# Employment Relations in Dual Labor Markets (It's Nice Work If You Can Get It!)

Oi, Walter Y.

Working Paper No. 40
April 1986

# Employment Relations in Dual Labor Markets

(It's nice work if you can get it!)

by

Walter Y. Oi

Earnings depend on employer size and job tenure which, in turn, is longer in bigger firms. Several theories have been advanced to explain these two empirical regularities. R.A. Lester pointed out that large firms may practice wage leadership, are more likely to be organized by trade unions, have greater ability to pay, and, hire workers of superior quality.[1] Other theories direct attention to the way in which the level and structure of wages are affected by the presence of fixed employment costs and the need to monitor worker performance, to provide incentives for greater work effort, or, to compensate employees for arduous working conditions. Efficiency wage models offer yet another explanation for the firm size profile of wages. The theory and evidence supporting these models are, in my opinion, weak. Moreover, the models tacitly assume a background world of segmented labor markets.

The widely differing employment relations in the labor market were perceptively described by Doeringer and Piore. Casual labor and temporary help find work in spot markets where there is a simple exchange of wages for labor time. More complicated employment relations, which characterize lifetime jobs, are supported by implicit contracts. Based on their analyses of personnel policies in large firms and of pay and turnover of unskilled workers, Doeringer and Piore concluded that there was a dual labor market.

Fortunate individuals, mainly white and male, got good jobs in a primary labor market where they received training, high wages, and stable employment. Other, presumably, equally qualified, individuals are forced to work in a secondary labor market characterized by low wages, little chance for advancement, and high turnover rates. The wage differential between the two markets cannot be eliminated because workers in the two sectors constitute non-competing groups.[2] In principle, the primary sector includes all of the employment relations where pay and task assignments are guided by administrative rules. Primary jobs involve more than an exchange of money for labor time. Doeringer and Piore contend that 81.6 per cent of all employees were located in the primary sector.[3] One can quibble about the accuracy of their estimate, but it is reasonable to suppose that nearly all large firms establish internal labor markets. The high pay and nice work of primary sector workers are sustained in the Doeringer-Piore model by artificial entry barriers. Labor economists have to acknowledge that labor differs from non-human factors, jobs are usually described by composite bundles, and most employment relations are idiosyncratic. Alfred Marshall identified five pecularities which distinguished labor from other factors: the worker sells his work but retains property in himself, the seller of labour must deliver it himself, labour is perishable, sellers of it are often at a disadvantage in bargaining, and it takes a great length of time from providing additional supplies of specialized ability.[4] The importance of conditions at the work site, promotion opportunities, and unique jobs is implicit in Marshall's second peculiarity. Large firms in the primary sector tend to adopt team production methods and design compensation plans that generate economic rents for a majority of their employees. Good pay and pleasant jobs are, I shall argue, the results of a market equilibrium in which firms as well as workers are heterogeneous. High pay and long jobs in big firms are sustained by scarce but able entrepreneurs.

## 1. Firm Size Profiles of Wages and Job Tenures

Wages are higher and job tenures longer in larger firms and plants.[5] The magnitudes of these differences is described in Table 1. The wage difference between large and small firms in the U.S. was 54.1 per cent in 1983. The difference in monthly earnings in large vs. small firms was 34.2 per cent in Japan and 31.3 per cent in Korea.

Labor turnover rates are substantially lower in larger firms. The difference in the mean duration of job tenure between large and small firms was (8.93 - 4.20) = 4.73 years. Although most jobs are of short duration lasting an average of only 3.9 years, a typical week of employment will be supplied by a worker who will hold his job for an average of 18.3 years.[6] Jobs are likely to be more durable when the employment relation yields positive post contractual rents for both the worker and the firm. Reference to Table 1 reveals that, with the exception of professional workers in Korea, employees in large firms enjoy higher wages and longer job tenures in Japan and Korea. These empirical regularities evidently hold in virtually all labor markets.

The separate effects of firm and plant size on wages can be seen from the data of Table 2. Men's wages in small establishments (P1 in Table 2) climb from $ 7.119 to $ 9.349 across the five firm size groups, an increment of 38.4

per cent. In the largest firms with 1,000 or more employees, the increment due to plant size is 28.3 per cent. Female wages rise by 20.8 per cent moving across the firm size categories in P1, while the plant size effect on wages in large firms, F5, was 33.8 per cent. The separate tabulations for Manufacturing and Wholesale/Retail Trade indicate that the firm size variable has a stronger effect in Manufacturing. The large plant size effect in Trade may be the result of heterogeneity across three-digit industries in Trade.[7]

The influence of other variables on the relation of wages and size was studied by estimating three wage equations for samples of full-time employees classified by sex and industry. Equation (1) is the log-linear counterpart to Table 2 where the log of average hourly earnings is regressed on 8 firm/plant size dummy variables. In equation (2), I add a vector of worker/job characteristics X, while equation (3) includes dummy variables for unionism and pension plans.[8] The percentage differentials shown in Table 3 describe the difference in the geometric mean wage in the i-th size category in relation to the mean wage $W_0$ of employees in the smallest firms, 1-24 employees.[9] With no adjustments, eq. (1), the wage increment enjoyed by men in small plants of medium sized firms, MF/SP, was 25.7 per cent above the base wage of $ 6.62 paid to men in small firms. Inclusion of the worker traits in equation (2) reduce these two wage increments to 15.0 per cent, MF/SP, and 25.9 per cent LF/LP. Controlling for unionism and the presence of pension plans reduce these wage differences to 4.0 and 17.0 per cent. These wage increments due to plant and firm sizes are somewhat smaller for females, 17.7 per cent for MF/SP and 41.2 per cent in LF/LP. However, controlling for worker characteristics in equation (2) reveals that the <u>relative</u> wage differential due to plant/firm size are roughly the same for women and men.

A strong firm size effect is evident from the results reported in the second panel of Table 3. The partial effect of plant size is trivial, less than 5 per cent in large Manufacturing firms. Holding worker traits constant, the wage difference due to firm size in Trade was only 7 per cent. Similar patterns are observed for females in these two industries. The size of the wage differentials due to plant and firm size is substantial and calls for an explanation.

## 2. Spreading the Fixed Employment Costs

Forging an employment relation is costly. In the search models of G.J. Stigler and others, individuals allocate time and money to seek a higher wage from a distribution of wage rates. Jobs are composite bundles where the wage is only one, but possibly the most important, component.[10] The costs of finding suitable employment are likely to be higher if the searcher plans to be in the labor market for longer periods or if she/he is more highly educated or has specialized skills. Indeed, search could represent the largest part of the mobility costs of changing jobs. In equilibrium, wages must be sufficient to cover any fixed costs that might be incurred in securing the job.

On the demand side, a firm's outlays for recruiting and training constitute a fixed cost that drives a wedge between a worker's expected marginal value product, MVP*, and his wage W. Higher fixed costs call for a higher quasi rent, $Q = (MVP^* - W)$ which amortizes F over an employee's expected period of employment T.[11] Firms that incur high fixed employment costs have an obvious incentive to adopt pay and employment practices that extend T thereby spreading the burden of the fixed, overhead cost.

In a world of asymmetric information where workers know their quit propensities but firms do not, Salop and Salop showed that firms can attract stable employees through self selection by requiring them to post bonds. If front end bonds are infeasible, due, say, to capital market imperfections, the same outcome could be achieved by introducing an upward sloping wage profile.[12]

The backloading of pay could be prompted by reasons other than the spreading of exogenously fixed employment costs. Becker and Stigler (1974) argued that postponing pay may be an effective means of preventing malfeasance by employees in positions of trust. This same argument appears in the agency model of Lazear (1979) where seniority pay premiums deter shirking and give employees an incentive to put forth greater work effort. The empirical evidence presented by Hashimoto and Raisian (1985) and Brown and Medoff (1986) reveals that employees in large firms do face steeper wage profiles.

## 3. The Monitoring Cost Hypothesis

A firm in the Alchian-Demsetz model coordinates inputs and monitors their performance. If large firms incur higher supervision costs, they will demand more productive workers.

Consider a model in which a firm has one entrepreneur with a fixed supply of calendar time $\bar{H}$ which is allocated to monitoring workers hM or managing production. Output is a function of labor N and management T, $X = f(N,T)$ where N and T are measured in efficiency units, $N = \mu M$, $T = \lambda(\bar{H}-hM)$.[13] The firm's profits depend on the firm's choice of the number of workers M and worker quality $\mu$.

(3.1) $\pi - \pi(M,\mu) = PX - W(\mu)M.$

The conditions for profit maximization are,

(3.2a) $P\mu f_N = W(\mu) + \delta \quad [\delta = P\lambda h f_T]$

(3.2b) $PMf_N = MW'(\mu)$

The first states that the MVP of an additional worker $P\mu f_N$, is equated to its full price, the sum of the market wage plus the implicit monitoring cost, $\delta = P\lambda h f_T$. The second states that the return to moving to a higher quality labor is equated to its incremental cost, $MW'(\mu)$. The efficiency or quality level $\mu$ is attained where the marginal cost of hiring a more productive worker is equated to the average cost per efficiency unit of labor services as depicted in Figure 1.

(3.3) $$W'(\mu) = \frac{W(\mu) + \delta}{\mu}$$

Abler entrepreneurs with higher values of $\lambda$ command larger teams, but they also face higher implicit monitoring costs $\delta$.[14] It is thus efficient for an abler entrepreneur to demand more productive workers who can reduce the supervisory cost per efficiency unit of labor services. A positive relation between firm size M and wages $W(\mu)$, in this model is a result of efficient job matches where high-$\lambda$ entrepreneurs are matched with high-$\mu$ employees. In Part 5 below, I relax the tacit assumption that efficiency or productivity $\mu$ is an innate worker trait.

4. Efficiency Wages in the Primary Labor Market

In this class of models, labor productivity depends on the real wage, $\mu = \mu(W)$. Firms choose an efficiency wage W which minimizes the unit cost per efficiency unit of labor services $N = \mu M$. Yellon (1984) shows that the efficiency wage, and hence, the optimum productivity or effort per worker $\mu$, is attained when the elasticity of $\mu$ with respect to the wage is unity.[15]

$$(4.1) \quad \left(\frac{W}{\mu}\right)\mu'(W) = 1, \text{ or } \quad W'(\mu) = \frac{W}{\mu}$$

where $W(\mu)$ is the inverse of $\mu(W)$. Firms will not cut the efficiency wage even though there are unemployed persons who are willing to work at a lower wage because any wage cuts will lead to lower productivity on the part of incumbant employees. Yellon claims that efficiency wage models can explain the phenomena of rigid real wages, involuntary unemployment, and a distribution of real wages across otherwise identical workers.

In the Shapiro and Stilitz model, jobs in one sector, (call it the primary sector), require more effort e and pay a higher wage which compensates employees for the disutility of greater work effort. Absent supervision, opportunistic workers will shirk resulting in lower output and profits. Shirking can be deterred by raising the capture probability through surveilance and imposing higher penalities if caught. The "penalty" in the SS model takes the form of an opportunity cost wherein the firm pays a super-normal wage. An employee who shirks runs the risk of losing this high-wage job and entering the ranks of the unemployed where she/he gets a lower wage $\bar{W}$.[16] A "no shirk condition" describes the minimum wage W which deters <u>all</u> shirking given the mandated effort level e, income when unemployed $\bar{W}$, the surveilance or monitoring rate q, an exogenous separation rate from the primary sector b, and the interest rate r. In equilibrium, labor's marginal value product F'(L), is equated to the no shirk wage.[17]

$$(4.2)\quad F'(L) = W = \bar{W} + e + \left(\frac{e}{q}\right)\left[b\left(\frac{N}{N-L}\right) + r\right]$$

where N is the potential labor supply so that the unemployment rate is $U = \left(\frac{N-L}{N}\right)$. The equilibrium wage and employment in the primary sector L are depicted in Figure 2. Less monitoring, meaning a fall in q, increases the expected utility of shirking and shifts the NSC curve upward. Wages have to be advanced to prevent shirking, but this reduces the equilibrium level of employment. Equation (4.2) implies that increases in $\bar{W}$, e, b, and r will all result in upward shifts in the NSC curve resulting in higher wages W and lower employment L.

The SS model yields implications similar to those of an efficiency wage model. Unemployed workers realize a lower present value of utility and would be willing to work in primary jobs at a wage below the efficiency wage W. However, once employed at this lower wage, they behave in an opportunistic fashion and shirk.[18] The labor market in the Shapiro-Stiglitz world is characterized by the payment of super-normal wages and an equilibrium pool of unemployed workers who serve as role models showing that one can be made worse-off if she/he is caught shirking. This same idea appears in the dual labor market model of Bulow and Summers (1986).[19]

Competitive equilibrium in these models is non-optimal resulting in "too much" unemployment. Welfare can be improved by taxing profits and subsidizing wages. Instead of super-normal wages, shirking could be deterred by requiring performance bonds. This latter option is dismissed by arguing that firms might reneg.[20] The labor market in this contrived model is characterized by firms that have to pay super-normal wages to elicit greater work effort where the necessary supply price W is higher, the lower the rate of unemployment. The interaction of demand and supply for primary jobs thus generates an equilibrium pool of unemployed persons, (N-L), which serves as a disciplinary device. The authors admit that this is not the only explanation for unemployment, but they claim that it is a significant factor.[21]

It is instructive to explore a model in which the supply price of effort is derived from an individual's utility function, $U = U(W,e)$ with $U_W > 0$ and $U_e < 0$. Suppose that a secondary sector job provides a wage $W_0$ in return for supplying $e_0$ units of effort. An individual who holds such a job realizes a base utility of $U_0 = U(W_0,e_0)$. If a primary sector firm demands an effort level, $e > e_0$, it must pay a wage $W_1$ such that the utility of a primary job is at least as great as that of a secondary job; following Eaton and White (1983), we can call this the labor supply constraint.

(4.3) $U(W_1,e) \geq U_0$ [labor supply constraint]

The supply prices needed to elicit different levels of effort lie along an indifference curve $U_0$ which is fixed by the utility of the external job. An increase in the utility of outside work, (due either to a rise in $W_0$ or a fall in $e_0$), moves the individual to a higher indifference curve, $U_0^*$.[22] The efficiency wage which minimizes $W_1/e$, (the unit cost of labor services), is attained at point E where a ray through the origin is tangent to the indifference curve $U_0$. If wage income and effort are both normal goods, an increase in the utility of outside work will be accompanied by an increase in $W_1$ but a decrease in $e_1$.[23] These implications presume that worker performance is fully monitored.

With partial monitoring, a worker will perform and supply the requisite work effort if the utility of the primary job package, U(W,e) exceeds the expected utility of shirking $\hat{U}$ which is a weighted average of successful shirking, $U_s = U(W,e_0)$ and the utility from unsuccessful or foiled shirking, $U_f = U(0,e_0)$. In this formulation, I assume that loafing on-the-job entails some effort $e_0$ and that an unsuccessful shirker is fired and gets a zero wage.[24] The weight attaching to $U_f$ is simply the probability that a shirker will be caught and fired, the monitoring rate q. Performance meaning no shirking is thus assured when,

(4.4a) $U(W,e) \geqq \hat{U} = (1-q)U_s + qU_f$. [no shirk condition]

Let $U_c = U(W,e)$ denote the utility of complying with the effort standard. Equation (4.4a) can be rewritten, (4.4b) $$q \geq \frac{U_s - U_c}{U_s - U_f}$$

Compliance is assured if the monitoring rate q exceeds the ratio of the incremental gain from shirking relative to complying over the opportunity cost of being caught. At low levels only slightly above $e_0$, $U_c$ may fall below the utility of outside work $U_0$; in this case, the no shirk wage W is less than the certain supply price $W_1$ needed to compensate for the moderately greater effort, $e > e_0$. However, if e and hence W are increased, the expected utility of shirking climbs. There is some break-even wage $W_b$ such that $\hat{U}$ just equals $U_0$. This is defined by,

(4.5a) $$(1-q)U(W_b, e_0) + qU(0, e_0) = U_0$$

(4.5b) $$\frac{dW_b}{dU_0} = \frac{1}{(1-q)U'_{sw}} > 0 \qquad \frac{dW_b}{dq} = \frac{U_s - U_f}{(1-q)U'_{sw}} > 0$$

where $U'_{sw}$ = dU\dW evaluated at $(W, e_0)$. Increases in either the utility of outside work $U_0$ or monitoring intensity q raise the break-even wage at which shirking becomes the preferred option.

The supply price W needed to attract a non-shirking employee to a primary job thus depends on three factors: the utility of outside work $U_0$, effort required on the primary job e, and the monitoring rate q.

(4.6) $W = W(U_0, e, q)$

This supply curve is discontinuous. It is defined by the labor supply constraint (4.3) for compensating wages, $W = W_1 < W_b$, and by the no-shirk condition (4.4a) for higher effort levels.

(4.6a) $W = W_1(e, U_0)$ [for $W < W_b$: from $U(W_1, e) = U_0$]

(4.6b) $W = W(e, q)$ [for $W > W_b$: from $U(W, e) = (1-q)U_s + qU_f$]

The discontinuity in the supply curve, ABC, shown in Figure 4 occurs at B where given q, $\hat{U}$ exceeds $U_0$; compliance for effort levels above $e_b$ can only be obtained by paying a super-normal wage. A rise in the supply price of outside work raises the supply curve along the AB branch, but it has no effect on the right branch.

(4.7a) $$\frac{dW}{dU_0} = \frac{1}{U'_{cw}} \text{ [for } W < W_b\text{]} \qquad \frac{dW}{dU_0} = 0, \text{ [for } W > W_b\text{]}$$

The wage increment needed to elicit more effort is an increasing function of e, and it exhibits a discontinuity at B.

(4.7b) $$\frac{dW}{de} = \frac{-U_e}{U_w} > 0, \quad [W < W_b] \qquad \frac{dW}{de} = \frac{-U_e}{U'_{cw} - (1-q)U'_{sw}} > 0, \quad [W > W_b]$$

An increase in q raises the break-even wage and pushes the upper branch of the supply curve to the right to AB*C*.

$$(4.7c)\quad \frac{dW}{dq} = 0, \quad [W < W_b] \qquad \frac{dW}{dq} = -\left[\frac{U_s - U_f}{U'_{cw} - (1-q)U'_{sw}}\right] < 0, \quad [W > W_b]$$

Assume that the cost of monitoring a worker is an increasing function of its rate, $\delta = \delta(q)$ with $\delta' > 0$, $\delta'' > 0$, and that output is a function of the labor input measured in efficiency units, N = eM. The profits of a competitive firm will then be a function of three decision variables, employment M, effort e, and monitoring q.

$$(4.8)\quad \pi = Pf(N) - (W+\delta)M, \quad [N = eM,\ W = W(e,q,U_0 0,\ \delta = \delta(q)]$$

The first-order conditions for profit maximization are:

$$(4.8a)\quad Pef_N = W + \delta$$

$$(4.8b)\quad PMf_N = MW'_e, \qquad [W'_e = (dW/de) > 0]$$

$$(4.8c)\quad \delta'(q) = -W'_q \qquad [W'_q = (dW/dq) \leqq 0]$$

Eliminating M from (4.8b) and substituting into (4.8a) yields,

$$(4.8d)\quad W'_e = \frac{W+\delta}{e}$$

Since the firm in this model is a price-taker in both product and factor markets, the optimal choice of effort e and monitoring q is invariant to employment M. It is the same (e,q) which minimizes the full cost per efficiency unit of labor.[25] The equilibrium is depicted in Figures 5A and 5B.

The firm picks an optimum monitoring rate q* in Figure 5A such that no one shirks. The optimum effort level e* minimizes the unit cost of labor, $C = \frac{W+\delta}{e}$. The kink in the marginal effort cost curve, $W'_e$ can never lie to the right of the minimum at point E. The examples that I have examined lead me to conjecture that when effort and monitoring are simultaneously chosen, the kink in $W'_e$ and, hence, in the $-W'_q$ curve, will occur at the minimum of the unit cost curve C.[26] A more troubling implication of this model is that when the utility of outside work rises, as it does in the upswing of a cycle, the marginal effort cost curve $W'_e$ shifts upward. The efficiency wage W(e,q) in the primary sector rises, but the equilibrium effort level e* falls implying that worker productivity is counter cyclical.

Efficiency wage models ordinarily assume a world of identical individuals. Some receive higher wages in a primary sector where they put forth more effort. Workers have to be monitored to enforce compliance, and in equilibrium a worker's MVP has to exceed its efficiency wage by an amount equal to the monitoring cost. If firms choose both effort and monitoring intensities, the competitive equilibrium is unlikely to involve the payment of super-normal wages. Wages in the secondary sector are determined by competitive market forces. An expansion in primary sector demand will, in general, raise $W_0$ and the utility of outside work. Such an increase will affect the optimum (profit maximizing) effort level. However, in a model of identical individuals who exhibit a rising marginal disutility of effort, a rise in $U_0$ leads to a fall in e* which is contradicted by the data. Finally, it is claimed that these efficiency wage models can account for a distribution of real wage rates across otherwise identical individuals. If they are truly identical, they have the same supply curve of effort like ABC in Figure 4. Real wage differences could only arise if firms locate at different places on ABC, but in this event, all wage differences are simply compensating differences due to different effort levels.

## 5. Compensating Differences for Team Production

Transaction and enforcement costs can influence the choice of production methods and the composition of the work force. According to Alfred Chandler (1982), the success of many giant industrial firms can be traced to the introduction of standardized goods that are produced in large volumes using batch, assembly line techniques. The returns to specialized equipment and specific training are enhanced, and monitoring costs can be reduced by adopting rigid, integrated production organizations. The distinguishing feature of internal labor markets is, indeed, the presence of administrative rules that guide the allocation of labor resources. Production is often organized around teams. Joint production with fixed proportions makes it difficult to measure the contributions of individual team members. More importantly, if workers are asked to work in tandem, they can be expected to ask for wage premiums which is a point that was nicely developed by Dierdorf and Stafford.

Suppose that employment was offered at an hourly wage of $W_0 = 10$ where each individual can select her/his length of the work-week. The i-th individual maximizes utility, $U = U_i(X,L) = U_i(WH,\ T-H)$ where it is assumed for the moment, that non-wage income is zero. Let $U^* = U_i(WH^*,\ T-H^*)$ denote this maximum. This utility function could be expressed in terms of work-hours, $U = \Psi_i(X,H)$ where $\Psi'_{iH} = -U'_{iL} < 0$. In Figure 6, I show the equilibrium positions of two individuals where person 1 prefers leisure, $H_1^* < H_2^*$. For a given utility level, the wage income, $X = WH$, needed to induce H hours of work can be determined by inverting the utility function, $\Psi_i(X,H)$.

$$(5.1) \quad X = X_i(U_i^*,H), \qquad \frac{dX}{dH} = \left(\frac{U'_{iL}}{U'_{iX}}\right) = -\left(\frac{\Psi'_{iH}}{\Psi'_{iX}}\right).$$

In team production, the two individuals must supply the <u>same</u> number of workhours. If person 2 has to cut his work hours to the optimum of the first person, $\bar{H}_2 = H_1^*$, he has to be paid an income of $\bar{X}_2 = (D_2H_1^*)$, and the hourly wage is the tangent of a ray through $D_2$. Alternatively, person 1 could be asked to expand his work-hours to $\bar{H}_1 = H_2^*$. The wage income has to be raised to $\bar{X}_1 = (D_1H_2^*)$, and the hourly wage is now the tangent of the ray through $D_1$. The common work-week $\bar{H}$ which minimizes the hourly cost of labor is obviously attained at point E where $\bar{X}_1 = \bar{X}_2 = (E\bar{H})$ in Figure 6. Three remarks are in order: (1) the hourly labor cost, $\bar{W} = \bar{X}/\bar{H}$, is above the wage $W_0$ which allowed flexible hours; indeed, the difference, $(\bar{W}-W_0)$, is larger, the smaller is the elasticity of substitution of X for H; (2) the common length of the work-week $\bar{H}$ is less than the arithmatic mean of the optimum work-hours, $(H_1^* + H_2^*)\backslash 2$; and, (3) with only two individuals, standardization of the work-week can be accomplished with <u>no</u> gain in utility for either team member. However, if each is told that the hourly wage is $\bar{W} > W_0$, both will be dis-satisfied with the standard work-week. Person 1 will want to work fewer hours, while person 2 wants to work more hours. The firm must impose an hours restriction and has to be prepared for worker unrest about the length of the work-week.

Turn next to the case where a team contains three workers. For any given work-hours schedule H, we can rank the wage incomes needed to attain the utility with flexible hours given by (5.1). Suppose that when $W = W_0$, the three express the following preferences, $H_1^* < H_2^* < H_3^*$. If the work-week is set at $H = H_1^*$, it is reasonable to expect that $X_1^* < X_2 < X_3$. At the other end, if $H = H_3^*$, the income demands will be $X_1 > X_2 > X_3^*$.[27] If a firm has to pay the same wage to all of its employees, the supply price needed to assemble the team is given by the <u>maximum</u> of the compensating incomes $(X_i)$. In fact, the common wage corresponding to this maximum will produce an economic rent for one of the three team members. Given single crossing indifference curves, the size of the economic rent will be larger, the smaller is the elasticity of substitution of X for H, the wider the discrepancy in preferred work-hours of the marginal team members, and the closer is $H_2^*$ to the standard week $\bar{H}$.[28] The aggregate economic rents will be larger when the size of the team is expanded, and the dispersion in tastes and non-wage incomes is greater for the marginal members.

The length of the work-week is only one dimension of a composite job. According to G.S. Becker (1985), "Firms buy a package of time and effort from each employee with payment tied to the package." The hourly wage depends on the effort intensity of the job, $W = W(\epsilon)$. Each individual is endowed with fixed supplies of calendar time $\bar{T}$ and effort $\bar{E}$ which can be allocated to market work and household production. Individuals who have stronger preferences for effort intensive household activities such as child rearing, tend to choose less effort intensive market jobs paying lower wages.[29] Sex biased preferences and the allocation of effort could thus account for the observed female/male wage ratio.

Jobs that impose more arduous demands on employees have to pay higher wages containing compensating, equalizing differences. Two bodies of evidence support the proposition that unionized jobs, mainly in large firms, are associated with harsher working conditions. First, the wage equations estimated by Duncan and Stafford reveal that (a) workers do receive wage premiums for less desirable working conditions, and (b) union work requires more effort. The union wage differential of 31.3 per cent falls to 20.6 per cent when three working condition variables are added to the wage equation. Unionized employers also provide less time for training and rest breaks, and this adjustment reduces the union wage gap to 18.9 per cent.[30] Second, Brown and Medoff (1978) and Kim Clark (1980) found that unionism is associated with higher labor productivity. Kim Clark reported that in a sample of 53 newly organized cement plants, output per manhour rose by 8 to 10 per cent following unionization. These productivity gains could have been achieved by increasing the capital labor ratio, improving the organization of production, insisting upon a faster workpace, etc.. Prior to unionization, each firm presumably chose a job package (consisting of a wage, effort level, and monitoring rate) that maximized profits. If an employer tried to accelerate the workpace, the incremental costs of eliciting more work effort would have exceeded the incremental revenues from larger output flows. However, if union wage gains produce economic rents, the employer will try to recapture part of these rents by raising the mandated effort level. Disputes may arise about the speed of the assembly line, the length of coffee breaks, etc., but the parties will probably compromise at an effort level above that in the pre-union state.[31]

Effort intensive jobs (those that have faster workpaces on mechanized lines, require more physical/mental exertion of employees, establish more disciplined work settings, etc.), have to pay higher wages to compensate for the more arduous work. In the monitoring cost model of Part 3, large firms with high monitoring costs demanded more productive employees where higher productivity could have been obtained by demanding more effort. Within an internal labor market, an effort standard is likely to be applied to all employees within a given job classification. The wage-effort trade-off depicted in Figure 3 surely varies across individuals. The wage $\bar{W}$ needed to elicit the same effort level from all team members is determined by the maximum of the compensating (utility constant) wages applicable to the team members in a fashion analogous to that in the work-week example of Figure 6.[32]

Large teams in hierarchical organizations are more easily controlled by standardizing products and processes. J.M. Clark contended that this principle might be applied to the composition of the work force.

> "Standardization is one of the most pervasive terms in the lexicon of business. There are standardized products, standardized machines, standardized processes, and the satirist of Main Street, Mr. Sinclair Lewis, is doing his best to convince us that business is producing standardized people." [J.M. Clark (1923), p. 96]

Baron, Bishop, and Dunkelberg have shown that large firms spend more to recruit, hire, and train new employees. Big firms seem to follow the fixed-wage model of C. Pissarides where an employer announces a fixed wage, establishes hiring standards, and searches until it finds a suitable job applicant. They assemble teams of homogeneous employees and adopt relatively inflexible production techniques.[33] Small firms, on the other hand, follow the flex-wage model, perhaps because they face lower monitoring costs and are better able to redesign tasks to conform with the abilities of the new hires.[34]

## 6. Summation

The empirical evidence is unassailable. Employees in larger firms receive higher wages and hold their jobs for longer tenures. The wage-tenure profile also appears to be somewhat steeper in larger firms. Further, the proportion of total compensation put into fringe benefits tends to be higher in larger firms. The impact of firm size on wages, job tenures, and the compositon of the work force is qualitatively similar but quantitatively different across industries and occupations. The wage increment associated with larger firm size appears to be greater in manufacturing where the largest firms operate large establishments that use few part-time employees. The largest food store chains with 10,000 or more employees control numerous, comparatively small establishments, and their wages are only slightly higher than wages in very small food stores. Blue collar production workers apparently realize higher wage gains, (relative to white collar clerical staff) by working in large firms.[35] In this paper, I have examined four models that may help to explain these empirical regularities.

Firm specific investments in search and training, (forging employment relations and adapting to idiosyncratic production methods), constitute fixed employment costs that have to be amortized over an employee's expected period of employment. Efficient job matches with longer mean durations can be achieved by introducing an upward tilt to the wage-tenure profile. The slope of this profile will be steeper if a firm and its employees share the costs of acquiring firm-specific human capital. To the extent that these fixed costs are positively related to firm size, models of the type analyzed in Part 2 imply that wages and job tenures will also be positively related to firm size. If, however, suitable proxies for investment in firm-specific training and search were put into a wage equation, they should account for the gross wage differences; i.e. the residuals would be unrelated to firm size dummy variables.

The monitoring cost hypothesis assumed an underlying distribution of entrepreneurial abilities, $g(\lambda)$. High-$\lambda$ entrepreneurs employed more workers, but they also incurred higher implicit monitoring costs $\delta$ which could be more efficiently amortized by hiring more productive workers. One means of obtaining higher productivity is to employ more highly educated and stable workers (married men, single women, and full-time employees). Another is to establish a faster workpace and a more disciplined work setting.

The efficiency wage models of Part 4 admit that greater work effort can be elicited by paying higher wages, but the disutility of greater exertion invites shirking. It is presumed that this type of opportunistic behavior can be deterred by paying a super-normal wage which in combination with a low income for the unemployed, raises the opportunity cost of shirking. The theoretical support for this kind of model wobbles when the wage-effort trade-off is derived from an individual's utility function, and identical firms choose an effort level e and monitoring intensity q to maximize profits.

A team in the model of Part 5 is defined as a collection of individuals whose activities are guided by a common set of work rules. Adherance to standard working practices and placement in a discrete number of job categories with their accompanying standard rates of pay, describe a work setting in which infra-marginal employees realize positive economic rents. In the Doeringer and Piore model, pay and working conditions in the primary sector are protected from external competition by artificial entry barriers to product and labor markets. An alternative model proposed by Williamson, Harris, and Wachter (1975) views the internal labor market as an efficient organization that minimizes transaction and enforcement costs. It is a view that I endorse. There have to be gains from organizing production around teams and adopting rigid work rules. To the extent that workers object to these restrictions, resources must be allocated to enforcing compliance and monitoring performance. The labor market surely contains heterogeneous agents. Individuals with differing abilities and preferences search for suitable employments described by wages, working conditions, promotion opportunities, and "whether or not his associates will be such as he cares to have". Employers also care about whom they employ, for if they did not, they would not have spent so much on recruiting new hires and screening incumbants for promotion. The widely differing employment relations which we observe in the labor market are, I contend, the results of a competitive equilibrium in which heterogeneous workers and firms are striving to maximize utilities and profits.

## FOOTNOTES

1. The confused state of economic theory is illustrated by two excerpts from principles texts cited by Lester, notes 21 and 22, p. 65. One text argues that large firms may use their monopsony power to depress wages resulting in a negative relationship between firm size and wages. Another text contends that large firms with monopoly power can enjoy the luxury of paying superior wages.

2. This idea is credited to J.E. Cairnes (1874) who argued that capital as well as labor could constitute non-competing groups.

> "I shall be told ... that capital and labor can be shifted about from one occupation to another, ... is a mere figment of the economical brain, without foundation in fact. Once embodied in a form suitable for actual work, capital ... is for the most part, incapable of being turned over to other uses. ... Industrial skill is not a thing to be acquired in a moment, and that which a man possesses is the result, in general, of considerable time and outlay devoted to its acquisition." [Cairnes (1874) p. 65]

It is apparent that he understood specific capital and specific human capital. Cairnes recognized that some adjustments could be made by new entrants and the withdrawal of "worn out" labor. However, he concluded that all (wage) differences could not be equilibrated through resource flows across occupations. Cairnes model is evident in Clark Kerr's discussion of the balkanization of the labor market.

3. Their breakdown included 3.2 per cent in the Armed Forces, 11.8 per cent in public enterprises, 9.4 per cent in craft unions, and 24.0 per cent in structured small enterprises; confer Doeringer and Piore, Table 1, p. 42. I question whether the last two categories meet the criteria for inclusion in the primary sector. If I deduct these, 45.0 per cent of all employees are in the primary sector. The May 1979 CPS survey revealed that 39.0 per cent of all employees were in firms with 1,000 or more employees.

4. Confer Marshall's Principles, Book VI, Chapters 3, 4, 5, pp. 550-570.

5. Empirical support for these two relationships can be found in, among other places, Lester (1967), Mellow (1982), and Oi (1983b). The recent study by Brown and Medoff (1986) examines data from several sources and provides us with a longer bibliography of earlier studies.

6. As in R. E. Hall (1982), a job is defined by a worker-firm attachment. The mean duration of 8.93 years is taken from Table 1, U.S. workers in large firms in 1983; it represents a truncated mean which differs from the mean of a length-biased sample of completed spells of job tenure, the figure of 18.3 years which is taken from Akerloff and Main (1981) is based on Census data for 1967. The distinction between terminally weighted means and length biased means is explained in Hyman Kaitz (19 ) and Steven Salant (19 ).

7. Small establishments with 1-24 employees in Trade are mainly concentrated in Eating and Drinking Places and in Food Stores, while Trade employees in establishments with 1,000 or more persons tend to be in Wholesale Trade or in Department Stores.

8. The three equations were,

$$Y = SA_1 + e_1, \quad Y = SA_2 + XB_2 + e_2, \quad Y = SA_3 + XB_3 + ZC_3 + e_3$$

where Y = the log of the average hourly earnings. S is a matrix containing a unit vector for the intercept and eight dummy variables for the four larger firm size groups and two plant size groups. I combined plants with 25 or more employees into one group. The X vector includes education, experience, tenure, their squares, race, and marital status. Finally Z contains two dummy variables indicating if the individual is employed by a unionized firm or a firm that provides pension plans.

9. Let $W_i$ denote the geometric mean of hourly earnings in the i-th size group. The wage equation implies that $(W_i/W_0) = \exp.a_i$. Take the anti-log of the regression coefficient $a_i$ in the wage equation, subtract one, and express the result as a percentage. The results are the figures shown in Table 3. The underlying wage equations can be found in Oi (1985).

10. According to Marshall,

> "When a person sells his services, he has to present himself where it is delivered. It matters nothing to the seller of bricks whether they are to be used in building a palace or sewer, but it matters a great deal to the seller of labour who undertakes to perform a task of given difficulty whether or not the place in which it is to be done is a wholesome and pleasant one, or whether or not his associates will be such as he cares to have. In those yearly hirings which still remain in some parts of England the labourer inquires what sort of temper his new employer has quite as carefully as what rate of wages he pays." [p. 566]

The largest part of search costs are, I suspect, incurred to determine the subjective value of the non-wage aspects of the employment relation.

11. The quasi-rent Q which amortizes F is simply, $Q = (\frac{F}{r})[1-e^{-rt}]$. The implications of labor as a quasi-fixed factor are developed in Oi (1962) and Becker (1964). Estimates of F reported in Oi and in D.O. Parsons (1972) indicate that the degree of fixity is positively related to the wage for different grades of labor.

12. In the Salop and Salop model, quit propensities are exogeneous and are unaffected by the size of the wage premium in a two-part wage. Employees sort themselves; slow quitters choose upward sloping wage profiles while fast quitters prefer flat wage profiles. S. Nickell (1975) and W. K. Viscusi (1980) have developed similar models of self-selection. If wages are postponed to later periods, they will include interest so that the average wage for an upward sloping wage profile will exceed the flat wage.

13. Worker quality is measured by $\mu$, while an entrepreneur's capacity to convert calendar time into efficiency units of management T depends on her/his ability $\lambda$. I assume that each worker requires h units of the entrepreneur's calendar time to monitor performance. Finally, a worker's wage is an increasing function of productivity, $W = W(\mu)$ with W' and W" greater than zero. This model is described in Oi (1983a), and I reproduce only the main features here.

14. Cristopher Hall (1986) has produced a counter example in which $(dM/d\lambda) = 0$; i.e. better entrepreneurs do not control larger teams. Indeed, <u>all</u> firms hire the same number of workers in Hall's model. He reaches this result because he assumes an exponential wage function, $W(\mu) = \mu^A$. In my response, I argue that an exponential wage function is inconsistent with competitive market equilibrium.

15. This same equation gives the efficiency wage that maximizes profits for a firm choosing employment M and W to maximize, $\pi = Pf(N) - WM$, where $N = \mu M$. The first-order conditions are,

$$\frac{d\pi}{dM} = P\mu f_N - W = 0. \quad \frac{d\pi}{dW} = PMf_N\mu'(W) - M = 0.$$

Since $Pf_N = 1/\mu'(W)$, we get the result shown in equation (4.1).

16. One can interpret $\bar{W}$ as the income from unemployment insurance or household production. With only one sector, Shapiro and Stiglitz argue that the optimal U.I. income $\bar{W}$ set by an employer, should be zero.

17. Shapiro and Stiglitz assume a linear utility function for identical individuals. The net utility of a primary job is (W-e) which has to exceed the utility of an effortless alternative, $\bar{W}$ by an amount equal to the value of losing and regaining a primary job. This is the last term on the right of equation (4.1). Each primary worker has a probability b of leaving her/his job, but given the relative size of the unemployment pool, there is some probability of re-entry.

18. Individuals as well as firms are indentical in the SS model. Hence, an employed person who moves into the primary sector behaves just like her/his peers. He will shirk if offered a wage, $W < (\bar{W}+e) + (\frac{e}{q})[\frac{b}{U} + r]$.

A different kind of efficiency wage model is implicit in A. Weiss (1980) where workers of different abilities (productivities) are paid the same wage. An increase in the wage raises the average quality of workers, but each worker supplies her/his endowment of ability.

19. Bulow and Summers assume that workers in the secondary sector are perfectly and costlessly monitored. They are paid a wage $\bar{W}$ which is a constant, irrespective of the level of secondary employment. However, wages and employment in the primary sector are determined by the intersection of demand, $F'(L)$, and supply which is derived from a no shirk condition similar to that in Shapiro and Stiglitz. In the SS model each person either holds a primary job or is unemployed, but BS assume in their model of Part I that everyone is employed either in the primary or secondary sectors. In fact, if SS had simply relabeled things and claimed that each unemployed person really held a secondary job paying a wage $\bar{W}$, the SS model is seen to be virtually identical to the first BS model.

In Part IV of the BS paper, unemployment is introduced, but each individual <u>not</u> in the primary sector is indifferent between being unemployed or holding a secondary job.

20. Posting bonds or backloading pay as means to prevent shirking are dismissed because short-sighted firms will allegedly accept the bonds and fire workers. According to SS, "There is no way to discipline the firm from this type of opportunism." (p. 442].

In passing, if cyclical changes in employment L are generated by shifts in aggregate demand, real wages will exhibit a pro-cyclical pattern which is not borne out by the postwar data. Further, if changes in L are generated by shifts in the NSC curve, a 1 percentage point decrease in the unemployment rate will be accompanied by less than a 1 percentage point increase in output because of diminishing returns. This is clearly contrary to Okun's law.

Finally, the non-optimality of competitive equilibrium is, in this model, explained by diminishing returns; i.e. labor's marginal product, $F'(L)$ is less than its average product, $F(L)/L$. The model neglects the fact that capital and entrepreneurs have to be rewarded and that monitoring is costly. In long run equilibrium, competitive firms have to earn positive quasi-rents over and above the returns to labor, $Q = [F(L) - LF'(L)] > 0$, to cover any fixed and omitted costs.

21. Shapiro and Stiglitz write:

> "The type of unemployment studied here is not the only or even the most important source of unemployment in practice. We believe, however, that it is a significant factor in the observed level of unemployment, especially in lower paid, lower skilled, blue-collar occupations." [p. 445]

It is a second-best reason for unemployment. Greater effort is evidently profitable in the primary sector even though e is not identified as an argument of the production function. (We can presume that e is implicit in $F(L)$ because e is exogenous and fixed in the SS model.) The wage is the only admissable variable that can be used to secure compliance with the effort standard. The authors ignore the other sources of equilibrium unemployment that were categorized by W. H. Hutt.

Finally, if overpayment is more prevalent for low-wage blue-collar workers, their turnover rates should be lower than the turnover rates of high-skilled workers in the primary sector who get relatively smaller economic rents. It would be illuminating to assemble data to test this implication.

22. Implicit differentiation of (4.3) yields,

$$(dW_1/de) = -U_e/U_W > 0, \quad (dW_1/dU_0) = 1/U_W > 0.$$

The supply price $W_1$ is an increasing function of the effort e demanded by a primary sector employer as well as of $U_0$, the utility of a secondary job.

23. W and e are said to be normal goods if the marginal rate of substitution, $-(U_e/U_W)$, is an increasing function of both e and W; i.e. the slopes of indifference curves get steeper along any horizontal slice (increasing e) as well as along any vertical slice (increasing W).

24. Eaton and White assume that shirking entails zero effort. The argument is not affected by assuming different values for effort while shirking, or for the income when fired so long as $U_S > U_c > U_f$; i.e. successful shirking yields a gain, $G = (U_s - U_c)$, while unsuccessful shirking, if caught, inflicts an opportunity loss, $L = (U_s - U_f)$ greater than the gain. The hard problem which is not addressed here is that the model must be extended to an inter-temporal utility function where an individual can re-enter the primary market.

25. The unit cost is simply, $C = (\frac{W+\delta}{\delta})$. We have,

$$\frac{dC}{de} = (\frac{1}{e})[W_e' - (\frac{W+\delta}{e})] = 0, \qquad \frac{dC}{dq} = (\frac{1}{e})[W_q' + \delta'(q)] = 0$$

which are seen to be the same as (4.8d) and (4.8c).

Eaton and White minimize the full price of a monitored worker, $(W+\delta)$ for a given effort level. In their example of a super-normal wage, the firm could either reduce $(W+\delta)$ by reducing $\delta$, or it could establish a higher effort level. The latter adjustment path is not considered in Eaton and White.

26. From (4.7b) and (4.7c), we see that when $W > W_b$, $W_q' = (U_s-U_f)(W_e'/U_e)$. If the kink were to the right of E, the monitoring cost $\delta$ could be reduced by cutting q. If the kink occurred between D and E, the minimum unit cost would generate an economic rent for primary sector workers. In this event, an increase in q would enable the firm to raise the minimum cost effort level. My conjecture is that profit maximization will push the firm to point E where $W_1 = W_b$, and the utility of work is the <u>same</u> in both primary and secondary sectors.

27. This will be so if the indifference curves of two individuals cross only once. If $\sigma_{XH}$ is extremely small for person 2, (the middle individual), and $\sigma_{XH}$ is very large for person 3, then $\Psi_3$ could cross $\Psi_2$ twice resulting in a situation where $X_1^* < X_3 < X_2$ when $H = H_1^*$.

28. A numerical example based on a Cobb-Douglas utility function, $U = X^{\alpha}(T-H)^{\beta}$, illustrates these points. When X = WH, the case of no non-wage income, the utility maximizing supply of work hours is invariant to the wage, $H^* = (\frac{\alpha}{\alpha+\beta})$. Set $W_0 = 10$, T = 100 hours, and parameters for three individuals of $\alpha_1 = .4$, $\alpha_2 = .5$, and $\alpha_3 = .6$. With flexible hours, we have,

| | Person 1 | Person 2 | Person 3 |
|---|---|---|---|
| $H^*_i$ | 40 | 50 | 60 |
| $X^*_i = W_0 H^*_i$ | 400 | 500 | 600 |
| $U^*_i$ | 128.15 | 158.11 | 203.10 |

The standardized work-week which minimizes $\bar{W}$ is obtained by setting $X_1 = X_3$; this turns out to be, $\bar{H} = 48.99$ hours, and $\bar{X} = 510.27$. The hourly wage for team members is thus, $\bar{W} = 10.42$. Person 2 could have been induced to reduce his work-week from $H^*_2 = 50$ to $\bar{H} = 48.99$ in return for a cut in pay from $X^*_2 = 500$ to $X_2 = 490.10$. This individual thus enjoys an economic rent measured in consumption units of $(\bar{X} - X_2) = 20.17$. If person 2's optimum work-hours had been $H_2 = 55$, he would have received a smaller rent.

29. Becker assumed that earnings I depend on inputs of effort E and workhours H, I = I(E,H). If I(E,H) is homogeneous of the first degree, it can be rewritten as, $I = HW(\epsilon)$ where $\epsilon = E/H$ is the effort intensity per workhour. It is assumed that $W' > 0$ and $W'' < 0$ due to diminishing returns. This concept of effort differs from the labor augmenting index of efficiency where efficiency units are proportional to hours, N = eH which is implicit in the efficiency models of Part 4 above.

30. See Duncan and Stafford, p. 365 for definitions of their three working condition variables--machine use, availability of free time, and scale of effort expended at work. Training time averaged 3.8 hours per week for union members and 4.6 hours for non-union employees. Mincer (1984) reported that union members receive less formal training. Separate estimates of union wage differentials for male, blue-collar workers reported by Duncan and Stafford indicated smaller union effects.

31. Internal labor markets should respond to wage advances above competitive levels in ways that are similar to the responses of competitive labor markets to minimum wages. The analyzes of minimum wage effects by Walter Wessells, Belton Fleischer, and others show that when minimum wages are raised, firms respond by cutting fringe benefits and raising labor productivity by shortening the length of the work-week in retail trade.

32. In my earlier example, the commom package consisting of earnings and workhours, $(\overline{WH}, \bar{H})$, generated a utility of the primary job $U_p$ which equaled the utility of another job offering a choice of workhours at an hourly wage $W_0 < \bar{W}$ for <u>exactly</u> two marginal team members. If the team had three members, one of them realized an economic rent. This rent could, in principle, be recaptured by introducing an additional dimension to the job package. With three decision variables and three team members, the firm could keep all three employees on their respective constant utility indifference surfaces. Large firms with large teams appear to offer more complicated pay packages. This might be a response to the imposition of more rigidities in larger internal labor markets. I wish to thank Douglas Bernheim for directing my attention to this implication.

33. When workers are alike and perform tasks in the same prescribed way, surveilance costs can be reduced. Big firms make less use of part-time employees who require more supervision. Disruptions due to breakdowns and shortages of materials are costlier for batch, assembly processes. This might explain the tendency for big firms to engage in vertical integration and to spend more on industrial safety.

34. The obverse is pointed out by Doeringer and Piore (1971) who write:

> "Succinctly put by one engineer, enterprises `mold men to jobs, not jobs to men'." (p. 131)

Primary sector workers are also more likely to be paid at standard rates of pay where the wage is tied to the job rather than to the individual. Brown and Medoff (1986) at p. 38 reported that the percentage of employees who were paid at individually set wages was inversely related to establishment size.

35. Brown and Medoff caution that the sample is not random and contains mainly high skilled blue collar workers. This finding lends some support to the team production hypothesis. Blue collar workers are typically confronted by stricter work schedules, while white collar, clerical staff are often allowed to work on flex-time, etc..

REFERENCES


Addison, J.T., and Siebert, W.S., The Market for Labor: An Analytical Treatment, Goodyear Publishing Company, Inc., (Santa Monica: 1978).

Akerlof, G.A. and Main, B.G.M., "An Experience Weighted Measure of Employment and Unemployment Durations", American Economic Review 71 (Dec. 1981).

Barron, J.M., Bishop, J., and Dunkelberg, W.C., "Employer Search: The Interviewing and Hiring of New Employees", Review of Economics and Statistics, (Feb., 1985), 67, 43-52.

Becker, G.S., "Human Capital: A Theoretical and Empirical Analysis", New York: Columbia University Press for the NBER (1964).

Becker, G.S., "Human Capital, Effort, and the Sexual Division of Labor", Journal of Labor Economics 3, pt. 2 (Jan., 1985), S33-S58.

Brown, C. and J.L. Medoff, "Trade Union in the Production Process", Journal of Political Economy 86, (June, 1978), 355-378.

Brown, C. and J.L. Medoff, "The Employer Size Wage Effect", (Harvard Institute of Economic Research, Discussion paper No. 1202: Jan. 1986).

Bulow, J.I. and L.H. Summers, "A Theory of Dual Labor Markets with Applications to Industrial Policy, Discrimination, and Keynesian Unemployment", (NBER Working Paper No. 1666: July, 1985), forthcoming in Journal of Labor Economics, (1986).

Cairnes, J.E., "Some Leading Principles of Political Economy Newly Expounded", (New York: Harper, 1874), Part 1, Chapter 3, Section 5, pp. 62-65.

Calvo, Guillermo, "Quasi-Walrasian Theories of Unemployment", American Economic Review Proceedings, (May, 1979), 69, 102-07.

Chandler, A., "Global Enterprise", (Xerox, Harvard University: 1982).

Clark, K.B., "Unionization and Productivity: Micro-Econometric Evidence", Quarterly Journal of Economics, (Dec., 1980), 95, 613-639.

Deardorff, A.V. and F.P. Stafford, "Compensation of Cooperating Factors", Econometrica, (July, 1976), 44, 671-84.

Doeringer, P.B. and M.J. Piore, Internal Labor Markets and Manpower Analysis, D.C. Heath and Co., Lexington, Mass. (1971).

Duncan, G.J. and F.P. Stafford, "Do Union Members Receive Compensating Wage Differentials?", American Economic Review 70, (1980) 355-71.

Eaton, B.C. and W.D. White, "The Economy of High Wages: An Agency Problem", Economica, 50 (May, 1983) 175-181.

Fleisher, B.M., Minimum Wage Regulation in Retail Trade, American Enterprise Institute, (Washington: 1981).

Foss, M.R., Changes in the Workweek of Fixed Capital, Washington, D.C. (1981), American Enterprise Institute.

Hall, Christopher, "Heterogeneous Firms: A Consumer Report", Journal of Economic Inquiry, (forthcoming, 1986).

Hall, R.E., "The Importance of Lifetime Jobs in the U.S. Economy", American Economic Review 72, 716-24.

Hutt, W.H., The Theory of Idle Resources. Reprint. Indianapolis: Liberty Press ([1939] 1977).

Kaitz, Hyman, "Analyzing the Length of Spells of Unemployment", Monthly Labor Review 15 (1970) 11-20.

Lucas, R.E.,Jr., "On the Size Distribution of Business Firms", Bell Journal of Economics 9 (1978) 508-23.

Marshall, A., Principles of Economics, The MacMillan Co., New York: 1920.

Mellow, W., "Employer Size and Wages", Review of Economics and Statistics 64 (Aug., 1982) 495-501.

Mincer, J., "The Economics of Wage Floors", Research in Labor Economics, 6 (1984) 311-332.

Nickell, S.J., "Wage Structures and Quit Rates," International Economic Review 17 (Feb., 1976), 191-203.

Oi, W.Y., "Labor as a Quasi-Fixed Factor," Journal of Political Economy, (1962), 70: 538-55.

Oi, W.Y., "Low Wages and Small Firms," Report submitted to the U.S. Dept. of Labor Office of the Assistant Secretary for Policy Evaluation and Research (November, 1985).

Oi, W.Y., "Heterogenous Firms and the Organization of Production", Journal of Economic Inquiry 21 (April, 1983a) 147-71.

Oi, W.Y., "Fixed Employment Costs of Specialized Labor", in Measurement of Labor Cost, J.E. Triplett, ed. (1983b) 63-116.

Pissarides, C.A., Labor Market Adjustment, Cambridge: Cambridge University Press (1976).

Rosen, S., "Hedonic Prices and Implicit Markets", Journal of Political Economy 82 (1974) 34-55.

Salant, Steven, "Search Theory and Duration Data: A Theory of Sorts", Quarterly Journal of Economics, (1977), 91: 39-57.

Salop, J. and S. Salop, "Self Selection and Turnover in the Labor Market", Quarterly Journal of Economics 90 (1976) 619-627.

Stigler, G. J., "Information in the Labor Market," Journal of Political Economy 70 (1962) 94-105.

Triplett, J.E., The Measurement of Labor Cost, University of Chicago Press, Chicago, Ill, (1983), see pp. 1-60.

Wessels, W.J., Minimum Wages Fringe Benefits and Working Conditions, American Enterprise Institute, (Washington: 1980).

Yellen J.L., "Efficiency Wage Models of Unemployment," American Economic Review, Papers and Proceedings of the Ninety-Sixth Annual Meeting 74 (May 1984) 2,200-205.

Table 1

Wages, Earnings, and Job Tenure by Firm Size and Country

| | COUNTRY | WAGES | EARNINGS | JOB TENURE | EDUCATION |
|---|---|---|---|---|---|
| 1A. | U.S. 1983, All Private Employees | | | | |
| | Large, 1000+ | 9.638 | 19975 | 8.93 | 13.05 |
| | Small, 1-24 | 6.253 | 11199 | 4.20 | 12.22 |
| | Ratio | 1.541 | 1.784 | 2.215 | 1.068 |
| 1B. | U.S. 1979, All Regular Employees | | | | |
| | Large, 1000+ | 7.292 | 15459 | 8.71 | 12.70 |
| | Small, 1-24 | 4.880 | 9111 | 3.88 | 11.95 |
| | Ratio | 1.494 | 1.697 | 2.245 | 1.063 |
| 2A. | Japan 1979, All Regular Employees | | | | |
| | Large, 1000+ | 1.140 | 210.9 | 11.6 | |
| | Small, 10-99 | 0.763 | 157.1 | 7.4 | |
| | Ratio | 1.494 | 1.342 | 1.568 | |
| 2B. | Japan 1979, All Regular Employees | | | | |
| | Large, 1000+ | 0.336 | 65.9 | 10.0 | |
| | Small, 10-99 | 0.238 | 51.2 | 5.7 | |
| | Ratio | 1.412 | 1.287 | 1.754 | |
| 3A. | Korea 1980, Male Professional/ Managerial Workers | | | | |
| | Large, 500+ | | 580.8 | 5.1 | 14.8 |
| | Small | | 432.7 | 6.0 | 14.5 |
| | Ratio | | 1.342 | 0.850 | 1.021 |
| 3B. | Korea 1980, Male Production Workers | | | | |
| | Large 500+ | | 225.0 | 3.4 | 9.7 |
| | Small | | 171.4 | 2.1 | 8.8 |
| | Ratio | | 1.313 | 1.619 | 1.102 |

Notes: (a) U.S. data taken from the May CPS, (b) Wages refer to usual hourly earnings, (c) Earnings for U.S. are annual earnings and are monthly earnings for Japan and Korea, (d) Wage and earnings for Korea refer to persons 40-44 years of age.

TABLE 2

AVERAGE HOURLY EARNINGS BY FIRM AND PLANT SIZE: 1983

| | INDUSTRY/PLANT SIZE | F1 | F2 | F3 | F4 | F5 |
|---|---|---|---|---|---|---|
| Females | All Industries | | | | | |
| | F1 | 5.259 | 5.814 | 6.501 | 5.864 | 6.355 |
| | F2 | | 6.08 | 6.222 | 5.997 | 6.494 |
| | F3 | | | 6.67 | 6.594 | 6.995 |
| | F4 | | | | 7.414 | 8.003 |
| | F5 | | | | | 8.505 |
| | MANUFACTURING | | | | | |
| | F1 | 6.032 | 6.556 | 8.073 | 7.489 | 7.135 |
| | F2 | | 5.781 | 6.149 | 5.564 | 7.197 |
| | F3 | | | 5.858 | 5.918 | 6.994 |
| | F4 | | | | 6.958 | 7.519 |
| | F5 | | | | | 8.536 |
| | TRADE | | | | | |
| | F1 | 4.403 | 4.746 | 5.379 | 5.513 | 4.663 |
| | F2 | | 4.758 | 5.094 | 4.545 | 4.914 |
| | F3 | | | 5.625 | 6.045 | 5.597 |
| | F4 | | | | 8.396 | 6.754 |
| | F5 | | | | | 6.712 |
| Males | All Industries | | | | | |
| | F1 | 7.119 | 8.686 | 9.297 | 9.617 | 9.849 |
| | F2 | | 8.631 | 10.162 | 9.326 | 10.444 |
| | F3 | | | 9.616 | 10.161 | 11.085 |
| | F4 | | | | 9.424 | 11.748 |
| | F5 | | | | | 12.637 |
| | MANUFACTURING | | | | | |
| | F1 | 7.344 | 8.034 | 7.63 | 10.412 | 11.664 |
| | F2 | | 8.425 | 9.44 | 10.398 | 10.8 |
| | F3 | | | 8.898 | 9.572 | 10.528 |
| | F4 | | | | 9.618 | 11.322 |
| | F5 | | | | | 12.61 |
| | TRADE | | | | | |
| | F1 | 6.253 | 6.529 | 9.638 | 7.129 | 7.634 |
| | F2 | | 7.636 | 8.152 | 7.046 | 8.19 |
| | F3 | | | 8.778 | 9.884 | 8.526 |
| | F4 | | | | 7.839 | 11.774 |
| | F5 | | | | | 11.396 |

Table 3

Percentage Wage Differentials by Firm and Plant Size, 1983/a

| Percentage Wage Differential | MEN (1) | MEN (2) | MEN (3) | WOMEN (1) | WOMEN (2) | WOMEN (3) |
|---|---|---|---|---|---|---|
| All Industries | | | | | | |
| MF/SP | 25.7 | 9.6 | 4 | 19.7 | 13.5 | 9.9 |
| LF/SP | 36.5 | 12.4 | 4.1 | 21.7 | 14 | 7.6 |
| MF/LP | 32.8 | 15.3 | 9.2 | 22.4 | 13.5 | 9 |
| LF/LP | 62.6 | 27.8 | 17.4 | 41.2 | 26.1 | 16.8 |
| Mean Wage | 8.62 | 8.63 | 8.63 | 5.91 | 5.91 | 5.91 |
| Base Wage/b | 6.62 | | | 5.55 | | |
| No. in Sample | 7857 | 7833 | 7833 | 5998 | 5973 | 5973 |
| Manufacturing | | | | | | |
| MF/SP | 10.2 | -2.8 | -7.4 | 44.5 | 30.8 | 25.4 |
| LF/SP | 56.5 | 20.2 | 12.3 | 50.6 | 36.9 | 29.2 |
| MF/LP | 21.9 | 7.9 | 3.9 | 6.4 | 11.7 | 7.6 |
| LF/LP | 57.5 | 25.2 | 17.4 | 38.3 | 33.3 | 23.9 |
| Mean Wage | 9.47 | 9.47 | 9.47 | 6.33 | 6.33 | 6.33 |
| Base Wage/b | 6.88 | | | 5.21 | | |
| No. in Sample | 2669 | 2661 | 2661 | 1284 | 1275 | 1275 |
| Trade,(Wholesale/Retail) | | | | | | |
| MF/SP | 34.9 | 23.4 | 16.5 | 16.6 | 16.6 | 7.8 |
| LF/SP | 22.2 | 7 | -0.43 | 11.7 | 9.8 | 2.02 |
| MF/LP | 26 | 15.8 | 9.71 | 13.7 | 10.1 | 3.16 |
| LF/LP | 38.1 | 20.1 | 10.1 | 21.8 | 15.5 | 2.37 |
| Mean Wage | 7.16 | 7.17 | 7.17 | 4.79 | 4.79 | 4.79 |
| Base Wage/b | 6.17 | | | 4.38 | | |
| No. in Sample | 1696 | 1691 | 1691 | 1438 | 1433 | 1433 |

Notes: In equation (1), ln AHE is regressed on 8 firm/plant size dummy variables. Equation (2) includes education, tenure, experience, and industrial affiliation. Part-time employment, union, and pension are included in equation (3).

a. The percentage differential is the anti-log of the regression coefficient minus one, and expressed as a percentage.

b. The base wage is the anti-log of the intercept corresponding to small firms and small plants with 1-24 employees. It is reported only for eq. (1)

c. MF/SP denote a medium size firm with 100-499 employees and a small plant with 1-24 employees. LF/LP stands for a large firm with 1,000 or more employees and largish plant with 25 or more employees.

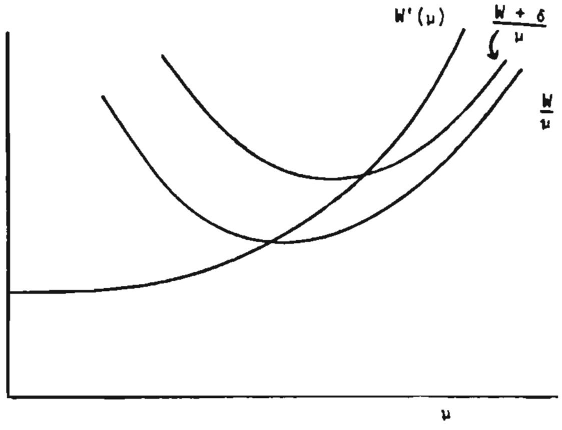


Figure 1

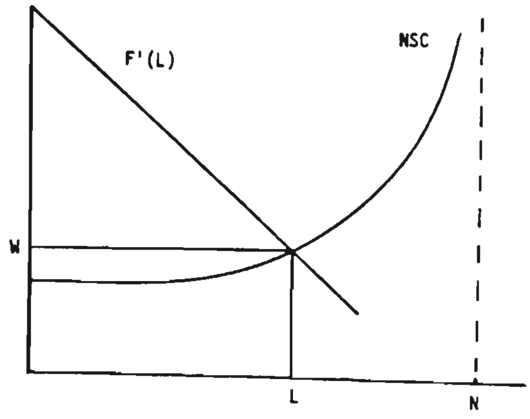


Figure 2

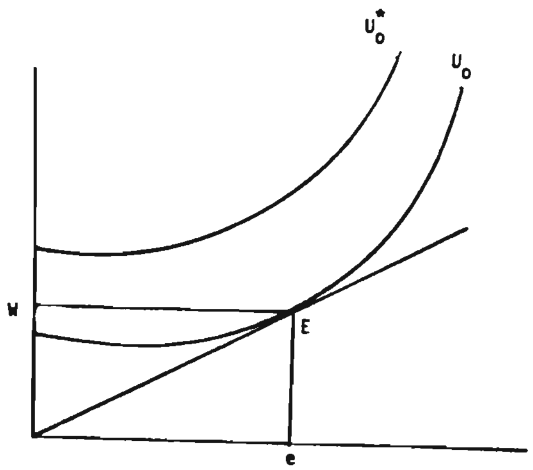


Figure 3

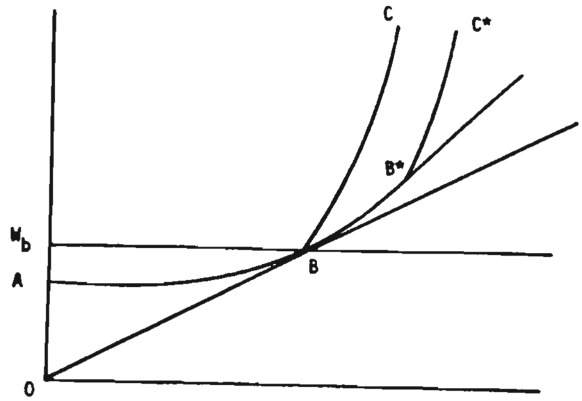


Figure 4

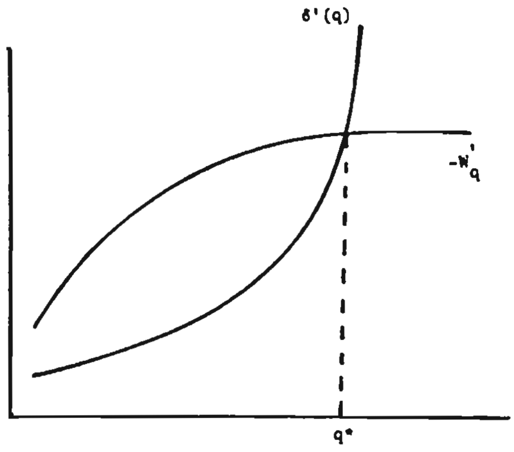


Figure 5A

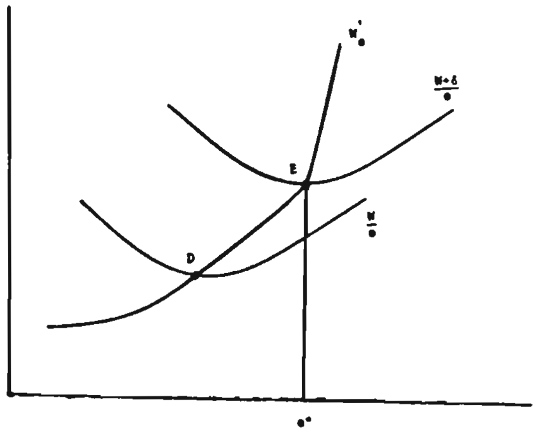


Figure 5B

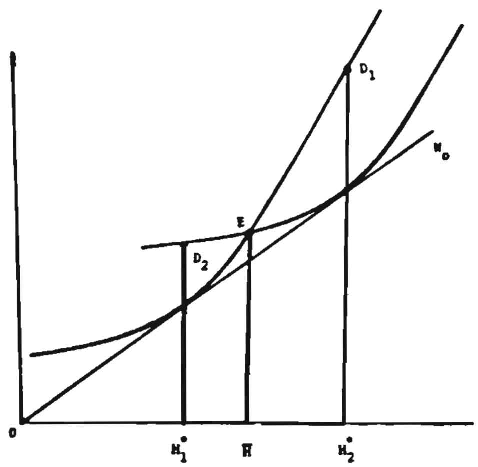


Figure 6

To order copies of the above papers complete the attached invoice and return to Christine Massaro, W. Allen Wallis Institute of Political Economy, RCER, 109B Harkness Hall, University of Rochester, Rochester, NY 14627. Three (3) papers per year will be provided free of charge as requested below. Each additional paper will require a $5.00 service fee which must be enclosed with your order. For your convenience an invoice is provided below in order that you may request payment from your institution as necessary. Please make your check payable to the **Rochester Center for Economic Research**. **Checks must be drawn from a U.S. bank and in U.S. dollars**.

---

W. Allen Wallis Institute for Political Economy

**Rochester Center for Economic Research, Working Paper Series**

---

**OFFICIAL INVOICE**

Requestor's Name ______________________________

Requestor's Address ______________________________

______________________________

______________________________

______________________________

Please send me the following papers free of charge (**Limit: 3 free per year**).

WP# ______ WP# ______ WP# ______

I understand there is a $5.00 fee for each additional paper. Enclosed is my check or money order in the amount of $__________. Please send me the following papers.

WP# ______ WP# ______ WP# ______

WP# ______ WP# ______ WP# ______

WP# ______ WP# ______ WP# ______

WP# ______ WP# ______ WP# ______