Wage Dispersion and Allocation of Jobs

Fredrik Heyman*
SSE/EFI Working Paper Series in Economics and Finance
No. 479

December, 2001

Abstract

This paper use Swedish establishment-level panel data on job turnover and wages to test the hypothesis of a positive relation between job reallocation and degree of wage compression as proposed by Bertola & Rogerson (1997). The effect of wage dispersion on job turnover is negative and significant in the manufacturing sector. The wage compression effect is stronger on job destruction than on job creation, suggesting that wages are more rigid downward than upward. For the service sector results are reversed. Further results include (i) a strong positive relationship between the industry share of temporary employees and job turnover and (ii) a negative relationship between the amount of work-time flexibility and job reallocation. The estimation method is industry fixed-effect models that control for sector heterogeneity.

Keywords: Job creation and job destruction, wage dispersion, temporary employment contracts.

JEL: J21, J31, J63

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*Stockholm School of Economics, fredrik.heyman@hhs.se. I am grateful for comments by Mahmood Arai, John Earle, Mikael Lindahl, Lena Nekby, Mårten Palme, Jonas Vlachos, and seminar participants at FIEF, HHS, SOFI and at the EEA meting in Lausanne 2001. I also thank the National Institute of Economic Research (NIER) for providing me with data.

1 Introduction

During the past decade the rate of job reallocation in different markets has been estimated in numerous empirical studies.[1] Studies based on US and European data yield very similar results: the gross job turnover rate is approximately 20 percent in observed countries. Given the large institutional differences in terms of job security legislation and unionization, the similarity between Europe and the US may seem surprising.

The question as to why economies with very different labor market regulations give rise to similar rates of job turnover has not received much attention in the literature. One possible explanation for similar labor reallocation rates across labor markets with very different employment-protection legislation concerns differences in wage setting institutions. Bertola & Rogerson (1997) argue that although job-security laws lead to lower job flows, its impact might be reduced if other institutional differences have opposite effects. One such difference is wage setting. Wage setting institutions are, on average, much more centralized in Europe than in the US. This in turn leads to greater uniformity of wages across industries and firms. A compressed wage structure implies that firms cannot adjust wages as a response to positive or negative demand shocks. Instead, firms have to adjust either the number of employees or the number of hours worked by the workforce. This implies, all else equal, that there is a positive relationship between the degree of wage compression and the magnitude of gross job flows.[2]

Bertola & Rogerson's conclusion is that when labor protection laws and wage setting institutions are considered jointly, the result might very well be that job flows in countries with high adjustment costs and a compressed wage structure mimic those in countries with low adjustment costs and decentralized wages. If wage-setting institutions have a significant effect on the reallocation of jobs, this may partly explain reported similarities between European and US job reallocation rates.

Evidence presented in OECD (1993) and Blau & Kahn (1996) is consistent with the notion that wages are more compressed in Europe than in the US. It also gives an indication that wage setting institutions and the degree

[1] See Dunne et al. (1989), Leonard (1987) and Davis & Haltiwanger (1992,1997) for job flows. Abowd et al. (1996), Anderson & Meyer (1994), Burda & Wyplosz (1994), Burgess et al. (1996), Hamermesh (1996) and Albeack & Sörensen (1998) study both job- and worker flows. Three Swedish studies are Andersson (1999), Arai & Heyman (2000) and Persson (1998). For related theoretical literature on job flows, see e.g. Hopenhayn (1992), Burda & Wyplosz (1994), Caballero & Hammour (1994), Mortensen (1994), Mortensen & Pissarides (1994) and Caballero & Hammour (1996).

[2] A similar relationship can be found in Moene & Wallerstein (1997). They investigate the effects of wage compression through centralized bargaining on growth.

of wage compression very well may be an important factor behind observed similarities between European and US gross job flows. Despite the attention that Bertola & Rogerson's article has received in explaining similarities between European and US job flows, their model has not been empirically tested.

In this paper I will empirically test the Bertola & Rogerson hypothesis of a positive relationship between the degree of wage compression and job turnover on Swedish panel data. In order to accommodate the Swedish institutional framework I will extend the Bertola & Rogerson model by introducing the presence of two types of employment contracts and also take into account that total labor input is a function of both the number of employees and hours worked. The first extension will take into account the trend towards differentiated employment-contracts in many countries. The presence of fixed-term contracts with low adjustment costs makes employment more responsive to shocks in labor demand, and hence more volatile. However, volatile temporary employment contracts can coexist with more stable employment for employees with permanent contracts. This can possibly lead to a segmented labor market where one group of workers with unstable employment act as a buffer for changes in labor demand for labor. The second extension takes into account that in response to a negative shock, firms can choose between reducing the number of employees and paying the relevant adjustment costs or, by adjusting the number of hours worked by the employees.

Due to data quality considerations such as country differences in sample coverage, definitions of establishments, the ability to link establishments over time and sector coverage, cross-country comparisons on gross job flows and wage dispersion are problematic.[3] Instead, this paper will use Swedish data to analyze the relationship between wage compression and job reallocation at the industry level. The data contain quarterly information on establishment employment turnover and wages for a panel of more than 10 000 establishments in the Swedish private sector, covering the time period 1992:3 to 1999:2.

Very few studies use econometric methods to explain variation in job flows. This study will estimate the theoretical model in reduced form using panel data. The estimation technique is fixed-effects regression. The fixed-effects model controls for unobservable industry heterogeneity which can be correlated with the included independent variables and cause an endogeneity problem.

Estimating industry fixed-effects models for 14 two-digit industries (6 in

[3]These problems are discussed in Davis & Haltiwanger (1999).

manufacturing and 8 in non-manufacturing) show results that suggest substantial sector heterogeneity. The effect of wage dispersion on job turnover is negative and significant in the manufacturing sector. This supports the Bertola & Rogerson hypothesis that a more compressed wage structure will result in higher job reallocation rates. Running separate regressions for job creation and destruction show a negative and significant effect of wage dispersion on job destruction, whereas the effect is insignificant in the job creation-equation. These results are consistent with wages being more rigid downwards than upwards. The degree of wage dispersion has no significant effect on job turnover in the non-manufacturing sector

The remainder of the paper is organized as follows: A brief description of the Swedish labor legislation is presented in Section 2. This section also describes the Swedish wage-setting system. A theoretical model that links wage setting, employment protection legislation and turnover of jobs is presented in Section 3. Section 4 describes the data. The empirical specification is discussed in Section 5. Section 6 reports estimation results and discusses their implication for the observed stylized fact that European and US gross job flows are of the same magnitude. Section 7 concludes the paper.

2 The institutional setting in Sweden – labor market legislation and wage formation

2.1 Labor market legislation

The Swedish Employment Protection Act (LAS) has traditionally been built on two principles: permanent contracts for an indefinite period of time as the normal type of employment and dismissals based on a just cause only. Legislation also contains rules on notification periods and priority rules in case of layoffs. The last two decades has seen a gradual liberalization of labor laws. For instance, in 1982 the use of fixed-term contracts was relaxed with the introduction of a trial period. Strict priority rules such as last in, first out, have also been relaxed.

In comparison, the US system is characterized by little statutory regulations at the federal level and varying legislation from state to state. At the basis of American labor legislation lies the principle of employers right to hire and fire at will. Furthermore, employers are basically free to determine length of prior notification, since statutory provisions are lacking. Only in a few states are dismissals restricted by statutory requirements of just cause. A federal law, giving some protection to workers in case of mass layoffs is found in the so-called Plant Closing Act from 1988. Finally, around 25 percent of

American workers are protected by provisions in collective agreements.

Swedish labor legislation is much more restrictive for permanent contracts than for temporary ones. In order to restrict the use of temporary contracts, LAS gives a list of cases in which fixed-term contracts are allowed.[4] The most important cases in which time-limited contracts are permitted for are (i) one trial period of six months, (ii) seasonal or temporarily excessive work loads, (iii) replacement of employees on leave and a few other cases. For some cases there are limitations on the duration of the contract. Employees are for example obliged to transform a temporary contract to a permanent one if the employee has had time-limited contracts for 3 years out of a 5 year period.

In 1997, rules concerning fixed-term contracts were relaxed in so far that these were possible without specifying an objective reason, under the condition that no more than five workers at the same time be employed on a fixed-term basis. Furthermore, the maximum duration for temporary contracts was extended to 18 months for newly established firms.

Concerning termination costs of employment contracts, LAS is more restrictive for permanent contracts than for temporary ones. Under these circumstances, an increase in firm employment is likely to start by an increase in the number of temporary workers. In this way, firms obtain an option to transform a fraction of temporary contracts to permanent contracts if initial uncertainty about demand decreases. Analogously, in a downturn, temporary contracts are the first to be terminated. Lower termination costs associated with temporary contracts enable firms to reduce adjustment costs by using temporary workers as a buffer for employment adjustment.[5] This implies larger volatility for temporary contracts compared to permanent contracts.

The possibility of using flexible workers in the production process differ between firms in different industries. Table 1 displays large sector-variation in the fraction of temporary workers. Service industries like trade, real estate and other services have the highest fraction, whereas the lowest fraction is found in traditional manufacturing industries such as machinery, electricity and textiles. These fractions are fairly stable over time.

2.2 Wage formation

For several decades, beginning in the 1950s, Swedish wage formation was heavily influenced by the principle of a solidarity wage policy. Solidarity

[4]Additional possibilities for fixed-term contracts may be created in collective agreements between employer and employee organisations.

[5]See Saint-Paul (1996), Cabrales and Hopenhayn (1997) and Alonso-Borrego (1998) for analyses of temporary and permanent employment.

wage policy with its emphasis on “equal pay for equal work” was one of the cornerstones of the so-called Swedish model. From an industrial policy perspective, the idea behind “equal pay for equal work” was to set pressure on, and gradually force out of the market weak firms, thereby enhancing industry productivity. Active labor market policy had the role of allocating labor from declining to expanding industries and regions. Solidaristic wage policy was made possible by a highly centralized wage bargaining system.

During the period 1956-83, centrally negotiated wage agreements were made by the two main parties in the Swedish labor market: the Central organization of blue-collar workers (LO) and the Central confederation of private employers (SAF). These framework wage agreements were then followed by negotiations at both industry and local levels. Centrally negotiated wage levels were more or less binding and often included special low wage provisions, aimed at increasing the relative wage of workers at the lower end of the wage distribution. As a result of the egalitarian wage policy, wage dispersion in Sweden, measured as the total variance of blue-collar workers, declined by 75 percent between 1962 and 1983 (see Hibbs & Locking (1999)). As pointed out by Hibbs & Locking (1999), the Swedish wage distribution was so compressed that a relative wage increase of around 30 percent was sufficient to carry a worker from the 10^{th} to the 90^{th} decile of the wage distribution.

The decline in wage inequality ended in the 1980s. This came about by the breakdown of centrally negotiated wage agreements between LO and SAF. Wage agreements after 1983 have primarily involved industry-level negotiations. This implies that Sweden has gone from a tri-level bargaining system to a two-level system with industry- and plant-level bargaining. Furthermore, the egalitarian view on wage setting was gradually dissolved and practically disappeared around 1990. The effect of these changes in the wage-formation process on relative wages was quite dramatic: between 1983 and 1993, the relative wage dispersion increased by 49 percent (see Edin & Holmlund (1992) and Hibbs & Locking (1999)). This means that wage dispersion in the early 1990s was of the same order of magnitude as that in the mid-1970s. The trend towards increased wage inequality continued in the 1990s, hand in hand with a more decentralized wage bargaining system. However, the Swedish wage distribution is, in an international perspective still, very compressed

3 Theoretical Model

There are two types of workers: workers with permanent contracts (l_P) and workers with temporary contracts (l_T). The contracts differ in hiring and firing costs. Adjustment costs are higher for permanent contracts than for temporary contracts. Given that employment legislation concerning permanent and temporary contracts is identical in all industries I assume that the possibilities to use temporary workers in the production process is exogenous and constant over time for each industry. This means that firms in industries with a high fraction of temporary workers to a higher degree can use temporary contracts as a buffer for shifts in labor demand in contrast to firms with a low fraction of temporary employees. Consequently, costs for adjusting the labor force become lower for firms with a high fraction of temporary employees than for firms with a low fraction of workers with temporary contracts.

In the model there is a continuum of firms with a total mass of 1. In every period firms are subject to an idiosyncratic demand (or productivity) shock. With a certain probability the firm is either in a "good" state, θ_G, or in a "bad" state, θ_B, with $\theta_B < \theta_G$. As in Bertola (1990) I assume that the state of each firm is characterized by a two-state Markov process. The transition probability, p, is symmetric with p being the probability of a firm moving from the good (bad) state to the bad (good) state. Each firm's state is uncorrelated to the state of other firm's so in every period $p/2$ firms switch from the good state to the bad state at the same time as $p/2$ firms move from the bad state to the good state.

Firms maximize the discounted value of current and future profits. For each time period and state $i \in \{G, B\}$, the profits for a representative firm in industry k is given by

$$\Pi_k^i = (\theta^i L - \frac{1}{2}\beta L^2) - w^i L - AC_P - AC_T \tag{1}$$

where the term in parenthesis is the firm's revenue. $L = L_P + L_T$ is total labor input consisting of permanent and temporary labor. AC_P and AC_T are adjustment costs for permanent and temporary workers, respectively. In every period, the firm set employment so that the expected marginal revenue product is equal to the wage plus adjustment-costs. The marginal revenue product is equal to θ^i - βL^i. Wages are exogenous but state-contingent in the model. This means that $w = w^G$ in "good" times whereas $w = w^B$ in "bad" times with $w^G > w^B$.[6] The model can apply to any type of wage-setting

[6]In accordance with Swedish wage formation, wages are the same for permanent and temporary employees.

institutions, since what will determine job turnover is the degree of wage dispersion. In a highly decentralized system, wages will be determined by the state of the individual firm, giving rise to wages that are closely linked to the current state. This will not be the case in a centralized system where the relationship between individual productivity and wages is weaker. Therefore, the difference between w^G and w^B becomes smaller.

L in equation (1) can be seen as total labor input. Total labor input includes both the number of workers and the number of hours worked. Total labor input can subsequently be decomposed as the product of the number of employees and the amount of hours they work per period, that is $L = hl$. Given that working hours only are flexible upwards, let the number of working hours, h, in the two states be given by

$$\begin{aligned} h^G &= h(1+\sigma) && if \theta = \theta^G \\ h^B &= h && if \theta = \theta^B \end{aligned} \tag{2}$$

where h is the negotiated number of hours per employee and σ is the amount of overtime that employers can use during expansions, $\sigma \in (0, \sigma^{MAX}]$.[7] We can now rewrite the firm's marginal revenue product with respect to L:

$$\begin{aligned} MRP_L^G &= \theta^G - \beta h(1+\sigma) l^G \\ MRP_L^B &= \theta^B - \beta h(1+\sigma) l^B \end{aligned} \tag{3}$$

To solve for optimal labor demand in the two states we must first define the firm's value function in the two states. The value functions for firms in expansion (V^G) and in recession (V^B) are given by:

$$\begin{aligned} V^G &= \theta^G - \beta h(1+\sigma) l^G - W^G + \frac{1}{1+r}\left[(1-p)V^G + pV^B\right] \\ V^B &= \theta^B - \beta h l^B - w^B + \frac{1}{1+r}\left[PV^G + (1-p)V^B\right] \end{aligned} \tag{4}$$

The optimal employment policy for firms in expansion implies that the marginal increase in revenue from hiring Δl people is equal to the marginal

[7]In Europe the scope for substituting hours for workers is in reality asymmetric. Employers cannot decrease the number of hours worked for the workforce, and thereby save on the wage per employee. The extent to which overtime is used is in many European countries determined through negotiations between employer organizations and unions or through legislation.

cost of hiring. Analogously, for firms in recession, the optimal employment policy is to equate the shadow loss of revenues from dismissing workers to the firing cost. Hence in optimum the following relationship must be satisfied:

$$\begin{aligned} V^G &= \Delta l_P H_P + \Delta l_T H_T \\ V^B &= \Delta l_P F_P + \Delta l_T F_T \end{aligned} \tag{5}$$

where Δl_P and Δl_T are the change in the number of permanent and temporary employees, respectively. H_P, H_T, F_P and F_T are the hiring-and firing costs for the two types of workers with $H_P > H_T$ and $F_P > F_T$. This implies that firms with a higher fraction of temporary employees more easily can adjust to changes in demand by using its stock of temporary workers. Substituting (5) into (4) yields the following expression for labor demand in the two states:

$$\begin{aligned} l^G &= \frac{1}{\beta h(1+\sigma)}\left[(\theta^G - w^G) - \frac{r+p}{1+r}H - \frac{p}{1+r}F\right] \\ l^B &= \frac{1}{\beta h}\left[(\theta^B - w^B) - \frac{p}{1+r}H + \frac{r+p}{1+r}F\right] \end{aligned} \tag{6}$$

where $H \equiv \Delta l_P H_P + \Delta l_T H_T$ and $F \equiv \Delta l_P F_P + \Delta l_T F_T$. In steady state, 50 percent of the firms are in the good state while the remaining 50 percent are in the bad state. Given the symmetric Markov process, job creation equals employment growth in expanding industries $(l_G - l_B)$ times the number of firms that move from recession to expansion $(p/2)$. Analogously, job destruction is equal to $|(p/2)(l_B - l_G)|$. Summing job creation and job destruction yields job reallocation. The job reallocation rate (JRR) is given by:

$$JRR = \frac{1}{N}\left[\frac{p}{2}(l^G - l^B) + |\frac{p}{2}(l^B - l^G)|\right] = \frac{p}{N}(l^G - l^B) \tag{7}$$

where N is total employment. Substituting (6) into (7) yields the following expression for the job reallocation rate:

$$JRR = \frac{\left[(\theta^G - \theta^B) - (w^G - w^B) - \frac{r+2p}{1+r}(H+F) - \sigma\left(\left(\theta^B - w^B\right) + \frac{p}{1+r}H + \frac{r+p}{1+r}F\right)\right]}{\beta h(1+\sigma)N} \tag{8}$$

From equation (8) we see that job reallocation is increasing in the degree of wage compression. Equation (8) also states that job reallocation is increasing in the probability of switching states and decreasing in the amount of hours worked and overtime. More frequent use of overtime in expansions will lead to less new hires and less turnover of labor. Furthermore, job reallocation is increasing in the difference between θ^G and θ^B, a measure of how volatile the business cycles are. Finally, the level of job reallocation is negatively related to the cost of hiring and firing the two types of workers. This in turn depends on the fraction of temporary employees. Firms that have a high fraction can more easily adapt to changes in demand by adjusting its stock of temporary employees. This is due to hiring and firing costs being lower for temporary contracts than for permanent ones.

4 Data and Descriptive Statistics

The data are from Short Term Wage Statistics (*Konjunkturstatistik, löner för privat sektor*) and Short Term Employment Statistics (*Kortperiodisk Sysselsättningsstatistik*) collected by Statistics Sweden (SCB). These data contain information on employment turnover and wages for a panel of more than 10 000 establishments in the non-agriculture private sector. The Short Term Wage Statistics collects information on wages for blue- and white-collar workers.[8] Data are quarterly for the period 1991-95 and monthly from 1996 and onwards. A representative sample is drawn from the population of private sector establishments with at least five employees, stratified according to industry affiliation and employment size. The sample covers establishments/plants in machinery and mining (sic-codes C+D) and firms in the service sectors. For blue-collar workers the survey asks questions about number of hours worked, number of overtime hours worked, *average hourly earnings* excluding and including retroactive wage supplements, and number of blue-collar employees. For white-collar workers the variables are number of hours worked, number of overtime hours worked, negotiated *monthly salary* excluding and including commissions and retroactive wage supplements, and number of white-collar employees. For all firms and establishments 5-digit sic-codes are available. Figures 1 and 2 depict real wages and yearly real wage changes for the Swedish private sector.

- Figures 1 and 2 about here -

From the figures we see that real wages were more or less unchanged during the period 1992-95 but have thereafter increased. The real wage increases after 1995 are mostly due to the low inflation during this time period.[9]

[8] The two groups of workers are defined according to their union affiliation.

[9] Inflation decreased from above 10 percent in 1991 to around zero in 1999.

The annual mean real wage increase for the entire period is 2.2 percent for blue-collar workers and 2.7 percent for white-collar workers. Table 1 shows descriptive statistics for 14 industries (6 in manufacturing and 8 in non-manufacturing). The table displays large inter-industry wage differentials. For blue-collar workers, the highest wages are found in mining and wood, whereas the lowest wages are in hotel and banking. White-collar workers receive the highest wages in banking and chemistry and the lowest in transport and hotel.

- Figure 3 about here -

As a measure of total and industry wage dispersion I use the coefficient of variation, CV $(= std(W)/mean(W))$. Each group is weighted by its share of the total wage sum. When computing industry variation in wages I use the share of wages for white- and blue-collar workers for each industry and time-period, V_{itW} and V_{itB}, respectively. Hence, the following measures for variation in wages for industry i at time t will be used:

$$CV_{it} = V_{itb}\frac{std(W_{itB})}{mean(W_{itB})} + V_{itW}\frac{std(W_{itw})}{mean(W_{itw})}, \tag{9}$$

where t=1992:3, ... ,1999:2 and i=1, ... ,14. Figure 3 depicts the coefficient of variation of wages for the period 1992-99. The mean coefficient of variation for the whole period is 0.14 for blue-collar workers and 0.17 for white-collar workers. Industry means are presented in Table 1.

The Short Term Employment Statistics contain quarterly information on the stock of permanent and temporary contracts as well as direct information on hires and separations for permanent and temporary workers. A representative sample is drawn from the population of private-sector establishments of all sizes in Sweden, stratified according to industry affiliation and establishment size. The establishments are randomly divided into three equal groups. Each group responds every quarter to questions on employment and worker turnover for one month each. The information on the number of employees refers to a particular date in the month, while separations and hires refer to flows during the entire month. As an example, one third of the sampled establishments in the second quarter report information for April, while the other two groups report the corresponding information for May and June. The information on establishment employment as well as hires and separations is supplied for both permanent (time unlimited) and temporary (time limited) contracts, separately for men and for women (see Arai & Heyman (2000) for more details on the data).

Job flows are computed on the basis of the changes in number of employees (n) at establishment (e) over time (t) . Job Creation (JCR) and Job Destruction (JDR) rates for sector i at time t are given by:

$$JC(D)R_{it} = \frac{\Sigma_e(|n_{et} - n_{e,t-1}|)}{\Sigma_e 0.5(n_{et} + n_{e,t-1})}; \qquad if \quad n_{et} \geq (\leq) n_{e,t-1} \tag{10}$$

Net employment growth is equal to the difference between JCR and JDR whereas job reallocation is equal to the sum of JCR and JDR. Table 2 presents mean quarterly gross job flow rates for the period 1992-99.

- Table 2 about here -

Job creation is on average 4 percent and varies between 2 and 6 percent. The corresponding figure for job destruction is 5 percent, varying between 3 and 6 percent. The mean job reallocation rate is 9 percent. Gross job flows are higher in non-manufacturing than in manufacturing. If we study individual industries for 14 two-digit industries we see that highest job reallocation rates are observed in hotel, construction and real estate. The lowest job reallocation rates are observed in textiles, chemistry and metal and manufacturing.

5 Empirical Specification

I will use the following empirical specification to test equation (8):

$$JRR_{it} = \beta_0 + \beta_1 WDISP_{it} + \beta_2 TEMP_{it} + \beta_3 OVERT_{it} + \beta_4 NET_{it} + \nu_i + \varepsilon_{it} \tag{11}$$

where JRR_{it} is job reallocation in sector i at time t, $WDISP$ is wage dispersion, $TEMP$ is the fraction of temporary employees to total employment and $OVERT$ is the fraction of overtime hours to total hours worked. ν_i is a time-invariant industry-specific effect and ε_{it} is the usual residual. All equations include NET, net employment change, reflecting the current state of the business cycle.

Equation (8) states job reallocation as a function of wage dispersion, adjustment costs and the use of overtime. The coefficient of variation will be used as a measure of wage dispersion. I use the fraction of temporary employment as a proxy for labor adjustment costs. A high fraction of temporary labor will lead to lower adjustment costs when firms' stock of employees change. Information on overtime is only available for blue-collar workers. All variables are industry sector means (6 manufacturing and 8 non-manufacturing industries), roughly corresponding to the two-digit system of industry classification. In 1993 the Swedish industry classification changed system from SNI69 to SNI92. The 14 industries analyzed in this paper are constructed in such a way so as to enable comparisons over time. To check for robustness to industry classification, all equations are re-estimated using the new industry classification. This corresponds to data for on 47 industries for the period 1993 to 1999. Results are, with a few exceptions unchanged.

I will also estimate equation (11) with job creation and job destruction separately as dependent variables. The motivation is that if wages are more rigid downward than upward, the effect of wage dispersion on job turnover will differ between job creation and job destruction. More specifically, wage dispersion ought to have a larger impact on job destruction than on job creation.[10]

The fixed-effect model assumes that the industry specific effect, v_i, is fixed. The random-effect model assumes that the industry specific error term is random and drawn from a common distribution and assumed to be independent with the independent variables. The random-effect estimator is a weighted average of the estimates produced by the between and within estimators. This means that both cross-sectional variation and time-series variation is taken into account which makes it more efficient than the fixed-effects estimator. A priori it is not obvious which model should be used.

To test for the presence of industry-specific effects, several tests can be applied. One test is the Breusch and Pagan LM-test for random effects. The null-hypothesis is that the variance for the industry-specific effects is equal to zero. Rejection of the null is a sign of presence of industry-specific effects. As can be seen in Table 4, the estimated test statistic is significantly different from zero in four out of five regressions, indicating presence of industry-specific effects.

To discriminate between the fixed-effects and the random-effect models, the Hausman test is appropriate (see Baltagi (1995)). If the correlation between v_i and the regressors is different from zero, the GLS estimator becomes biased and inconsistent. This is not the case for fixed-effect estimation. The Hausman test compares the two estimators.[11] The Hausman tests presented

[10]Recently, several papers have used survey data consisting of interviews with managers and labor representatives to explore the mechanism behind nominal wage rigidity and why nominal wages are so insensitive to macroeconomic shocks (see e.g. Agell & Lundborg (1999) and Bewley (1998)). In the Agell & Lundborg (1999) study, covering firms in the Swedish manufacturing sector, only 2 out of 153 firms had experienced nominal wage cuts during the 1990s. The low figure is despite the largest economic downturn in Sweden since the 1930s, with total unemployment increasing from 4 percent in 1991 to more than 12 percent in 1993.

[11]Both estimators are consistent in the case of no correlation between vi and the re-

in Table 3 and 4 and in unreported estimated equations seem to support use of the fixed-effects model.

The positive correlation between the regressors and the individual-specific effects means that there exist unobservable effects that differ between industries. This in turn leads to a non-zero correlation between ε_{it} and $\mathbf{X}_{it}$, i.e. the regressors are endogenously determined. This endogeneity may be driven by the large differences that exist between the 14 industries. These include differences in wage-setting institutions, market structure, union power, and possibilities to use temporary employees as well as technological and organizational differences that influence how the right-hand side variables are determined. By performing the fixed-effects technique, the ν_i are wiped out, leaving the within estimator unbiased and consistent for β.

6 Results

Results are presented in Table 3 and 4. In Table 3, equation (11) is estimated for the entire private sector, as well as for the manufacturing and service sectors. Furthermore, estimations are also presented using the 90-10 percentile ratio as an alternative measure of wage dispersion. Table 4 shows results when job creation and job destruction are used separately as dependent variables. Once again I estimate equations for the entire private sector, as well as for the manufacturing and service sectors.

- Table 3 about here -

Looking first at the results for job reallocation, one sees that for the entire private sector (column 1), $WDISP$ is not significant. The other variables all have expected signs and are statistically significant from zero. The positive sign for $TEMP$ indicates higher job turnover in firms that are in industries with a high fraction of temporary employees. These firms can more easily adapt to labor demand changes by changing the number of temporary employees. The estimate for $TEMP$ is 0.42.

The coefficient for the overtime variable, $OVERT$, is negative and equal to –0.53. This suggests that job turnover is lower in industries where the number of working hours is flexible. Rather than to change the number of employees, firms can adjust the number of hours worked per employee. Economically, it can in many situations be cost effective for a firm to vary

gressors. The fixed-effect estimator is consistent whether H_0 is true or not, while the random-effect estimator is consistent and asymptotically efficient if H_0 is true, but is inconsistent if H_0 is false. The test statistic is distributed as chi-two square under H_0.

the average working-time per employee rather than to adjust the number of employees.

The descriptive statistics presented in Table 1 point to large differences between industries in manufacturing and in non-manufacturing. There are therefore reasons to believe that differences between the two sectors influence the estimated coefficients. An insignificant effect of wage dispersion on job turnover at the aggregate level might mask important sector heterogeneity.

To check for sector heterogeneity I run separate regressions for manufacturing and non-manufacturing. These regressions are reported in columns (2) and (3). The effect of wage dispersion on job turnover is negative and significant in manufacturing. The estimate of $WDISP$ is –0.33 suggesting that in the manufacturing sector, a more compressed wage structure will lead to a higher job reallocation rate, a result in accordance with the Bertola & Rogerson hypothesis. The estimate implies that a one standard deviation increase in $WDISP$ reduces JRR by 0.007. This amounts to 12 percent of the median of JRR. The corresponding effect is 14 percent for an industry in the 10th percentile of the job reallocation distribution. Interaction terms, interacting the wage dispersion variable with the share of temporary employees, overtime and net employment change, are never significant. Hence the effect of wage dispersion does not systematically differ between firms with different fraction of temporary employees or different use of overtime. Furthermore, results are not altered when I add a time dummy for periods during which rules for fixed-term contracts were relaxed.

Turning to the non-manufacturing sector, the effect of wage dispersion is reversed. Column (3) displays that there is a positive and significant correlation between $WDISP$ and JRR in the service sector.

Hence, sector differences seem to play an important role in determining the relationship between the degree of wage compression and job reallocation. For instance, technological and organizational differences between, on average, larger capital-intensive firms in manufacturing and smaller firms in the service sectors may affect the extent to which jobs are reallocated.[12] Furthermore, unions have traditionally been weaker in the service sector than in the manufacturing industry. Together with the fact that the service industry consists of smaller firms this may affect the extent to which the wage distribution affects job turnover.

The coefficients for fraction of temporary employees and overtime have expected signs and are significant in both sectors. Net employment change is negative and significant in manufacturing reflecting a countercyclical pattern

[12] Arai & Heyman (2000) find clear differences both in levels and in the cyclical pattern for job reallocation.

in job reallocation. This is not the case in the non-manufacturing sector where the coefficient for employment growth is insignificant.[13]

An often-used measure for wage dispersion is the 90-10 percentile ratio. To check for robustness of the results for $WDISP$, I also estimate equations using this ratio instead of the coefficient of variation. Results are displayed in columns (4) – (6) in Table 3.

Results for the $WDISP$ variable are qualitatively unchanged. The effect of wage dispersion on job turnover is negative in manufacturing whereas it is positive in non-manufacturing. The estimated coefficient is equal to –0.09 in the manufacturing sector. This means that an increase in $WDISP$ with one standard deviation reduces JRR with 0.005. Given that the median job reallocation rate is equal to 0.056, the estimate indicates that a one standard deviation reduces JRR in the median industry with approximately 8 percent.

Columns (1) - (6) in Table 4 display results when job creation and job destruction are used separately as dependent variables.

- Table 4 about here -

The wage dispersion variable is not significant, neither in the full sample nor in the non-manufacturing sector. In manufacturing, $WDISP$ is negative for both job creation and job destruction, having a higher coefficient value (in absolute terms) for job destruction. However, the variable is only significant for job destruction. For the manufacturing sector, results are in line with wages being more rigid downwards than upwards, leading to higher rates of job turnover in economic downturns than in economic upturns. Hence, asymmetric wage rigidity, in the sense of more rigid wages downward than upward, seems to influence the way in which the wage distribution effects job turnover. More specifically, the combination of a compressed wage structure, more rigid wages downward than upward, and a deep recession in the Swedish manufacturing sector in the early 1990's may explain the observed sector differences regarding the relationship between wage structure and reallocation of jobs. The sector differences result in support for the Bertola and Rogerson hypothesis of a negative relationship in the manufacturing sector. However, the economic significance is rather small. Only a small fraction of the variation in job turnover is explained by the degree of wage compression.

Finally, to check for robustness of the results in the manufacturing sector, and to further exploit the question of endogeneity in wage dispersion, instrumental variable regressions are estimated. As an instrument for $WDISP$ I

[13]This result is in line with Boeri (1996) stressing that countercyclical job turnover mainly concerns the manufacturing industry.

use lagged values of $WDISP$. Columns (7)-(9) in Table 3 displays the results. In all equations, one year lags of $WDISP$ are used as instrument for $WDISP$.[14] As can be seen from Table 3, IV-estimation does not alter the results for wage dispersion. $WDISP$ is negative and significant in both the equation that has total job reallocation as the dependent variable, as well as in the equation with job destruction as the dependent variable (see column (8) and (9)). The other explanatory variables are qualitatively unchanged.

7 Summary and Conclusions

One puzzle from the job creation and job destruction literature is the similar flows observed in both the US and Europe. Given that the US labor market is to a greater degree unregulated than the European market, we would expect significantly higher job flows in the US than in Europe. Bertola & Rogerson propose one explanation for the observed similarities. They argue that differences in wage-setting institutions have an important role to play and that there exist a positive relationship between the degree of wage-compression and gross job flows. This means that job flows in countries with high adjustment costs and a compressed wage structure can be similar to those in countries with low adjustment costs and high wage dispersion.

This paper is the first to empirically test the Bertola & Rogerson hypothesis. Due to a number of problems associated with comparing job flows and relative wages across countries, this paper use Swedish data. Using establishment data on job turnover and wages, the relationship between wage compression and job reallocation is studied at the industry level.

The estimation technique is industry fixed-effects estimation on 14 two-digit industries. Results indicate large sector differences regarding the effect of the degree of wage dispersion on job reallocation. The effect is, in accordance with Bertola & Rogerson, positive in the manufacturing sector. Furthermore, running separate regressions for job creation and job destruction yields a negative and significant effect of wage dispersion on job destruction and an insignificant effect on job creation. These results are in accordance with wages being more rigid downwards than upwards. Turning to the non-manufacturing sector, no significant effects are found.

The quantitative effect of the impact of wage dispersion on job turnover is of limited size. A one standard deviation increase in wage dispersion reduces total job reallocation by around 10 percent.

[14]Results are robust to time structure choice. I have also instrumented CV in a random-effects model without any changes in results. Furthermore, a Hausman-test comparing the random-effects model, with and without instruments is not rejected.

Further results include (i) a very strong positive effect of the industry-share of temporary employees on job reallocation and (ii) a negative relationship between the use of overtime and job turnover. The latter result suggests that job reallocation is lower in industries where the number of hours worked is flexible. If the fraction of temporary employees is taken as a proxy for adjustment costs for labor, then the results indicate that the largest part of variation in gross job flows is explained by differences in the cost of adjusting labor, rather than differences in wage dispersion.

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Tables and Figures

Table 1. Descriptive statistics. 14 industries, 1992:3 – 1999:2.

		Real Wage Blue-collar workers	Real Wage White-collar workers	CV Blue-collar Workers	CV White-collar Workers	CV All Workers	p(90/10) Blue-collar Workers	p(90/10) White-collar Workers	p(90/10) All workers	Fraction overtime	Fraction Temporary Employees
Banking:	Mean	74.75	19954	0.15	0.23	0.23	1.44	1.64	1,64	0.03	0.07
	STD	5.24	1463	0.03	0.02	0.02	0.08	0.09	0,09	0.01	0.02
Construct.:	Mean	92.80	19087	0.11	0.16	0.13	1.28	1.46	1,34	0.02	0.11
	STD	4.31	894	0.01	0.01	0.01	0.03	0.03	0,02	0.00	0.03
Electr. Etc.:	Mean	92.23	18189	0.11	0.12	0.12	1.28	1.30	1,29	0.04	0.04
	STD	5.98	1141	0.02	0.02	0.02	0.05	0.03	0,03	0.01	0.02
Real Estate:	Mean	79.41	18072	0.12	0.19	0.16	1.33	1.42	1,38	0.02	0.12
	STD	5.35	876	0.02	0.02	0.01	0.05	0.06	0,04	0.00	0.02
Food:	Mean	85.21	18276	0.11	0.17	0.13	1.32	1.39	1,35	0.03	0.15
	STD	5.17	1502	0.01	0.03	0.01	0.04	0.05	0,04	0.00	0.03
Hotel-Res.:	Mean	72.21	16787	0.13	0.15	0.13	1.36	1.39	1,37	0.01	0.28
	STD	3.23	915	0.02	0.03	0.02	0.06	0.06	0,05	0.01	0.04
Chemistry:	Mean	90.74	20099	0.13	0.14	0.14	1.37	1.38	1,38	0.04	0.06
	STD	6.41	1633	0.01	0.01	0.01	0.03	0.05	0,04	0.00	0.01
Machinery:	Mean	88.80	19537	0.12	0.16	0.13	1.32	1.37	1,35	0.04	0.05
	STD	5.94	1457	0.01	0.01	0.01	0.03	0.05	0,04	0.01	0.01
Mining:	Mean	106.34	19301	0.13	0.13	0.13	1.37	1.40	1,38	0.06	0.08
	STD	7.61	1480	0.01	0.03	0.01	0.04	0.07	0,04	0.01	0.04
Oth. Serv.:	Mean	80.67	17990	0.18	0.22	0.22	1.50	1.71	1,68	0.02	0.14
	STD	4.25	1156	0.02	0.01	0.01	0.03	0.04	0,04	0.00	0.01
Textile:	Mean	76.61	17483	0.12	0.16	0.13	1.30	1.48	1,35	0.02	0.04
	STD	4.85	953	0.01	0.01	0.01	0.03	0.06	0,02	0.00	0.01
Trade:	Mean	80.08	17820	0.13	0.20	0.17	1.33	1.55	1,46	0.02	0.12
	STD	5.23	1133	0.01	0.01	0.01	0.02	0.03	0,03	0.00	0.01
Transport:	Mean	87.86	16718	0.16	0.19	0.17	1.37	1.47	1,42	0.04	0.12
	STD	5.98	1384	0.02	0.02	0.01	0.03	0.04	0,03	0.01	0.02
Wood etc.:	Mean	96.14	18413	0.17	0.18	0.17	1.49	1.42	1,46	0.04	0.06
	STD	6.82	1533	0.01	0.02	0.01	0.05	0.07	0,05	0.00	0.01
Manufact.:	Mean	90.64	18851	0.13	0.15	0.14	1.36	1.41	1.38	0.04	0.07
	STD	11.06	1672	0.02	0.03	0.02	0.07	0.07	0.06	0.01	0.04
Nonmanu.:	Mean	82.50	18077	0.14	0.18	0.17	1.36	1.49	1.45	0.03	0.12
	STD	8.75	1510	0.03	0.04	0.04	0.08	0.14	0.14	0.01	0.07

Table 2. Descriptive statistics. Gross job flows. 1992:3 – 1999:2.

		Job Creation	Job Destruction	Job Reallocation	Net Empl. Change
Private sector	Mean	0.04	0.05	0.09	0.00
	STD	0.01	0.01	0.01	0.01
Manufacturing	Mean	0.03	0.03	0.06	0.00
	STD	0.02	0.02	0.02	0.03
Non-manufacturing	Mean	0.05	0.05	0.10	0.00
	STD	0.03	0.03	0.04	0.03

Table 3. Panel estimations. Fixed-effects regressions. Robust standard errors in parenthesis.

	(1)	(2)	(3)	(4)	(5)	(6)
	JRR	JRR	JRR	JRR	JRR	JRR
WDISP	0.09	0.26**	-0.33*	0.02	0.09**	-0.09*
	(0.09)	(0.12)	(0.11)	(0.03)	(0.04)	(0.03)
TEMP	0.30*	0.25*	0.38*	0.30*	0.22**	0.38*
	(0.06)	(0.09)	(0.06)	(0.06)	(0.10)	(0.06)
OVERT	-0.56*	-0.54*	-0.56***	-0.55*	-0.53*	-0.62***
	(0.16)	(0.21)	(0.32)	(0.16)	(0.21)	(0.32)
NET	-0.15**	-0.11	-0.15***	-0.16**	-0.16	-0.16***
	(0.07)	(0.11)	(0.10)	(0.08)	(0.11)	(0.10)
Constant	0.04**	0.03	0.11*	0.03	-0.04	0.17*
	(0.02)	(0.02)	(0.02)	(0.04)	(0.05)	(0.04)
Industry	All	Non-manuf.	Manuf.	All	Non-manuf.	Manuf.
Measure of wage disp.	CV	CV	CV	p(90/10)	p(90/10)	p(90/10)
Hausman-test	4.54 p=0.34	14.34 p=0.01	7.61 p=0.11	6.66 p=0.15	12.81 p=0.01	7.95 p=0.09
Breusch & Pagan LM-test	458.90 p=0.00	67.44 p=0.00	1.53 p=0.22	465.64 p=0.00	93.89 p=0.00	1.79 p=0.18
R^2	0.78	0.76	0.52	0.78	0.76	0.51
F	67.23	39.11	18.79	66.76	41.16	20.42
N	392	224	168	392	224	168
T	28	28	28	28	28	28

Note: * indicate significance at 1%-level, ** at 5%-level and *** at 10%-level.

Table 4. Panel estimations. Fixed-effects regressions. Robust standard errors in parenthesis.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	JCR	JCR	JCR	JDR	JDR	JDR	JRR	JCR	JDR
WDISP	0.05	0.12	-0.10	0.04	0.14	-0.23***	-0.56**	-0.09	-0.48***
	(0.07)	(0.09)	(0.07)	(0.09)	(0.11)	(0.12)	(0.26)	(0.18)	(0.29)
TEMP	0.55*	0.50*	0.57*	-0.24*	-0.25*	-0.19*	0.40*	0.63*	-0.23*
	(0.05)	(0.07)	(0.08)	(0.05)	(0.07)	(0.06)	(0.07)	(0.09)	(0.07)
OVERT	0.14	0.10*	0.52***	-0.70*	-0.64*	-1.08*	-0.82**	0.74*	-1.56*
	(0.13)	(0.16)	(0.29)	(0.17)	(0.22)	(0.36)	(0.42)	(0.29)	(0.47)
NET	0.21*	0.34*	-0.02	-0.37*	-0.45*	-0.13	-0.18	0.10	-0.28**
	(0.06)	(0.08)	(0.08)	(0.08)	(0.11)	(0.11)	(0.14)	(0.10)	(0.14)
Constant	-0.02	-0.04*	-0.01	0.06*	0.07*	0.12*	0.16	-0.02	0.19*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.05)	(0.04)	(0.06)
Industry	All	Non-manuf.	Manuf.	All	Non-manuf.	Manuf.	Manuf.	Manuf.	Manuf.
Measure of wage disp.	CV	CV	CV	CV	CV	CV	CV	CV	CV
Hausman-test	63.58	37.73	141.46	79.21	50.50	45.75			
	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00			
Breusch &	122.21	43.45	16.70	67.69	3.94	6.32			
Pagan LM-test	p=0.00	p=0.00	p=0.00	p=0.00	p=0.05	p=0.01			
R^2	0.74	0.72	0.69	0.54	0.56	0.32	0.51	0.72	0.34
F	50.56	40.75	21.67	25.17	18.03	10.84	13.94	21.38	6.51
N	392	224	168	392	224	168	144	144	144
T	28	28	28	28	28	28	28	28	28

Notes: (i) * indicate significance at 1%-level, ** at 5%-level and *** at 10%-level.
(ii) Columns (7) - (9) are estimated using 2SLS.
(iii) Results are qualitatively unchanged when p(90/10) is used as a measure for wage dispersion.

Figure 1. Real wages, 1992:3 - 1999:2

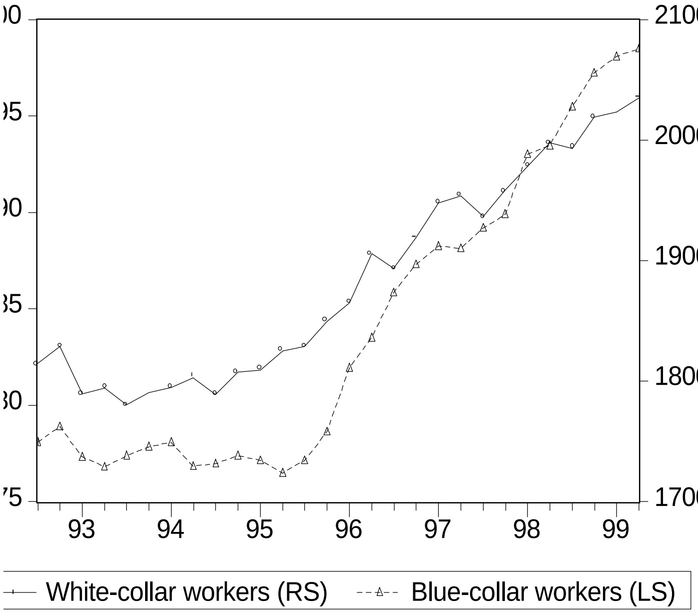

Figure 2. Yearly Real Wage Changes, 1993:3-1999:2

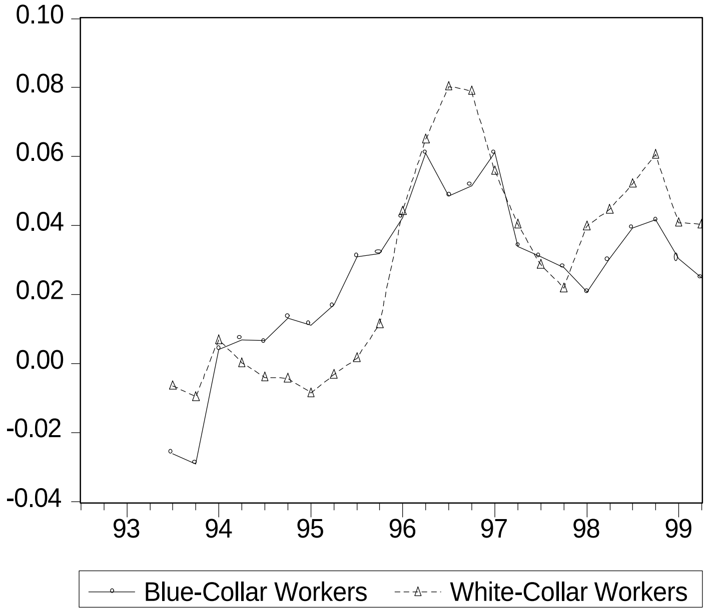

Figure 3. Wage Dispersion in the Swedish Private Sector, 1992:3-1999:2 (Coefficient of Variation)