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TENURE AND WAGES IN KANSAS LABOR MARKETS, 1899

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The focus of the paper is on the link between tenure and wages in association with the functioning of internal labor markets in the U.S. at the turn of the century. The paper finds that wage determination mechanism was different across occupational groups. Wages of those who had long-term labor relations were higher and probably determined under the rule of internal labor markets. Wages of those who had short jobs were lower and their determination mechanism worked more like a spot labor market. The wage differentials across occupational groups appear to have been in part due to efficiency wage scheme. Although compensating wage schemes did not explain wage differentials across occupation groups well, there was some evidence of compensating wage schemes within occupational groups. Unions played a certain role in raising wages, but they did not alter their members' profile of long-term wage arrangements.

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I. INTRODUCTION

Over 200 years ago, Adam Smith (1937, P. 122) wrote that "the high wages of workmen ····· are not so much the recompense of their skill as the compensation for the inconstancy of their employment." Would a similar statement describe the U.S. labor market at the turn of the century? In other words, were the workers with high risk of turnover compensated by wage premiums? The answer is not as unequivocal as Smith suggested.

Kim(1996a) have shown that a negative correlation between job tenure and the separation probability exists because workers with lower propensities to change jobs tend to have longer job tenure and vice versa, using the sample of Kansas wage earners in 1899. If this is valid, the 'compensating' reward system

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would predict a negative association between wages and tenure. However, a look at the same data provides a contradictory story. For example, railway workers in train service, a group of workers who served longer on their jobs, earned 870 dollars a year on average, while workers in building trades, who were mostly casual workers, averaged 391 dollars annually. To make the comparison based on wages free from seniority effects, let us examine initial annual wage earnings. These still show almost the same degree of inequality: a railway worker in train service had a starting salary of 620 dollars, while a building worker earned only 331 dollars, on average, in the first year.[1]

Clearly, this example raises several interesting questions. Why did a building worker accept a lower wage offer if he recognized that his layoff risk was so much higher than that of the railway worker? Were skill differentials the single missing linkage to explain the wage differentials? If not, why did wage payment systems differ across occupational groups? Through what mechanism and to what extent did wages relate to job tenure within and among occupational groups?

One explanation is that idiosyncratic labor relations across occupational groups buffered the labor market from market pressures and led it to become composed of noncompeting groups. As a result, a worker was not necessarily paid according to the compensating wage scheme that Smith predicted, and significantly different reward systems existed across occupational groups. As the set of rules and institutions governing allocation and pricing of labor are referred to as an 'internal labor market,' the functioning of the internal labor market might have been a major component in determining wages. A common observation in an internal labor market is that earning capacity is not only unique to a particular employment relationship but also increases as the relationship ages. In this sense, a particular focus of the paper is on the link between tenure and wages in association with the functioning of internal labor markets.

The paper is organized as follows. In section Ⅱ, I briefly explaining the Kansas data. Then, I explore theoretical arguments about wage determination mechanisms and develop a simple stochastic wage model in section Ⅲ. I discuss the empirical findings in section Ⅳ. The final section concludes.

Ⅱ. KANSAS BLS DATA

The 1899 survey of Kansas wage earners, conducted by the state's Bureau of Labor and Industry, was published in its Fifteenth Annual Report for 1899. Since its creation in 1885, the Kansas Bureau of Labor had undertaken a number of worker surveys, but the 1899 survey was the first under the new law of 1898.[2] The survey was conducted by mail. The Bureau did not report the

[1] See table 2

[2] In 1885, a law was passed requiring the commissioner of labor to inspect workshops, factories, mills, and private works to examine the sanitary conditions and to make

number of questionnaires it sent out, but 1,058 respondents "sufficiently complete for tabulation" were returned (Kansas Bureau of Labor and Industry 1900, p. 4). The Bureau classified the workers according to five occupational groups. The classes and numbers of the workers in each class are as follows:

Class A: Railway employees in train service	168
Class B: Railway employees in miscellaneous trades	87
Class C: Building trades	276
Class D: Miscellaneous trades	396
Class E: Female wage earners	131

This grouping of workers by the Bureau turns out to be particularly advantageous for the purpose of the paper. Among others, the comparison of workers in railway trades (Classes *A* and *B*) with those in building trades (Class *C*) offers a rare opportunity to highlight the cross-sectional differences in employment relations, for these two groups have been widely believed to have occupied the opposite ends of the spectrum. Railways were among the first American enterprises to introduce internal labor markets, whereas building trades were widely reputed to constitute the most casual jobs.[3] Classes *A* and *B* consist of skilled and semi-skilled workers, respectively, within the same job category of railways. A notable difference between them was found in terms of the wage rate.

Miscellaneous trades (Class *D*) consist of various kinds of occupations, so this class would be considered as representative of typical male wage earners in Kansas in 1899. Its comparison with female workers (Class *E*) would make it possible to examine gender differences in hiring practices. Moreover, such a comparison would be quite free from the bias that usually occurred due to the different compositions of occupations between male and female workers. In the sample, 42 percent of the miscellaneous trades and 78 percent of the female wage earners shared the same category of jobs such as office helpers, printers, retail clerks, and teachers.

Table 1 shows the industrial composition of workers in Kansas and the U.S. in 1900.[4] Compared to the state's total, workers in the railway and building

recommendations for changes to protect the security and health of the workers. This was revised in 1899, giving the commissioner police powers and the authority to carry out more rigorous inspections. Failure to comply was considered a misdemeanor punishable by fine and/or imprisonment. See Kansas Bureau of Labor and Industry (1900).

[3] For the development of internal labor markets in railways, see Chandler (1977), Lichter (1983), and Sundstrom (1988).

[4] In Table 1, the number of the Kansas total represented the labor force, while the numbers of the U. S. total represented employment including employees, self-employed and unpaid family workers. On the other hand, the Kansas BLS samples consist of wage earners only. As a result, those numbers of the Kansas BLS sample, the Kansas total and the U. S. total do not represent the same categorization of workers. However, I believe the discrepancy makes no difference in

[Table 1] Workers by Industry and Their Proportions, Kansas and the U.S. in 1900

	Kansas[a]	U.S.[b]
Agriculture	291.3 (100.0)	11,749 (100.0)
(Male)	284.6 (97.7)	11,019 (93.8)
(Female)	6.7 (2.3)	730 (6.2)
Non-Agriculture	216.4 (100.0)	15,548 (100.0)
Mining	11.6 (5.4)	637 (4.1)
Construction	22.3 (10.3)	1,665 (10.7)
Manufacturing	30.1 (13.9)	5,895 (37.9)
Transportation, Commerce Public Utilities	30.4 (14.0)	1,145 (7.4)
Trade, Finance, Real Estate	50.8 (23.5)	3,970 (25.5)
Service and Public Administration	71.2 (32.9)	2,236 (14.4)
(Male)	167.6 (77.4)	12,531 (80.6)
(Female)	48.8 (22.6)	3,016 (19.4)
Total	507.7	27,297

[a] The numbers for Kansas are for the labor force in thousand.
[b] The numbers for the U.S. are for employment in thousand.
Note: The numbers in parentheses are the percentages of those to the total agriculture or non-agriculture labor force.
Sources: Madden(1971); Lebergott(1964, p. 510)

trades sampled in the Kansas survey seem to be oversampled: As of 1900, workers in transportation and construction accounted for 29 and 17 percent, respectively, of the sample but only 14 percent and 10 percent, respectively, of the total of the state's non-agricultural labor force. On the other hand, female workers were undersampled, consisting of only 11 percent of the sample compared to 23 percent of the state's total. Nonetheless, the claim that workers in the Kansas survey were "representative of the various railway, mechanical and miscellaneous trades, as well as representative from a geographical point of view" finds acceptance (Kansas Bureau of Labor and Industry 1900, p. 4). In comparing the sample with the U.S. total, the similar tendency in the sampling biases is observed. One thing worth noting is that the proportion of workers involved in the transportation sector in Kansas was twice as large as that of the

the comparison of industrial composition of workers among them.

[Table 2] Descriptive Data of Kansas Wage Earners in 1899

	Class A	Class B	Class C	Class D	Class E	Total
Average Years on Job	7.73	8.46	2.98	4.31	2.82	4.97
Annual Wage Earnings($)	867.2	607.3	385.8	500.7	286.7	513.2
Annual Wage for those with less than 1 year tenure	619.9	463.0	371.6	403.8	182.4	411.8
Average Age	35.5	37.8	32.6	33.5	26.0	34.4
Union(%)	96.4	34.5	39.1	35.9	1.5	44.9
Immigrant(%)	4.8	13.8	10.9	12.1	3.8	9.6
Marriage(%)	83.9	86.2	82.6	64.6	0.8	66.3
Sample Size	168	87	276	396	131	1058

Source: Kansas Bureau of Labor and Industry (1900)

same category of works in the U.S. as a whole.[5] This might be a reason for why railway workers received such a large weight in the sample. Because of the geographical advantage due to its location, Kansas indulged itself lavishly in the construction of railways during the late nineteenth century.[6] The railroad opened the Great Plains for settlement by providing for the easy transportation of people and goods, which thereby offered vast employment opportunities in Kansas.

According to the estimation of the business cycle by Burns and Mitchell (1946), the year 1899 was a transitional period. After a contraction from 1893 to 1896, business activity had experienced an expansion until it was interrupted by a recession starting from June 1899 and reaching a trough in December 1900. However, the Kansas survey showed that employment opportunities in 1899 increased compared to those in 1898. To the question "As compared with 1898, has opportunity for employment in your trade in your locality increased?", 452 responded with an answer of "increased", 140 with "decreased" and 260 with "same" while 240 did not respond to the question. After all, one may not feel guilty to assume that the unemployment experiences observed in the Kansas sample might not have been seriously affected by the business cycle.

Table 2 presents some descriptive statistics of the reports by class. The average length of years of tenure for the current jobs is around 5 years for the

[5] As of 1900, workers in transportation accounted for 14.0 percent of the total of the non-agricultural labor force in Kansas and 7.4 percent of that in the U.S. See Madden (1971) and Lebergott (1964).

[6] Despite the tremendous interest in railroads, it was not until 1865 that any serious effort was made to bridge the Kansas plains. The first major line to build extensive trackage in Kansas was the Union Pacific. The Santa Fe railroad was opened in 1869. After gaining access to Chicago and the Pacific coast, the Santa Fe rose to a position of national importance and played a large part in the development of the West. The last major railroad to build extensively in the state was the Missouri Pacific, most of whose expansion took place between 1879 and 1892.

Kansas wage earners in 1899. Among them, railway workers, regardless of in the train service or not, had worked as long as 8 years for their current jobs on average whereas miscellaneous male workers averaged 4.3 years on the jobs and building and female workers averaged less than 3 years. Railway workers enjoyed the most secure jobs while building and female wage earners were among the least attached to the workforce. Given the fact that current tenures were, on average, halfway through their completed spells under the condition of the steady state, the apparent gaps of current tenures across occupational group would become ever wider when the comparison is based on the completed job tenures.

The annual wages of the wage workers under survey were 513 dollars, but they varied greatly across occupational groups. Railway workers in train service, the group of workers who served longest on their jobs, had the highest annual wage earnings of 867 dollars while female wage earners made only 287 dollars a year. The inequality was also observed between railway workers in train service (Class *A*) and those in other miscellaneous trades (Class *B*). The wage differentials between them turned out to be as much as 260 dollars. Note that both groups of workers had worked almost the same period on their jobs so that the seniority effect on wages could not have made much difference. Annual wages for the workers in building and miscellaneous trades (male) were 386 dollars and 501 dollars, respectively. To make allowance for seniority effects on wages, initial wage earnings are calculated by averaging annual wages of those who had worked for present employers less than 1 year. They show almost the same degree of inequality. A railway worker in train service had a starting salary of 620 dollars while a miscellaneous railway worker made 463 dollars, a building worker, 372 dollars, a male worker in miscellaneous trades, 404 dollars and a female wage workers, 182 dollars.

The unionization rate among the sampled workers was very high, covering 44.9 percent but with as many as 96.4 percent of railway workers in train service.[7] The extremely high rate of unionization among railway workers in train service stems from the fact that the schedules for them were mailed to the secretaries of labor organization in the train service department (Kansas Bureau of Labor and Industry, 1900, p. 4). Although it is not clear whether other classes were surveyed in the same way, the special interest of the Bureau in labor organizations during the survey must have biased it towards selecting more organized workers. The proportion of foreign born workers among the sampled workers was 9.6 percent, but among railway workers in train service the foreign

7 According to Wolman (1924), the total membership of trade unions in 1900 was 868,500. When the Lebergott(1964)'s total number of employment in nonagricultural sector in table 3.3 is used, the unionization rate in 1900 is calculated to be 5.6 percent. In a same way, based on Wolman and Lebergott's estimates, I calculate the unionization rate of building trades of 9.1 percent and that of transportation sectors of 16.5 percent. All these rates proved to be much lower than those of corresponding occupational groups in Kansas.

born made up only 4.8 percent. This suggests that most of immigrants settled into relatively unskilled occupations and were mostly blocked from the skilled and high wage occupations. Most of female wage earners were single, or 99.2 percent of the total female wage earners, and their average age was 26 years old. This observation is in contrast with male workers who were 34.2 years old on average and 76.8 percent of whom were married. Among the female wage earners, unionization rate was relatively low, 1.5 percent, and immigrants accounted for only 3.8 percent of female workers in the survey.[8]

Ⅲ. WAGE MODEL

Within an internal labor market, market processes and competitive pressures are absent to set the price of labor equal to the opportunity wage in an external market where wages are determined at the point where the supply and demand for labor are equated, or at the level of marginal products of labor. Although internal labor markets operate in all jobs to some extent, they are more frequently observed in long term jobs as a set of rules and procedures is necessarily a part of a labor contract, whether explicit or implicit. In cross-sectional data, workers who have long jobs not only earn more than those with the same total labor market experience in the external labor market, but also are paid more than those who have less job tenure.

The human capital model provides one obvious economic explanation for this pattern (Becker, 1964; Mincer, 1974; Hashimoto, 1981). It incorporates investment in the human capital in wage determination mechanism. Workers undertake three major kinds of investment in human capital to get jobs: education and training, migration, and search for new jobs. Each involves an initial cost, which is made in the hope and expectation that the investment will pay off in future jobs. It also appears to be the case that a worker with a higher initial investment in human capital is more likely to get a job under the control of an internal labor market since his/her human capital acts as a 'screening' device to the employer who sets a higher level of quality of their job applicants in the 'entry port'. The workers who obtains this job earn higher wages from the beginning because of their high productivity due to their investments in human capital. Furthermore, the worker becomes more skillful at specific jobs over time as a consequence of training, learning by doing, and other forms of investment in job-specific human capital. The growth of wages with tenure within the internal labor market is attributable to the workers' share of rent arising from productivity growth through investment in firm-specific human capital.

[8] The national average of unionization of female workers were unknown until 1910. According to Wolman (1924), the percent of organization among female wage earners was 1.5 percent in 1910. Considering the fact that unionization rates tended to increase rapidly at the turn of the century, the female wage earners under survey seemed to be selected disproportionately among organized ones.

An alternative interpretation of such wage arrangements explains them without appealing to human capital and productivity growth. It argues that the positive cross-sectional association between current tenure on the job and wages is not sufficient evidence to establish that wages rise with seniority. According to Abraham and Farber (1987, P.279), "workers who are 1) better workers, 2) in better jobs, or 3) in better worker-employer matches earn more throughout their jobs and also stay on their jobs longer." It is straightforward to show that the distribution of seniority in a cross section has a higher mean for workers on longer jobs. Thus, as long as workers earn more from the start they have longer average completed job durations

A key question in this argument is why some workers are paid more than observationally equivalent workers from the start. Without minimum wage laws or other government rules, the existence of initial wage differentials means that for some reason it is unprofitable for some employers to offer the same wages as those in external markets. According to the efficiency wage literature (Shapiro and Stiglitz, 1984; Yellen, 1984), the difficulty of observing workers' efforts and the resulting higher monitoring costs are the main reasons for employers to offer higher wages. Coping with workers' moral hazard, the employer may elicit more effort from their workers either by watching them more closely or by offering them higher wages. A worker who is paid only his opportunity cost has little incentive to perform especially well since losing his job would not be costly. Thus, higher than opportunity cost wages would result in not only extracting more effort from the workers but also reducing worker's turnover. Firms which operate internal labor markets are relatively large and their tasks are complex. Both make it harder to monitor workers' efforts and to encourage them adopt efficiency wage scheme to keep workers from shirking.[9]

In short, the issue is whether and why wages rise with seniority. According to the human capital model, workers earn more with seniority, because of their increased productivity due to investment in human capital. Therefore, it could be said that causality runs from current tenure to the wages paid on a specific jobs. As opposed to this, the efficiency wage model suggests a reverse causality in the wage-tenure relationship. That is, a higher wage relative to alternatives causes a longer expected duration for the job because a worker earning a relatively higher wage is more likely to survive. Note that, according to this

[9] Burrow and Summers (1986) and Esfahani and Salehi-Isfahani (1989) adopt the efficiency wage theory to explain dual labor markets. My explanation of wage differentials between an internal labor market and a spot market is basically in agreement with those attempts. Huberman (1991) uses the same kind of framework to examine the historical question of price and quantity adjustment for the cotton spinning industry in Lancashire, 1822-1852. Fairris and Alston (1993) argue that the distinction between efficiency wage and compensating payments is vague and any increase in labor intensity by efficiency wage payments calls for a compensating payment for the increased disutility of work. However, in their effort to simultaneously estimate the determinants of earnings and intensity, they find that efficiency wages are associated with increased intensity but that increased labor intensity does not produce a positive compensating payment.

argument, wages are ultimately associated with the eventual length of service on the job, or completed job tenure, but to less extent with current job tenure.

To incorporate the arguments above into an empirical setup, let's consider a wage determination model. Assume that the wage of individual i in job j at period t is determined by the following equation.

$$\ln W_{ijt} = B_0 X_{ij} + \beta_1 \mathrm{EXP}_{ij} + \beta_2 S_{ijt} + \varepsilon_{ijt} \tag{1}$$

$$\varepsilon_{ijt} = \varepsilon_i + \varepsilon_{ij} + \mu_{ijt}. \tag{2}$$

The variable W is hourly earning, X_{ij} is a vector of characteristics of the person and job, EXP_{ij} is pre-job experience, S_{ijt} is current job tenure, and ε_{ijt} is the error term. The error term consists of a fixed individual effect ε_i, a fixed job match effect ε_{ij}, and a transitory component μ_{ijt}. Higher order terms in regressors are suppressed for ease of exposition.

In equation (1), β_1 represents the returns to pre-job experience, including the returns to general human capital and any other growth in earnings that occurs automatically with time in labor markets. β_2 is the returns to tenure. The net return to tenure is appropriately defined as the difference between the coefficient on current tenure and the coefficient on pre-job experience, i.e., $(\beta_2 - \beta_1)$, ignoring second-order terms. A worker is more likely to stay in the current job when the net return to tenure is higher. Thus, $(\beta_2 - \beta_1)$ can be alternatively interpreted as a tenure premium for working an additional year at the current job.

Several economists have noted the structure of the error term as constructed in equation (2) may produce inconsistent estimates of the equation (1). To the extent that heterogeneity across individuals, ε_i, and across job matches, ε_i, are unmeasured, they represent omitted variables when the wage equation (1) is estimated using cross-sectional data. In particular, the tenure variable, S_{ijt}, is likely to be correlated with the error ε_{ijt} in the following ways. First, I expect a positive correlation between tenure and the individual fixed effect ε_i. Lack of drive and perseverance and health problems, for example, are likely to be positively correlated with quits and layoffs which, in turn, are negatively correlated with tenure. Second, match heterogeneity ε_{ij} is also likely to be positively associated with tenure and wages because workers who are in better worker-employer matches earn more throughout their jobs and also stay on their jobs longer.

The error term ε_{ijt} in equation (1), therefore, induces an upward bias in OLS estimates of the wage-tenure profile. To eliminate the bias in regression analysis of equation (1), consider the strategy of conditioning the earnings equation on

completed tenure (Abraham and Farber 1987; Topel 1986). To give this idea structure, write the linear projection of ε_{ijt} on completed tenure as:

$$E(\varepsilon_{ijt}|T) = \Phi_0 + \Phi_1 T_{ij}, \tag{3}$$

where T is a completed tenure. The arguments in the preceding section implies that $\Phi_1 > 0$ in the sense that better worker and good matches survive longer. Following Abraham and Farber (1987), augmenting the standard cross-section earnings equation by adding T, as an explanatory variable, yields:

$$\ln W_{ijt} = B_0 X_{ij} + \beta_1 \mathrm{EXP}_{ij} + \beta_2 S_{ijt} + \Phi_1 T_{ij} + \Phi_0 + \zeta_{ijt}, \tag{4}$$

where ζ_{ijt} is random effect in equation (3). Note that ζ_{ijt} is orthogonal to S_{ijt}.

A major attraction of equation (4) is that it provides a direct estimate of the relationship between completed job duration and earnings, which represents the importance of the relationship of individual and match heterogeneity with earnings through job duration. Note that, by construction, a correlation between completed duration and wages does not imply that it is the length of the job that induces higher wages. Rather, it is likely that the higher earnings throughout the job provide an incentive for workers to remain on their job. Viewed in this light, the variable of completed tenure provides a useful device for investigating the existence of efficiency wages. The positive coefficient of the completed tenure would reflect the efficient wage scheme, at least to some extent.

Ⅳ. ESTIMATION AND INTERPRETATIONS

For the estimation that follows, I use hourly wage rates as the dependent variable. As Kansas BLS data report only yearly wage earnings of workers, I construct the hourly wage rates in the following way:

$$W_{hr} = \frac{W_{yr}/(309 - DAYUNEM)}{HR} \tag{5}$$

where W_{hr} is hourly wage rates, W_{yr} is total wage earnings during the year, DAYUNEM is total number of days unemployed, and HR is average working hours.[10]

For current job tenure, I use the length of time worked for the present employer as reported in Kansas BLS, 1899. At the empirical level, the definition of tenure is the duration of service for any position with a given employer

[10] In equation (5), the number, 309, represents the total number of workdays during a year. It is obtained in the following way: 309=365 days a year-52 sundays-4 holidays (Christmas, 4 the of July, Easter and Thanksgiving, or New Year).

rather than a particular positions with that employer. A problem is that the Kansas BLS do not provide the information on completed job tenure which is used in the augmented model, equation (4). Fortunately, I estimated expected completed job tenures, using the same sample, in other place (see Kim 1996a). There a duration model was adopted to estimate the completed job tenures. In general, a duration model enables one to estimate the expected duration conditional upon survival based on the relation as

$$E(t|s) = s + \frac{\int_s^{\infty} S(t)dt}{S(s)} . \tag{6}$$

$E(t|s)$ is conceptually equivalent to the expected completed job tenure of a wage earner who has stayed at least for the period of s in a current job, and used here for the variable T_{ij}. In the above equation, $S(\cdot)$ is a survival function.

Pre-job experience contributes to increasing wages, especially initial offers, through accumulation of general human capital and continuing search for better jobs. Since an appropriate information about pre-job experience was not canvassed in the Kansas BLS, I use age when the worker began the current job as a proxy of pre-job experience. By doing this, I assume that general human capital grew automatically with time and that level of education did not affect accumulation of human capital qualitatively.

I include a union dummy in the model as unions are supposed to raise wages by means of monopoly power or efficient bargaining (Oswald 1985). In addition to the union dummy, I use the interaction variables of the union dummy with the variables of current and completed tenures, such as union*current tenure, union*current tenure squared, union*completed tenure and union*completed tenure squared. These interaction variables enable one to see if wage profiles over seniority were substantially different between union and nonunion members.

I separate the workers into two groups by adding a dummy of frequency of payments, where I assign 1 for workers who were paid monthly or less frequently and 0 otherwise. I assume that workers paid monthly or less frequently were guaranteed a higher job security than those otherwise in the sense that the frequency of payment was likely to be negatively associated with the consistency and regularity of the jobs they worked on. If the wages were determined under the compensation scheme 'within' occupational groups, the sign of its coefficient would be negative.

Urban workers were expected to be paid more due to higher living costs and other urban disamenities such as crowding. To capture this aspect, I introduce a dummy which distinguishes workers between urban and rural workers. The Kansas BLS data canvassed the counties where the workers lived but not cities and towns. So, I referred to U.S Twelfth Census 1900 to locate cities and

towns in each county. I consider persons as urban workers if they lived in a county that contained any city with a population over 10 thousand peoples. Besides, I include a immigrant dummy (if born outside the U.S., =1 and 0 otherwise) to see if there existed labor market discrimination against immigrants in terms of wages.

Tables 3-7 contain estimates of wage equations by occupational group. In each table, I present three sets of estimates: the first one is for the simple OLS model, equation (2), which does not control for completed job duration; the second one is for the augmented model, equation (4), which includes completed job duration as a regressor; and the last one is for the model where I add the interaction variables of the union dummy with tenure variables to the augmented model. I begin by classifying the workers into three occupational groups, railway workers, building workers and workers in miscellaneous trades, as the workers in each group were found to be almost identical in terms of job-separation behavior.

First, consider the regression results for railroad workers, given in table 2. Most interesting is the change in significance of the current tenure variables in the simple OLS model and augmented OLS model. That is, the current tenure which is significant in the simple model becomes insignificant after controlling for completed tenure. This implies that most of the cross-sectional correlation between hourly wage rates and seniority on the simple regression model reflects the influence of omitted variables. Instead, the variable of completed tenure proves to be significant in the augmented model. From this, one might say that, among railway workers, job-match heterogeneity dominated the accumulation of firm-specific capital for the increasing wage profile.

The variable of pre-job experience proves to be significant in all the models. It indicates that part of wage differentials among workers were due to general human capital accumulated before arriving at the current jobs, although it is not clear whether the human capital reflected a high level of education and job skills or continuous job search efforts.

The dummy of the frequency of payment also turns out to be significant. Its negative coefficient says that there was a wage premium for those who were paid daily, weekly or on piece rate. An interpretation of this is that railway workers who were paid relatively frequently were 'compensated' with higher wages as the shorter payment frequency implies less secure labor contracts intrinsically. Among railway workers, union members and urban workers received higher wages than nonunion members and rural workers, respectively.

However, it is a surprise to find that railway workers in train service earned 40-50 percent more than railway workers in miscellaneous trades. Were the technological differentials big enough to result in such a huge wage gap? I consider a part of this wage premium for the workers in railway service as reflecting an efficiency wage scheme. Note that it was hard to monitor railway workers in train service in the sense that their working places were not confined to a certain location.

[Table 3] Railway Workers

	(1)	(2)	(3)
Constant	-2.191***	-3.437***	-3.666***
	(-11.626)	(-9.376)	(-6.493)
Pre-Job Experience	0.011**	0.025***	0.024***
	(2.363)	(4.738)	(4.224)
Current Tenure	0.035**	0.012	0.042
	(2.385)	(0.752)	(1.635)
Current Tenure^2	-0.00002	-0.0002	-0.002
	(-0.030)	(-0.291)	(-1.542)
Complete Tenure		0.086***	0.105**
		(2.956)	(2.166)
Complete Tenure^2		-0.001	-0.002
		(-1.574)	(-1.588)
Union*Current Tenure			-0.046
			(1.404)
Union*Current Tenure^2			-0.002
			(1.550)
Union*Completed Tenure			0.002
			(1.550)
Union*Completed Tenure^2			-0.027
			(-0.466)
Union	0.271***	0.292***	0.640
	(2.633)	(3.004)	(1.296)
Paid Monthly or Less Frequently	-0.263**	-0.239**	-0.221**
	(-2.257)	(-2.144)	(-1.976)
Urban	0.178**	0.165**	0.160**
	(2.358)	(2.253)	(2.164)
Immigrant	0.043	-0.148	-0.103
	(0.355)	(-1.181)	(-0.773)
Train Service	0.406***	0.490***	0.472***
	(4.277)	(5.320)	(4.976)
R^2	0.400	0.469	0.483

***, ** and * indicate that the corresponding independent variables are significant at 1%, 5% and 10% significance level, respectively.

Notes: Numbers in parentheses are t-values. The F-statistic of the joint test for the interaction variables is 1.187.

[Table 4] Railway in Train Service

	(1)	(2)	(3)
Constant	-2.386**	-3.654***	-14.359
	(-6.753)	(-7.111)	(-0.985)
Pre-Job Experience	0.024***	0.035***	0.035***
	(3.540)	(5.048)	(4.973)
Current Tenure	0.032	-0.005	0.477
	(1.618)	(-0.232)	(-0.847)
Current Tenure^2	0.0008	0.0009	0.032
	(1.027)	(0.961)	(0.676)
Complete Tenure		0.101***	1.809
		(2.592)	(0.766)
Complete Tenure^2		-0.002	-0.063
		(-1.481)	(-0.690)
Union*Current Tenure			0.479
			(0.850)
Union*Current Tenure^2			-0.031
			(-0.659)
Union*Completed Tenure			-1.711
			(-0.725)
Union*Completed Tenure^2			0.062
			(0.673)
Union	0.432**	0.504**	11.216
	(2.114)	(2.570)	(0.768)
Paid Monthly or	-0.237	-0.095	-0.107
Less Frequently	(-1.038)	(-0.434)	(-0.489)
Urban	0.140	0.113	0.144
	(1.384)	(1.166)	(1.443)
Immigrant	0.025	-0.176	-0.194
	(0.126)	(-0.924)	(-1.011)
R^2	0.387	0.475	0.489

***, ** and * indicate that the corresponding independent variables are significant at 1%, 5% and 10% significance level, respectively.

Notes: Numbers in parentheses are t-values. The F-statistic of the joint test for the interaction variables is 0.700.

My interpretation of the efficiency wage scheme for those in train service was confirmed when I reran the regressions separately for the two groups of railway workers. The results are given in table 4 and 5. They share nothing in common in terms of significance of independent variables, implying that different forces were effective in the wage determination mechanism for both groups. For the

[Table 5] Railway in Miscellaneous Trades

	(1)	(2)	(3)
Constant	-1.706***	-1.305	-1.588*
	(-7.727)	(-1.436)	(-1.658)
Pre-Job Experience	-0.003	-0.009	-0.005
	(-0.550)	(-0.752)	(-0.435)
Current Tenure	0.036*	0.037*	0.056**
	(1.706)	(1.701)	(2.181)
Current Tenure^2	-0.001	-0.001	-0.001
	(-1.518)	(-0.251)	(-1.548)
Complete Tenure		-0.020	-0.013
		(-0.328)	(-0.200)
Complete Tenure^2		0.0001	-0.0001
		(0.112)	(-0.079)
Union*Current Tenure			-0.043
			(-0.673)
Union*Current Tenure^2			-0.00001
			(-0.002)
Union*Completed Tenure			0.001
			(0.004)
Union*Completed Tenure^2			0.001
			(0.155)
Union	0.156	0.155	0.284
	(1.381)	(1.345)	(0.197)
Paid Monthly or	-0.219*	-0.203*	-0.170
Less Frequently	(-1.842)	(-1.655)	(-1.342)
Urban	0.235**	0.226**	0.210*
	(2.147)	(2.022)	(1.726)
Immigrant	0.203	0.306	0.293
	(1.427)	(1.467)	(1.380)
R^2	0.273	0.278	0.314

***, ** and * indicate that the corresponding independent variables are significant at 1%, 5% and 10% significance level, respectively.

Notes: Numbers in parentheses are t-values. The F-statistic of the joint test for the interaction variables is 0.751.

railway workers in train service, pre-job experience, completed tenure and the union dummy turn out to be significant while for those in miscellaneous trades, the current tenure, the payment frequency dummy and the urban dummy are so. From these results, one may infer that the higher wages for those in train service were due to general human capital accumulated before getting the current

jobs, favorable job-match quality and a strong union effect, all of which led to a higher initial wages and, hence, indicated the operation of the efficiency wage scheme.

Perhaps the most interesting aspect of the regression results for railway workers in train service is that there is a very strong positive association between completed duration and earnings. Consider two otherwise equivalent workers: one of whom held a job that eventually last 10 years and the other whom held a sequence of two 5-year jobs. The railway worker in train service in the single 10-year job is estimated to have earned as large as 33.5 percent more in each year than the worker in the sequence of 10-year jobs. This large (completed) tenure premium would provide an explanation why railway workers in train service worked longer in their current jobs. Completed tenure had insignificant impact on wages of railway workers in miscellaneous trades, but current tenure did so. The estimated results in table 5 indicate that railway workers in miscellaneous trades earned 3.5 percent more in each year at the current jobs than what they expect to earn elsewhere.

A point worth mentioning here is that the interaction variables, shown in the last columns of the tables, turn out to be all insignificant. This is to say that tenure effect on wages, whether current or complete, was not particularly strong for unionized workers compared to nonunion ones. Unions played a role in raising wages in the workers in train service but not in changing their life-time profile of payment stream. The interaction variables are found to be insignificant for other occupational groups, too (see table 6 and 7). This is verified by the results of F-tests; the interaction variables, taken together, do not significant influence wages for all occupational groups. The F-statistics are provided in the notes of table 3-7.

Table 6 shows the regression results for the workers in building trades. None of the independent variables except the union dummy are significant. It implies that the wage equations do not properly explain the reward system for the building workers. In other words, market conditions might have been more important factors to cause variations of hourly wage rates across the workers than other nonmarket characteristics specified in the models, as predicted by the spot labor market. None of the tenure variables in equation (1) are significant in explaining the variation of wages among building workers. There was no tenure premium so that switching jobs did not cost them much. Note, however, that there existed the strong union effect on wages among building workers. Their coefficient of the union dummy is almost as big as that of railway workers in train service; unionized building workers received higher wage rates than the nonunionized by over 40 percent.

What about miscellaneous trades? Even though workers in this occupational group were most heterogeneous, the regression results shown in table 7 suggest that wages were determined on the basis of some regularities. Most importantly, both the current and completed tenure variables turn out to be significant. In

[Table 6] Building Trades

	(1)	(2)	(3)
Constant	-2.122***	-1.831**	-2.117**
	(10.233)	(-2.081)	(-1.727)
Pre-Job Experience	-0.003	-0.003	-0.004
	(-0.594)	(-0.598)	(-0.772)
Current Tenure	0.031	0.552	0.228
	(1.502)	(0.383)	(0.115)
Current Tenure^2	-0.001	0.002	0.005
	(-1.477)	(0.274)	(0.451)
Complete Tenure		-0.265	-0.057
		(-0.349)	(-0.054)
Complete Tenure^2		-0.004	-0.005
		(-0.413)	(-0.363)
Union*Current Tenure			-0.366
			(-0.052)
Union*Current Tenure^2			-0.0317
			(-0.100)
Union*Completed Tenure			0.063
			(0.020)
Union*Completed Tenure^2			0.019
			(0.104)
Union	0.426***	0.425***	0.485
	(2.778)	(2.743)	(0.140)
Paid Monthly or	0.190	0.197	0.203
Less Frequently	(1.387)	(1.389)	(1.401)
Urban	0.169	0.176	0.194
	(1.144)	(1.168)	(1.257)
Immigrant	0.201	0.218	0.235
	(1.167)	(1.221)	(1.255)
R^2	0.183	0.184	0.192

***, ** and * indicate that the corresponding independent variables are significant at 1%, 5% and 10% significance level, respectively.

Notes: Numbers in parentheses are t-values. The F-statistic of the joint test for the interaction variables is 0.267.

other words, human capital, match quality and efficiency wages all played a certain role in their reward system. See the magnitude of the coefficients of completed tenure, however: they are $0.5*10^{-4}$ and $-0.2*10^{-8}$, respectively. There is some evidence of the returns to favorable job-match, or efficiency wage scheme, but its effect on wages was almost negligible.

There existed positive tenure premiums for workers in miscellaneous trades. The worker who held the current job for 5 years is estimated to have enjoyed an annual tenure premium of 4.4 percent for staying at the current job. However, the thing is that the tenure premium decreased during early years of

[Table 7] Miscellaneous Trades

	(1)	(2)	(3)
Constant	-2.545***	-2.535**	-2.536**
	(-22.614)	(-22.734)	(-22.483)
Pre-Job Experience	0.007*	0.006*	0.006*
	(1.915)	(1.726)	(1.712)
Current Tenure	0.060***	0.060***	0.060***
	(3.501)	(3.420)	(2.914)
Current Tenure^2	-0.002***	-0.002*	-0.002
	(-1.973)	(-1.946)	(-1.599)
Complete Tenure		0.00005*	0.00001
		(1.898)	(0.159)
Complete Tenure^2		$-0.2*10^{-8}$***	$-0.1*10^{-8}$
		(-2.592)	(-0.809)
Union*Current Tenure			-0.007
			(-0.810)
Union*Current Tenure^2			0.0001
			(0.082)
Union*Completed Tenure			0.0001
			(1.392)
Union*Completed Tenure^2			-0.000001
			(-0.978)
Union	0.210**	0.205**	0.205
	(2.174)	(2.150)	(1.599)
Paid Monthly or	0.138**	0.152**	0.156**
Less Frequently	(2.271)	(2.533)	(2.594)
Urban	0.164*	0.161*	0.155*
	(1.931)	(1.925)	(1.836)
Immigrant	-0.175**	-0.170**	-0.165*
	(-2.001)	(-1.965)	(-1.879)
Male	0.190**	0.196***	0.204***
	(2.542)	(2.641)	(2.722)
R^2	0.169	0.193	0.201

***, ** and * indicate that the corresponding independent variables are significant at 1%, 5% and 10% significance level, respectively.

Notes: Numbers in parentheses are t-values. The F-statistic of the joint test for the interaction variables is 0.833.

tenure period: it began to increase after 15 years of tenure. This is in contrast with the consistent tenure premiums over tenure period for railway workers. This might provide an explanation why workers in miscellaneous trades had shorter job tenure than those in railway workers.

Union members and urban workers fared better. On the other hand, immigrant and female workers were disadvantaged, both of them were paid less by approximately 20 percent, respectively, than otherwise equivalent workers. One unexpected result shows up when one looks at table 7. The payment frequency dummy comes up with a positive coefficient. I expected a negative sign from it

based on a compensating differential wage scheme. I suspect that this contradiction was simply caused by heterogeneity of workers. That is, for a heterogeneous group of this kind, the dummy seems more likely to sort jobs into formal jobs where their tasks and payments were regular and informal jobs where they were not, rather than what I originally intended. If this explanation is accepted, then the rationale of the positive coefficient of the frequency of payment dummy would share that of wage differentials between railway workers and building workers.

V. CONCLUSION

I have found that wage determination mechanism was different across occupational groups. Wages of those who had long-term labor relations were higher and were probably determined under the rule of internal labor markets. Wages of those who had short jobs were lower and their determination mechanism worked more like a spot labor market. The wage differentials across occupational groups appear to have been in part due to efficiency wage scheme. For example, the difficulty in monitoring railway workers in train service caused them to be paid higher wages than others. The efficiency wages were also traced among the workers in miscellaneous trades, but in an intangible way.

Specific human capital accumulated during tenure on jobs was important for determining hourly wage rates of railway workers in miscellaneous trades and those in general trades. On the other hand, the general human capital obtained from the pre-job experience raised wages for railway workers in train service and miscellaneous workers, but it made no difference to other occupational groups. Workers in all occupational groups except for those in building trades earned tenure premiums in a way or another. Large and consistent tenure premiums offered to railway workers over tenure period gave them a motivation to be stable at their current jobs.

Although compensating wage schemes did not explain wage differentials across occupation groups well, there was some evidence of compensating wage schemes within occupational groups. For some occupational groups, workers who lived in urban area were paid more and so did those whose payment frequency was shorter and irregular.

Immigrant were paid equally in those occupational groups such as railway or building trades, but they were paid considerably less in the more general trades. Female workers were found to earn less money than otherwise equivalent male workers, which might be a sign of labor market discrimination against women. Unions played a certain role in raising wages, though the magnitudes of union effect varied depending on occupations. Union effects were most prominent for railway workers in train service and for building workers, while it is insignificant for railway workers in miscellaneous trades. However, unions did not alter their member's profile of long-term wage arrangements.

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