

Lindbeck, Assar; Snower, Dennis J.

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INTER-INDUSTRY WAGE STRUCTURE AND THE POWER OF INCUMBENT WORKERS

by

Assar Lindbeck and Dennis J. Snower

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Institute for International Economic Studies
S-106 91 Stockholm
Sweden

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Inter-industry Wage Structure and The Power of Incumbent Workers.

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I. Introduction

The apparent stability of the inter-industry wage structure across occupations, age groups, durations of job tenure, and countries has received renewed interest among economists. Industries which pay comparatively high wages to blue collar workers also tend to pay comparatively high wages to their white collar workers. The same tends to be true for a variety of occupational groups.¹ This regularity is also apparent for young and old workers and for workers with long and short job tenure². Such evidence suggests that wage differences among industries cannot be fully explained by differences in human capital or in seniority.

Turning from the stability of the inter-industry wage structure to its determinants, a few tentative empirical generalizations can be made. Industries which pay comparatively high wages tend to be characterized by high profits³, high concentration ratios in the product markets⁴, high capital-labor ratios⁵, and high union density.⁶

Various attempts have been made to explain this evidence. For example, according to the perfectly competitive theory of labor markets, inter-industry wage differences among workers with identically measurable

¹ See for example, Dickens and Katz (1986a).

² See Krueger and Summers (1986, 1988).

³ For example, Dickens and Katz (1986b), Blanchflower, Oswald, and Garrett (1987), Pugel (1980).

⁴ For example, Dickens and Katz (1986b), Kwoka (1983), Mishel (1982).

⁵ For example, Dickens and Katz (1986b), Lawrence and Lawrence (1985).

⁶ For example, Dickens and Katz (1986b), Podgursky (1982).

characteristics must be due to unmeasured differences in job attributes or in labor quality. However, it is beyond the scope of this theory to explain why inter-industry wage structure is related to inter-industry differences in concentration ratios and union density. Nor does the perfectly competitive theory explain why quit rates are comparatively low in the high-wage industries.⁷ (If the industries which pay comparatively high wages are compensating their workers for onerous jobs or high abilities, then it is not clear why these workers should be comparatively disinclined to leave their jobs.)

Another approach is to try to understand the inter-industry wage structure in terms of a competitive labor market model that is modified by adjustment costs. According to this approach, industries whose products are in rising demand are the ones which earn comparatively high profits and pay comparatively high wages. In this way, they encourage the entry of new firms and attract workers from industries whose products are in falling demand. This process is gradual and continues for as long as inter-industry demands are changing. In this context, the stability of the inter-industry wage structure across occupations, countries, age groups, and durations of job tenure may be viewed as the outcome of gradual, dynamic, free-market responses to changes in the composition of demand. The relation between wages and marginal profits across industries may be rationalized in this way as well. Note, however, that this approach does not predict wage differentials across industries with equal marginal profits and unequal average profits. Moreover, this theory, like the perfectly competitive approach, is not designed to explain how inter-industry wage differentials are related to inter-industry differences in concentration ratios and union density.

⁷ See Pencavel (1970).

A quite different explanation of the inter-industry wage structure is offered by the efficiency wage theory, which focuses on inter-industry differences in the relation between wages (on the one hand) and productivity and quit-related costs (on the other). In particular, industries which pay comparatively high wages are the ones who, according to the theory, are comparatively successful in eliciting work effort and reducing quits.⁸ However, since the theory assumes wages to be set in accordance with firms' profit-maximizing principles, it cannot explain the relation between wages and union density. Nor does the theory appear to have been successful in explaining the relation between wages and profits across industries.

This paper suggests another possible explanation of inter-industry wage structure, one arising from the insider-outsider theory.⁹ It does not share the particular drawbacks above and is complementary to the efficiency wage explanation. The basic idea underlying the paper is quite simple. According to the insider-outsider theory, wages are the outcome of a bargaining process whereby firms and their "insiders" (i.e. incumbent employees whose positions are protected by substantial labor turnover costs) share the economic rent from insider employment. In this context, the insiders' wages will be higher (*ceteris paribus*), the more their firms stand to lose from a breakdown in wage negotiations. We show that, under specified conditions, firms stand to lose more, the greater (a) their potential profit opportunities, (b) their capital-labor ratio, and (c) the concentration ratio and workers market power in their industries. In addition, our analysis suggests a further determinant of inter-industry wage structure: the industries that have comparatively high labor turnover

⁸ See Krueger and Summers (1988).

⁹ See, for example Lindbeck and Snower (1986; 1987a,b; 1988).

costs tend to pay comparatively high wages (*ceteris paribus*). The reason, of course, is that the greater these costs, the greater the rent from insider employment and, given the relative bargaining strengths of firms and their insiders, the higher the wage which the insiders will be able to achieve.

Our analysis is also meant to shed some light on why the industries which offer high pay to workers in one occupation tend also to offer high pay to workers in other occupations: The high-wage industries may be particularly vulnerable to the exercise of insider power. For example, industries which earn comparatively high profits tend to have a comparatively high stake in avoiding labor conflict among workers of all relevant occupational age, and, seniority groups.

Our model has two parts. The first describes the behavior of imperfectly competitive firms, each of which set their price, production, and employment levels. This part of the model is quite standard. The second part is less conventional; it deals with wage determination in the context of the insider-outsider theory.

We assume that the above decisions are made in two stages. First wages are set, taking the effect of this decision on prices, production, and employment into account. Then the price, production, and employment decisions are made, taking wages as given.

The paper is organized as follows. Section 2 deals with the firms' decisions. Section 3 describes wage determination as the outcome of a bargaining process between each firm and its insiders. Section 4 explores the implications of our model for inter-industry wage structure. Section 5 contains concluding remarks.

2. The Firms' Behavior

Let there be a fixed number (n) of identical firms in a particular industry, producing a homogenous product. Each firm has three factors of production: capital (K) and two labor inputs (L_A and L_B), corresponding to two occupations. It produces a nondurable output (q). Its production function is $q = f(L_A, L_B, K)$, where $f_i > 0$, $f_{ii} < 0$ for $i = 1, 2, 3$

Each firm is an imperfect competitor in the product market, defined by its industry. Let the industry-wide demand curve be

$$(1) \quad P = A \cdot \psi(Q),$$

where P is the product price and Q is industry-wide production. The elasticity of this demand curve,

$$(2) \quad \eta = - \frac{\partial Q}{\partial P} \cdot \frac{P}{Q} = - \frac{\psi}{\psi' \cdot Q} > 0,$$

is assumed to be constant.

We depict the firm's imperfectly competitive behavior in the product market by the simple device of letting the firm have a linear conjectural relation between its output and the overall industry output:

$$(3) \quad Q = Q_0 + v \cdot q,$$

where the firm takes Q_0 and v to be positive constants. This formulation has the advantage of simplicity without removing our analysis from the domain of conventional Nash bargaining games, on account of the following special cases: $v = F$ is the "cartel case"; in which all firms engage in joint profit-maximization; $v = 1$ is the "Cournot case"; in which each firm expects its production decisions to have no effect on the production decisions of the other firms; and $v = 0$ is the "Bertrand case"; in which each firm expects its production decisions to have no effect on the price

decisions of the other firms. (Since all firms produce a homogenous product, Bertrand conjectures give rise to perfectly competitive behavior).

In the industry-wide equilibrium, the firm's conjectures are correct. This consideration determines the equilibrium level of Q_0 : $Q = n \cdot q = Q_0 + v \cdot q$, so that

$$(4) \quad Q_0 = (n-v) \cdot q.$$

Let W_A and W_B be the nominal wages of labor of types A and B (respectively) and let R be the nominal user cost of capital. The firm takes these factor costs, together with its stock of capital (K), as exogenously given when it makes its price, production, and employment decisions.

The costs of labor turnover (which, as shown below, can be exploited by incumbents in wage bargaining) may come in a wide variety of guises. They include costs of hiring, training, and firing (e.g. Lindbeck and Snower (1984), Solow (1985)), insider-outsider differentials in cooperation and harassment activities (Lindbeck and Snower (1988a)), and effort responses to labor turnover (Lindbeck and Snower (1986)). However, for brevity (but without loss of generality), we consider only firing costs (e.g. severance payments) here.

The firm's incumbent workforces (m_A and m_B) of the two types of labor are historically given. The firm's total firing costs are $\sigma_A = \sigma_A(m_A - L_A)$ and $\sigma_B = \sigma_B(m_B - L_B)$, where $\sigma_A' > 0$ for $m_A > L_A$, $\sigma_A = 0$ for $m_A \leq L_A$, $\sigma_B' > 0$ for $m_B > L_B$, $\sigma_B = 0$ for $m_B \leq L_B$. Furthermore, we assume that the cost ($\tilde{\sigma}_A$) of firing a single insider of type A is a finite, positive constant, and similarly for the cost ($\tilde{\sigma}_B$) of firing a single insider of type B. The user cost of capital (R) is also exogenously given to the firm.

For simplicity, we suppose that the firm maximizes its profit (π) over one time period. Its decision making problem is

$$(5) \quad \text{Maximize } \pi = P \cdot q - W_A \cdot L_A - W_B \cdot L_B - R \cdot K \\ \text{ } q_A, L_B, L \quad - \sigma_A(m_A - L_A) - \sigma_B(m_B - L_B)$$

subject to

$$q = f(L_A, L_B, K)$$

$$P = A \cdot \psi(Q)$$

$$Q = Q_0 + v \cdot q$$

In the absence of firing, the first-order conditions for an interim optimum are

$$(6a) \quad \frac{\partial \pi}{\partial L_A} = f_A \cdot P + q \cdot A \cdot \psi' \cdot v \cdot f_A - W_A = 0 \\ = f_A \cdot P \cdot [1 + (q/Q) \cdot (Q \cdot \psi' / \psi) \cdot v] - W_A = 0 \\ = f_A \cdot P \cdot e - W_A = 0,$$

and

$$(6b) \quad \frac{\partial \pi}{\partial L_B} = f_B \cdot P \cdot e - W_B = 0,$$

where

$$(7) \quad e = 1 - \frac{v}{n \cdot \eta}$$

and $\eta = -(dQ/dP) \cdot (P/Q)$ is the industry-wide price elasticity of product demand. The term $(\eta \cdot n/v)$ may be interpreted as the firm's individual (conjectured) price elasticity of product demand. We call e the "market power parameter", since it is related to Lerner's index of monopoly power in the product market. In particular, let the proportional price-cost margin be $x = (P - MC)/P$, where MC is the marginal labor cost of production

(say, for t type A labor): $MC = (W/f_A)$. Since $P = W_A/(f_A \cdot e)$ by equation (6a), we find that $x = 1 - e$. Thus, as the market power parameter e rises, Lerner's index of monopoly power falls.

The behavior of the firm, as summarized by conditions (6a) and (6b), is taken into account when the firm engages in wage negotiations with its insider. We now turn to these negotiations.

3. Wage Determination

As noted, our account of wage determination rests on the insider-outsider theory. This theory presupposes the existence of substantial labor turnover costs, which generate economic rent and thereby permit insiders to exert market power. Furthermore, the insiders are assumed to exercise this power with a view to pursuing their own interests, rather than interests of "entrants" (newly hired workers) or "outsiders" (unemployed workers or employees whose positions are not protected by labor turnover costs). We suppose that insiders' wages are the outcome of a Nash bargain between each firm and its insiders.

The insiders may be assumed to bargain individualistically or collectively (e.g. through a union).¹⁰ According to one interpretation of the analysis below, the firm bargains singly with each insider, and both parties take the strategies of all other employees as given. Thus, the object of the bargain is the economic rent associated with the employment of the marginal insider. By another interpretation, the firm begins with a union comprising all the firm's insiders and the union wage objectives are formulated so as to ensure that all insiders are retained. Here, too, the

¹⁰ Existing empirical evidence indicates that industry wages are positively related to union density. However, union density does not appear to account for the lion's share of inter-industry wage differences and, besides, as Krueger and Summers (1986b, p.19) note, there is reason to believe that the relationship may not be a casual one.

object of the bargain is the economic rent associated with the employment of the marginal insider. Our aim is to avoid tying our explanation of inter-industry wage structure closely to assumptions about the presence of or absence of unions, since this wage structure is similar in countries which differ significantly with regard to unionization.

To fix ideas, however, our discussion will follow the former interpretation. Specifically, imagine a firm and an insider of type A bargaining over the insider's wage W_A . We assume that the firm has already reached wage agreements with all other insiders, whereby these workers are retained, type-A insiders receive the wage \hat{W}_A , and type-B insiders receive \hat{W}_B . We assume that all the firm's insiders of a particular type (A or B) are identical in terms of their productivity, bargaining strength, and turnover costs. Work is taken to be a discreet activity, so that an employee can be either fully employed or fully unemployed.

If the firm reaches an agreement to retain the insider (at a particular wage) with whom it bargains, then its type-A incumbent workforce will be m_A (since all other type-A insiders are retained as well). If an agreement is not reached, with the consequence that the remaining insider is fired, then the firm must decide whether to keep the insider's position vacant or whether to replace him by an outsider. As shown in Lindbeck and Snower (1988), this decision depends (among other things) on the size of the type-A incumbent workforce. (With diminishing returns to type-A labor, replacement is optimal when m_A is sufficiently low, and keeping the position vacant is optimal when m_A is sufficiently high.) For brevity, we simply suppose that the parameters of the firm's profit-maximization problem (including m_A) are such that keeping the position vacant is the optimal choice.

Assuming that the type-A incumbent workforce is "large" (so that a single type-A insider represents a negligibly small fraction of this workforce), the difference between the firm's profit in the presence and in the absence of an agreement is:

$$(8) \quad C = \left\{ P \cdot \frac{dq}{dL_A} + q \cdot \frac{dP}{dL_A} - (W_A - \tilde{\sigma}_A) \right\} \cdot dL_A$$

$$= \{ G_A - (W_A - \tilde{\sigma}_A) \} \cdot dL_A,$$

where

$$(9) \quad G_A = A \cdot \psi [Q_0 + v \cdot f(m_A, m_B, K)] \cdot f(m_A, m_B, k) \cdot e,$$

which is the marginal revenue product of type-A labor, $f_A \cdot P \cdot e$, evaluated at the incumbent workforces m_A and m_B .

Let the difference between the type-A insider's utility in the presence and in the absence of an agreement be given by

$$(10) \quad (9) \quad D = W_A - R_A$$

where R_A is the insider's reservation wage. (The latter is the wage at which the insider would be indifferent between employment and unemployment; it depends on such things as the level of unemployment benefits, the disutility of work, etc.).

Within this setting, the insider's wage may be derived as the solution to the following generalized Nash bargaining problem:

$$(11) \quad \text{Maximize } \Omega = C_A^\alpha \cdot D_A^{1-\alpha},$$

$$W_A$$

where α is a constant ($0 \leq \alpha < 1$) which measures the bargaining strength of the firm relative to that of the insider. Note that since the insider is assumed to capture at least some of the available economic rent, α must be less than unity.).

The first order condition of (10) yields the following negotiated wage:

$$(12a) \quad W_A^* = \alpha_A \cdot R_A + (1-\alpha_A) \cdot [G_A + \tilde{\sigma}_A].$$

Since all of the firm's type-A insiders face the same bargaining environment, they all receive W_A in equilibrium. Similarly, all the firm's insiders of type-B receive the following wage:

$$(12b) \quad W_B^* = \alpha_B \cdot R_B + (1-\alpha_B) \cdot [G_B + \tilde{\sigma}_B],$$

where α_B , R_B , and G_B , are defined analogously to α_A , R_A , and G_A (respectively). Observe that if $\alpha, \beta = 1$ (complete firm market power, which we rule out by assumption), then $W_A^* = R_A$ and $W_B^* = R_B$, as the perfectly competitive model of the labor market would predict. However, so long as $\alpha, \beta < 1$ (i.e. workers have some market power), then the marginal value products of labor (G_A and G_B) and the marginal turnover costs ($\tilde{\sigma}_A$ and $\tilde{\sigma}_B$) have a role to play in wage determination.

4. Inter-industry Wage Structure

Now consider the implications of this analysis for the inter-industry wage structure. To fix ideas, let us compare two industries, each containing a fixed number of identical firms. We assume that these industries differ in terms of profits earned, capital-labor ratios, and concentration ratios and degree of insiders' market power. Furthermore, in line with the analysis above, let the two types of labor work in each industry. These may be interpreted as workers with different occupations, different abilities (perhaps related to age), or different bargaining

strengths (perhaps related to seniority¹¹). Our object is to show that

(a) the inter-industry wage structure depends on the profits,

capital-labor ratios, insider market power, and concentration ratios of the industries, and thus

(b) industries which offer comparatively high pay to workers of one occupation, age, or seniority level, will also tend to offer comparatively high pay to workers of another occupation, age, or seniority level.

First, let us consider the effect of profits on wages. In particular, we restrict our attention to inter-industry profit differences which are not related to differences in capital-labor ratios, insider market power or concentration ratios. To this end, suppose that the two industries differ in terms of the shift parameter (A) in their product demand functions (1). The greater the parameter A (i.e. the greater the industry-wide product demand at any given price), the higher the profits earned by the firms of that industry, *ceteris paribus*. By (9), (12a), and (12b) it is easy to verify that

$$(13) \quad \frac{\partial W_i^*}{\partial A} = \frac{\partial W_i}{\partial G_i} \cdot \frac{\partial G_i}{\partial A} > 0, \quad i = A, B$$

In other words, the higher the profits of the firms in an industry, the greater the wage that will be paid to labor of any type.

Second, we turn to the influence of the capital-labor ratio on wages. Specifically, suppose that the two industries have the same type-A and type-B incumbent workforces but that they differ in terms of their capital stocks (K). By (9), (12a), and (12b), the effect of a change

¹¹ Since firm-specific skills and legal rights for job protection take time to acquire, the labor turnover costs σ_A and σ_B may be assumed to rise with seniority. Then, by (12a) and (12b), the more senior workers receive the higher wages.

in capital intensity on the outcome of the wage bargains is

$$(14) \quad \frac{\partial W_i^*}{\partial K} = \frac{\partial W_i}{\partial G_i} \cdot \frac{\partial G_i}{\partial K} = (1-\alpha_i) \cdot P \cdot e^2 \cdot f_K > 0, \quad i = A, B.$$

In other words, the greater the capital-labor ratio of the firms in an industry (*ceteris paribus*), the greater the wage received by both types of labor.

Third, consider the effect of the concentration ratio on wages. To fix ideas, suppose that the two industries are alike in all respects except for the number of firms they contain. The effect of this difference on the inter-industry wage structure may be derived as follows. As in our analysis of the demand shift parameter (A) and the capital stock (K), the number of firms (n) affects the outcomes of the wage bargains (W_A^* and W_B^*) by influencing the marginal revenue products of labor (G_A and G_B). This latter influence runs along two channels: the difference in the number of firms affects the market power parameter (e) and the firms' conjectural function (2). The first channel is straightforward: the greater the number of firms, the greater the market power parameter (e) (i.e. the lower Lerner's index of monopoly power). The second channel implies that the greater n , the greater Q_0 , by Equation (4) (i.e. each firm takes account of how many rivals it has when it formulates its conjectures about its rivals' reactions to its own decisions). By (7), (9), (12a), and (12b), these channels are given by

$$(15) \quad \frac{\partial W_i}{\partial n} = \frac{\partial W_i}{\partial G_i} \cdot \frac{\partial G_i}{\partial n}$$

$$= (1-\alpha_i) \cdot A \cdot \psi \cdot \frac{v}{n^2 \cdot \eta} \cdot f(m_A, m_B, K)$$

$$+ (1-\alpha_i) \cdot A \cdot \psi' \cdot e \cdot [f(m_A, m_B, K)],$$

where the two right-hand terms stand for the first and second channels, respectively. Observe that the two channels pull in opposite directions. It can be shown that

$$(16) \quad \frac{\delta W_1}{\delta n} \lesssim 0 \quad \text{iff} \quad n \lesssim \eta \cdot \frac{(1-e)}{(e)}$$

In short, if the number of firms per industry is sufficiently large, then the greater the number of firms, the lower the wage they will pay to both types of workers. In principle, this is a testable proposition.

Fourth, consider the effect of insider's market power on wages. Specifically, we assume that the industries are alike in all respects except for the market power parameters α_A and α_B . By (12a) and (12b)) it is easy to see that

$$(17) \quad \frac{\partial W_i^*}{\partial \alpha_i} = R_i - [G_i + \tilde{\sigma}_i] < 0, \quad i = A, B.$$

Thus, the greater the insiders' market power $(1-\alpha_i)$ in an industry -- perhaps on account of the degree of unionization -- the greater their wage.

Finally, let us examine the effect of labor turnover costs on wages. By (12a) and (12b), it is easy to see that the greater the labor turnover costs $\tilde{\sigma}_A$ and $\tilde{\sigma}_B$, the greater the corresponding wages:

$$(18) \quad \frac{\delta W_i}{\delta \tilde{\sigma}_i} = (1-\alpha_i),$$

which is positive as long as workers exercise some market power. By implication, industries which face comparatively heavy coverage by job security legislation will tend to pay workers of different types comparatively high wages.

5. Concluding Remarks

Our paper addresses two puzzling questions concerning the inter-industry wage structure in many countries:

- Why do industries which pay comparatively high wages to workers in one occupational group, age bracket, or seniority level also tend to pay comparatively high wages to other types of workers?

- Why are wages related to profits, capital-labor ratios, insiders' market power and concentration ratios, quite independently of workers' skills and the characteristics of jobs?

We offer an insider-outsider explanation for these features. If wages are the outcome of negotiations between firms and their insiders, then wages will depend (at least in part) on how much firms stand to lose from a failure of these negotiations. In our model such a failure means that insiders withhold their productive services from their firms. Under conditions specified above, we show that the greater the profits, capital-labor ratios, and concentration ratios, the greater the firms' potential cost from a negotiation failure, and consequently the higher the wages which workers of different types will receive. In this manner, we suggest a reason why wages may not depend entirely on the productivity of workers or the disagreeableness of their jobs.

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