occupation classification which contains also some industry-specific occupations, whereas non-manual and service sectors have common occupations across industries.

## 5.3. Development of the dispersion of wage changes and firm and occupation effects

There are two common elements across sectors in the development of total variation of wage changes (Figure 5.1). First, the standard deviations of wage changes increased during the economic upswing in the 1980s for manual and non-manual workers, and second, they declined during the great slump of the early 1990s. A difference in the trends seems to exist between sectors. The dispersion of wage changes for manual manufacturing workers has decreased since the end of the 1980s. At the end of the 1990s the standard deviation was about the same as during the depression years, but lower than during the late 1980s. On the other hand, for non-manual and service sectors the dispersion of wage changes has increased back to the pre-recession level. As a result, dispersions of wage changes have become more similar across sectors during the 1990s. This most likely reflects comprehensive income

policy agreements that characterized wage formation during the period. In addition, there is some evidence that the total dispersion in wage changes has been larger during the years of high inflation.[11] This is consistent with both sand and grease effects. The grease effect arises because higher inflation allows more dispersion of wage changes below the mean wage change instead of concentration at zero. The sand effect arises because higher inflation (uncertainty) creates more errors in firm level wage changes.

The standard deviations of firm and occupation effects are at a higher level for manual workers than for non-manual and service sectors workers (Figure 5.2). In addition, the standard deviation across employers is about twice that of occupations in all sectors. The level of standard deviations has been quite stable across years except during the upswing of the late 1980s and the downturn in the early 1990s, especially for firm effects. For manual workers there is some indication of a declining trend in standard deviations over the period.

## 5.4. The sand and grease regressions

The explanatory variable in regressions of standard deviations of employer and occupation effects on inflation is actually inflation plus labour productivity growth (CPIP). Labour productivity growth is added to inflation, because uncertainty regarding the growth of productivity adds directly to the sand effect owing to the increase of the overall confusion in wage setting. Labour productivity growth is also added to the grease effect, because it makes possible for firms to reduce real labour cost given the level of nominal wage increases, so productivity growth relaxes the constraint of downward wage rigidity in the same way as higher inflation. (Appendix 1 contains the exact definitions of macroeconomic variables that are used in the models.)

The standard quadratic versions of the sand and grease regressions fit poorly to the standard deviations of firm and occupation effects in all sectors (Table 5.2). CPIP and CPIP squared are both statistically insignificant in all models and the shape of the fitted curve is often against the expected concave form. This means that we are not able to identify sand or grease for Finland by using the methodology proposed by Groshen and Schweitzer (1999).

We tested the robustness of this conclusion in detail (Tables 5.3-5.6). First, there are quite few observations for each sector, so we estimated also a model pooling all sectors and adding

sector dummies. This does not change the overall conclusions from the sectoral models (Table 5.2). Second, since the quadratic terms were not significant we estimated linear models (not reported). These suggest a positive relationship for manual workers between occupation and firm standard deviations and CPIP, but no correlation for non-manual workers and negative relationship for the service sector (not significant for the occupation effect). Third, there may have been other changes over time in addition to inflation that needs to be taken into account. However, the inclusion of a simple time-trend to the basic model does not change the above results (Table 5.3). There was also a sharp rise in unemployment during the early 1990s recession, simultaneously with the disinflation. Hence, it may be important to control for unemployment when looking at inflation effects on wage dispersion. However, the inclusion of the unemployment rate to the basic version of sand and grease regressions does not change the results (Table 5.4). Fourth, higher centralization (co-ordination) in wage negotiations may reduce the dispersion of wage changes overall as well as in firm and occupation dimensions. We included to the estimated equation variables that capture changes in centralization of wage negotiations over the period either as an indicator for industry level bargaining or as the share of workers *outside* centralized bargaining (Table 5.5). Decentralization exerts a small positive effect on the firm standard deviation (sand effect), but no effect on occupation standard deviation. Importantly, the sand and grease effects of CPIP remain insignificant. Finally, we decomposed the inflation effect to expected inflation and an inflation surprise. This distinction can be motivated as a check of the identification strategy as proposed by Groshen and Schweitzer (1999). The grease effect arises from the flexibility in real wage adjustment provided by expected inflation, but not by inflation surprises. On the other hand, inflation surprises can give rise to the sand effect related to errors in wage setting. Therefore, occupation variation should be mostly related to expected inflation and inflation surprises should primarily affect the employer variation. Our results in Table 5.6 are not consistent with this prediction. The surprise variables are no less significant than expected variables in occupation regressions, and the surprise variables are not generally more significant in firm regressions compared to occupation regressions. This raises serious doubts about the suitability of the proposed identification strategy in Finnish labour markets.

## 5.5. Discussion

Groshen and Schweitzer (1999) assume that there is a two-stage wage determination that is common in large companies in the United States, but the framework does not capture the

heart of the collective bargaining system that has been applied in Finland during the period of the investigation. In the Finnish collective bargaining, centralized bargaining bodies aggregate inflation expectations across firms and employees before there is any agreement on nominal wage changes. In turn, the nominal wage change stipulated in the collective agreements has obviously been an important element in the determination of the inflation rate during the past few decades.

This feature means that the firm effects in wage changes may not capture so much the differences in inflation expectations, but rather the differences in the wage drift between firms. The dispersion of firm effects may then reflect the firm-level flexibility in wage changes that positively contributes to the adjustment of the labour market, rather than the errors concerning inflation expectations. To sum up, the method proposed by Groshen and Schweitzer (1999) does not describe the essential features in the micro-level adjustment of individual wages in the Finnish wage bargaining system. In particular, the expected vs. surprise inflation analysis in the previous section reinforces our doubts about this identification strategy in Finland.

## 6. Procedure for rigidity estimates

This section briefly describes the methodology that is used in the International Wage Flexibility Project to assess wage change histograms to determine the extent of nominal and real wage rigidity in the labour market. Dickens and Goette (2005) and Dickens et al. (2006) provide a detailed description of the protocol. The following discussion on the methodology of the project is based on Dickens et al. (2006).

The protocol has two main elements. The first one is a correction for measurement error. It extracts the estimated distributions of true wage changes from observed wage changes. Hence, the true wage change distribution is an estimate of error-free presentation of observed wage changes. The second main stage is the estimation of wage rigidities. It involves comparing true wage changes with the notional ones. The notional wage change distribution is the counterfactual situation in which there would be no wage rigidities that hinder the adjustment of individuals' wages.

### 6.1. Correction for measurement error

Observed wage changes contain errors, which has to be taken into account in the calculation of measures for nominal and real wage rigidities, because measurement error in wage levels seriously impedes the assessment of wage rigidity, because it creates spurious variance in wage changes. For instance, there may timing problems in allocating hours and wages into particular quarter in the manual wage survey data, which are then reflected in the hourly wages calculated from these data.

The amount of measurement error in any data source is an empirical matter. There are different ways to identify errors in the data. The correction technique applied in the International Wage Flexibility Project does not require strong assumptions about the underlying distribution of wage changes.[12] The correction is based on the following relationship between true wage changes and the observed ones:

$$(1)\ f^o = T f^t$$

where $f^o$ is a vector of observed frequencies in each cell of the wage change histogram, $f^t$ is a similar vector for the true frequencies and $T$ is a transition matrix whose columns are the percentage of observations in each cell of the true distribution that will end up in each cell of the observed distribution owing to measurement errors in wages. Inverting $T$ and multiply both sides of equation 1 by that inverse, gives

$$(2)\ T^{-1} f^o = f^t.$$

Hence, if the transition matrix $T$ is known, the true wage change distribution can be recovered from the observed distribution. This requires assumptions about the structure of errors, which affect the structure of T. The method assumes that errors, when made, are independent and have a two-sided Weibull distribution (Dickens et al. 2006).[13] It is also assumed that the probability of making an error is independent. Furthermore, it is assumed that the true wage change is not autocorrelated, which implies that all autocorrelation in wage changes is due to measurement error. Hence, the variance of measurement error can be estimated from the negative autocorrelation of observed wage changes. There is earlier U.S. micro-level evidence supporting this particular assumption (Abowd and Card 1989). Dickens et al. (2006) argue in addition that the potential sources of positive autocorrelation, such as collective agreements that are negotiated for several years, are swamped by the negative measurement error. The method-of-moments is used to estimate the parameters of the error distribution, the fraction of the population that is prone to errors, the fraction of those who are prone to errors that make errors in that particular period, and the estimated true wage change distribution (i.e. the elements of $f^t$). Additional moments that allow the identification of parameters are obtained from predictions about the frequency that people with wage increases (decreases) larger than some value receive wage decreases (increases) smaller than another value. These 'switcher moments' reflect measurement error, and the method minimizes a quadratic distance measure between actual and predicted fraction of people switching.

### 6.2. Estimation of rigidities

To measure nominal and real wage rigidities, the generalized method of moments is used to fit a simple model of wage changes to the error-corrected (true) wage-change histograms for each data set year (Dickens et al. 2006). The method essentially uses the fraction of observations in each cell of the wage change histogram as the moments. The model assumes

that, in the absence of rigidity, log wage changes have a symmetric two-sided Weibull distribution, which is referred to as the notional wage change distribution.[14] Hence, in the absence of wage rigidities, the mean wage change equals the median wage change. As a result, all deviations from the symmetry are caused by the existence of nominal and real wage rigidities.

To quantify the amount of nominal and real wage rigidities it is necessary to make additional assumptions about the way that wage rigidities transform the notional wage change distribution to the observed (true) distribution. A fraction of the population (r) is potentially subject to downward real wage rigidity. If their notional wage change is below their or their firm's expected rate of inflation, they will receive a wage change equal to that expected rate of inflation rather than equal to their notional wage change. The mean and standard deviation of the expected rate of inflation in each year are also parameters of the model and they are estimated separately for each year. In addition, a fraction of the population (n) is potentially subject to downward nominal wage rigidity. Such workers who have a notional wage change of less than zero, and who are not subject to downward real wage rigidity, receive a wage freeze instead of a nominal wage cut.

The procedure used in the International Wage Flexibility Project yields estimates of the extent of downward nominal wage rigidity (*n*) and of downward real wage rigidity (*r*). The measures for nominal and real wage rigidity vary between 0 and 1, where 0 indicates perfect flexibility (no one is constrained) and 1 indicates perfect rigidity (all workers potentially subject to real rigidity are constrained). The definition of *n* is the fraction of workers who are not affected by downward real wage rigidity, but who are affected by downward nominal wage rigidity. For this reason, there is no *a priori* reason for *n* and *r* to be negatively correlated. In particular, the measures for the extent of nominal and real wage rigidity are not reported as shares of all workers. They are proportions of workers that are actually subject to particular type of rigidity of those workers that are potentially subject to the rigidity considered.

We implement this procedure separately for each three sectors and each year that we have data for: manual manufacturing workers 1986-2000, non-manual manufacturing workers 1986-2000, and the private service sector workers 1991-2001.

## 7. Estimates for rigidities

### 7.1. Measurement error and limitations

This section documents the Finnish results based on the protocol for the estimation of nominal and real rigidities. Dickens et al. (2006) provide a meta-analysis of the results covering all 16 countries that have taken part to the International Wage Flexibility Project. We concentrate on the results based on the estimated ('true') wage change distribution that is corrected for measurement errors in the data, rather than on the observed distribution or their comparison, except for the non-manual workers for which we use measures based on observed (uncorrected) distribution.[15] The reasons are twofold. First, we have three different data sets for different sectors/worker groups, so we need to concentrate on some set of results without attempting too many comparisons. Second, estimated values for the probability of measurement error imply quite low amounts of measurement error for manufacturing white-collar and the service sectors. The error rate is 0.05 (5%) for these two sectors. The error rate is calculated from the equation (1-p)c, where p is an estimate of the probability of making no errors and c is an estimate for making an error if prone to error (see Dickens and Goette 2005). This means that for these sectors it should not matter much whether we use observed or estimated distributions. On the other hand, there seems to be quite a lot measurement error in wages in the blue-collar manufacturing data: the error rate is 0.25 (25%) for this sector. This is reflected in the apparent gap between rigidity measures calculated from observed versus estimated distribution and notable differences in the histograms for observed and estimated wage changes for blue-collars. But if the difference is due to measurement error, there is not much point in looking at uncorrected results.

The most likely reason for the presence of more measurement error for manual manufacturing workers is the different wage concept, which is the hourly wage rate for blue collars as opposed to monthly salary for other sectors. As of now, we do not know the exact sources of measurement error in the hourly wages, since the method used here is the first time it has been revealed to exist. The prevailing view is that all of the employer wage surveys behind our data are accurate as such. However, the hourly wage is simply calculated from the wage bill and hours worked during a quarter. Hence, some error in either wages or hours or most likely an inconsistency between the two must be the source of error in the data.

The definition of downward real wage rigidity adopted in the International Wage Flexibility Project may be difficult to distinguish empirically from the effects of bargaining on wage determination as discussed above (see also Dickens et al. 2006). Centralized wage bargains set a floor for wage changes while allowing decentralized changes above the floor, often called "wage drift". The histogram for wage changes then resembles that for downward real wage rigidity, but the spike will reflect the negotiated minimum real wage change rather than the expected rate of inflation only. The estimation protocol restricts the expected rate of inflation to fall within reasonable bounds for such an expectation (Dickens et al. 2006). For countries with this sort of wage drift at play, it is possible to estimate considerable real wage rigidity in years when the floor falls within a preset range for expected inflation, but not in years when the floor is above that range. This inconsistency will also have spillover effects on our estimates of nominal rigidity. Furthermore, it is difficult to separate nominal and real wage rigidity from each other during the years of very low inflation, i.e. during most of the late 1990s in Finland. However, this distinction is less relevant when inflation is very low, because the effects of nominal and real rigidities on wages are essentially the same.

### 7.2. The quantitative magnitude of micro-level wage rigidities

The median wage change has been strongly procyclical in all sectors, and the overall development over time of the medians reflects strongly the development of inflation (Figure 7.1). In addition, underlying fluctuations in median wage changes have been also in other respects largely similar across sectors. This is not a great surprise as such, because the period is dominated by broadly-based collective labour agreements that have produced quite similar real wage rises across sectors based on the rate of aggregate productivity growth. This is often referred to as the "wage norm" applied in collective agreements. However, during the early 1990's recession years the median worker experienced real wage declines. The real wage increases of the median worker also seem smaller in late 1990s compared to late 1980s. The measures for kurtosis and skewness of wage changes get typically high values in the years in which there have been centralized agreements that have induced zero pay rise. In this sense, such measures seem to capture rigidities produced by collective bargaining.

We report our estimation results for the amount of nominal and real rigidities as average values over several years to obtain a clearer picture of the level and changes in rigidities, because there have been large fluctuations in these measures from year to year. We use three

periods; late 1980s (1986-1990), the recession years (1991-1993/1992-1994), and late 1990s (1994-2000/1995-2001). The results in Figure 7.2 and Table 7.1 reveal that the amount of nominal rigidity has been highest during the recession period of 1991-1993/1992-1994. This reflects the nominal wage freeze implemented by the collective agreements during the great depression of the early 1990s. The level of nominal rigidities has been highest in the service sector, and virtually non-existent in the manual manufacturing sector.

Averages of real rigidities for the same three periods reveal that the amount of real rigidities in wage changes has been smallest during the recession period 1991-1993/1992-1994. This is shown in Figure 7.3 and Table 7.2. The level of real rigidities was lowest in the non-manual and service sectors during this period. The amount of real rigidities has been highest for manual manufacturing workers in late 1980s and late 1990s. It is notable that in late 1990s the level of real rigidity has increased back to the late 1980s levels, despite the much higher level of unemployment during late 1990s. On the other hand, this pattern over time in real rigidity and unemployment makes it hard to argue, that real wage rigidities are the direct cause of unemployment.

The amount of nominal rigidities over time across sectors is illustrated in Figure 7.4. Measures of nominal rigidity indicate the existence of nominal wage rigidity only in some years, mostly due to specific reasons related to those years (like wage freeze of 1992-1993 and a postponement of contract wage increases in 1997). Nominal wage rigidities seem to be unimportant for manual manufacturing workers even in these years. This is consistent with the histograms for wage changes that do not contain spikes at zero wage change for manual manufacturing workers.

Respectively, the amounts of real rigidities over time across sectors are depicted in Figure 7.5. They confirm the fact that the amount of real rigidities was at its lowest level during the great depression of the early 1990s. Real rigidities have been high in all sectors during the periods 1994-1996 and 1999-2000, and in most years of late 1980's in manufacturing. We also regressed the measures of nominal and real rigidities on the changes in unemployment and real GDP. These results give additional support that nominal rigidities have been high and the real rigidities low during the depression years.

To sum up, the estimates convey the picture that there has been a great deal of either real or nominal rigidities in all sectors in most years. However, the constraint of real rigidity on wage determination was relaxed considerably during the recession years. On the other hand, nominal rigidity increased and therefore formed the ultimate limit to downward wage flexibility.

In international comparison, the extent of real wage rigidity seems to be high in Finland compared with the other European countries (Figure 7.6). In particular, the estimate for real rigidity obtains the second highest value for Finland after Sweden (Dickens et al. 2006). It is interesting that the amount of real wage rigidity is much higher in Finland than, for instance, in Austria despite the fact that both of these countries have centralized labour markets. In contrast, the amount of nominal wage rigidity does not seem to be particularly high in Finland from the perspective of international comparison. The results also indicate a tendency for a negative correlation between the real and nominal wage rigidity, but there are notable exceptions to a monotone negative relation. In France and Sweden both rigidities are high and in Germany low.

## 7.3. Macroeconomic sensitivity of wage changes to unemployment

In order to look at the macroeconomic flexibility of wage setting to economic conditions we estimate simple Phillips curves or wage equations. That is, we regress the average change in nominal wages on unemployment. Pehkonen (1991, 1999) provides earlier estimates for Finland along this strand of research. We also use these regressions to evaluate the idea that downward rigidities in wages make the adjustment of wages to economic conditions less flexible. Since downward wage rigidities mean that wage change distributions become asymmetric by shifting negative nominal and real wage changes upward in the distribution, it means that the average wage change is higher with rigidities than without them. If the average wage change responds negatively to unemployment, the wage changes will become more constrained from below by rigidities when unemployment is higher. This implies that the response of average wage change to unemployment is smaller than without rigidities. We attempt to look at this effect by using the mean wage change from the estimated notional distribution as the dependent variable in addition to the observed mean wage change. If downward rigidities in wages prevent the adjustment of wages to economic conditions, the unemployment coefficient should be larger (in absolute value) in a regression for the

estimated mean, compared to the coefficient for observed mean (see Dickens and Goette 2005). The estimated mean of notional wage changes is obtained from the rigidity protocol.

Columns (1)-(2) in Tables 7.3-7.5 present the simple specifications with only an indicator for years with industry-level bargains as an explanatory variable in addition to unemployment. The results indicate a significant negative relationship between wage growth and unemployment in all sectors. The unemployment effect on observed mean wage change is about -0.4 in all sectors in column (1). The unemployment coefficients for the estimated mean wage change in columns (2) are very close to the observed equations (marginally larger for white collars and services, but somewhat smaller for blue collars). This is in contrast to the idea that the responsiveness of wages to unemployment is prohibited by downward wage rigidities. Rather, it seems that observed wage changes adjust to unemployment in the same way as the notional wage changes that are not affected by rigidities.

Columns (3)-(6) augment the simple specification by including expected inflation and productivity growth in the equation to capture the effects of inflation and productivity growth in wage setting. We measure expected inflation alternatively by the consumer's inflation forecast from a Statistics Finland survey (columns (2)-(4)) or by the estimate of expected inflation from the rigidity protocol (columns (5)-(6)). The inflation forecast is the expected inflation one year ahead at the start of the period over which the wage change is measured. Some experimentation indicated that the lagged productivity growth was more significant than the current one, so we use it. It may be that the past observed productivity growth is taken into account and rewarded in wage negotiations rather that expected productivity growth during the contract period. For the service sector productivity growth is lagged two periods as it seemed to work best. This could indicate that the wage setting in services follows that of manufacturing sector's by one year lag.

The unemployment effect in the augmented model becomes less significant, but usually remains significant (at least at 10% level) when the estimate for inflation expectations is used. The value of unemployment effect varies more between observed and estimated specifications, but there is no systematic tendency for the effect to be larger on notional wage changes than for observed changes. There is some evidence for this only in the service sector. However, it is important to keep in mind that these augmented specifications may stretch the data too far, because the number of observations is quite low. Another feature which may

affect the results is the high correlation between expected inflation and unemployment during the observation period: -0.91 for the inflation forecast and -0.81 for the estimated inflation in blue collar data. This correlation partially explains the insignificance of most coefficients in these models. Productivity growth affects wage changes positively in a fairly consistent manner, with a coefficient of 0.2-0.5 in different models and sectors. In contrast, the effect of expected inflation is extremely volatile, and is often negative. Finally, the effect of industry level bargains is to increase wage growth compared to years with centralized bargains, a result consistent with the earlier Finnish findings (see Alho 2002; Uusitalo 2005).

To sum up, we find hardly any evidence that the notional mean wage change would be more sensitive to unemployment than the observed mean wage change (or observed median wage change: we have estimated all models also with that and the results are very close to those with observed mean). This would seem to indicate that although the measured real rigidity is high, it is not notably undermining the adjustment of average wage changes to economic conditions.

## 8. Conclusions

This paper analysed the flexibility of the Finnish labour markets from the microeconomic perspective by focusing on individual-level wage changes for job stayers. The study covered the private sector workers by using three separate data sets obtained from payroll records of employers' associations. Two main conclusions from wage formation emerge. First, there has been macroeconomic flexibility in the labour market. This means that average wage changes negatively respond to an increase in unemployment and the downward real rigidity measure declined during the worst years of early 1990's recession. Consistent with this, a large number of employees experienced a decline in their real wage during the great depression of the early 1990s when unemployment soared. This was put into effect by wage moderation through collective labour agreements. Second, the evidence based on individual-level wage change distributions reveals that especially real wages are definitely rigid in Finland. International comparison supports this finding (Dickens et al. 2006). Hence, there is not much flexibility in the labour market from the microeconomic perspective. In addition, the evidence points out that individual-level wage changes have regained the high levels of real rigidity during the late 1990s that prevailed in the 1980s, despite the continued high (but declining) level of unemployment.

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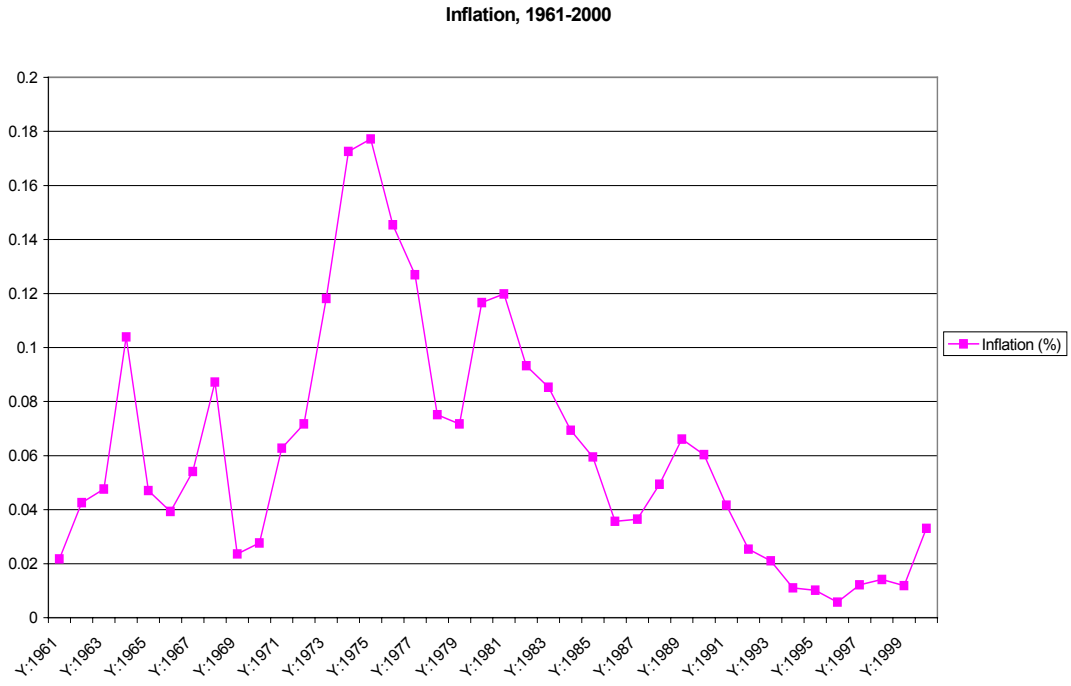
**Figure 1.1.** Inflation and unemployment rate, 1961-2000.



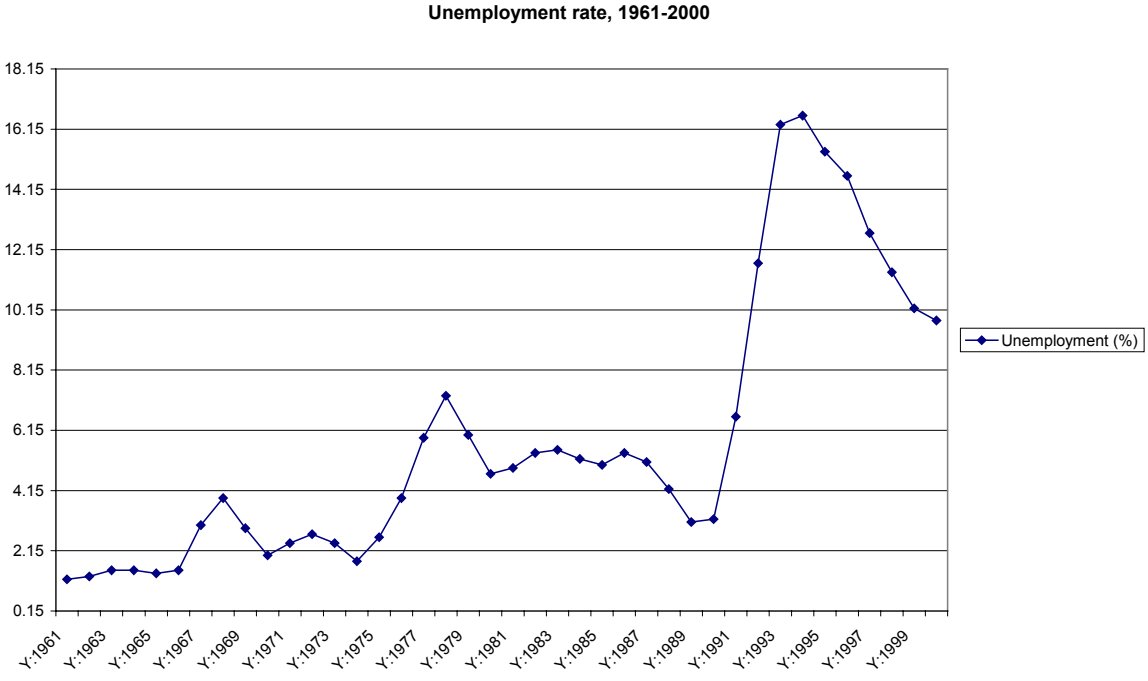



**Figure 4.1.** Illustration of nominal and real wage rigidity.

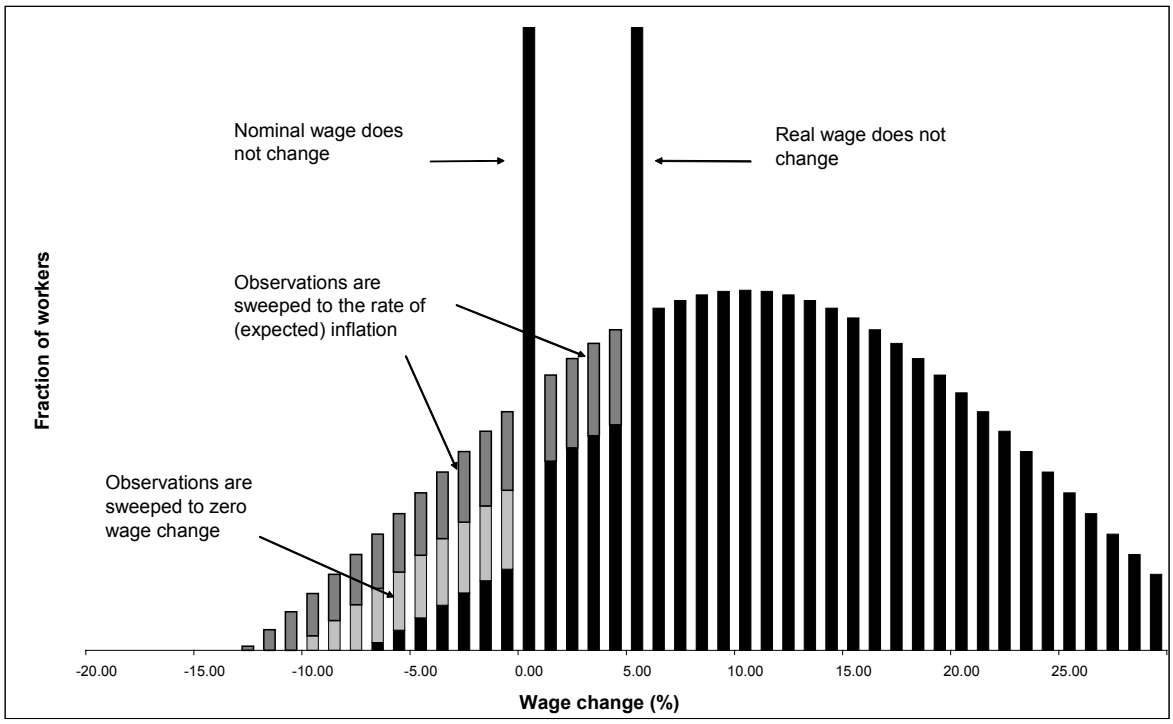


**Figure 4.2a.** Observed wage change distributions for manual manufacturing workers 1986-1990. (Actual inflation is shown with black and contract wage increase with grey.)

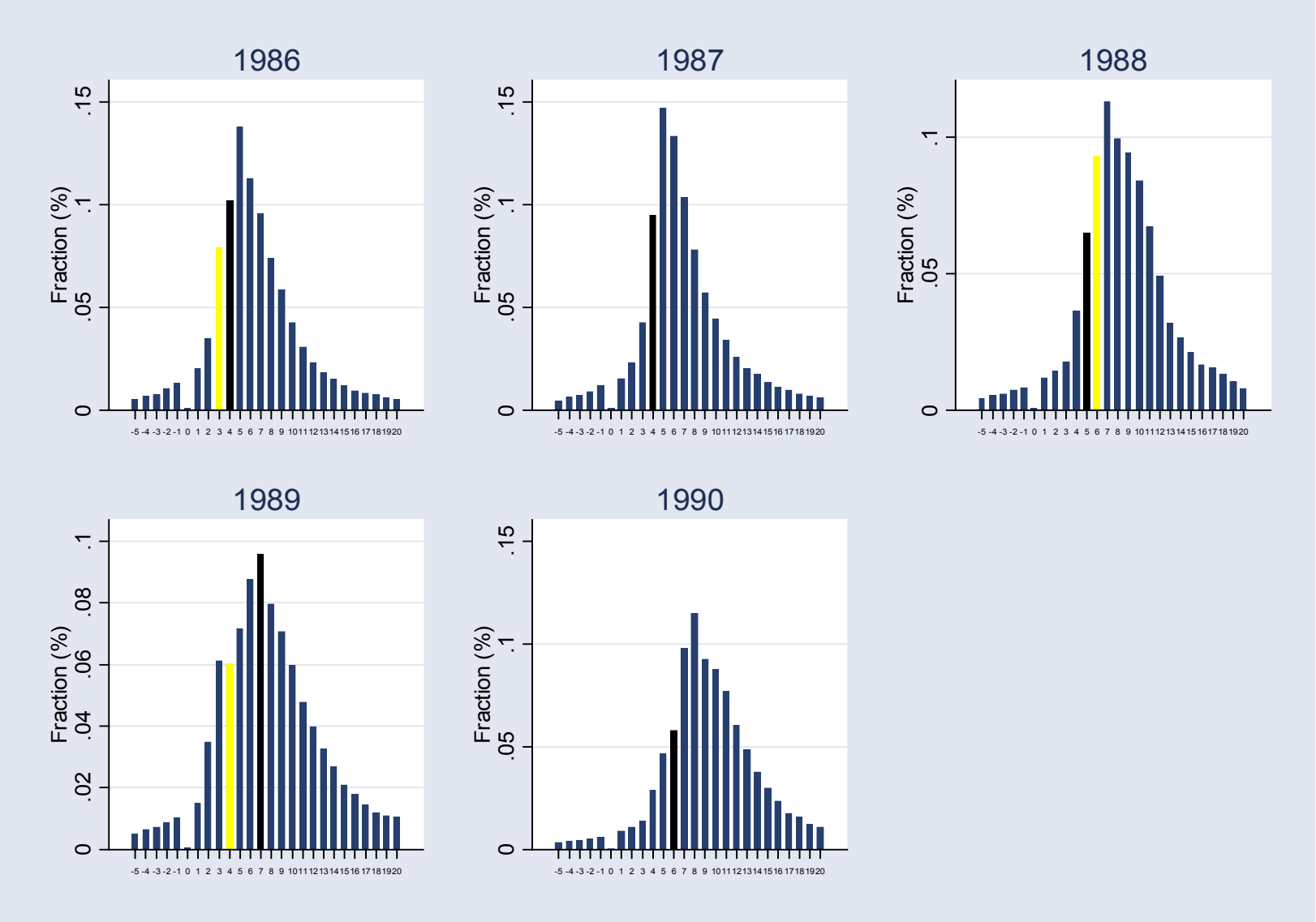


**Figure 4.2b.** Observed wage change distributions for manual manufacturing workers 1991-1995. (Actual inflation is shown with black and contract wage increase with grey.)

**Figure 4.2c.** Observed wage change distributions for manual manufacturing workers 1996-2000. (Actual inflation is shown with black and contract wage increase with grey.)

**Figure 4.3a.** Observed wage change distributions for non-manual manufacturing workers 1986-1990. (Actual inflation is shown with black and contract wage increase with grey.)

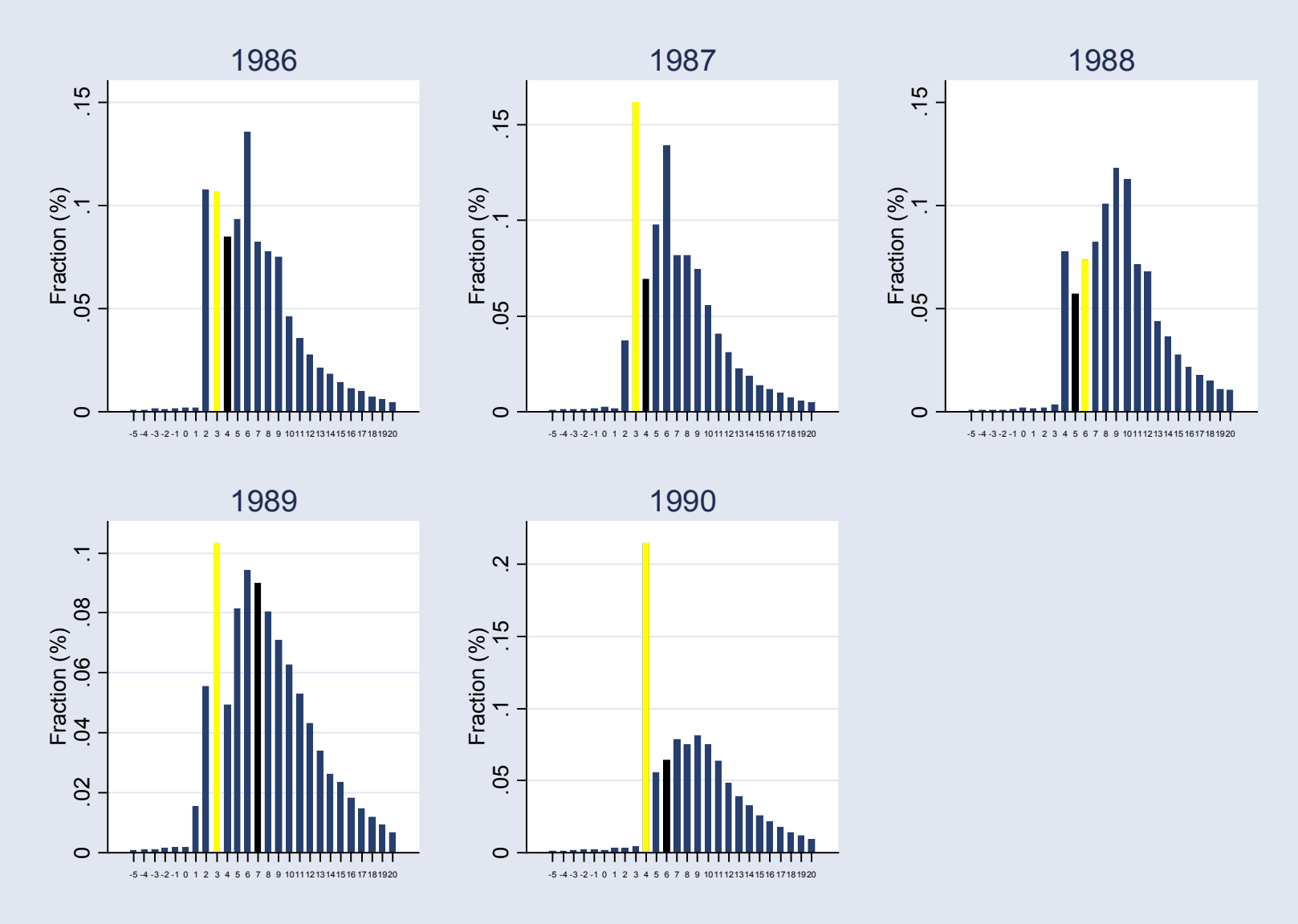


**Figure 4.3b.** Observed wage change distributions for non-manual manufacturing workers 1991-1995. (Actual inflation is shown with black and contract wage increase with grey.)

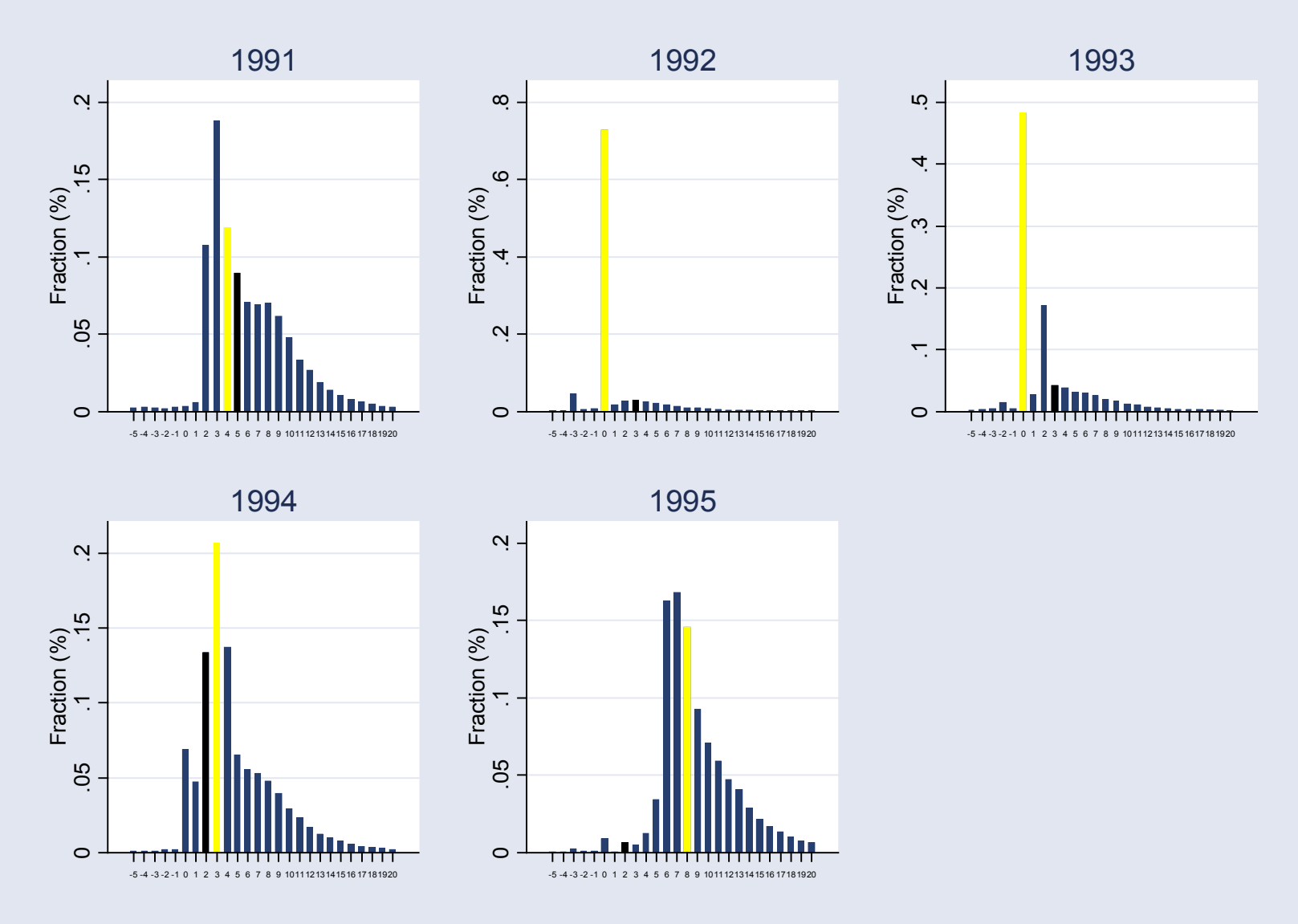


**Figure 4.3c.** Observed wage change distributions for non-manual manufacturing workers 1996-2000. (Actual inflation is shown with black and contract wage increase with grey.)

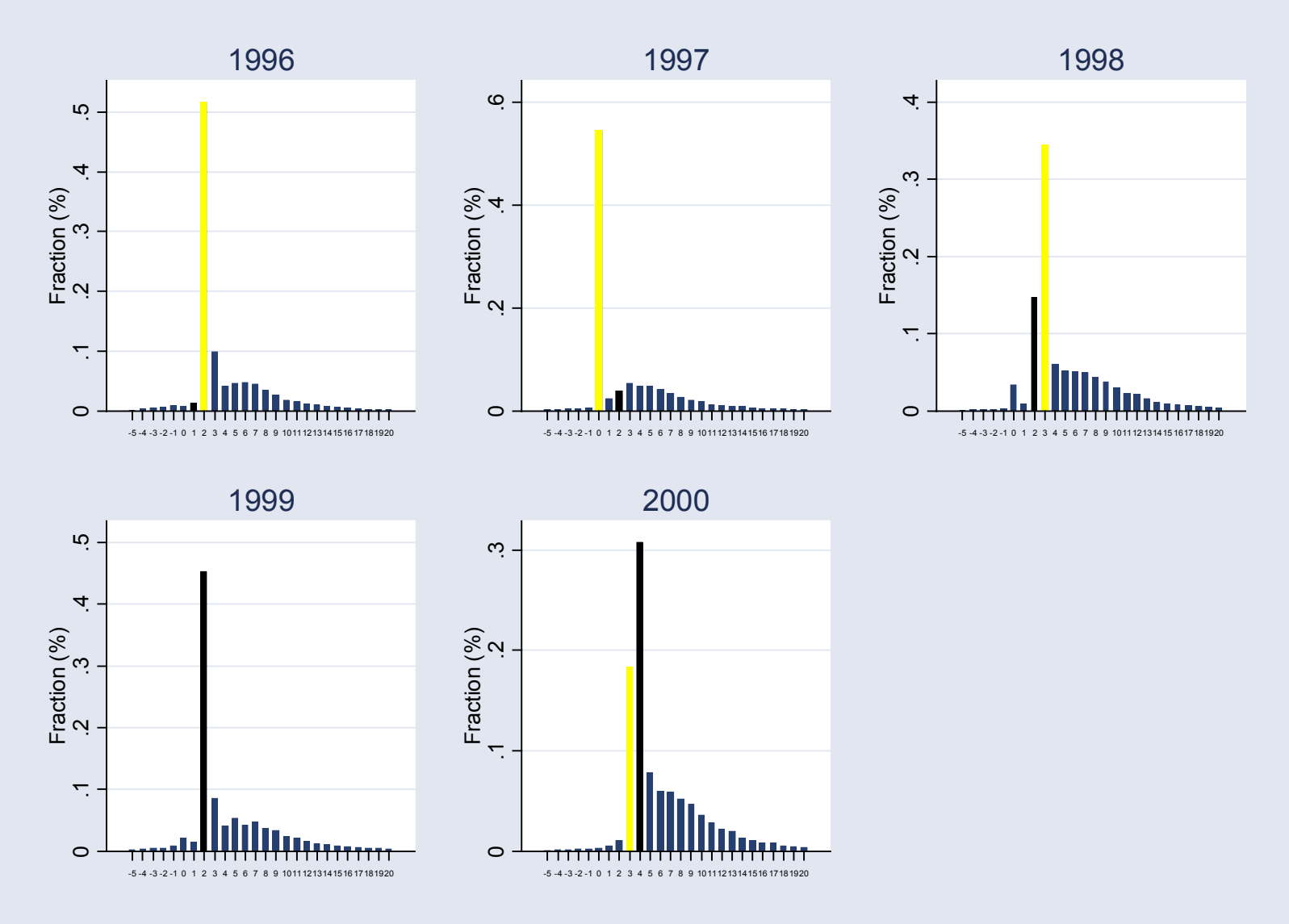


**Figure 4.4a.** Observed wage change distributions for service sector workers 1991-1995. (Actual inflation is shown with black and contract wage increase with grey.)

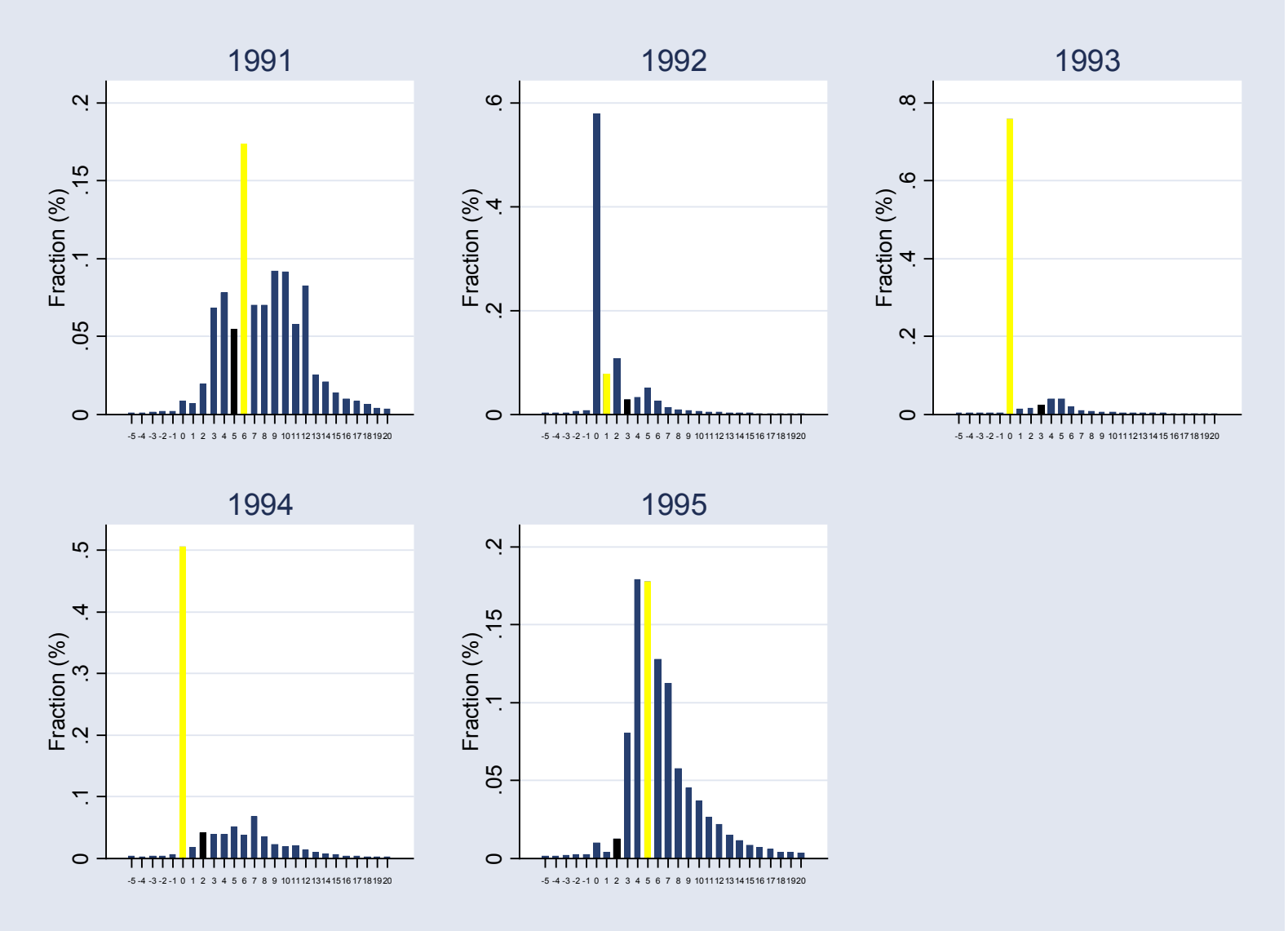


**Figure 4.4b.** Observed wage change distributions for service sector workers 1996-2001. (Actual inflation is shown with black and contract wage increase with grey.)

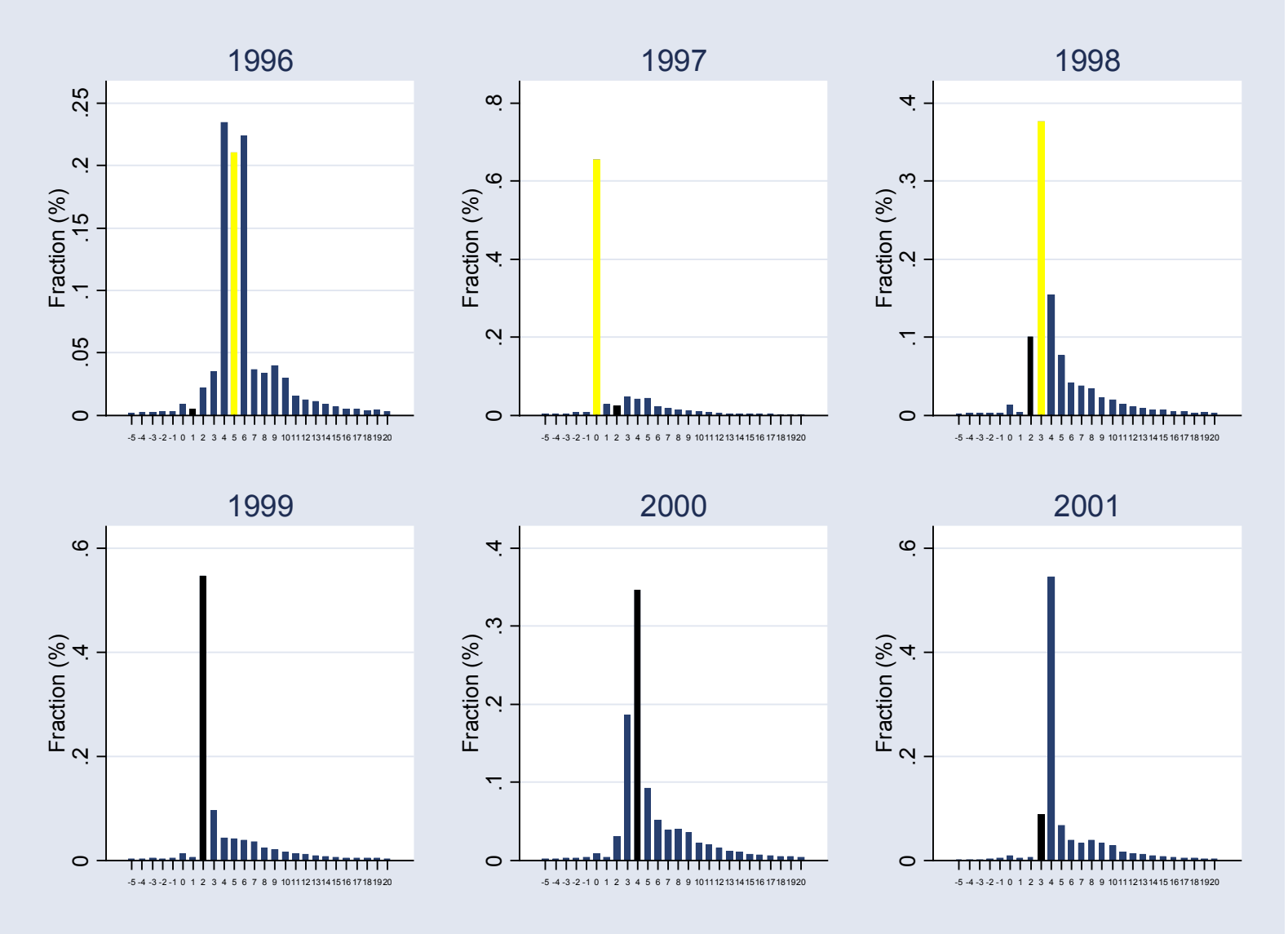


**Table 4.1.** Proportion of employees that have experienced negative wage changes.

| | *Nominal wage* | | | *Real Wage* | | |
|---|---|---|---|---|---|---|
| | Manufacturing | Manufacturing | Services | Manufacturing | Manufacturing | Services |
| | Manual workers<br>Hourly pay | Non-manual workers<br>Monthly pay | Monthly pay | Manual workers<br>Hourly pay | Non-manual workers<br>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 4.2.** The average wage decline for those employees that have experienced negative wage changes.

| | *Nominal wage* | | | *Real Wage* | | |
|---|---|---|---|---|---|---|
| | Manufacturing | Manufacturing | Services | Manufacturing | Manufacturing | Services |
| | Manual workers<br>Hourly pay | Non-manual workers<br>Monthly pay | Monthly pay | Manual workers<br>Hourly pay | Non-manual workers<br>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 4.3.** The Nickell-Quintini (2003) regressions for manufacturing manual workers.

| Dependent variable: share of negative real wage changes | | |
|---|---|---|
| Median of real wage change | -5.42** | -4.36** |
| | (-4.26) | (-3.86) |
| Dispersion of real wage changes (P75-P35) | -0.96 | 1.39 |
| | (-0.22) | (0.38) |
| Inflation rate | 1.49 | 1.61* |
| | (1.54) | (2.01) |
| Change in inflation rate | -1.55 | -0.43 |
| | (-1.15) | (-0.36) |
| Dummy for the recession years (1991-1993) | | 0.13** |
| | | (2.70) |
| N | 19 | 19 |
| Adj $R^2$ | 0.80 | 0.86 |

Notes: t-values in parenthesis: significance indicated by ** (5%), * (10%).

**Table 5.1.** ANOVA results for annual wage changes for different sectors.

**A. Manual Manufacturing workers, 1986-2000**

| Source of Variation | Degrees of Freedom | Marginal Contribution to SS | Percent of Total Sum of Squares | Percent of Model Sum of Squares | Marginal F-Stat. |
|---|---|---|---|---|---|
| **Region*year** | 29 | 637 | 13.8 | 44.6 | 6619 |
| **Occupation*year** | 12494 | 74.8 | 1.6 | 5.2 | 1.8 |
| **Joint occupation and employer** | | 160.5 | 3.5 | 11.2 | |
| **Employer*year** | 22277 | 556.8 | 12.1 | 39.0 | 7.5 |
| **Model** | 34800 | 1429.1 | 31.0 | 100 | 12.4 |
| **Residual** | 960440 | 3187.2 | 69.0 | | |
| **Total** | 995240 | 4616.3 | 100 | | |

**B. Non-manual Manufacturing workers, 1986-2000**

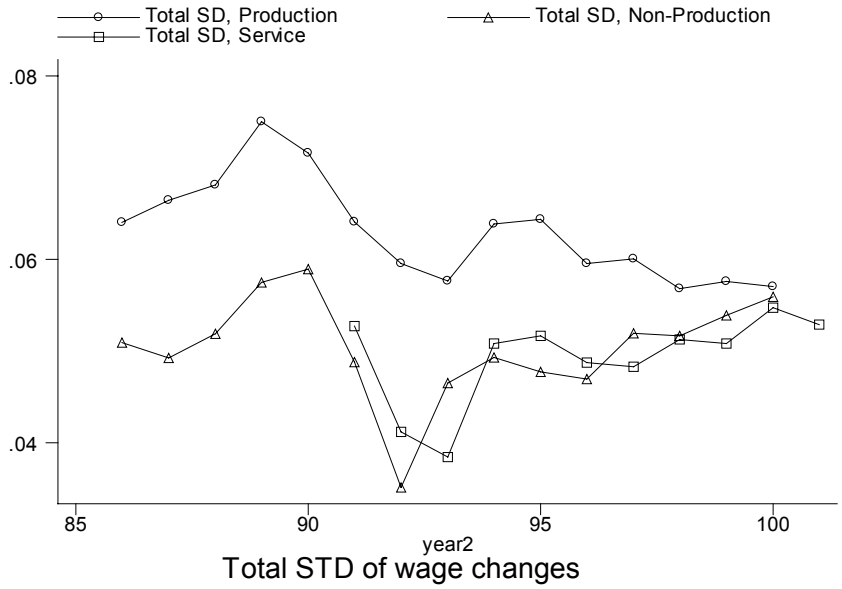
| Source of Variation | Degrees of Freedom | Marginal Contribution to SS | Percent of Total Sum of Squares | Percent of Model Sum of Squares | Marginal F-Stat. |
|---|---|---|---|---|---|
| **Region*year** | 29 | 693.5 | 18.1 | 60.0 | 10491.8 |
| **Occupation*year** | 1158 | 22.8 | 0.6 | 2.0 | 8.7 |
| **Joint occupation and employer** | | 40.1 | 1.0 | 3.5 | |
| **Employer*year** | 34214 | 398.5 | 10.4 | 34.5 | 5.1 |
| **Model** | 35401 | 1154.9 | 30.2 | 100 | 14.3 |
| **Residual** | 1173065 | 2673.6 | 69.8 | | |
| **Total** | 1208466 | 3828.5 | 100 | | |

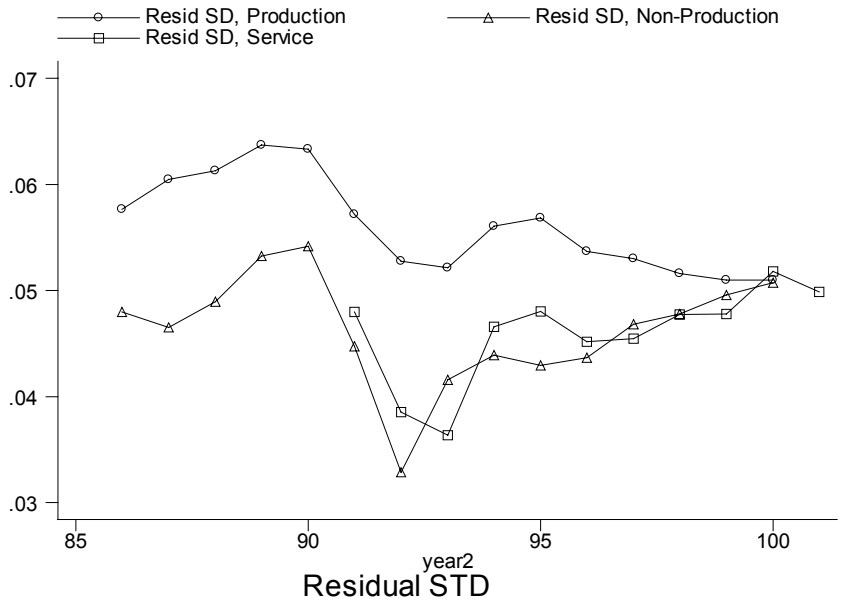
**C. Service sector workers, 1991-2001**

| Source of Variation | Degrees of Freedom | Marginal Contribution to SS | Percent of Total Sum of Squares | Percent of Model Sum of Squares | Marginal F-Stat. |
|---|---|---|---|---|---|
| **Region*year** | 21 | 458.9 | 16.6 | 60.8 | 9993.7 |
| **Occupation*year** | 581 | 14.7 | 0.5 | 1.9 | 11.6 |
| **Joint occupation and employer** | | 44.4 | 1.6 | 5.9 | |
| **Employer*year** | 35251 | 236.9 | 8.6 | 31.4 | 3.1 |
| **Model** | 35853 | 754.9 | 27.4 | 100 | 9.6 |
| **Residual** | 916109 | 2003.1 | 72.6 | | |
| **Total** | 951962 | 2758 | 100 | | |

Notes: Occupation and employer (firm) effects are marginal effects, i.e. their contribution to the Sum of Squares when all other effects are already included in the model. The Joint occupation and employer effect is calculated by subtracting the marginal contributions of occupation and employer (and region*year) from the Model Sum of Squares. This reflects the inability of ANOVA to unambiguously divide observed wage changes to occupation and firm components.

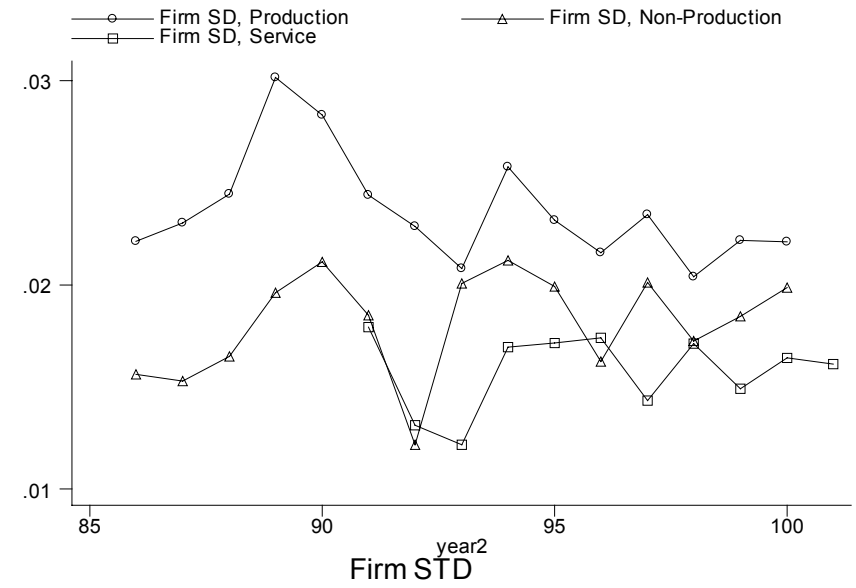
**Figure 5.1.** Standard deviations of wage changes and residuals by sector, 1986-2001.

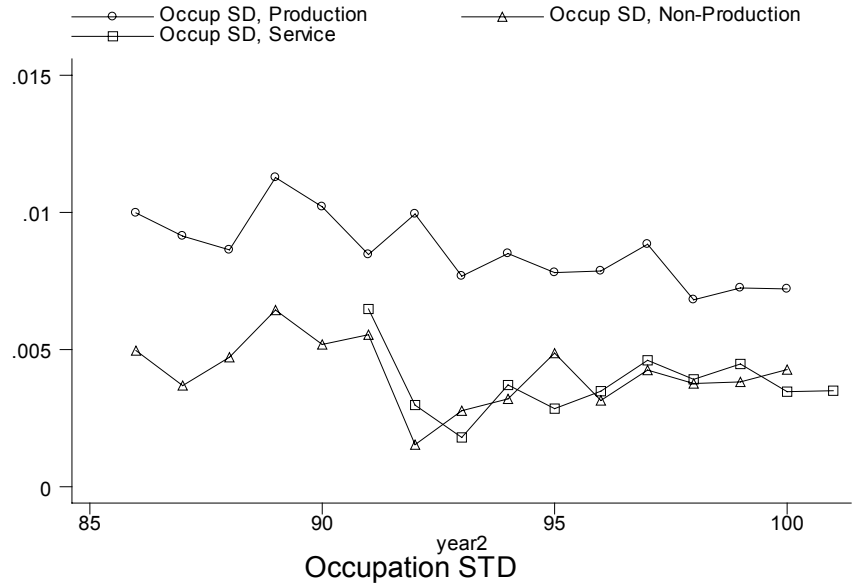



Notes: Standard deviations are from an ANOVA model for wage changes on firm and occupation (including year and year*region interaction effects). Total STD of wage changes is the standard deviation of dependent variable in this model, and Residual STD is the residual standard deviation.

**Figure 5.2.** Standard deviations of firm and occupation effects by sector, 1986-2001.




Notes: Standard deviations are for estimated marginal firm and occupation effects from an ANOVA model for wage changes including year and year*region interaction effects.

**Table 5.2.** Basic grease and sand regressions.

| | Occupation Standard Deviation | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Pooled | | Production | | Non-Production | | Service | |
| Cpip | -0,008 | -(0,21) | 0,038 | (0,59) | -0,067 | -(1,00) | 0,068 | (1,06) |
| Cpip^2 | 0,106 | (0,39) | -0,092 | -(0,22) | 0,509 | (1,14) | -0,644 | -(1,40) |
| DNProd | -0,004 | -(9,87) | | | | | | |
| Dserv | -0,005 | -(9,45) | | | | | | |
| _cons | 0,009 | (6,24) | 0,006 | (2,97) | 0,006 | (2,59) | 0,002 | (1,25) |
| AdjR-sq | 0.7656 | | 0.1710 | | -0.0076 | | 0.2230 | |

| | Firm Standard Deviation | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Pooled | | Production | | Non-Production | | Service | |
| Cpip | -0,094 | -(1,20) | -0,050 | -(0,36) | -0,163 | -(1,15) | 0,0353 | (0,34) |
| Cpip^2 | 0,724 | (1,36) | 0,617 | (0,66) | 1,187 | (1,27) | -0,5427 | -(0,74) |
| DNProd | -0,006 | -(6,21) | | | | | | |
| Dserv | -0,008 | -(7,89) | | | | | | |
| _cons | 0,026 | (9,70) | 0,024 | (4,91) | 0,023 | (4,72) | 0,0159 | (5,12) |
| AdjR-sq | 0.6442 | | 0.0969 | | -0.0018 | | 0.2107 | |

| | Residual Standard Deviation | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Pooled | | Production | | Non-Production | | Service | |
| Cpip | -0,080 | -(0,51) | 0,057 | (0,24) | -0,120 | -(0,41) | 0,0268 | (0,10) |
| Cpip^2 | 0,725 | (0,69) | 0,085 | (0,05) | 1,182 | (0,61) | -0,8348 | -(0,44) |
| DNProd | -0,010 | -(5,53) | | | | | | |
| Dserv | -0,010 | -(5,05) | | | | | | |
| _cons | 0,058 | (10,78) | 0,052 | (6,41) | 0,048 | (4,82) | 0,0477 | (5,96) |
| AdjR-sq | 0.4849 | | 0.0726 | | -0.0240 | | 0.1149 | |

Notes: Dependent variables are standard deviations of occupation or firm effects, or the residual standard deviation from ANOVA models. The explanatory variables are the sum of inflation and productivity growth (Cpip) and its square (Cpip^2), and dummies for non-production (DNProd) and service sectors (Dserv) in the pooled model that includes all three sectors. Constant (_cons) is reported. Appendix 1 contains the exact definitions of macroeconomic variables that are used in the models. t statistics in parentheses. * significant at 5%; ** significant at 1%.

**Table 5.3.** Grease and sand regressions with time trend (Trend) and its square (Trend^2).

| | **Occupation standard deviation** | | | |
|---|---|---|---|---|
| | Pooled | Production | Non-Prod | Service |
| Cpip | -0.045 | -0.000 | -0.125 | 0.079 |
| | (1.18) | (0.01) | (1.76) | (1.17) |
| Cpip^2 | 0.288 | 0.073 | 0.827 | -0.734 |
| | (1.14) | (0.20) | (1.82) | (1.54) |
| Trend | -0.003 | 0.001 | -0.005 | -0.010 |
| | (1.31) | (0.51) | (1.41) | (1.42) |
| Trend^2 | 0.127 | -0.089 | 0.263 | 0.512 |
| | (1.23) | (0.58) | (1.38) | (1.42) |
| DNProd | -0.004 | | | |
| | (10.86)** | | | |
| Dserv | -0.005 | | | |
| | (9.58)** | | | |
| Constant | 0.135 | -0.052 | 0.246 | 0.477 |
| | (1.49) | (0.38) | (1.48) | (1.44) |
| Observations | 41 | 15 | 15 | 11 |
| R-squared | 0.84 | 0.61 | 0.36 | 0.55 |

Notes: t statistics in parentheses. * significant at 5%; ** significant at 1%.

| | **Firm standard deviation** | | | |
|---|---|---|---|---|
| | Pooled | Production | Non-Prod | Service |
| Cpip | -0.088 | -0.059 | -0.061 | 0.043 |
| | (1.03) | (0.38) | (0.40) | (0.34) |
| Cpip^2 | 0.683 | 0.597 | 0.660 | -0.593 |
| | (1.22) | (0.60) | (0.67) | (0.66) |
| Trend | 0.003 | 0.007 | 0.005 | -0.001 |
| | (0.70) | (0.87) | (0.71) | (0.11) |
| Trend^2 | -0.158 | -0.374 | -0.275 | 0.074 |
| | (0.70) | (0.89) | (0.67) | (0.11) |
| DNProd | -0.006 | | | |
| | (6.08)** | | | |
| Dserv | -0.008 | | | |
| | (7.58)** | | | |
| Constant | -0.112 | -0.281 | -0.245 | 0.081 |
| | (0.56) | (0.77) | (0.68) | (0.13) |
| Observations | 41 | 15 | 15 | 11 |
| R-squared | 0.68 | 0.36 | 0.32 | 0.37 |

Notes: t statistics in parentheses. * significant at 5%; ** significant at 1%.

**Table 5.4.** Grease and sand regressions with unemployment (unemp) and its square (unemp^2).

| | **Occupation standard deviation** | | | |
|---|---|---|---|---|
| | Pooled | Production | Non-Prod | Service |
| Cpip | -0.015 | 0.026 | -0.096 | 0.083 |
| | (0.48) | (0.44) | (1.86) | (2.09) |
| Cpip^2 | 0.048 | -0.133 | 0.567 | -0.717 |
| | (0.22) | (0.34) | (1.65) | (2.49)* |
| Unemp | -0.001 | -0.001 | -0.001 | -0.001 |
| | (2.75)** | (1.58) | (1.57) | (2.74)* |
| Unemp^2 | 0.000 | 0.000 | 0.000 | 0.000 |
| | (2.03) | (1.30) | (1.06) | (2.36) |
| DNProd | -0.004 | | | |
| | (12.88)** | | | |
| Dserv | -0.004 | | | |
| | (10.98)** | | | |
| Constant | 0.013 | 0.011 | 0.011 | 0.011 |
| | (8.67)** | (3.90)** | (4.53)** | (3.64)* |
| Observations | 41 | 15 | 15 | 11 |
| R-squared | 0.88 | 0.53 | 0.61 | 0.82 |

Notes: t statistics in parentheses. * significant at 5%; ** significant at 1%.

| | **Firm standard deviation** | | | |
|---|---|---|---|---|
| | Pooled | Production | Non-Prod | Service |
| Cpip | -0.073 | -0.056 | -0.112 | 0.061 |
| | (1.00) | (0.50) | (0.75) | (0.59) |
| Cpip^2 | 0.387 | 0.315 | 0.779 | -0.752 |
| | (0.76) | (0.42) | (0.78) | (1.01) |
| Unemp | -0.002 | -0.002 | -0.001 | -0.002 |
| | (2.87)** | (2.73)* | (0.92) | (1.47) |
| Unemp^2 | 0.000 | 0.000 | 0.000 | 0.000 |
| | (2.72)* | (2.44)* | (1.06) | (1.47) |
| DNProd | -0.006 | | | |
| | (6.77)** | | | |
| Dserv | -0.007 | | | |
| | (7.82)** | | | |
| Constant | 0.034 | 0.036 | 0.025 | 0.027 |
| | (9.55)** | (6.73)** | (3.52)** | (3.33)* |
| Observations | 41 | 15 | 15 | 11 |
| R-squared | 0.75 | 0.62 | 0.27 | 0.54 |

Notes: t statistics in parentheses. * significant at 5%; ** significant at 1%.

**Table 5.5.** Grease and sand regressions with wage bargaining variables.

| | **Occupation standard deviation** | | **Firm standard deviation** | |
|---|---|---|---|---|
| | Pooled | Pooled | Pooled | Pooled |
| Cpip | 0.001 | -0.010 | -0.131 | -0.132 |
| | (0.03) | (0.24) | (1.64) | (1.74) |
| Cpip^2 | 0.043 | 0.118 | 0.964 | 0.959 |
| | (0.15) | (0.42) | (1.80) | (1.89) |
| Indbarg | -0.000 | | 0.001 | |
| | (0.86) | | (1.73) | |
| Centind | | 0.000 | | 0.002 |
| | | (0.22) | | (2.42)* |
| DNProd | -0.004 | -0.004 | -0.006 | -0.006 |
| | (9.83)** | (9.74)** | (6.38)** | (6.61)** |
| Dserv | -0.005 | -0.005 | -0.008 | -0.008 |
| | (9.37)** | (9.31)** | (8.17)** | (8.36)** |
| Constant | 0.008 | 0.009 | 0.027 | 0.027 |
| | (5.99)** | (6.16)** | (10.11)** | (10.48)** |
| Observations | 41 | 41 | 41 | 41 |
| R-squared | 0.79 | 0.79 | 0.70 | 0.73 |

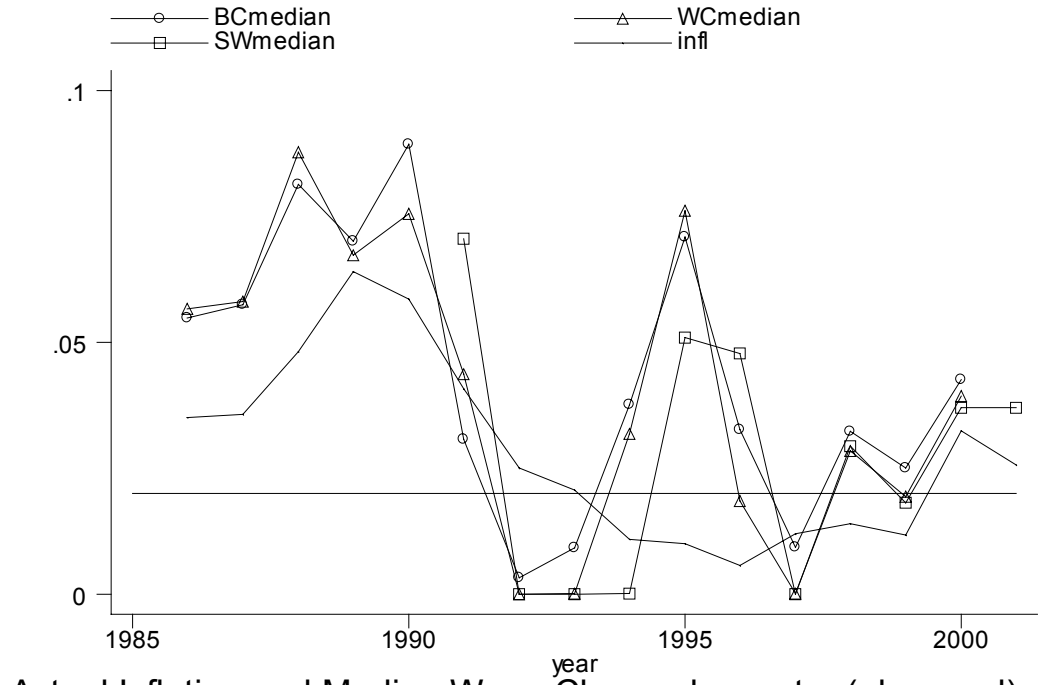
Notes: Indbarg = an indicator for industrial-based contracts and Decentind = decentralization index. These are reported in Table A2. t statistics in parentheses. * significant at 5%; ** significant at 1%.

**Table 5.6.** Grease and sand regressions with expected inflation and inflation surprise. (The squared terms are included as indicated.)

| | **Occupation standard deviation** | | | **Firm standard deviation** | | |
|---|---|---|---|---|---|---|
| | Production | Non-Prod | Service | Production | Non-Prod | Service |
| Inflforec | -0.087 | 0.026 | -0.115 | -0.089 | -0.012 | 0.136 |
| | (0.70) | (0.24) | (1.18) | (0.39) | (0.04) | (0.62) |
| Inflforec^2 | 2.015 | 0.697 | 3.342 | 3.576 | 1.340 | -1.478 |
| | (1.07) | (0.42) | (1.90) | (1.04) | (0.28) | (0.38) |
| Inflsurp | 0.084 | -0.104 | 0.013 | -0.011 | -0.270 | -0.223 |
| | (1.16) | (1.62) | (0.23) | (0.08) | (1.48) | (1.75) |
| Inflsurp^2 | -10.265 | 8.270 | -10.956 | -5.073 | 34.086 | 9.655 |
| | (1.22) | (1.11) | (1.65) | (0.33) | (1.62) | (0.65) |
| Constant | 0.009 | 0.003 | 0.005 | 0.023 | 0.016 | 0.013 |
| | (5.49)** | (1.69) | (3.76)** | (7.50)** | (3.87)** | (4.54)** |
| Observations | 12 | 12 | 11 | 12 | 12 | 11 |
| R-squared | 0.64 | 0.70 | 0.80 | 0.75 | 0.35 | 0.60 |

Notes: Expected inflation from consumer survey (Inflforec) and inflation surprise (inflsurp = actual inflation – expected inflation). t statistics in parentheses. * significant at 5%; ** significant at 1%.

**Figure 7.1.** Actual inflation (infl) and median wage change by sector (BC is blue collars, WC is white collars and SW is service sector).




Actual Inflation and Median Wage Change by sector (observed)

**Figure 7.2.** Averages of nominal wage rigidities.

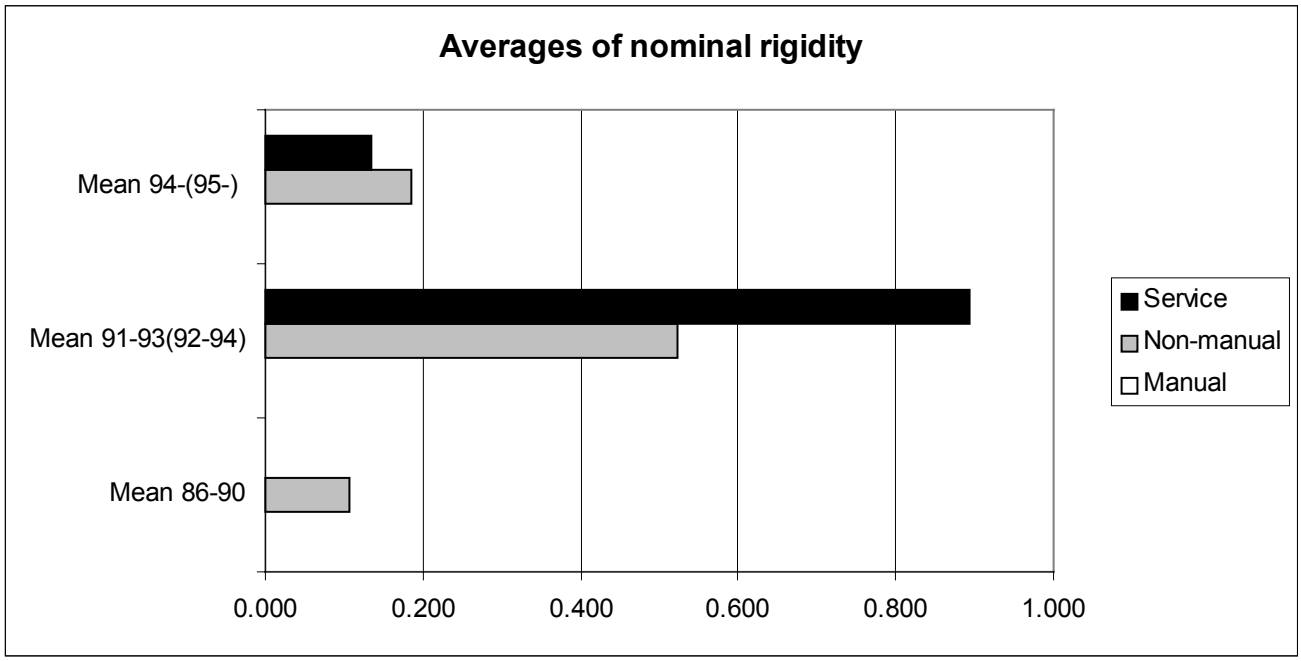



**Table 7.1.** The amount of nominal wage rigidities (averages over several years).

| | Manual manufacturing | Non-manual manufacturing | Services |
|---|---|---|---|
| 1986-1990 | 0.00 | 0.11 | .. |
| 1991-1993 (1992-1994) | 0.00 | 0.52 | 0.89 |
| 1994- (1995-) | 0.00 | 0.18 | 0.14 |

Notes: Averages for services are from the years 1992-1994 and from the years 1995-2001.

**Figure 7.3.** Averages of real wage rigidities by sector and period.

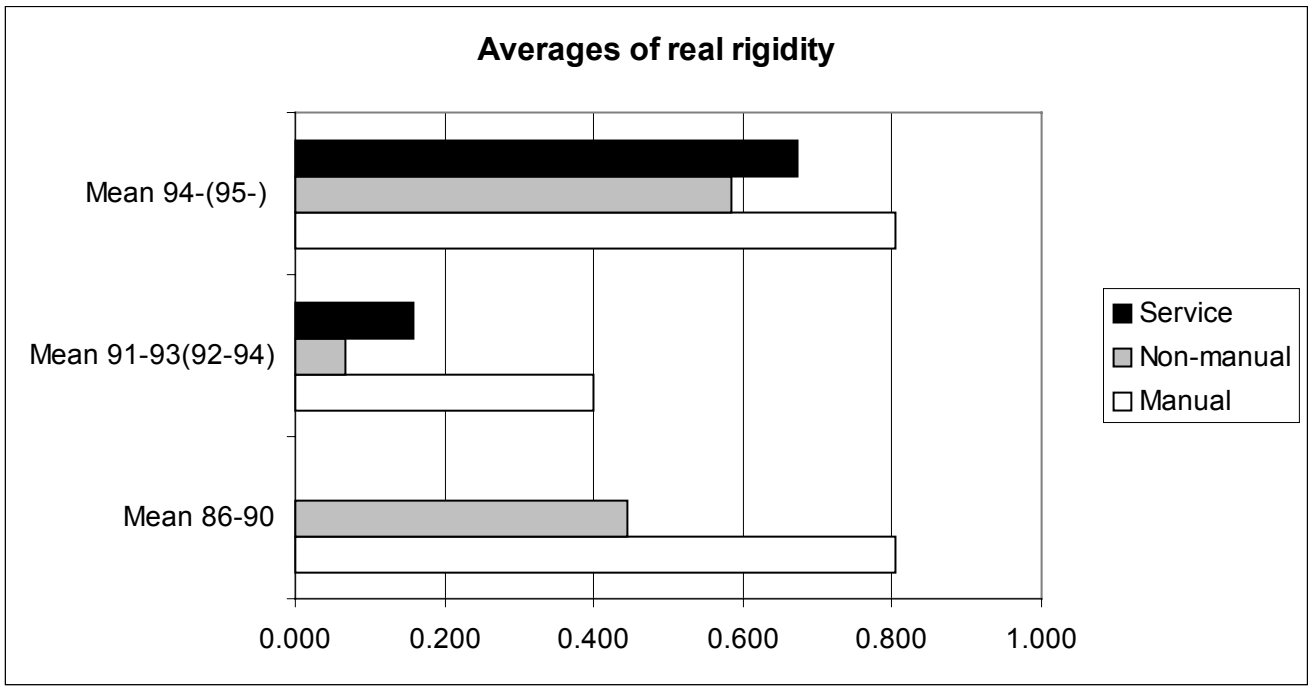



**Table 7.2.** The amount of real wage rigidities (averages over several years).

| | Manual manufacturing | Non-manual manufacturing | Services |
|---|---|---|---|
| 1986-1990 | 0.80 | 0.45 | .. |
| 1991-1993 (1992-1994) | 0.40 | 0.07 | 0.16 |
| 1994- (1995-) | 0.80 | 0.58 | 0.67 |

Notes: Averages for services are from the years 1992-1994 and from the years 1995-2001.

**Figure 7.4.** Evolution of nominal wage rigidities by sector, 1986-2001.

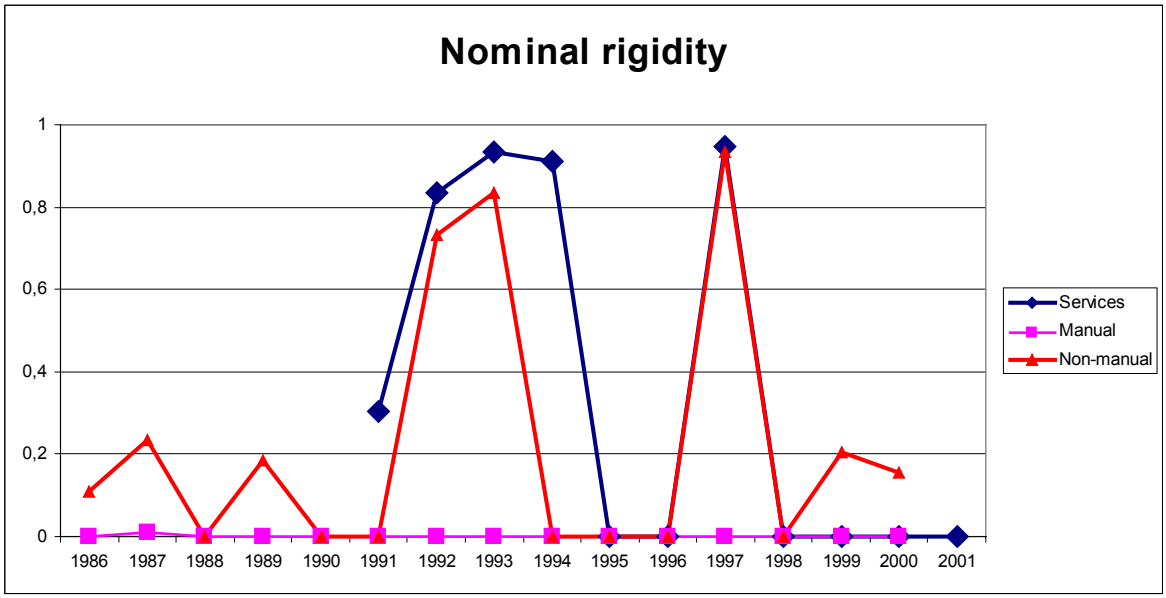


**Figure 7.5.** Evolution of real wage rigidities by sector, 1986-2001.

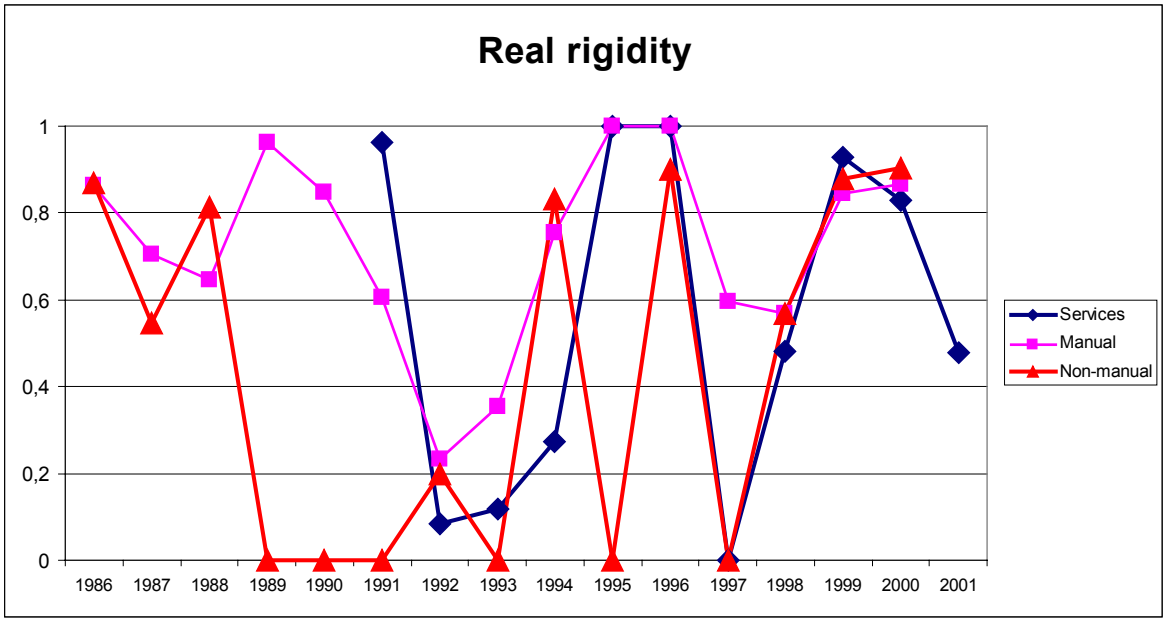


**Figure 7.6.** The amount of nominal and real wage rigidities in different countries (Source: Dickens et al. 2006).

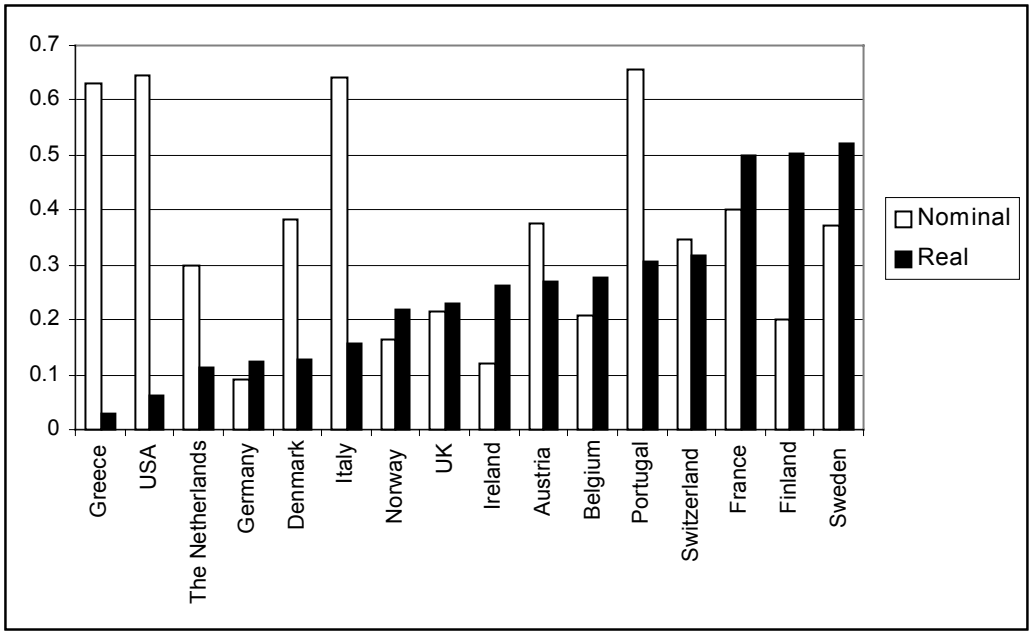


**Table 7.3.** Sensitivity of wage changes to unemployment.

**Blue Collar**

| | (1) Observed mean | (2) Estimated mean | (3) Observed mean | (4) Estimated mean | (5) Observed mean | (6) Estimated mean |
|---|---|---|---|---|---|---|
| Unemployment(t) | -0.389*** | -0.310*** | -0.316 | -0.450 | -0.429** | -0.320* |
| | (4.0) | (3.24) | (0.76) | (1.08) | (2.71) | (2.00) |
| Productivity growth(t-1) | | | 0.447 | 0.499 | 0.497* | 0.426 |
| | | | (1.28) | (1.43) | (2.15) | (1.78) |
| Expected Inflation(t) | | | 0.250 | -0.470 | -0.082 | -0.010 |
| | | | (0.23) | (0.43) | (0.18) | (0.02) |
| Industry bargain | 0.029** | 0.033*** | 0.020 | 0.025 | 0.020* | 0.026** |
| | (2.77) | (3.28) | (1.30) | (1.66) | (1.98) | (2.45) |
| Constant | 0.082 | 0.059 | 0.009 | 0.066 | 0.069 | 0.044 |
| | (7.99) | (5.81) | (0.92) | (1.05) | (2.60) | (1.61) |
| Observations | 15 | 15 | 12 | 12 | 15 | 15 |
| Adj. R-squared | 0.56 | 0.52 | 0.49 | 0.36 | 0.64 | 0.57 |

Notes: Expected inflation is the inflation forecast form consumer survey in columns 3-4, and the estimated inflation in columns 5-6. Significance: *** 1%, ** 5%, * 10%.

**Table 7.4.** Sensitivity of wage changes to unemployment.

**White Collar**

| | (1) Observed mean | (2) Estimated mean | (3) Observed mean | (4) Estimated mean | (5) Observed mean | (6) Estimated mean |
|---|---|---|---|---|---|---|
| Unemployment(t) | -0.401*** | -0.416*** | -0.399 | -0.184 | -0.477** | -0.456** |
| | (4.65) | (4.06) | (1.05) | (0.44) | (3.07) | (2.41) |
| Productivity growth(t-1) | | | 0.401 | 0.395 | 0.423* | 0.470* |
| | | | (1.26) | (1.13) | (2.05) | (1.87) |
| Expected Inflation(t) | | | 0.046 | 0.458 | -0.279 | -0.131 |
| | | | (0.05) | (0.42) | (0.52) | (0.20) |
| Industry bargain | 0.033*** | 0.039*** | 0.026* | 0.026 | 0.026** | 0.031** |
| | (3.57) | (3.58) | (1.91) | (1.70) | (2.81) | (2.76) |
| Constant | 0.086 | 0.066 | 0.069 | 0.015 | 0.085 | 0.056 |
| | (9.39) | (6.14) | (1.21) | (0.23) | (2.98) | (1.63) |
| Observations | 15 | 15 | 12 | 12 | 15 | 15 |
| Adj. R-squared | 0.65 | 0.61 | 0.56 | 0.48 | 0.71 | 0.65 |

Notes: Expected inflation is the inflation forecast form consumer survey in columns 3-4, and the estimated inflation in columns 5-6. The estimated mean is from the observed distribution without measurement error correction. Significance: *** 1%, ** 5%, * 10%.

**Table 7.5.** Sensitivity of wage changes to unemployment.

**Service sector**

| | (1) Observed mean | (2) Estimated mean | (3) Observed mean | (4) Estimated mean | (5) Observed mean | (6) Estimated mean |
|---|---|---|---|---|---|---|
| Unemployment(t) | -0.422** | -0.443** | -0.141 | -0.572* | -0.409* | -0.504** |
| | (2.68) | (3.25) | (0.61) | (2.28) | (2.13) | (2.75) |
| Productivity growth(t-2) | | | 0.215 | 0.354 | 0.431 | 0.273 |
| | | | (0.81) | (1.23) | (1.72) | (1.14) |
| Expected Inflation(t) | | | 1.03 | -0.560 | -0.028 | -0.243 |
| | | | (1.36) | (0.68) | (0.07) | (0.63) |
| Industry bargain | 0.029** | 0.038*** | 0.022 | 0.027* | 0.016 | 0.029* |
| | (2.67) | (4.07) | (1.90) | (2.08) | (1.23) | (2.38) |
| Constant | 0.083 | 0.061 | 0.022 | 0.076 | 0.068 | 0.065 |
| | (4.30) | (3.64) | (0.59) | (1.87) | (2.24) | (2.25) |
| Observations | 11 | 11 | 11 | 11 | 11 | 11 |
| Adj. R-squared | 0.50 | 0.67 | 0.66 | 0.65 | 0.55 | 0.65 |

Notes: Expected inflation is the inflation forecast form consumer survey in columns 3-4, and the estimated inflation in columns 5-6. Significance: *** 1%, ** 5%, * 10%.

**Appendix 1.** Definitions of macroeconomic variables.

| Variable | Definition | Source |
|---|---|---|
| Unemployment | The unemployment rate, % | Labour Force Survey by Statistics Finland |
| Inflation (actual) | Annual change in cost-of-living index, % (1951==100) | Statistics Finland |
| Expected inflation | Expected annual average change in the inflation rate during the following year, % | The Bank of Finland (Kari Takala) based on consumer sentiment surveys by Statistics Finland |
| Productivity growth | Annual change in labour productivity in the private sector, % | National Accounts by Statistics Finland |
| Contract wage | Annual contract wage change separately for manufacturing manual and non-manual workers and for the private service sector workers, % | For the years 1980-2000 based on Marjanen (2002), and for the year 2001 based on wage survey by TT |
| Decentralization index | The share of trade union members that are outside central bargain, % | For the years 1980-1997 based on Ruuttu (1997), and for the years 1998-2001 based on information from SAK |

**Appendix 2.** Description of wage-setting institutions.

1. Dominance of collective bargaining

Finland is one of the Nordic welfare states with high labour taxes, extensive social benefits and one of the highest rates of trade union membership and coverage of collective wage agreements in the OECD, and with minimum increases of nominal wages being determined by collective bargaining (Layard and Nickell 1999; Table A1). The structure of the Finnish wage bargaining tends to involve a high degree of coordination between both unions and employers, with a framework agreement being determined centrally on a one- or two-year basis, followed by union level bargains in the context of this framework agreement of labour market issues. (Santamäki-Vuori and Parviainen (1996) and Vartiainen (1999) provide summaries of the Finnish labour market institutions.) As one important outcome of collective agreements, wage compression is high in Finland. In particular, Moisala and Uusitalo (2004) report based on European Community Household Panel (ECHP) that dispersion in gross wages in Finland is narrow in comparison with the other EU countries.

Labour market policy is the result of a close and long-term interplay between organised agents and the government. This feature means that Finland provides an example, *par excellence,* of a corporatist political and economic system (e.g. Vartiainen 1998). The labour market parties and also other important economic and political actors are comprehensively organised and co-operate in centralised wage bargaining and dialogue on a broad range of issues related to economic and social policy. As a result, trade unions and employer's organisations explicitly take into consideration aggregate economic conditions like the rate of inflation and the future growth prospects when negotiating nominal wage increases.

Since 1968 the labour market organisations and the government have concluded centralized income policy agreements in an effort to stabilize macroeconomic development and to improve working conditions and the social security system. This means that government is involved directly or indirectly in most negotiations on wage

and employment terms and has introduced, for instance, income tax cuts in order to moderate future wage increases. These tax cuts are quite often conditioned on the success of the collective wage agreements to maintain price stability.

Around 70% of the salaried labour force belongs to trade unions nowadays. The wage earners have altogether 81 trade unions belonging to three different central organisations. The high unionisation rate is at least partly explained by the fact that membership fees are tax deductible; the fees are mainly collected by employers and, in particular, by the involvement of the unions in the administration of unemployment insurance benefits. Accordingly, Pehkonen and Tanninen (1997) conclude that the trade union density rate would fall considerably if earnings-related unemployment insurance were cut to the level of the basic unemployment benefits.

There was no decline at all in the trade union density rate during the great depression of the early 1990s (Figure A1). In contrast, there was a substantial increase in the trade union density rate. The reason for this evolution is most likely an increase in the perception of job instability among employees during the severe slowdown in aggregate economic activity. After the depression, however, union density has declined by more than 10 percentage points in less than ten years. This rate resembles the decrease in the union density during the Thatcher years in the UK. Böckerman and Uusitalo (2006) show that the decline has been caused by the emergence of an independent UI fund that provides unemployment insurance without requiring union membership, which has eroded the so-called Ghent system, where the unions administer government-subsidized unemployment insurance funds. The changes in the composition of the labour force and the changes in the labour market explain only about a quarter of this overall decline.

The coverage ratio of the collective bargaining in Finland is less exceptional compared to the other countries, since the real impact of the collective agreements usually tends to be stronger than would be implied by the crude unionisation rate in other OECD countries. The French labour markets constitute a typical example of a country in which the unionisation rate is low, but the coverage ratio of collective agreements is high. In addition, relative to other European countries, the labour market regulation is not

particularly strict in Finland (e.g. Layard, Nickell and Jackman 1991; Layard and Nickell 1999; Table A1).

The Finnish 'wage increase formula' was formalised by the social partners and the Ministry of Finance in the tri-partite Incomes Policy Commission in 1995 (Mermet 2001).[16] The formula defines the scope for nominal wage cost increases as the sum of the core inflation target (e.g. 2% *per annum*) and the average increase in productivity across the whole economy. This means that nominal wages are not encouraged to adjust to the changes in productivity that are specific to certain sectors. As a result of this, wage changes have not followed the growth rate of labour productivity in booming industries like electronics during the late 1990s. The tri-partite Incomes Policy Commission orders reports on specific issues that are directly related to wage formation.

To sum up, collective bargaining dominates wage formation. Despite discussions and pressures for changes in these institutions from time to time, the wage setting practices can be described as quite stable over our period of analysis (1985-2001). Hence, it is not possible to explain the changes in the amount of nominal and real wage rigidities over the period by the changes in wage-setting institutions.

## 2. Wage formation

### 2.1. Wage structure

The Finnish wage bargaining has been overwhelmingly dominated by the collective agreements (Tables A2-A3). The collective labour contracts (*työehtosopimus,* TES) constitute the ultimate backbone of wage formation (Vartiainen 1998). They contain the broad outlines of wage formation. The collective labour contracts are incomplete owing to the fact that collective labour contracts cannot fully contain all possible characteristics of various jobs in the diverse population of the Finnish companies. This feature of the Finnish wage formation means that the collective labour contracts usually contain a set of minimum wages (*taulukkopalkka*) at different job-complexity levels and

educational levels. The complexity levels of various jobs are stipulated based on the negotiations between employees and employers.

Collective agreements are widely binding in Finland. A national collective agreement made for a given industry between a trade union and an employers' federation is, by definition, binding on all employers that belong to that particular federation. If about half of the employees in the industry are in the service of these organized employers, then the national collective agreement is universally binding. This means that the collective agreement also applies to employers that are not members of the federation that has negotiated the agreement. As a result, the coverage of collective bargains in Finland is around 95% of all employees, one of the highest rates in the OECD (e.g. Layard and Nickell 1999).

There is no statutory minimum wage legislation as such in Finland, but the minimum wages of each binding collective agreement constitute an effective floor for wages in that particular industry. In any given year, there is, therefore, a great number of effective floors for nominal wages. Hence, the level of minimum wages differs across sectors. In addition, there is some grading by age and experience of employees (Santamäki-Vuori and Parviainen 1996). In particular, minimum wages that are stipulated in the collective labour agreements tend to be lower for young employees. For these reasons, it is hard to assess the impact of minimum wages on wage rigidities in Finnish case. Available international comparisons tend to indicate that the effective minimum wages are not particularly high compared with the average wage in Finland. It has been estimated that the ratio of minimum wages to average wage in Finland is 0.52 (Layard and Nickell 1999). The same figure, for instance, in Italy is as high as 0.71.

## 2.2. Changes in wages

The outcomes of the collective bargaining can be structured as follows (e.g. Vartiainen 1998). The collective agreement (TES) contains an agreement on a general nominal wage increase, most often stipulated as a percentual one, that is to be applied to all

wages and salaries. At the same time, each wage bargain also updates the tariff wages by the amount of the general rise. The general wage increase is usually interpreted as an across-the-board increase of all existing wages and salaries including any individual or firm specific wage components that are paid on top of the tariff wages. Hence, the final impact of the wage bargain depends mainly on that general wage increase.

Along with the general rise, the collective agreements may include allowances for specific purposes, for example low wage or female allowances with a purpose of increasing wages for some worker groups more than by the general rise. Further, a mixed pay rise formula (X% or Y euros at minimum) is quite often applied and it tends to produce some wage compression. Alho and Pekkarinen (2004, pp. 14) observe that there has been a gradual erosion of these solidaristic elements in wage formation during the late 1990s. Employers and AKAVA (Confederation of Academic Professional Associations) have demanded this.

### 2.3. Additional elements

There are additional elements in the wage formation (Vartiainen 1998). First, what the individual unions and their employer counterparts agree on the structure of tariff wages and salaries affects the pay of employees according to whether their baseline pay is near to the tariff level. If tariff levels are increased by more than the general increase, the final impact of the agreement is usually greater than the general increase if a large proportion of workers were earning a wage somewhere near the tariff level. Second, the so-called wage drift plays an important role in the wage formation (more details are given in section 2.4 below). Third, during the 1990s selected provisions were added to the collective agreements which have made it possible to agree locally about certain issues like daily working hours in an effort to adjust the effective labour input of companies. However, under the current law, these local agreements are legally acceptable only if their terms exceed those agreed at national level (Mermet 2001).[17] Hence, the minimum conditions cannot be repudiated by the conduct of local negotiations. Therefore, these provisions provide flexibility upwards, but not downwards that is needed to overcome economic hardships in companies. Hence, there

is not much room for wage cuts within the current institutional setting of the labour market, which are only possible by the mutual consent of employers and employees. In summary, local negotiations as currently implemented in Finland do not undermine the broad picture of collective wage formation.

## 2.4. Wage drift and other elements of flexibility

Wage drift has, historically, accounted for around 30% of the total increase in earnings (e.g. Vartiainen 1996; Marjanen 2002; Piekkola and Marjanen 2003). The magnitude of wage drift is calculated as a difference between actual and agreed (at national or sectoral level) nominal wage increases. This means that structural changes in the labour market (for instance, a strong growth in high-wage industries during the recovery or layoffs of low-wage employees during the economic slowdown) have an impact on the magnitude of wage drift.

The evolution of wage drift has been procyclical over the period of investigation. Hence, there is an increase in wage drift in the times of good macroeconomic performance. The empirical micro-level studies show that wage drift responds mainly to company-specific profitability (Piekkola 2001). Local agreements on wages that have become more popular during the late 1990s are shown as a wage drift in aggregate wage statistics (Mermet 2001).

The role of performance-related pay has increased in the labour market during the 1990s. Eiro (2001) documents that 36% of all employees in manufacturing are affected by performance-related pay, the same figure is 9% for the state sector and 2.4% in the municipal sector. Despite this, the performance-related pay covers only a small proportion of the total earnings even in manufacturing, where it has been most commonly adopted.[18]

# 3. Collective bargaining negotiations

## 3.1. Income policy agreements

Collective bargaining rounds have typically started with a preliminary negotiation between the central organisations in the context of the so-called Income Policy Agreement (IPA; *tulopoliittinen kokonaisratkaisu*) (Table A2). This means that the IPA has usually been considered for various reasons by the central organisations to be the most preferred outcome of a bargaining round.

There is no formal legal basis for overall, economy-wide centralisation of wage bargaining (Vartiainen 1998). This means that the central organizations cannot negotiate agreements that would legally bind their member unions or employer federations. That negotiation between central organisations, when successful, has produced a recommendation for wage increases. The individual unions and employer organisations have then rallied to that central framework agreement or rejected it, in which case negotiations have been conducted separately at industry-level (the division of blue-collar trade unions follows closely broad industries in manufacturing; white-collar employees with academic qualifications are mostly organised according to professions). This feature of wage formation means that it has been quite normal that some unions/employers remain outside the centralised agreement. The IPAs have been more comprehensive during the 1990s as a consequence of macroeconomic difficulties (see column three in Table A2). This has lead to the concentration of individual-level wage changes around the level of centralised agreement (see Figures 4.2a-4.2c; 4.3a-4.3c and 4.4a-4.4b of this report). As a result, the dispersion of individual-level wage changes declined a lot especially during the great depression of the early 1990s (see Figure 5.1).

### 3.2. Industry-based contracts

When there is no sufficiently comprehensive willingness for a centralised IPA, the trade unions and the employer organisations bargain and conclude deals to cover their own sector (Vartiainen 1998). The outcomes concerning nominal wage changes are in these cases based on a great number of industry-based contracts. The rejected outcome of an Income Policy Agreement has usually put an effective floor to nominal pay rises in these particular bargaining rounds. In the case of industry-based contracts, 'general pay rise in contract' (*yleislinja*) that is reported in Table A2 refers to pay rise that has been the most common in that particular bargaining round. Uusitalo (2002) provides some empirical evidence that the distribution of wages has been more compressed during the times of collective agreements.

The implemented industry-based contracts have usually induced substantially larger average increases in nominal wages compared with the outcomes of IPAs during the 1980s and the 1990s (Alho 2002; Uusitalo 2005). (The same result is reported in Tables 7.3-7.5 of this report.) This aspect is as expected, because the main motivation for the IPAs is to moderate and coordinate diverse wage claims in the first place. This feature of wage formation is consistent with the inverted U-shape hypothesis of centralisation effects suggested by Calmfors and Driffill (1988). It has been shown that the metal and the paper industries, which constitute the backbone of the Finnish export industries, have traditionally been the leading sectors in nominal wage increases during the past few decades (Hartman 1997).

### 3.3. Settlement of labour disputes

The government undertook a number of measures to improve the legislation concerning labour relations and also the management of labour disputes after the end of the Second World War. The outcome of these measures was that the Finnish Parliament in 1946 amended the Collective Agreements Act and passed the Labour Court Act. These Acts came into force and the Finnish Labour Court (*työtuomioistuin*) started operating at the

beginning of 1947. The existing Labour Court Act has been passed in 1974. Later amendments concerning, for instance, the system of civil servants' collective agreements and the judicial procedure at the Labour Court have been passed.

The establishment of the separate Labour Court was firstly deemed necessary due to the fact that general courts of law were regarded as being too slow to handle these issues. Secondly, they were considered not to have the special expertise required in settling often highly complex labour disputes arising out of collective labour agreements. In addition, it was considered significant that a court which was composed of members who represent the employers' as well as the employees' most important organizations, could gain the overall confidence of the labour organizations in a more comprehensive manner than the general courts of law. In this sense, the Labour Court is an important part of the Finnish collective bargaining framework and its implementation. For instance, the cases that are related to industrial peace in the labour market are tried at the Labour Court. Hence, the issues tried at the Labour Court tend to cover a number of employees at the same time. Finally, the positive experiences gathered in the other Scandinavian countries, especially in Sweden, with their separate labour courts contributed to the establishment of the Labour Court also in Finland.

There is the national conciliator (*valtakunnan sovittelija*) in Finland that aims to resolve industrial disputes by prior negotiation. This is aimed to diminish the number of breakdowns in industrial peace. The National Conciliators' Office (*valtakunnan sovittelijan toimisto*) is operated under the Ministry of Labour.

## 4. Emergence of wage moderation during the 1990s

Theory says that there should be a decline in the real wage level of employees in response to a collapse in labour demand even in the labour market characterised by collective bargaining. The downward movement of nominal and real wages was clearly limited at the onset of the great depression of the early 1990s. In particular, because of worsening export prices, the growth of real product wages turned out to be excessive in 1989-1991 (Kiander and Vartia 1996; 1998). Hence, the *ex post* real product wages

were higher than originally intended, due to lower than expected producer prices. The result was an unexpected upsurge of real product wages, which deteriorated the competitiveness of the Finnish companies. A surge in the unemployment rate and depreciation of the *markka* finally stopped the growth of real wages during the early 1990s.

There was, however, significant wage moderation by using the instruments of the centralized bargaining system during the depression. Nominal wages were *frozen* by collective agreements over the period from 1992-1993 (as reported in Table A2). There was even an attempt by the social partners to *cut* nominal labour costs by 7% in 1991 in order to avoid currency depreciation. (The proposition to cut labour costs by 7% included 3% cut in nominal wages and 4% 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 (Kiander and Vartia 1998, pp. 367-368). 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. Since inflation was slower than expected and there was a continuation of a small but positive wage drift, this meant that real wages were more or less unchanged in 1992-1994. However, increase in income taxes and social contributions meant that the real after-tax incomes decreased by approximately 3-6% per year in these years (see Kiander and Vartia 1998, pp. 291).

The average nominal increases in wages have evidently been moderate with respect to an increase in labour productivity in Finland during the 1990s. In particular, during the early 1990's recession years the median worker experienced real wage declines (see Figure 7.1 of this report). Hence, there has been a great deal of macro-level adjustment and flexibility in the labour market. As a result, there has been a substantial (and it seems permanent) decline in the labour share (i.e. the share of wages and salaries as a percentage of nominal GDP) since the great depression of the early 1990s (e.g. Kyyrä 2002) (Figure A2). The moderate increases in nominal wages by the collective agreements are the principal reason for the decline in the labour share from the macro-economic perspective (Sauramo 2004).[19] Holm and Romppanen (1999) conclude that

these moderate increases in nominal wages have contributed to a quite rapid decline in the unemployment rate during the same period, which has been the most important aim of the moderation of the wage claims by means of the collective labour agreements in the first place. This broad macroeconomic perspective based on the average evolution of wages across individuals with respect to the growth rate in labour productivity is largely excluded from our analysis of the micro-level rigidity of individual wages during the 1990s.

**Table A1.** The selected features and outcomes of the Finnish labour market (Source: CESifo; Dice). [http://www.cesifo.de/].

| | |
|---|---|
| *Features:* | |
| Centralisation of collective bargaining[1] (1994) | 2+ |
| Co-ordination of collective bargaining[2] (1994) | 2+ |
| Collective bargaining coverage[3] (%) (1995) | 95 |
| The trade union density rate[4] (%) (1994) | 81 |
| Employment protection strictness[5] (the late 1990s) | 2.0 |
| *Outcomes:* | |
| The employment rate[6] (%) (2000) | 67.2 |
| Part-time employment[7] (%) (2000) | 10.4 |
| Labour disputes[8] (the average 1970-1999) | 396 |
| Earnings dispersion[9] (D5/D1) (1996) | 1.40 |
| Performance related pay[10] (1998) | 36 |

Notes:

[1] 1=company/plant-level, 2=sectoral level, 3=central level. Source: OECD Employment Outlook 1997.

[2] The degree of co-ordination includes both union and employer co-ordination. Each characteristic has been assigned a value between 1 (for uncoordinated/decentralised) and 3 (for co-ordinated/centralised). Source: OECD Employment Outlook 1997.

[3] The number of employees covered by a collective agreement divided by the corresponding total number of wage and salary earners. Source: OECD Employment Outlook 1997.

[4] Trade union membership as a percent of wage- and salary earners (based on employed members only). Source: OECD Employment Outlook 1997.

[5] The average of indicators of employment protection strictness for regular contracts and temporary contracts. The United States gets the index value of 0.2 and the employment protection strictness is at its highest level in Portugal, where the index gets the value of 3.7. Source: OECD Employment Outlook 1999.

[6] The employment rate is defined as employment divided by population aged 15 to 64 years. Source: Employment Outlook 2001.

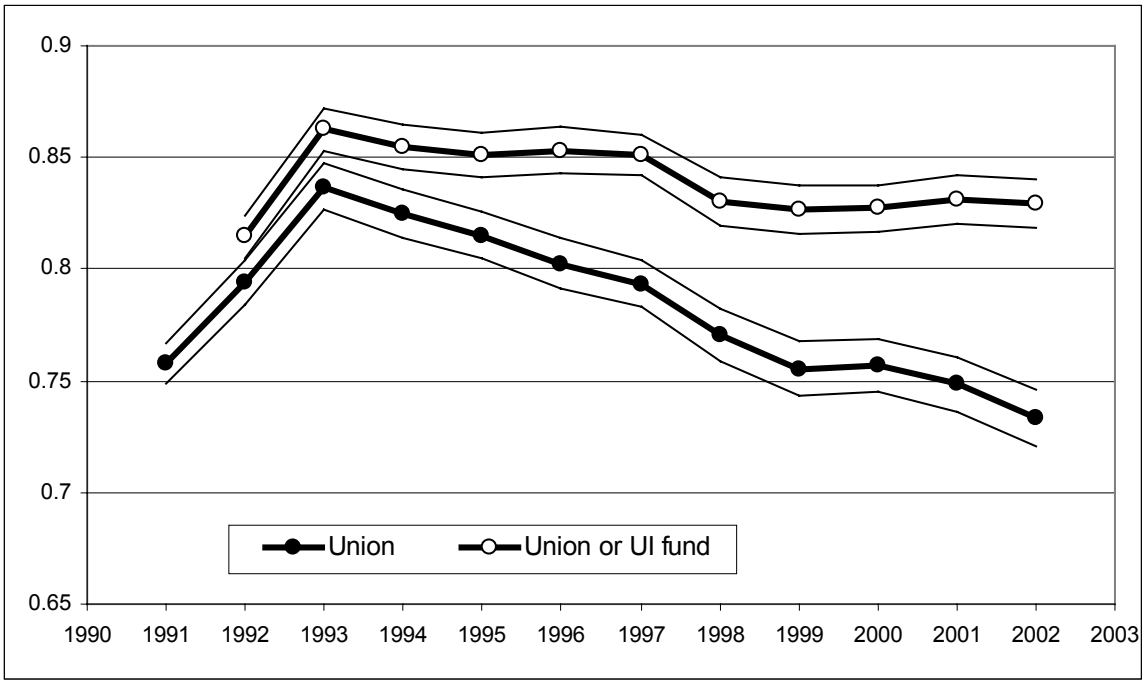
[7] Part-time employment is measured as part-time employment as a proportion of total employment. Part-time employment refers to persons that usually work less than 30 hours a week in their main job. Source: OECD Employment Outlook 2001.

[8] Lost working days per 1000 employees, annual average over the period 1970-1999. The OECD average is 230. Source: ILO, EIRO, Eurostat, National Statistics, and Institut der deutschen Wirtschaft Köln.

[9] D1 refers to the upper earnings limits of the first decile of employees ranked in order of their earnings from lowest to highest. D5 corresponds to median earnings. The D5/D1 gets the value of 2.08 for the United States (1998). Source: OECD Employment Outlook 1996; CESifo calculations.

[10] The number of employees affected by performance related pay in the manufacturing industries (%). Source: EIRO, Observer 3'01.

**Figure A1.** The evolution of the trade union density (Source: Böckerman and Uusitalo 2006).




Note: Thin lines indicate 95% confidence intervals.

**Table A2.** The labour market contracts, 1980-2000.

| Year | Contract type | Centralization index[2] | Duration | Contract started | Index clause | General pay rise in contract (%) | Contract wage index change (%), 4th quarter to 4th quarter |
|---|---|---|---|---|---|---|---|
| 1980 | Industrial-based contracts | 100 | 1 year | 1.3.1980 / 1.10. 1980 | NO | 11.3 | 12.4 |
| 1981 | Pekkanen 9.3.1981 / 1. phase | 36 | 2 years | 1.3.1981 / 1.9.1981 | NO | 7.0 | 8.3 |
| 1982 | 2. phase | 36 | .. | 1.3.1982 / 1.10. 1982 | NO | 8.4 | 9.3 |
| 1983 | Industrial-based contracts | 100 | 1 year | 1.3.1983 / 1.10. 1983 | NO | 5.6 | 7.6 |
| 1984 | Pekkanen 28.3.1984 / 1. phase | 23 | 2 years | 1.3.1984 / 1.10. 1984 | YES | 4.0 | 4.6 |
| 1985 | 2. phase | 23 | | 1.3. 1985 | | 3.8 | 5.4 |
| 1986 | So-called VHS-contract 16.3.1986 / 1. phase | 17 | 2 years | 1.3.1986 | YES | 2.8 | 4.5 |
| 1987 | 2. phase | 17 | .. | 1.3. 1987 | NO | 3.4 | 5.0 |
| 1988 | Industrial-based contracts | 100 | 2 years | 1.3.1988 | NO | 5.3 | 8.0 |
| 1989 | IPA[1] 15.9.1988 | 38 | 1 year | 1.3.1989 | YES | 3.6 | 4.9 |
| 1990 | Kallio 15.1.1990 / 1. phase | 20 | 2 years | 1.3.1990 | YES | 5.9 | 6.3 |
| 1991 | 2. phase | 26 | | 1.5.1991 | NO | 1.7 | 2.6 |
| 1992 | Ihalainen-Kahri 29.11.1991 (Extension of prevailing contract to 31.10.1993) | 6 | 2 years | 1.3.1992 | YES | 0.2 | 0.0 |
| 1993 | Revision of prevailing contract 30.11.1992 | 6 | .. | .. | NO | 0.6 | 0.1 |
| 1994 | Industrial-based contracts | 100 | 1 year | 1.11.1993 | NO | 2.5 | 0.9 |
| 1995 | Industrial-based contracts | 100 | 1-2 years | | NO | 5.0 | 5.4 |
| 1996 | IPA 11.9.1995 / 1. phase | 0 | 2 years | 1.11. 1995 | YES | 1.8 | 2.4 |
| 1997 | 2. phase | 0 | .. | 1.10.1996 | NO | 1.3 | 0.0 |
| 1998 | IPA 27.11.1997 / 1. phase | 5 | 2 years | 1.1.1998 | YES | 2.1 | 2.7 |
| 1999 | 2. phase | 5 | .. | 1.1.1999 | NO | 1.6 | 1.9 |
| 2000 | Industrial-based contracts | 100 | 1 year | 1.3.2000 | NO | 3.1 | 3.2 |
| 2001 | IPA, 1. phase | 0 | 2 year | 1.2. 2001 | YES | 3.0 | |

Sources: Pehkonen and Santamäki-Vuori (1999), except years 2000-2001 added by authors. Changes in contract wage index are authors' calculations based on data from the ETLA database.

Notes:

[1] IPA is an acronym for Income Policy Agreement (*tulopoliittinen kokonaisratkaisu,* TUPO) which refers to a broad collective framework agreement on income and economic policy issues (often including changes in taxation and/or social policy).

[2] % of union members outside central bargain (Source: Ruuttu 1997). We are grateful to Jorma Antila concerning the estimates for the years 1998-2001.

[3] The general pay rise in contract (%) and the annual change in the contract wage index (%) differ due to the changing timing of rises in contract wage that induces the so-called carry-over effect from year to year.

**Table A3.** The evolution of the collective wage bargaining, 1980-2000 (Source: Golden, Lange and Wallerstein 2002).

| | *Confederal involvement in wage setting** | *Government involvement in wage setting*** | *Bargaining level**** |
|---|---|---|---|
| 1980 | 3 | 5 | 3 |
| 1981 | 9 | 9 | 4 |
| 1982 | 9 | 9 | 4 |
| 1983 | 3 | 5 | 3 |
| 1984 | 9 | 9 | 4 |
| 1985 | 9 | 9 | 4 |
| 1986 | 9 | 9 | 4 |
| 1987 | 9 | 9 | 4 |
| 1988 | 3 | 5 | 3 |
| 1989 | 3 | 5 | 3 |
| 1990 | 9 | 9 | 4 |
| 1991 | 9 | 9 | 4 |
| 1992 | 9 | 9 | 4 |
| 1993 | 9 | 9 | 4 |
| 1994 | 3 | 5 | 3 |
| 1995 | 3 | 5 | 3 |
| 1996 | 9 | 9 | 4 |
| 1997 | 9 | 9 | 4 |
| 1998 | 9 | 9 | 4 |
| 1999 | 9 | 9 | 4 |
| 2000 | 3 | 5 | 3 |

Notes:

*3=”Confederation(s) participates in tales or in formulation of demands for all affiliates.”

*9=”Confederation negotiates national wage agreement without peace obligation.”

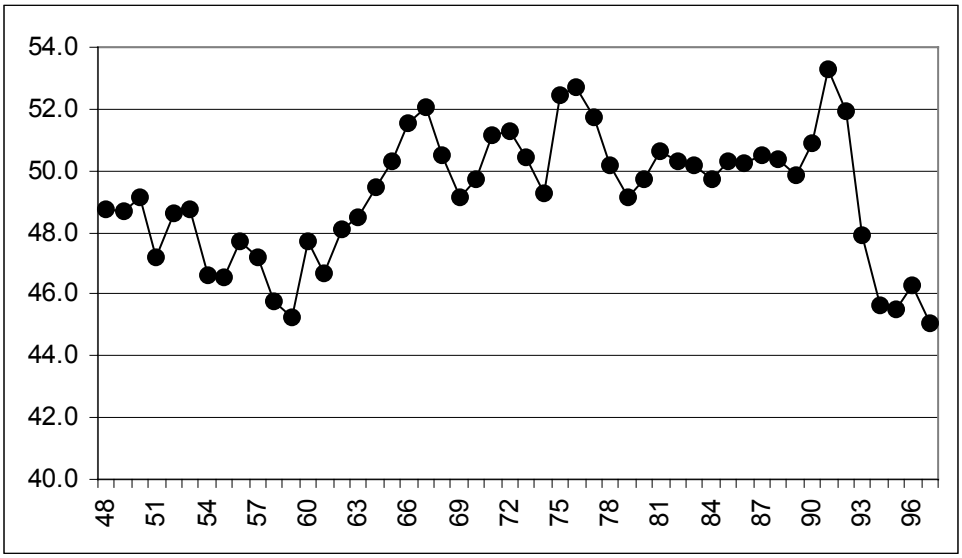
**5=”Goverment recommends wage quidelines or norms.”

**9=”Formal tripartite agreement for national wage schedule without sanctions.”

***3=”Industry-level wage setting without constraints.”

***4=”Sectoral wage-setting without sanctions.”

**Figure A2.** The share of wages and salaries of the GDP, 1948-1997 (Source: National Accounts).[20]



Footnotes:

[1] Holden (2004) provides a survey of the literature.

[2] Koskela and Vartiainen (1997) raised this issue in the Finnish discussion concerning the effects of EMU on wage setting and employment.

[3] Fehr and Gächter (2000) provide a survey on this issue. Keynes (1936) stressed the notion of fairness as an important factor of wage formation.

[4] Kiander and Vartia (1996), and Honkapohja and Koskela (1999) provide surveys of the great slump of the early 1990s in Finland. Koskela and Uusitalo (2003) provide a discussion of the Finnish unemployment problem in the European context.

[5] Pehkonen (1999) provides an update.

[6] The method presented by Kahn (1997) was tried in the International Wage Flexibility Project. It did not produce meaningful results for Finland, because the assumption that the key aspects of the wage change distribution are not changing over time, is not holding in the Finnish case.

[7] E.g. Smith (2000) provides a discussion about the measurement error in wage changes in survey data.

[8] The inclusion of movers across firms 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.

[9] The models are estimated covering the 1990s. Böckerman, Laaksonen and Vainiomäki (2003) document and discuss the results in detail.

[10] Uusitalo and Vartiainen (2005) also analyse the firm component in Finnish wages and wage increases by using ANOVA models. There are two main differences between their analysis and ours, which make the results not comparable. They combine the manual and non-manual data into one data set, and they do not include occupation indicators in their analysis.

[11] Groshen et al. (2004) report this finding for a number of countries in the International Wage Flexibility Project.

[12] Previous approaches to correcting for measurement error make strong functional form assumptions about the residuals in true wage changes, or require high-frequency data on wage changes (Dickens et al. 2006).

[13] A two sided Weibull distribution is defined by the following cumulative density function:

$$F(x) = \begin{cases} for\ x \le \mu & .5e^{\left(\frac{x-\mu}{\beta}\right)^{\alpha}} \\ otherwise & 1-.5e^{\left(\frac{\mu-x}{\beta}\right)^{\alpha}} \end{cases}.$$

The three parameters allow variation in the mean ($\mu$), the dispersion ($\beta$), and the peakedness ($\alpha$) of the distribution (Dickens et al. 2006). All three parameters of the distribution are estimated in each year for each sector.

[14] Details for the justification of using Weibull distribution can be found in Dickens et al. (2006). Briefly, examination of the true wage change distributions in the IWFP project (and some other researchers) indicate that wage change distributions are more peaked and have fatter tails than the normal distribution. Second, the upper half of the distribution (above median), which is presumably not affected by wage rigidities, is well approximated by a Weibull distribution.

[15] The measurement error correction routine is based on the assumption of negative autocovariance of wage changes, which is not true in a number of years in the non-manual data. To secure rigidity estimates for all years we are forced to use the uncorrected distribution for this sector.

[16] The Incomes Policy Commission drafts economic reports and estimates to assist in incomes policy negotiations and decision-making. The Prime Minister's Office appoints members from representatives of employee and employer organisations and expert members. The chairman and secretary are officials from the Ministry of Finance. The Commission was established in the early 1970s.

[17] Heikkilä and Piekkola (2005) report based on a recent survey that employers want the locally bargained wage share to be around half of the total wage rise. In contrast, the majority of the employees want that share to be in the region of 1-24%.

[18] Snellman, Uusitalo and Vartiainen (2003) investigate the role of performance-related pay in the Finnish manufacturing industries.

[19] Maliranta (2002) argues that micro-level restructuring has played an important role in the decline of the labour share during the 1990s.

[20] We are grateful to Pekka Sauramo for this figure.