The Signalling Role of Promotions in Japan[1]

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Abstract

Under asymmetric information conditions regarding worker productivity between current and prospective employers, a worker's promotion signals his/her productivity. In this paper, we tested the signalling role of promotion, using Japanese micro-level data. We found that among lower-level positions, promotion seems to signal a worker's ability, and both the business cycle and foreign-capital ratio of his/her company significantly strengthen this effects. These results suggest that *external* labour market conditions (i.e. asymmetric information regarding a worker's abilities between a current and prospective employer) affect the economic differences among workers in the *internal* labour market.

Keywords: Strategically delayed promotion, Signalling, Wage growth, Japan.
JEL Classification Numbers: C23, J31, L22.

1. Introduction

The pace of promotion in Japanese large firms tends to be slower than that seen in firms in Western developed countries. In Japan, workers with similar observable characteristics are typically not differentiated until they have been in the workforce for approximately 10-15 years (Itoh 1991). The phenomenon of the Japanese firms waiting a considerable length of time to select workers in a promotion competition, which is termed 'late selection', has been explained in several studies (e.g. Ariga et al. 2000). This paper sheds light on aspects of the asymmetric employer learning approach by considering a case wherein (1) the current employer has the advantage of observing a

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worker's productivity, and (2) the task assignments by the current employer are publicly observable. In such a case, the promotion of a worker to a higher-level task reveals information regarding the worker's productivity to potential employers, which in turn raises the wage cost to deter the worker from leaving the current employer. The current employer then has an incentive to delay the promotion of the worker in that the wage-cost savings realised by delaying the promotion exceeds the increase in productivity realised by promoting the worker to the higher-level task. Moreover, if a worker's education level signals his or her productivity, the incentive for the current employer to delay the promotion of less-educated workers is especially strong.

The existence of the signalling role of promotion implies that the current employer has the incentive to exploit the value of private information at the expense of efficiency in social productivity. Moreover, if the promotion process contains state dependency, that is, the experience of higher-level task changes the worker's ability or preference in conforming to further higher-level tasks, promotion differences made possible by the current employer's strategic behavior will produce long-term economic disparity in terms of promotion opportunities.

The purpose of this paper is to test the signalling role of promotion by using Japanese micro-level data. If a worker's education level has a signalling role under the condition of asymmetric employer learning, a wage increase in line with a promotion will be larger for less-educated workers than for highly educated ones. Because the amount of information revealed by a promotion is greater for lesser-educated workers, a current employer will be more inclined to raising the wages for lesser-educated workers in order to retain them.

We owe our empirical model to DeVaro and Waldman (2009), who tested the signalling role of education by using the personnel records of a US firm in the financial-service industry. They estimated the wage function for different education-level groups and tested the differences in wage increases owing to promotions among these different groups. We rearranged Japanese micro-level data in order to acquire pseudo-panel data regarding education categories, and tested the differences in wage growth due to promotion using the same empirical model.

Wage growth in line with promotion also depends on the business cycle and foreign-capital ratio of the firm that employs the worker. During an economic boom, the total labour demand curve will shift upwards; as a result, the wage cost for the current employer to retain the worker will increase. On the other hand, if firms with high foreign-capital ratios have a stronger tendency to hire mid-career workers than low foreign-capital firms, the wage cost for the current employer to retain the worker will

increases for industries where the foreign-capital ratio tend to be high. As an original contribution to the literature, this paper examines the effects of the business cycle and foreign-capital ratio of a firm on wage growth due to promotion.

The analysis in this paper is structured in the following manner: Section 2 explains the theoretical backgrounds of the empirical model. Section 3 provides a data description, whereas section4 shows the estimation model and reports the empirical results; the latter section includes a subsection that briefly examines the effects of a firm's business cycle and foreign-capital ratio. Section 5 summarizes our empirical findings and discusses policy implications.

2. Theoretical Background

As a worker's potential productivity is unobservable, employers have learned to predict worker productivity by gleaning some observable characteristics (e.g. educational attainment, qualifications, and past job experience). If the observable characteristics are deemed sufficient for predicting a worker's potential productivity, then an employer's information regarding a worker's productivity is said to be *symmetric*, that is, both the current employer and prospective employer have the same information regarding a worker's productivity. Symmetric employer learning is a phenomenon that was empirically supported by Farber and Gibbons (1996)、Altonji and Pierret (2001) 、and Schonberg (2007). On the other hand, if a worker's productivity is marked or affected by unobservable heterogeneity in terms of quality, then an employer's information regarding a worker's productivity is said to be *asymmetric*, that is, the current employer has an information advantage over the prospective employer regarding the worker's productivity. Asymmetric employer learning is a phenomenon that is supported by the findings of Gibbons and Katz (1991) and DeVaro and Waldman (2009). This paper uses the analytical framework of DeVaro and Waldman (2009) for examining "asymmetric employer learning" in the Japanese labour market.

This study's empirical analysis is based on the strategic delayed promotion model (Waldman 1984, Ricart i Costa 1988, Bernhardt 1995, Ishida 2004). Under the circumstance where the current employer can observe the worker's productivity, but prospective employers cannot, we consider that either task assignment within a firm or the worker's educational level could signal that worker's productivity for every prospective employer.

As DeVaro and Waldman (2009) indicated, we can derive the following testable

implications. The first implication is that the incentive to distort the promotion decision decreases according to a worker's educational level. Since a promotion produces information regarding a worker's productivity that is observable by prospective employers, the current employer will delay the promotion of workers who produce more information because these workers incur higher wage costs; they are paid higher wages to prevent them from being bid away from the firm. If the promotion of less-educated workers produces more information regarding productivity than that produced on the promotion of highly educated workers, the promotion rate will increase with educational level, even if there are no differences between the workers in terms of unobserved characteristics.

The second implication, which is closely related to the first implication, is that wage increase due to promotion decreases according to worker educational level. Because more information due to promotion is produced for less-educated workers, the current employer must pay a higher wage, that is, an amount that corresponds with the market wage if an employee would receive on being promoted.

Third, since a promotion early in the career signals a worker's capability, these two aforementioned implications hold more weakly for a promotion late in the career. This paper tests the second implication of the signalling role of promotion[3].

3. Data

We used a micro-level data-set from the *Basic Survey on Wage Structure* (*Wage Census*), gathered between 1989 and 2008. The Japanese government (i.e., the Ministry of Health, Labour and Welfare) compiles this survey annually and covers almost every region and industry (except agriculture) in Japan. It contains information regarding an employee's wage and working days/hours, according to worker attributes (age/tenure group, gender, educational attainment, full-time/part-time status, class of position, etc.) and firm attributes (industry, firm size, etc.).

There are four classes of positions: director (*bu-cho*), section manager (*ka-cho*), chief (*kakari-cho*) and foreman (*shoku-cho*). From the non-official positions (*hi-yakushoku*), white-collar workers ascend the promotion ladder in the following order: chief, section manager, and director. Blue-collar workers, on the other hand, ascend in a different order, which is as follows: foreman, chief, section manager, and director[4].

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[3] On the empirical analysis of wage growth attached to promotion, see McCue (1996), Booth et al. (2003), and Blau and DeVaro (2007).

[4] As is evident, higher-level positions exist in Japanese enterprises. In this dataset, the director is defined as the highest class of position.

For panel-data analysis, we constructed a pseudo-panel data-set. We limited the sample to male standard employees who were senior high school or university graduates, and who were also full-time workers employed by establishments with 10 or more employees[5]. Subsequently, we constructed a pseudo-cohort data-set for senior high school graduates and university graduates whose tenure was 10-19 years (Figures1 and 2). For example, university graduates who were 32 years old and would complete tenure of 10 years in 1989, and those who continued to work at the same enterprise until they 41 years old and would complete a tenure of 19 years, belonged to cohort1.

We calculated the mean value of real wage per hour, the class-of-position (i.e., director, section manager, chief, foreman) dummy, and the establishment size to which the employee belonged to. The real wage per hour was calculated by dividing the sum of the total payment and one-twelfth of the total bonus payment denominated by consumer price index (CPI), the sum of the contracted hours of work, and all overtime work hours.

Table1 shows the mean value of real wage per hour, class-of-position dummy, and establishment size. The tables show that the white-collar executive job (i.e., director, section manager, and chief) ratio among the university graduates exceeded that of senior high school graduates.

4. Empirical Analysis

We used a pseudo-panel data set for university/senior high school graduates with 11 cohort groups, over a period of 10 years.

The empirical specification is as follows[6]:

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[5] A 'Standard employee' is defined as an employee who continues to work in the same enterprise upon graduating from school.

[6] DeVaro and Waldman (2009) examined the effects of *discrete* promotion variable ($promotion = 1$) on wage growth ($\ln W_{it} - \ln W_{it-1}$), using a micro-level personnel data-set. Because the promotion variable P_{lt} is *continuous* in our data-set, we used $\ln W_{it}$ as a dependent variable, instead of $\ln W_{it} - \ln W_{it-1}$.

The current wage can be written as $P_{lt} * W_{t,l} + (1 - P_{lt}) * W_{t,l-1}$, where P_{lt}, $W_{t,l}$, and $W_{t,l-1}$ are promotion probability, average wage in rank l and average wage in lower rank $l-1$, respectively. The partial derivative of the logarithm of the current wage by P_{lt} (γ_{1l} in equation (1)) is $\left(W_{t,l} - W_{t,l-1}\right) / \left(P_{it} * W_{t,l} + \left(1 - P_{it}\right) * W_{t,l-1}\right)$, which indicates the deflated wage growth by promotion from rank $l-1$ to l.

$$\ln W_{it} = \gamma_0 + \gamma_{1l} \sum_{l=1}^{3} P_{lt} + \sum_{l=1}^{3} \gamma_{2l} P_{lt} Edu\_Senior + X_{it}\beta + \alpha_i + \varepsilon_{it} \quad (1)$$

W_{it} indicates the mean value of real wage per hour of an individual who belongs to cohort i, year t. P_{lt} is the ratio of employees who obtained rank l in year t, and Edu_Senior is the dummy variable for senior high school graduates. X_{it} is a vector of control variables that includes tenure, dummy variable for senior high school graduate, and logarithms of enterprise size. α_i and ε_{it} are the cohort-specific component and error term, respectively. We estimated the equation for university/senior high school graduates separately. If educational attainment serves as a signal of a worker's productivity, a promotion would produce information regarding a worker's productivity more readily among senior high school graduates than among university graduates. Then, wage growth according to promotion is larger among senior high school graduates than among university graduates, while controlling for unobserved characteristics; this is expressed as $\gamma_{2l} > 0$ in equation (1). Our empirical strategy is to test the hypothesis $\gamma_{2l} > 0$ for each rank (i.e., director, section manager, chief, foreman).

Table2 shows the empirical results for the aggregate of all industries and all cohort groups. For chief and foreman, the coefficients of cross-terms with senior high school graduates were significantly positive, suggesting that the signalling role of promotion exists for these lower ranks; this finding is consistent with the third implication mentioned above: for low-level position workers, wage increases due to promotion decrease as education level increases[7]. On the other hand, the coefficients of cross-terms with senior high school graduates were significantly negative for each of directors and section managers. What does this mean? One can take one of two interpretations of the coefficient γ_{2l} . One interpretation, which has been mentioned previously, is from the perspective of asymmetric employer learning; however the difference between university and senior high school graduates in terms of wage growth in line with promotion can be explained by the technical complementarities between rank and education level[8]. If a higher job rank complements higher educational attainment, that is, the increase of productivity is higher for university graduates than for senior high school graduates, then it is possible that wage growth with promotion increases with educational attainment.

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[7] The same result is obtained by DeVaro and Waldman (2009).
[8] DeVaro and Waldman (2009) offer a similar interpretation.

4.1 Effects of Business Cycle

The effects of revealed information regarding a worker's productivity, as seen through his or her promotion, on wage growth may depend on the business cycle of the firm in question. When the economy is booming and aggregate labour demand is vigorous, wage growth used to mitigate potential poaching increases. In order to control the business cycle as it affects wage growth, we divided the cohort group by intensity of labour demand. In this paper, we adopted the *Active Job Openings to Applicants* (*Yuko-Kyujin Bairitsu*; hereafter, AJOA) from the *Employment Referrals for General Workers* surveyed by Japan's Ministry of Health, Labour, and Welfare as an index of intensity of labour demand. Figure3 shows the AJOA from 1989 to 2008; it shows that that the ratio showed a downward trend between 1991 and 2002, and then increased again. We calculated the average value of AJOA in each cohort, for each 10-year period[9]. The results were as follows: cohort1, 0.82; cohort2, 0.75; cohort3, 0.67; cohort4, 0.59; cohort5, 0.51; cohort6, 0.51; cohort7, 0.52; cohort8, 0.54; cohort9, 0.58; cohort10, 0.61; cohort11, 0.64. We divided the original sample into two groups, the High AJOA Cohort (cohort1, cohort2, cohort3, cohort4, cohort9, cohort10, and cohort11), and the Low AJOA Cohort (cohort5, cohort6, cohort7, and cohort8). Table3 presents the estimated regressor coefficients for both the Low AJOA Cohort and High AJOA Cohort; the estimates are broadly similar between the two. Comparing the size of coefficients for the cross-terms of the foreman ratio and the senior high school dummy, the coefficients were larger in the High AJOA Cohort. This result shows the possibility of strengthening the signalling role in the promotion of a foreman during an economic boom. On the other hand, the coefficients for the cross-terms of the section manager ratio and the senior high school dummy in the High AJOA Cohort group had larger negative absolute values. This result can be explained as the strengthening of complementarities between the work of a section manager and educational attainment, because of the economic boom.

4.2 Effects of Foreign-Capital Ratio

In this section, we test the hypothesis that the signalling role of a promotion is stronger in firms whose industries tend to bear high foreign-capital ratios. The reasons for the hypothesis are as follows[10]. First, because these firms are subsidiaries of their

[9] For example, for cohort1, we calculated the average from 1989 to 1998.
[10] See, Japan Institute of Labour (1992).

respective overseas parent companies, their human resource management, which is based on the global labour market, falls under the influence of the parent company. Second, because these tend to be 'small' companies, their development of an internal labour market tends to be limited. As a result, human resource allocation is more likely to rely on the external labour market. Third, because these are newly established companies, their hiring tends to focus more on mid-individuals, to employ skilled workers.

The *Basic Survey on Wage Structure* dataset does not include the foreign-capital ratio index, and so, we used the *Establishment and Enterprise Census* (*Jigyosho, Kigyo Toukei Chosa*) from the years 1998-2001, 2004-2005, and 2008, in order to identify workers who belong to firms whose industries tend to bear high foreign-capital ratio. This survey was conducted on all establishments in Japan; it provides basic data on establishments and enterprises, such as the industry size and the number of persons engaged. The foreign-capital ratio index was surveyed in the years 1998-2001, 2004-2005, and 2008, and we merged the *Establishment and Enterprise Census* dataset with that of the *Basic Survey on Wage Structure*, in terms individual worker ID.

Table5 presents the distribution of workers classified by foreign-capital ratio. The percentage of workers in the finance industry whose enterprises were fully owned by foreign capital was higher than that in any other industry; in other industries, approximately 90% of the workers had been hired by enterprises where the foreign-capital ratio was 0%. We calculated the mean value of the foreign-capital ratios of enterprises, by industry, and averaged for the sample period. The results were as follows: finance, 2.970%; wholesale, 1.356%; manufacturing, 1.116%; transportation, 0.559%; real estate, 0.544%; utilities, 0.475%; services, 0.401%; mining, 0.382%; and construction, 0.223%. In this paper, we define the finance, wholesale, and manufacturing industries as 'high foreign-capital ratio industries', and the real estate, transportation, utilities, services, mining, and construction industries as 'low foreign-capital ratio industries'.

Table4 shows separate estimates of the wage equations for the 'high foreign-capital ratio industries' and 'low foreign-capital ratio industries'. The coefficients for the cross-terms of the chief ratio and senior high school dummy, and those of the foreman ratio and senior high school dummy for 'high foreign-capital ratio industries' were significantly positive, although the size of the coefficients were insignificant for 'low foreign-capital ratio industries'. These results indicate that the poaching intensity for chief and foreman is higher among high foreign-capital ratio industries.

5. Conclusion

As Ishikawa (2001) noted, if 'in the market, we say that the 'genuine wage disparity' that is problematic exists when there are workers who have the same ability and preference and yet do not obtain the same job opportunity (p.246)'. Promotions that are strategically delayed by exploiting the information asymmetry between the current and prospective employers may produce a 'genuine wage disparity' among workers, if promotion has some state dependency.

In order to examine the existence of strategically delayed promotion in Japan, we used Japanese micro-level data to test the signalling role of promotion, which is considered an element of asymmetric information between the current employer and prospective employer. We found that promotion from lower-level positions (e.g. promotion to chief [*kakari-cho*] or foreman [*shoku-cho*] apparently signal a worker's ability, and the business cycle and foreign-capital ratio of that worker's employing firm can significantly strengthen these effects. These results suggest that an *external* labour market condition (i.e. asymmetric information regarding a worker's abilities, between the current employer and prospective employer) exacerbates economic differences among workers through the *internal* labour market (i.e. the promotion process). Whenever we analyse the 'genuine wage disparity' through the internal labour market, the external labour market condition must also be considered.

Whether strategically delayed promotions produce a 'genuine wage disparity' among workers in the long term depends on the state dependency of promotion[11]. In future research, a test of state dependency in the promotion process in Japanese enterprises must be considered.

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Figure1 Structure of Pseudo-Cohort (University Graduates)

Male University Graduates -age-

	Cohort group										
	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort
year	11	10	9	8	7	6	5	4	3	2	1
1989											32
1990										32	33
1991									32	33	34
1992								32	33	34	35
1993							32	33	34	35	36
1994						32	33	34	35	36	37
1995					32	33	34	35	36	37	38
1996				32	33	34	35	36	37	38	39
1997			32	33	34	35	36	37	38	39	40
1998		32	33	34	35	36	37	38	39	40	41
1999	32	33	34	35	36	37	38	39	40	41	
2000	33	34	35	36	37	38	39	40	41		
2001	34	35	36	37	38	39	40	41			
2002	35	36	37	38	39	40	41				
2003	36	37	38	39	40	41					
2004	37	38	39	40	41						
2005	38	39	40	41							
2006	39	40	41								
2007	40	41									
2008	41										

Male University Graduates -tenure-

	Cohort group										
	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort
year	11	10	9	8	7	6	5	4	3	2	1
1989											10
1990										10	11
1991									10	11	12
1992								10	11	12	13
1993							10	11	12	13	14
1994						10	11	12	13	14	15
1995					10	11	12	13	14	15	16
1996				10	11	12	13	14	15	16	17
1997			10	11	12	13	14	15	16	17	18
1998		10	11	12	13	14	15	16	17	18	19
1999	10	11	12	13	14	15	16	17	18	19	
2000	11	12	13	14	15	16	17	18	19		
2001	12	13	14	15	16	17	18	19			
2002	13	14	15	16	17	18	19				
2003	14	15	16	17	18	19					
2004	15	16	17	18	19						
2005	16	17	18	19							
2006	17	18	19								
2007	18	19									
2008	19										

Source: Basic Survey on Wage Structure (microdata).

Figure2 Structure of Pseudo-Cohort (Senior High School Graduates)

Male Senior High School Graduates -age-

	Cohort group										
	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort
year	11	10	9	8	7	6	5	4	3	2	1
1989											28
1990										28	29
1991									28	29	30
1992								28	29	30	31
1993							28	29	30	31	32
1994						28	29	30	31	32	33
1995					28	29	30	31	32	33	34
1996				28	29	30	31	32	33	34	35
1997			28	29	30	31	32	33	34	35	36
1998		28	29	30	31	32	33	34	35	36	37
1999	28	29	30	31	32	33	34	35	36	37	
2000	29	30	31	32	33	34	35	36	37		
2001	30	31	32	33	34	35	36	37			
2002	31	32	33	34	35	36	37				
2003	32	33	34	35	36	37					
2004	33	34	35	36	37						
2005	34	35	36	37							
2006	35	36	37								
2007	36	37									
2008	37										

Male Senioir High School Graduates -tenure-

	Cohort group										
	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort
year	11	10	9	8	7	6	5	4	3	2	1
1989											10
1990										10	11
1991									10	11	12
1992								10	11	12	13
1993							10	11	12	13	14
1994						10	11	12	13	14	15
1995					10	11	12	13	14	15	16
1996				10	11	12	13	14	15	16	17
1997			10	11	12	13	14	15	16	17	18
1998		10	11	12	13	14	15	16	17	18	19
1999	10	11	12	13	14	15	16	17	18	19	
2000	11	12	13	14	15	16	17	18	19		
2001	12	13	14	15	16	17	18	19			
2002	13	14	15	16	17	18	19				
2003	14	15	16	17	18	19					
2004	15	16	17	18	19						
2005	16	17	18	19							
2006	17	18	19								
2007	18	19									
2008	19										

Source: Basic Survey on Wage Structure (microdata).

Table1 Basic Statistics

Male University Graduates

	Cohort group										
	Cohort 11	Cohort 10	Cohort 9	Cohort 8	Cohort 7	Cohort 6	Cohort 5	Cohort 4	Cohort 3	Cohort 2	Cohort 1
Real Wage per Hour	0.344 (0.052)	0.34 (0.044)	0.347 (0.040)	0.349 (0.038)	0.353 (0.039)	0.349 (0.037)	0.347 (0.035)	0.348 (0.032)	0.348 (0.039)	0.349 (0.040)	0.349 (0.042)
Director	0.011 (0.010)	0.008 (0.087)	0.008 (0.008)	0.007 (0.006)	0.009 (0.010)	0.008 (0.009)	0.008 (0.009)	0.008 (0.010)	0.01 (0.009)	0.009 (0.010)	0.009 (0.008)
Section Manager	0.145 (0.087)	0.141 (0.086)	0.14 (0.091)	0.138 (0.093)	0.135 (0.091)	0.133 (0.086)	0.12 (0.086)	0.115 (0.081)	0.125 (0.090)	0.124 (0.093)	0.107 (0.082)
Chief	0.169 (0.039)	0.18 (0.035)	0.188 (0.028)	0.183 (0.033)	0.183 (0.038)	0.185 (0.037)	0.176 (0.035)	0.182 (0.030)	0.175 (0.026)	0.164 (0.025)	0.167 (0.020)
Foreman	0.01 (0.007)	0.009 (0.004)	0.01 (0.005)	0.009 (0.003)	0.01 (0.003)	0.009 (0.004)	0.011 (0.004)	0.01 (0.004)	0.009 (0.003)	0.009 (0.004)	0.011 (0.003)
Establish -ment Size	403.6 (35.6)	451.3 (50.3)	511.8 (83.2)	542.4 (47.6)	531.3 (27.6)	529.5 (33.8)	529.6 (42.8)	536.3 (79.6)	487.7 (63.7)	422.1 (96.6)	467.4 (99.5)
Sample Size	2459	2863	3219	3220	2763	2605	2934	2877	2342	2311	2585

Male Senior High School Graduates

	Cohort group										
	Cohort 11	Cohort 10	Cohort 9	Cohort 8	Cohort 7	Cohort 6	Cohort 5	Cohort 4	Cohort 3	Cohort 2	Cohort 1
Real Wage per Hour	0.254 (0.040)	0.255 (0.035)	0.256 (0.030)	0.256 (0.028)	0.254 (0.026)	0.252 (0.026)	0.252 (0.023)	0.248 (0.023)	0.244 (0.022)	0.24 (0.021)	0.241 (0.022)
Director	0.0003 (0.0006)	0.0005 (0.0004)	0.0004 (0.0004)	0.0003 (0.0004)	0.0007 (0.0008)	0.0006 (0.0007)	0.0002 (0.0003)	0.0007 (0.0008)	0.001 (0.001)	0.0005 (0.0007)	0.0007 (0.0009)
Section Manager	0.01 (0.007)	0.007 (0.006)	0.007 (0.006)	0.006 (0.005)	0.008 (0.006)	0.007 (0.006)	0.006 (0.006)	0.007 (0.006)	0.012 (0.012)	0.011 (0.013)	0.01 (0.009)
Chief	0.061 (0.031)	0.052 (0.028)	0.046 (0.025)	0.045 (0.025)	0.051 (0.026)	0.046 (0.027)	0.042 (0.024)	0.044 (0.027)	0.049 (0.031)	0.044 (0.030)	0.042 (0.030)
Foreman	0.04 (0.011)	0.044 (0.013)	0.044 (0.017)	0.043 (0.012)	0.044 (0.012)	0.051 (0.015)	0.05 (0.015)	0.051 (0.015)	0.047 (0.012)	0.04 (0.010)	0.043 (0.016)
Establish -ment Size	462.3 (52.3)	570.3 (79.9)	658.8 (89.1)	635 (59.5)	524.4 (37.8)	545.8 (42.3)	574.1 (47.7)	534.9 (40.3)	433 (39.5)	357.3 (33.7)	416.8 (19.8)
Sample Size	1294	1491	1724	1672	1575	1592	1694	1654	1593	1467	1525

Note: Mean value of 10 years. Standard errors in parentheses.

Table2 Estimates of Wage Equations (All Industries, All Cohort Group)

	Fixed Effects	Random Effects
Director ratio	−1.312	−0.629
	(0.810)	(0.812)
Section manager ratio	0.190	−0.049
	(0.169)	(0.127)
Chief ratio	0.245	0.166
	(0.134)	(0.126)
Foreman ratio	−3.377	−4.143
	(0.878)	(0.878)
Director ratio *Senior high school graduates dummy	−11.613	−10.829
	(6.337)	(6.029)
Section Manager ratio *Senior high school graduates dummy	−3.435	−3.956
	(0.857)	(0.792)
Chief ratio *Senior high school graduates dummy	1.327	1.180
	(0.463)	(0.338)
Foreman ratio *Senior high school graduates dummy	2.483	3.225
	(1.025)	(0.978)
Tenure	0.034	0.040
	(0.004)	(0.003)
Senior high school graduates dummy	−	−0.336
		(0.029)
ln (establishment size)	−0.032	0.046
	(0.022)	(0.012)
Sample size	220	220
R-squared	0.397	0.981

Notes: Standard errors are in parentheses.

Table3 Estimates of Wage Equations (Each Cohort)

	Low AJOA Cohort		High AJOA Cohort	
	Fixed Effects	Random Effects	Fixed Effects	Random Effects
Director ratio	−1.558	−1.471	−0.282	0.431
	(0.769)	(0.799)	(1.097)	(1.080)
Section manager ratio	0.094	0.322	0.009	−0.268
	(0.203)	(0.156)	(0.212)	(0.157)
Chief ratio	−0.215	−0.102	0.463	0.346
	(0.126)	(0.116)	(0.188)	(0.174)
Foreman ratio	−0.757	−0.815	−3.725	−4.760
	(0.813)	(0.836)	(1.223)	(1.194)
Director ratio *Senior high school graduates dummy	−5.149	−6.358	−13.680	−9.343
	(4.968)	(4.975)	(9.843)	(9.270)
Section Manager ratio *Senior high school graduates dummy	−2.202	−2.680	−4.114	−4.652
	(0.930)	(0.954)	(1.205)	(1.098)
Chief ratio *Senior high school graduates dummy	0.649	1.421	1.262	1.081
	(0.465)	(0.394)	(0.617)	(0.446)
Foreman ratio *Senior high school graduates dummy	0.879	0.716	2.373	3.243
	(0.936)	(0.913)	(1.428)	(1.389)
Tenure	0.034	0.028	0.039	0.046
	(0.005)	(0.004)	(0.006)	(0.004)
Senioir-high-school graduates dummy	−	−0.363	−	−0.302
		(0.024)		(0.042)
ln (establishment size)	0.083	0.070	−0.026	0.045
	(0.025)	(0.024)	(0.030)	(0.015)
Sample size	80	80	140	140
R-squared	0.051	0.995	0.582	0.979

Notes: Standrad errors are in parentheses.
Low AJOA (Active Job Openings to Applicants) Cohort contains cohort5-8 ,High AJOA Cohort contains cohort1-4 and 9-11.

Table4 Estimates of Wage Equation (Low and High Foreign Capital Ratio Industries)

	Low foreign capital ratio industries		High foreign capital ratio industries	
	Fixed Effects	Random Effects	Fixed Effects	Random Effects
Director ratio	−0.703	−0.578	−0.382	0.160
	(0.702)	(0.683)	(0.729)	(0.772)
Section manager ratio	−0.252	−0.257	0.530	0.224
	(0.147)	(0.137)	(0.136)	(0.114)
Chief ratio	0.097	0.101	0.344	0.170
	(0.112)	(0.110)	(0.132)	(0.126)
Foreman ratio	−3.572	−3.814	−2.224	−2.683
	(0.935)	(0.894)	(0.660)	(0.676)
Director ratio *Senior high school graduates dummy	−9.515	−6.286	−7.328	−9.548
	(6.152)	(5.964)	(4.179)	(4.115)
Section manager ratio *Senior high school graduates dummy	−2.569	−3.483	−2.088	−2.200
	(1.247)	(1.191)	(0.525)	(0.527)
Chief ratio *Senior high school graduates dummy	−0.256	−0.147	0.975	0.912
	(0.404)	(0.383)	(0.341)	(0.279)
Foreman ratio *Senior high school graduates dummy	2.138	2.339	2.642	2.807
	(1.496)	(1.434)	(0.749)	(0.732)
Tenure	0.045	0.045	0.023	0.030
	(0.003)	(0.003)	(0.004)	(0.003)
Senioir high school graduates dummy	−	−0.221	−	−0.416
		(0.025)		(0.030)
ln (establishment size)	0.014	0.039	−0.005	0.055
	(0.020)	(0.018)	(0.018)	(0.011)
Sample size	220	220	220	220
R-squared	0.462	0.961	0.326	0.983

Notes: Standard errors are in parentheses.

Table5 Transition of Fforeign-Capital Ratio, According to Industry

year: 1998

	Foreign capital ratio				
	0%	0%～49%	50%～99%	100%	average(%)
Mining	0.980	0.017	0.000	0.002	0.415
Construction	0.971	0.029	0.000	0.000	0.223
Manufacturing	0.941	0.053	0.004	0.002	0.992
Utilities	0.927	0.073	0.000	0.000	0.325
Transportation	0.958	0.037	0.001	0.004	0.673
Wholesale	0.937	0.049	0.005	0.008	1.674
Finance	0.728	0.267	0.000	0.005	2.387
Real estate	0.966	0.034	0.000	0.000	0.386
Services	0.979	0.019	0.002	0.000	0.307

year: 1999

	Foreign capital ratio				
	0%	0%～49%	50%～99%	100%	average(%)
Mining	0.977	0.021	0.000	0.002	0.454
Construction	0.969	0.031	0.000	0.000	0.253
Manufacturing	0.939	0.055	0.004	0.003	1.072
Utilities	0.935	0.065	0.000	0.000	0.271
Transportation	0.965	0.031	0.001	0.002	0.531
Wholesale	0.940	0.048	0.007	0.005	1.502
Finance	0.721	0.271	0.002	0.005	2.526
Real estate	0.964	0.036	0.000	0.000	0.491
Services	0.980	0.017	0.002	0.000	0.337

year: 2000

	Foreign capital ratio				
	0%	0%～49%	50%～99%	100%	average(%)
Mining	0.978	0.020	0.000	0.003	0.476
Construction	0.965	0.034	0.001	0.000	0.305
Manufacturing	0.935	0.059	0.004	0.002	1.091
Utilities	0.934	0.066	0.000	0.000	0.290
Transportation	0.965	0.032	0.001	0.002	0.478
Wholesale	0.936	0.050	0.006	0.008	1.726
Finance	0.721	0.271	0.002	0.006	2.535
Real estate	0.956	0.044	0.000	0.000	0.643
Services	0.979	0.019	0.001	0.000	0.292

Source: Establishment and Enterprise Census (microdata).

Table5 Transition of Foreign-Capital Ratio, According to Industry (continued)

year: 2001

	Foreign capital ratio				
	0%	0%～49%	50%～99%	100%	average(%)
Mining	0.978	0.020	0.000	0.002	0.444
Construction	0.968	0.032	0.000	0.000	0.237
Manufacturing	0.933	0.060	0.004	0.002	1.111
Utilities	0.931	0.069	0.000	0.000	0.309
Transportation	0.965	0.033	0.001	0.002	0.407
Wholesale	0.928	0.060	0.003	0.009	1.695
Finance	0.736	0.262	0.001	0.000	1.775
Real estate	0.955	0.045	0.000	0.000	0.653
Services	0.980	0.017	0.004	0.000	0.409

year: 2004

	Foreign capital ratio				
	0%	0%～49%	50%～99%	100%	average(%)
Mining	0.971	0.029	0.000	0.000	0.518
Construction	0.967	0.033	0.000	0.000	0.211
Manufacturing	0.951	0.043	0.004	0.003	1.001
Utilities	0.925	0.075	0.000	0.000	0.341
Transportation	0.965	0.031	0.001	0.003	0.726
Wholesale	0.950	0.040	0.003	0.007	1.375
Finance	0.783	0.193	0.006	0.018	3.496
Real estate	0.946	0.052	0.000	0.002	0.677
Services	0.982	0.014	0.000	0.004	0.623

year: 2005

	Foreign capital ratio				
	0%	0%～49%	50%～99%	100%	average(%)
Mining	0.990	0.010	0.000	0.000	0.132
Construction	0.985	0.015	0.000	0.000	0.066
Manufacturing	0.942	0.053	0.003	0.002	1.011
Utilities	0.928	0.072	0.000	0.000	0.345
Transportation	0.971	0.025	0.001	0.003	0.616
Wholesale	0.968	0.027	0.001	0.003	0.656
Finance	0.790	0.169	0.002	0.039	4.910
Real estate	0.966	0.034	0.000	0.000	0.255
Services	0.985	0.011	0.000	0.004	0.550

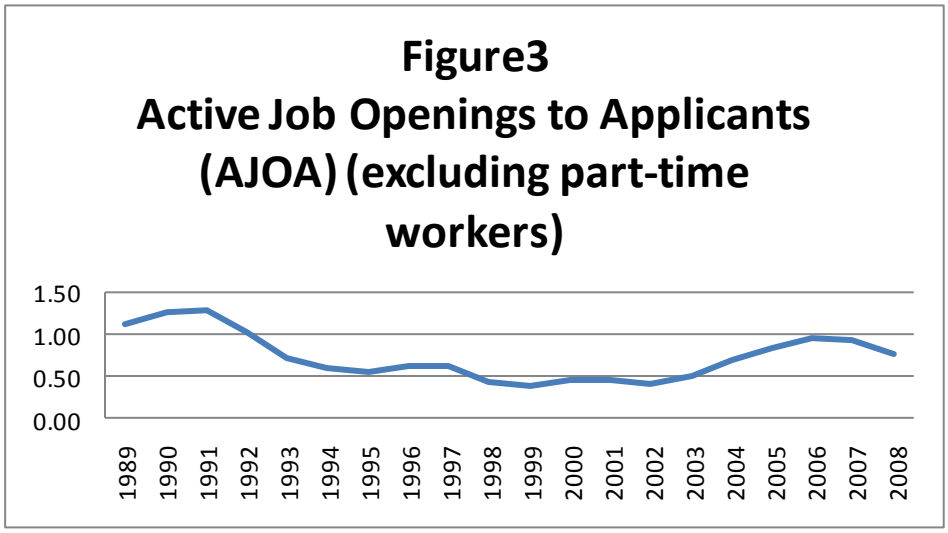
Source: Establishment and Enterprise Census (microdata).

Table5 Transition of Foreign-Capital Ratio, According to Industry (continued)

year: 2008

	Foreign capital ratio				
	0%	0%～49%	50%～99%	100%	average(%)
Mining	0.981	0.019	0.000	0.000	0.237
Construction	0.979	0.021	0.000	0.000	0.269
Manufacturing	0.944	0.049	0.002	0.005	1.532
Utilities	0.886	0.114	0.000	0.000	1.446
Transportation	0.982	0.013	0.002	0.003	0.479
Wholesale	0.970	0.024	0.001	0.004	0.861
Finance	0.832	0.145	0.011	0.011	3.162
Real estate	0.968	0.027	0.003	0.002	0.703
Services	0.990	0.008	0.001	0.001	0.289

Source: Establishment and Enterprise Census (microdata).



Source: Ministry of Health, Labour, and Welfare *Employment Referrals for General Workers.*