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Wage dispersion and employment turnover in Taiwan

Meng-Wen Tsou[a], Jin-Tan Liu[b,*]

[a]Department of International Trade, Tamkang University, Taiwan
[b]Department of Economics, National Taiwan University and NBER, 21 Hsu-Chow Road, Taipei 100, Taiwan

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Abstract

Using matched employer–employee data on the Taiwanese manufacturing sector, we find a negative relationship between wage dispersion and job reallocation, and (excess) worker turnover, whilst greater excess separation of lower quality workers is shown to be a characteristic of plants with more flexible wage structures.

Keywords: Wage dispersion; Employment turnover

JEL classification: J2; J4

1. Introduction

In many of the prominent theories of worker mobility, the emphasis is placed upon matching quality, job search and human capital acquisition. The key feature of the 'matching model' presented by Jovanovic (1979) was that the productivity of a particular match between a plant and its workers was ex ante variable and unobservable. Indeed, the quality of a match is an experience good, in that it is revealed over time with the accumulation of tenure; i.e., both plants and workers will gradually discover information revealing the quality of the match; those proving to be 'bad matches' will leave, whilst those proving to be 'good matches' will stay.

* Corresponding author. Tel.: +886 2 2351 9641x520; fax: +886 2 2321 5704, 2351 1826.
E-mail address: liujt@ntu.edu.tw (J.-T. Liu).

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The matching model predicts that if wages are a good proxy for the value of the current job match, then there will be a reduction in employee turnover with higher wages. In addition, greater variations in wages will lead to an increase in the option value of job mobility, which implies that those jobs that are characterized by a compressed wage structure will have an inherently higher resignation rate than otherwise similar jobs with dispersed wages.

Since wage flexibility will yield greater excess separation rates for workers who are poor matches, but less excess worker separation rates for those who are good matches, the relationship between wage flexibility and excess worker reallocation remains unclear (Haltiwanger and Vodopivec, 2003; Ilmakunnas and Maliranta, 2003). Nevertheless, a number of the prior studies have suggested a positive association between wage dispersion and excess worker reallocation.

Using matched employer–employee data from Norway, Barth and Dale-Olsen (1999) demonstrated a positive relationship between employer–specific wage premium variances and excess turnover rates. Haltiwanger and Vodopivec (2003) found that in Solvenia, an economy in transition, plants with higher wage dispersion levels had lower job reallocation rates and higher excess worker reallocation rates. Controlling for plant and average worker characteristics in the Finnish business sector, Ilmakunnas and Maliranta (2003) also concluded that plants with greater internal variations in wages had higher 'churning' rates.

In this paper, we use matched employer–employee data on the manufacturing sector in Taiwan to examine the relationship between wage dispersion and employment turnover. Controlling for a variety of workforce composition characteristics, we find that plants with more compressed wage structures have higher job reallocation and (excess) worker turnover rates. Those plants with more flexible wage structures exhibit greater excess separation rates amongst their lower quality workers, which is consistent with the matching hypothesis.

2. Data and measurement

The dataset for this study is drawn from the Labor Insurance (LI) wage records in Taiwan covering the period from 1999 to 2001. The main advantage in using the LI wage records dataset is that both employer and employee identifiers are observable. The LI wage records dataset includes the employer's identification code, an identifier for each individual working for the company, individual monthly wages and demographic information on age, gender and education attainment for each employee. This enables us to construct measures of job and worker turnover based upon a comparison of employee and employer matches in consecutive years. However, the dataset also has a number of limitations; for example, as a result of the lack of information on the number of hours worked, and similar limitations on details of tenure, we are unable to measure either the hourly wage or the seniority of any individual employee. Furthermore, the dataset does not contain direct information on the various separation routes, such as lay-offs, resignations and normal or early retirement.

Our analysis in this study is restricted to manufacturing firms listed in the Taiwan Stock Exchange. These firms are larger and more likely to be better-performing firms than their smaller counterparts, with some of them also owning multi-plants. The Taiwan Economic Journal (TEJ) database provides the employer identification code for each of the firm's plants[1]. Our construction of the matched employer–

[1] Fok et al. (2004) also utilized the TEJ data to evaluate the impact of bank relationships on firm performance during the periods before and after the 1997 Asian Financial Crisis.

employee data is based upon common recording of the employer identification code from the LI and TEJ datasets, with the unit of analysis in this study being the plant. Our analysis comprises of a total of approximately 528 plants and 500,000 workers.

Our definitions of job and worker flows are similar to those originally proposed by Davis and Haltiwanger (1992). The job reallocation rate (JR) is the sum of job creation and destruction rates; the worker reallocation rate (WR) is measured as the sum of hiring and separation rates; excess job reallocation (EXJR) is measured as the difference between gross job reallocation and the absolute value of net employment change; excess worker reallocation (EXWR), or 'churning flows,' is measured as the difference between worker reallocation and the absolute value of net employment change; and finally, excess separation (EXS) is defined as the difference between separation and job destruction.

The worker composition characteristics in this study include the proportion of employees below the age of 30, the proportion of employees over the age of 55, the proportion of female employees, the proportion of less well-educated employees (elementary school and junior high school education) and the proportion of higher educated employees (university degrees or above).

A possible concern with the TEJ data is that the sample is not representative of the actual population within manufacturing plants in Taiwan. After comparing the descriptive statistics of the key variables for those establishments in the TEJ data with establishments within the manufacturing sector as a whole, we find that TEJ employers are much larger, employ more skilled workers and pay higher wages than employers within the sector as a whole, which is consistent with our expectation that TEJ plants will be relatively more successful and skills-intensive than smaller employers[2]. Although it is clear that the TEJ data do not provide a representative sample of the underlying population of all manufacturing establishments in Taiwan, the matched employer–employee data are still of value with regard to the analysis of a variety of labor market issues.

3. Empirical results

In terms of contributing to both job and worker flows, the manufacturing sector has been found to be the most important sector in Taiwan, due largely to the low threshold entry and exit costs stemming from the presence of a dense network of subcontractors (Aw et al., 2000). Both job reallocation and worker turnover within the manufacturing sector are pro-cyclical, with the cyclical property of job flows closely mirroring the findings for three developing countries – Chile, Colombia and Morocco – but running contrary to the findings for the industrialized countries. However, the pro-cyclicity of worker turnover is consistent with the evidence for the United States and Denmark, suggesting that labor turnover is more dynamic in Taiwan than in Western economies (Tsou et al., 2002).

We estimate the job/worker flow regressions with wage dispersion, average wages, workforce composition characteristics, and two-digit industry dummies as regressors. Following the approach of Haltiwanger and Vodopivec (2003), the average wage is defined as the average residual wage estimated from the standard wage equation, and the measure of a plant's internal wage dispersion is computed from

[2] To save the space, we do not report the descriptive statistics of TEJ establishments and all of the establishments within the manufacturing sector.

the distribution of residual wages.[3] Table 1 shows the OLS regressions for job reallocation, worker reallocation and excess worker reallocation.[4]

The models are estimated using the total employment within the plant, both with and without weighting. Since the explanatory power of the weighted regressions is higher than that of the unweighted regressions, and since the results are generally similar, we will focus on the results of the weighted regressions.

Examining the job reallocation regression first, we find that wage dispersion has a significant and negative correlation with job reallocation, implying that plants with a more compressed wage structure have higher job reallocation rates, which is consistent with the Bertola and Rogerson (1997) hypothesis that a plant with a more flexible wage structure will have less employment volatility. We find a similarly strong inverse relationship between wage dispersion and worker reallocation rates.

Turning to the regressions on excess worker reallocation, we find a negative association between wage dispersion and excess worker reallocation, a result which is at odds with the findings of Barth and Dale-Olsen (1999) on Norway, Haltiwanger and Vodopivec (2003) on Slovenia, and Ilmakunnas and Maliranta (2003) on Finland. One possible explanation for this phenomenon is that wage dispersion within a plant may also reflect the spread in internal opportunities for the plant's employees. Thus, plants with higher wage dispersion rates may have lower excess worker turnover rates. In addition, we find that the average wage of the establishment generally has a negative association with job reallocation, worker reallocation and excess worker reallocation rates, a finding which is similar to the evidence reported for Maryland by Burgess et al. (2000).

With regard to the workforce composition variables, those plants with a higher proportion of female workers had higher job and worker reallocation levels in the boom year of 2000, but lower (excess) worker reallocation levels in the downturn year of 2001, which suggests that for female workers in particular, job-switching costs may be sensitive to the business cycle. Where the workforce in a plant is characterized by higher proportions of young employees, lower educated employees and higher educated employees, higher (excess) worker reallocation levels are apparent.

Following the approach adopted by Haltiwanger and Vodopivec (2003), we further test the matching hypothesis that higher excess separation rates at plants with greater wage dispersion are associated mainly with workers at the lower end of the residual wage distribution chain. Since the residual wage for each individual is measured as a proxy for employee quality, we rank employees in terms of quartiles of the plant-level and sector-level wage residual distribution. We then compute the excess separation rate for each of the wage quartile groups within each of the plants based upon these plant-level and sector-level quartiles. More specifically, by using the two ranking processes, we have, in effect, four excess separation rates for each plant.[5]

In order to examine the relationship between excess separation rates by quartiles and plant wage dispersion, we use the excess separation rate by quartiles as a dependent variable, along with plant

[3] The standard wage equation is estimated in this study by use of the log of individual monthly wages as a dependent variable. The explanatory variables include four education dummies (junior high school, senior high school, junior college and university education or above), experience, experience squared and gender. After controlling for a variety of worker characteristics, the residual wage for each individual can be constructed as a crude proxy of worker quality (Haltiwanger and Vodopivec, 2003).

[4] To save the space, we do not report the coefficients of worker composition variables and industry dummies in Tables 1 and 2.

[5] There are only potentially four groups in each plant since a plant may not have any worker in a particular quartile group when the sector-level wage distribution is used.

Table 1
The relationship between wage dispersion and reallocation, 2000 and 2001

	2000						2001					
	JR		WR		EXWR		JR		WR		EXWR	
	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted
Wage dispersion	−0.0001 (−1.17)	−0.0001 (−1.79)*	−0.0004 (−3.32)***	−0.0002 (−4.64)***	−0.0002 (−3.12)***	−0.0003 (−8.23)***	−0.0003 (−2.01)**	−0.0001 (−3.94)***	−0.0005 (−3.64)***	−0.0003 (−7.90)***	−0.0003 (−3.12)***	−0.0002 (−6.47)***
Average wage	−0.2308	0.0017	−0.1233	−0.0769	0.1075	−0.0786	−0.2875	−0.1588	−0.3834	−0.4047	−0.0959	−0.2459
$\bar{R}^2$	0.11	0.25	0.41	0.59	0.34	0.44	0.05	0.13	0.13	0.38	0.14	0.29
N	528	528	528	528	528	528	528	528	528	528	528	528

All regressions include the intercept, workforce composition characteristics and industry dummies for two-digit SIC industries. All regressions are estimated, both with and without weighting, by the total employment within the plant. Figures in parentheses are t-statistics. ***, ** and * represent statistical significance at 1%, 5% and 10% level respectively.

Table 2
The relationship between wage dispersion and excess separation rates (EXS) by wage quartiles, 2000 and 2001

	2000				2001			
	Sector-wide quartiles		Plant-based quartiles		Sector-wide quartiles		Plant-based quartiles	
	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted
Wage dispersion	-4.62×10^{-5}	1.02×10^{-5}	−0.0002	−0.0001	0.0003	0.0001	5.91×10^{-5}	4.10×10^{-5}
(WD)	(−0.62)	(0.29)	(−1.88)*	(−2.55)***	(3.20)***	(2.68)***	(0.75)	(1.26)
WD × 2nd	-3.47×10^{-5}	−0.0001	0.0001	2.90×10^{-5}	−0.0001	−0.0001	-4.17×10^{-5}	-4.81×10^{-5}
quartile dummy	(−0.36)	(−2.49)**	(1.38)	(0.73)	(−1.28)	(−1.69)*	(−0.40)	(−1.24)
WD × 3rd	2.29×10^{-5}	−0.0001	0.0001	−0.0001	−0.0004	−0.0001	−0.0001	−0.0001
quartile dummy	(0.23)	(−1.56)	(0.60)	(−2.32)**	(−3.10)***	(−3.02)***	(−1.32)	(−2.89)***
WD × 4th	−0.0003	−0.0002	-3.10×10^{-5}	-3.93×10^{-5}	−0.0009	−0.0007	−0.0008	−0.0008
quartile dummy	(−2.88)***	(−4.62)***	(−0.29)	(−1.00)	(−7.68)***	(−15.81)***	(−7.89)***	(−21.17)***
Average wage	0.1074	0.0122	0.0875	−0.0272	0.0958	−0.0332	−0.0716	−0.2000
	(2.82)***	(0.35)	(2.24)**	(−0.71)	(1.98)**	(−0.80)	(−1.76)*	(−4.82)***
$\bar{R}^2$	0.11	0.16	0.12	0.18	0.06	0.24	0.05	0.28
N	1940	1940	2058	2058	1971	1971	2057	2057

See Table 1.

wage dispersion and the interactions of three quartile dummy variables (the second, third and fourth quartiles) as regressors. The average residual wage, workforce composition characteristics and the two-digit industry dummies are also included as controls. We present the OLS results using the two different definitions of the quartiles, with both weighted and unweighted estimates again being reported in Table 2.

The coefficients of wage dispersion are generally positive, indicating that, for the lowest quartile workers, an increase in plant wage dispersion leads to an increase in excess separation rates. An examination of the interaction terms shows that almost all of the interaction coefficients are significantly negative, which implies that excess separation levels in the higher quartiles are lower than those in the lowest quartiles. Our results suggest that a more compressed wage structure results in greater excess separation of lower quality workers, thus providing support for the job-matching hypothesis.

4. Conclusions

This paper uses matched employer–employee data to analyze the relationship between wage dispersion and worker employment within the manufacturing sector in Taiwan. After controlling for specific characteristics based upon workforce composition, our results show that higher job reallocation and (excess) worker turnover rates are a characteristic of plants with more compressed wage structures. Our study provides support for the matching hypothesis that greater excess separation of lower quality workers is a characteristic of plants with more flexible wage structures.

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