Seminar Paper No. 323

INSIDERS AND OUTSIDERS IN

WAGE DETERMINATION

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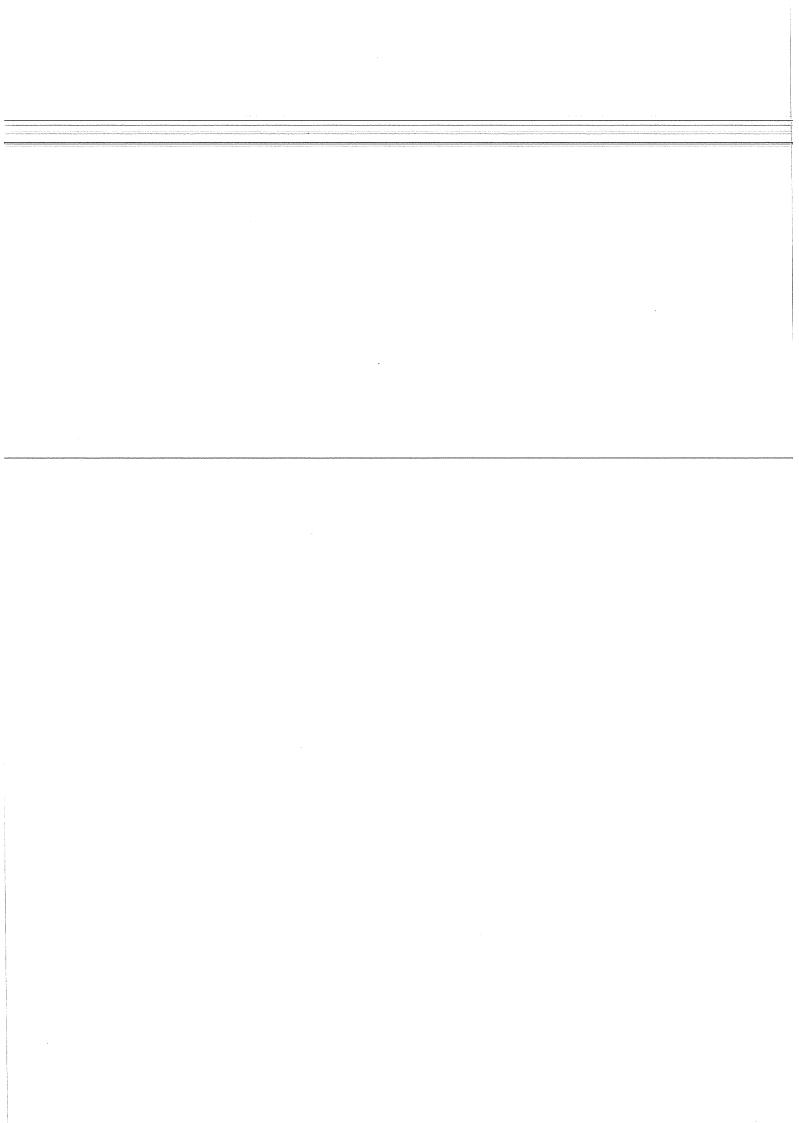by

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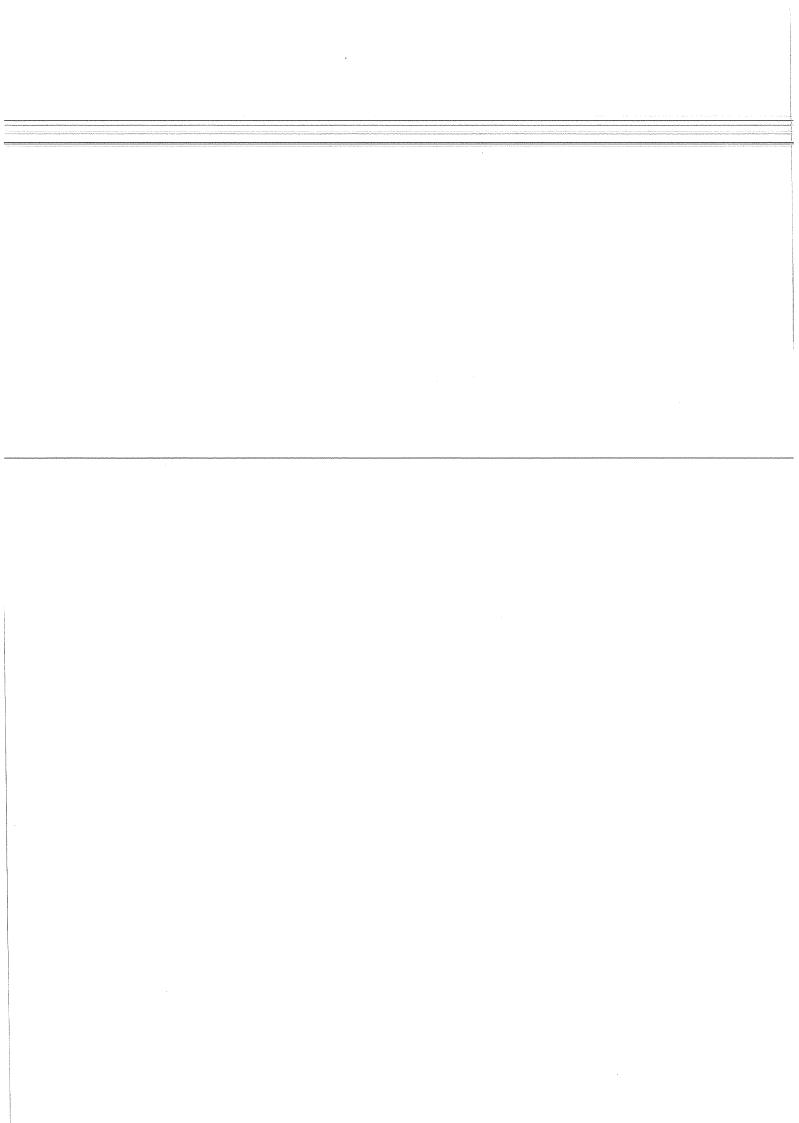Massachusetts Institute of Technology,
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Insiders and Outsiders in Wage Determination

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Abstract

A firm starts with a group of insiders or seasoned workers. There is
also a large pool of outsiders who are initially less productive, but
are transformed into insiders after one period of employment. The firm
gains from having a large pool of insiders, some of whom may be laid
off in bad years. Insiders gain from keeping their numbers small. If
the insiders set their wage unilaterally, they will choose a path in
this extreme case prevents employment of outsiders even if future
employment prospects are good. If the wage path is set by bilateral
bargaining, the extra advantage to the firm permits employment of some
outsiders in some situations.

I. Background

The labor market is still somewhat of a puzzle for macroeconomists. At least since Pigou (1933), it has been clear to mainstream theory that an atomistically competitive labor market could not produce the sort of persistent unemployment we see. (I take the proposal that the real-world labor market is actually in market-clearing equilibrium with respect to some (mis)perceived demand and supply conditions to be a clever _jeu d'esprit_ and not a serious description of modern capitalist economies in prolonged recession.) That still leaves a wide variety of possible market institutions and accompanying "imperfections" to be analyzed.

For a long time mainstream macroeconomics more or less ignored the problem of finding an adequate description of the labor market that would fit comfortably with the rest of accepted theory. In the past decade, however, there has been a true renaissance in this field, with alternative models appearing almost monthly. The result has been a better understanding of the implications that follow from the long-term character of the employment-relation, and from the prevalence of explicit and implicit bargaining. This is surely one of the good effects of the movement to reconcile macroeconomic and microeconomic modes of analysis. Success is not yet at hand, however. Some persistent and macroeconomically significant characteristics of the labor market still elude plausible explanation.

One of the hardest nuts to crack, it seems to me, is to explain why

unemployed workers do not compete for existing jobs by offering to work at

jobs for which they are qualified at a wage lower than that currently

being paid to incumbents. Some current theories have an answer to that

question, but an unacceptable one, at least to me. In some contract

theories, firms are allowed to make payments to currently unemployed

members of their labor pool. The result is usually the "indifference

principle": in the optimal contract, workers are equally well off whether

employed or laid off. That answers the question all right, but only by

flying in the face of the common observation that laid-off workers are

glad to find work, and their families often celebrate the event. This is

discussed in the survey by Azariadis Stiglitz (1983).

There are also sensible models that contradict the indifference

principle and show why any labor-market equilibrium must exhibit a

utility-differential in favor of employed workers. A current favorite

rests on the assumption that firms are able only imperfectly to measure

the effort being put out by their employees. These "efficiency wage"

models are ably outlined by Yellen (1984). If the indifference

principle ruled, many workers would presumably rest on the job, since

being found out and fired would be painless. The equilibrium

utility-differential between employed and unemployed must be enough to

induce the equilibrium amount of effort from the employed. There is

probably something to this story, though I am not sure how it coheres with

the fact that many employment contracts differentiate explicitly between

ordinary layoff and discharge "for cause".

The interesting thing about this sort of model is that an unemployed

worker would be motivated to offer to work at a bit less than the going

wage; it is the employer who would refuse the deal. The reason, of

course, is that the employer would reckon that the worker, once employed

at a lower wage, would have less than the appropriate reason to fear being

fired, and would therefore be inclined to do less than the appropriate

amount of work. The trouble with this story is that the unemployed

workers ought to keep trying. There is always the chance that the next

firm will be tempted. After all, unemployed workers do try; what they

don't do is engage in wage-cutting. If this model were really describing

a major part of what happens in labor markets, I would expect to see more

wage-cutting offers on the part of the unemployed, especially since many

of them can demonstrate that their current unemployment does not result

from having been fired for cause.

I hasten to confess that I, personally, do not find this reluctance

to be so great an intellectual problem; but that is only because I,

personally, do not find it hard to imagine that the unemployed do so

little undercutting of the wage because they think it is an improper or

undignified thing to do, and because they would not like others to do it

unto them if roles were reversed, as they might be next time. But I

realize full well that this is not the way economics is supposed to model

the world, and so I mention it only as a Galilean remark (i.e., something

best muttered to oneself). That leaves us without a good explanation of

the behavior of the unemployed, and I will not provide one here.

We have better prospects of modelling the behavior of the other

parties in the labor market: employers and employed workers. By itself,

that would go some way toward explaining (or explaining away) the

reticence of the unemployed. Once they have concluded a formal or

informal agreement with their workers and achieved the desired level of

employment under that agreement, employers often announce simply that they

are not hiring. Unemployed workers, knowing the state of affairs, may not

bother to try. Of course an explanation is required of employers'

behavior, but that may be easier. I have already mentioned one such

explanation; Lindbeck & Snower (1984); and this paper will provide a

third.

Any attempt to model a unionized labor market in anything less than

the longest run must start with a strategic choice about the degree of

centralization in collective bargaining. Economists in many European

economies, such as the Nordic ones gravitate toward the assumption of

centralized bargaining between an all-inclusive trade union and a single

employer. This is natural in economies where nearly 90 % of blue-collar

workers belong to a union, and where collective bargaining tends to occur

at the national level. My model is more suited to US conditions where

only about a third of blue-collar workers and fewer than a quarter of

all workers are organized, and even industry-wide bargaining is far

from universal. In such a situation, both parties know that there is,

out there, a large number of nonunion workers, even if a firm is dealing

with a disciplined union. Nonunion workers may, of course, lack some

of the skills, especially the firm-specific skills, possessed by union

members. The particular problem I want to study is the effect on

wage-bargaining of the presence of that unorganized fringe.

This paper shares a basic orientation with Lindbeck & Snower (1984).

Most models of bargaining and contracting in the labor market pay

attention only to the conflict of interest between the firm-employer

and its labor pool or group of attached potential employers. When there

is involuntary unemployment, however, the interests of employed and

unemployed workers also diverge. This is obviously the case if the

indifference principle does not hold. Even if it does, there is a

conflict of interest between workers under the contract and those -- new

entrants to the labor force and others -- who are currently without a

contract of any kind, and are seeking long-term membership in a labor

pool. The basic similarity between this paper and the one by Lindbeck &

Snower is that they both focus on this important and neglected aspect of

the labor market; see also McDonald & Solow (1985).

The difference between the present paper and Lindbeck & Snower's is

that the latter focusses mainly on hiring and firing costs and the

incumbent workers' ability to exploit the market power that these costs

confer, whereas here we concentrate on skill differences (which are also

mentioned by Lindbeck & Snower) and longer-run considerations concerning

the ultimate size of the labor pool. In addition, Lindbeck & Snower

focus on the firm's decision whether to replace some or all of its

incumbent workers with outsiders, whereas we take it for granted that the

firm cannot or will not do that, and look only at the firm's decision

whether to make a marginal addition to the size of its labor pool.

Both papers succeed in showing how the wage policy of the incumbent

group of workers is affected by the presence of unemployed outsiders;

neither solves the problem of accounting for the passive behavior of the

outsiders. Lindbeck & Snower observe that outsiders who succeed in

gaining employment by undercutting and replacing some incumbents might

find themselves ostracized by the remaining insiders. That rings true,

but it is just a particular aspect of the "propriety"-constraint mentioned

earlier. In the part of the field that they cover, the two papers are

complementary.

II. Outline of a Model

We now start the formal specification of the model, explaining the

notation as we go along.

The story extends over two periods, but we are mainly concerned with

what happens in the first. That is because the second period, being the

"last" period, has special characteristics that are of no real

significance.[1)]

The firm starts with a pool of experienced workers, m in number. If

it employs e_{11} of them in period 1 it will generate an output whose market

value is $s_1 f(e_{11})$. Here s_1 is a parameter describing the state of the

firm's product market in the first period. The state is entered

multiplicatively for convenience and simplicity. Similarly in period 2,

if the firm employs e_{12} skilled workers they will generate a revenue

$s_2 f(e_{12})$. For now we treat s_1 and s_2 as known; but eventually we will

want to think of s_2 as a random variable of known distribution.

There is also available a large supply of workers who belong to no

firm's labor pool. Some of these may be new entrants or re-entrants to

the labor force; but others may be workers who have held jobs with other

firms but have been laid off with no prospect of recall, for the usual

reasons. These unemployed workers lack firm-specific skills possessed by

members of a labor pool. They are therefore less productive than

experienced workers. If the firm we are studying were to hire e_{21}

inexperienced workers in period 1 along with e_{11} skilled workers, one might quite generally write the revenue generated as $s_1 F(e_{11}, e_{21})$, where F would have to be given a special property to represent the lower productivity of inexperienced workers. (For example, $F(x,y) > F(y,x)$ whenever $x > y$.) We will settle for a simple special case of this assumption, namely that the firm's revenue in the first period will be $s_1 f(e_{11}) + s_1 \phi f(e_{21})$ where ϕ is a fixed constant between zero and one. In period 2, the firm's revenue from employing e_{12} experienced and e_{22} inexperienced workers is $s_2 f(e_{12}) + s_2 \phi f(e_{22})$.

We are concerned with the wage rate of skilled workers in periods 1 and 2, called w_{11} and w_{12}, respectively. Unskilled workers have a reservation wage of w_2, which we take to be the same in both periods.[2] The reservation wage is determined by some mixture of unemployment compensation, leisure, wages in casual employment, the availability of casual employment, and other such factors.

Labor is the only variable factor of production. Thus the firm's objective is to achieve a large value of

$$s_1[f(e_{11}) + \phi f(e_{21})] - w_{11}e_{11} - w_2 e_{21} + R\{s_2[f(e_{12}) + \phi f(e_{22})] - w_{12}e_{12} - w_2 e_{22}\}$$

where R is a discount factor. For reasons touched on earlier, the firm is assumed not to make payments to laid-off members of its labor pool.

If the firm operated in a series of spot markets for the two kinds of labor, facing parametric wages, it would determine e_{11}, e_{21}, e_{12}, and e_{22} by four independent marginal productivity conditions. (The discount factor would not matter at all, because there would be no intertemporal implications of any of the firm's actions, so no reason for it to compare one period with another.) But the labor market of the model is not like

that, and so the firm chooses its behavior differently.

The story extends over two periods. As mentioned, the firm starts with a pool of experienced workers, m in number. These workers are organized in a formal or informal union. For a first pass, we assume that the union is able simply to quote wages w_{11} and w_{12} for experienced labor in the two periods, while the firm is able to choose levels of employment unilaterally. Thus firm also decides how many inexperienced workers e_{21} to hire in the first period, if any. They are freely available at the reservation wage w_2. (The parallel quantity e_{22} in the second period is unimportant, because the second period is -- artificially -- the last period, and so we forget about it.) Our key assumption is that inexperienced workers hired in period 1 are thereby transformed into experienced workers in period 2. Moreover, they become members in good standing of the union in period 2. In other words, the initial insiders do not care at all about the welfare of outsiders, but any who are hired by the firm are thereafter on a par with other insiders. The central question addressed in this paper is the effect of this intertemporal connection on the firm's employment decision and the union's wage-setting decision.

In the set-up as we have described it, the firm's choice of e_{11} will satisfy

$$s_1 f'(e_{11}) = w_{11}, \tag{1}$$

subject to the usual boundary conditions. If "<" holds at $e_{11}=0$, the firm employs no skilled workers; if ">" holds at $e_{11}=m$, the firm employs its whole labor pool in the first period.

Taking the first period by itself, it would be in the firm's interest

to hire some inexperienced workers if

$$s_1 \emptyset f'(0) > w_2$$

and the best number to hire, still looking only at the first period, would

be determined by the obvious marginal-productivity condition. In fact we

assume that this inequality is _not_ satisfied. If the only consideration

were first-period profit, the firm would not choose to hire any of the

unemployed. This condition is perhaps excessively strong. It can be read

as limiting the model to periods in which s_1 is not too large. It

corresponds to what employers often say, especially in not very good

years, though that does not guarantee its truth. But the firm has yet

another motive to hire inexperienced workers in the first period: to train

experienced workers for period 2. This motive becomes effective if the

firm anticipates that its second-period employment of experienced workers

might profitably exceed m. When this factor is taken into account the

firm would be impelled to hire unemployed workers in period 1, even though

first-period results by themselves would not justify it, provided that

$$s_1 \emptyset f'(0) - w_2 + R[s_2 f'(m) - w_{12}] > 0. \tag{2}$$

If this inequality is satisfied, e_{21} is determined by

$$s_1 \emptyset f'(e_{21}) - w_2 + R[s_2 f'(m + e_{21}) - w_{12}] = 0. \tag{3}$$

These are, in summary, the first-order conditions with respect to e_{21} for

the firm's problem of maximizing

$$s_1[f(e_{11}) + \emptyset f(e_{21})] - w_{11} e_{11} - w_2 e_{21} + R\{s_2[f(e_{12}) + \emptyset f(e_{22})] - w_{12} e_{12}\}$$

subject to the constraints $e_{11} \leq m$ and $e_{12} \leq m + e_{21}$. If, as we suggested

earlier, the union is able to impose the condition that $e_{21} = 0$ unless

$e_{11} = m$, then that constraint must be observed too. These constraints come

into play only if $s_2 f'(m) > w_{12}$. Otherwise e_{12} is determined by

$$s_2 f'(e_{12}) = w_{12}. \tag{4}$$

These considerations define the demand for labor facing the union, to

which it must respond in quoting the wage rates for periods 1 and 2. The

next step is to specify the union's preferences. For the first period,

the union's objective is assumed to be $e_{11}(w_{11}-w_0)/m$, where w_0 is the

reservation wage for insiders, possibly larger than w_2. Two immediate

observations are called for: (a) it is more usual to write $U(w)-U_0$ with

$U(.)$ strictly concave but for now we set $U(w)=w$ for simplicity and leave

the general concave utility function for discussion later; cf. also

Pencavel (1985); (b) the factor $1/m$ can usually be omitted because it is

an exogenous constant, but here it matters because the second-period

membership of the labor pool is $m+e_{21}$ and that is endogenous via the

union's choice of w_{12}. Thus the relevant objective in period 2 is

$(m+e_{21})^{-1} e_{12}(w_{12}-w_0)$ and the union's complete objective function is

$$m^{-1} e_{11}(w_{11}-w_0) + R(m+e_{21})^{-1} e_{12}(w_{12}-w_0). \tag{5}$$

The union is assumed to discount utility at the same rate that the

firm uses to discount profit. The important thing about this formulation

is that the union suffers a direct utility-loss when its members are

unemployed. For given employment in any period, the union is worse off

the larger its membership.

In principle, now, the union knows e_{11}, e_{12}, and e_{21} as functions of

w_{11} and w_{12}. It chooses w_{11} and w_{12} to maximize (5) where

e_{11} is defined as a function of w_{11} by (1) and either $e_{21}=0$ and e_{12} is

defined by (4) or e_{21} is defined by (3) and $e_{12}=m+e_{21}$.

Our strategy is to maximize for the union and search out the

circumstances under which the union will set values of w_{11} and w_{12} which

induce the firm to choose $e_{21}=0$. When will the current incumbents select

a wage policy that excludes outsiders from employment? It is to be

emphasized that the insiders take full account of the fact that outsiders

hired this period will be insiders next period. In fact, what may induce

the incumbents to set a wage that has the effect of excluding outsiders

from current employment is precisely the realization that enlarging the

pool of insiders now will lead in the future to a higher unemployment rate

among members, and/or to the setting of lower wages in the future in order

to avoid that unemployment. The device that the incumbents use to

diminish or eliminate the current employment of outsiders is the setting

of a high enough wage for next period so that employers foresee no need to

enlarge the pool of skilled workers. Since the current productivity of

outsiders is assumed to be low, that is enough to exclude them from

current employment.

The interpretation we have in mind can be restated from another point

of view. The industry is subject to fluctuating demand for its product.

Since the firm assumes no long-run responsibility for its workers, it will

hire outsiders at their reservation wage any time their current (marginal)

productivity exceeds that wage. Suppose market conditions in period 1 are

not so good (i.e., s_1 not so large) that outsiders can be profitably

employed on that basis. The possibility exists that they might be hired

anyway if period 2 is expected to be prosperous enough (i.e., s_2 large

enough) so that the firm will need an enlarged pool of skilled workers

then. This possibility will be frustrated if the insiders choose to

convert the improving market prospects into a sufficiently high wage for

period 2 that the firm's demand for labor can be satisfied out of its

existing pool of trained workers. If that is the general outcome, then we

have a partial explanation of the persistence of unemployment in a mildly

cyclical economy.

III. Details

In this section it is shown that the model described does have the general property just mentioned. Under unrestrictive assumptions, the wage policy of the insiders will exclude the employment of unskilled outsiders unless their <u>current</u> productivity exceeds the wage at which they are available. Thus outsiders will be hired, even at the reservation wage, only in very good states.

It is the virtue (or the vice) of additivity that e_{12} and e_{21} are independent of w_{11}. If only period 1 were at stake, insiders would have no reason to worry about the hiring of outsiders because -- in this formulation -- they do not compete with e_{11}. We can restrict attention to the second term of (5) and consider the insider-union as choosing w_{12} to maximize the expression

$$V(w) = (m+e_{21})^{-1} e_{12}(w-w_0).$$ (6)

What does V look like as a function of w? (I omit the subscript 12 occasionally when the emphasis is on the running variable.)

To begin with, it is obvious that (2) determines a critical value w^*, say, with the property that $e_{21}>0$ if and only if $w_{12}<w^*$. Analogously, (4) provides another critical value of w, namely $w=s_2 f'(m)$, with the property that $e_{12}<m$ if and only if $w_{12}>s_2 f'(m)$. Since I have all along assumed s_1 to be such that $s_1 \emptyset f'(0)-w_2<0$, it follows from (2) that $w^*<s_2 f'(m)$. These observations can be summarized in the following way. For very high values of w_{12}, specifically those higher than $s_2 f'(m)$, the firm will not fully employ even its initial labor pool in period 2, given the state s_2 expected to rule then. That being so, $e_{21}=0$. For values of w_{12} a bit

below $s_2 f'(m)$ the initial labor pool will be fully employed in period 2,

i.e., $e_{12} = m$, but still $e_{21} = 0$ because the net gain from having an extra

skilled worker available in period 2, though positive, is not large enough

to cover the loss from employing an unseasoned worker in period 1. (This

loss can be thought of as a kind of training cost, but its size depends on

w_2 and s_1.) When w_{12} falls to w^*, e_{21} becomes positive, and increases

further for still lower values of w_{12}.

The lowest possible value of w_{12} is w_0, the reservation wage for

seasoned workers. For higher values, through w^* and all the way to

$s_2 f'(m)$ there is full employment of union members in period 2. In that

range, from (6), $V(w) = w - w_0$. This is shown in Figures 1a and 1b as the ray

with unit slope emanating from w_0.

Now let $g(.)$ be the inverse function of $f'(.)$. Thus, from (4),

$g(w/s_2)$ is the conventional demand function for seasoned labor in period

2; it is a decreasing function of its argument. Now consider the function

$g(w/s_2)(w-w_0)/m$. It represents (see (6)) the branch of $V(w)$ where $e_{12} < m$

and therefore $e_{21} = 0$, and I shall simply call it $V(w)$ for now. Clearly,

$V(w_0) = 0$. Moreover $V(w) = 0$ again for all w large enough to drive the demand

for skilled labor to zero. Whether any such wage exists depends on the

elasticity of $g(w/s_2)$ at high wages, of course. The natural and typical

assumption is that $V(w)$ is unimodal, whether or not it actually reaches

zero at the right-hand end. I need two more geometric facts about $V(w)$.

By direct calculation $V'(w_0) = g(w_0/s_2)/m$. If this quantity is no bigger

than one, it means that the firm's demand for skilled labor in period 2 is

not as big as m even if the union asks only for the reservation wage of

its members. Employment will be even lower at higher wage rates. In that

circumstance there can never be employment of outsiders. It must

therefore be taken that $V'(w_0)>1$. Finally, $V(s_2f'(m))=s_2f'(m)-w_0$ because

$w=s_2f'(m)$ is precisely the wage that yields $e_{12}=m$. The curve for $V(w)$ is

superimposed on Fig. 1a-b, which exhibit the two possible

configurations.

In both diagrams, the effective $V(w)$ facing the union of initial

insiders coincides with the ray from w_0 up until its intersection with the

unimodal curve at $w_{12}=s_2f'(m)$. Further to the right it coincides with the

unimodal curve. In Figure 1a, the union sets $w_{12}=s_2f'(m)$. In Figure 1b,

it sets $w_{12}=w^{**}$. In both cases $e_{21}=0$. The difference is that in the

configuration of Figure 1a, $e_{12}=m$; the original group of insiders is fully

employed in period 2, though their wage is high enough to render the

employment of outsiders unprofitable in period 1. In the configuration of

Figure 1b, w_{12} is set high enough so that even some of the initial

insiders are laid off in period 2. A fortiori no outsiders are hired in

period 1.

The comparative-static analysis of variations in s_2 is simple. The

unit ray from w_0 is obviously independent of s_2. The unimodal curve is

also anchored at w_0, and it shifts upward with higher values of s_2 because

$g(.)$ is a decreasing function of w/s_2. It is no surprise that the skilled

wage w_{12} is higher in better states. Further calculation shows that a

better state s_2 is more likely to lead to a situation like that shown in

Figure 1b. In other words, the insiders divide the benefit from a better

state between higher wage and higher employment until the initial

membership is fully employed. For still better states, only the wage is

higher.

This is a sharp result, but I want to emphasize that it is not a deep

one. In the model, the union cares about the unemployment rate of its

members and about the wage that employed members receive. Once the

second-period state is good enough to insure full employment for the

initial labor pool any further improvement is translated _entirely_ into a

higher wage. Because outsiders are initially unskilled, it would take a

discrete reduction in the wage below the level giving full employment of

insiders to induce the firm to hire outsiders. (Notice that small

variations in w_0 or s_1 have no effect on the union wage.) The insiders

are not motivated to enlarge the labor pool in that way, or in any way.

Thus outsiders can only achieve employment in states where their initial

productivity is high enough to justify it instantaneously. (Insiders

might wish to exclude outsiders even then, but that is the province of the

Lindbeck & Snower paper.)

IV. _Long-run Size of the Labor Pool_

So far the size of the union membership (m) has been treated as

exogenous, and the second-period state (s_2) has been assumed known. Over

the longer run, one can imagine that the union has some control over the

number of its members. The best size, from the union's point of view,

might depend on the frequency distribution of states. (The firm has no

long-run obligations to its workers in this model, so the firm would

always like the labor pool to be very large. That has to be recognized as

an over-simplification.)

Suppose the "typical" period is like the "second" period in the model

of Sections II-III. The "first" period is just an artificial start-up.

The model defines a best wage $w^{**}(s)$ as a function of the "second" period

state s. From earlier calculation we know that $w^{**}=sf'(m)$ in states good

enough to look like Figure 1a; and w^{**} satisfies the equation

$g(w^{**}/s)+(w^{**}-w_0)g'(w^{**}/s)s^{-1}=0$ for smaller s. The dividing-line comes at a value of s such that the intersection in Figure 1 is right at the maximum-point of $V(w)$. It is straightforward to show that the critical value of s is $w_0/(f'(m)+mf''(m))=s_0$ say. Thus the union achieves a level of utility which depends on the state in the following way:

$$V = (w^{**}(s)-w_0)=sf'(m)-w_0 \text{ for } s>s_0 \tag{7}$$

$$= m^{-1}g(w^{**}(s)/s)(w^{**}(s)-w_0) \text{ for } s<s_0.$$

Now suppose that the state s has a probability distribution $P(s)$. If the union can limit its membership in the long run, it might choose m to maximize the expected value of V as given by (7). This expected value can be written as

$$m^{-1}\int_0^{s_0} g(w^{**}/s)(w^{**}-w_0)dP(s)+\int_{s_0}^{\infty}(sf'(m)-w_0)dP(s). \tag{8}$$

Here s_0 is itself a function of m but that makes no difference because the two branches of the integrand coincide at s_0. Obviously, then, (8) is a decreasing function of m.

The conclusion is that the abstract group of insiders is better off the smaller it is. So far as the model is concerned, the "original" insiders ought never to want to add to their number or even to offset attrition. Again there is nothing subtle about this implication. The model offers the union no reward for absolute size. A larger number of members can only increase the probability of unemployment for some of them and decrease the full-employment wage.

(1) Naturally, if the union's objective function included the absolute size of the membership as an argument along with the unemployment rate of members, the result would be softened and some outsiders would be admitted in good states. Even so, the qualitative message of the model would remain: concern about future unemployment of members motivates insiders to limit the expansion of employment. In the real world, unions usually want to expand. Very likely the main reason, though not the only one, is to protect themselves against competition from non-union employers. This could be formalized; but formalization would only exhibit the outcome as dependent on the trade-off between absolute size of membership and the wage and employment-rate of members in the union's objective function. Since we have no grounds for intuition about that, there seems to be little point in grinding out the formalities here. In view of the importance of the issue, it would be worthwhile to model an industry with coexisting union and non-union firms, with some choice about which kind to be.

(2) One easy generalization can be taken care of briefly. It is more conventional to write the union's second period objective as $\frac{e_{12}}{m+e_{21}}[U(w)-U(w_0)]$ with $U(.)$ strictly concave. If that is done in the model of Section II, nothing much changes. The unit-slope ray from w_0 is replaced by the graph of $U(w)-U(w_0)$. It remains true that the natural

assumption $s_2f'(m) > w_0$ implies $V'(w_0) > U'(w_0)$ so that the picture in Figures

Fig. 1a-b is qualitatively unchanged. The only complication is that

multiple intersections are "more likely". (Even when $U(w)$ is linear

Fig. 1a-b could show multiple intersections because $V(w)$ has only has only

been assumed to be unimodal, not necessarily concave.) When there is more

than one intersection in Figure 1, it is always the furthest to the right

that matters, whether it leads to the configuration of Figures 1a or 1b.

One could justify the intuitive remark that a strictly concave $U(w)$ biases

the model toward the outcome described in Figure 1a.

(3) I can also relax the assumption of within-period additive separability

of the firm's revenue. The separability assumption has the objectionable

consequence, visible in (1), that e_{11} is independent of w_{12}, and therefore

of e_{21}. Employment of outsiders in period 1 is not a substitute for

employment of insiders in period 1. The appropriate generalization is to

interpret $y_1 = f(e_{11}) + s_1\phi f(e_{21})$ as output, not revenue, and to make

revenue a strictly concave function of output, $Q(y)$. I can then proceed

as before, only with rather more complication.

The comparative-static analysis of the firm's demand for labor leads

to the conclusion that

$$\frac{\partial e_{11}}{\partial w_{11}} < 0, \quad \frac{\partial e_{21}}{\partial w_{11}} > 0$$

$$\frac{\partial e_{11}}{\partial w_{12}} > 0, \quad \frac{\partial e_{21}}{\partial w_{12}} < 0.$$

The last two derivatives are precisely the intuitive improvement being

sought: insiders and outsiders are rivals in period one. The rest of the

analysis for the wage-setting union goes much as before. The firm will

employ outsiders in period 1 only if $Q'(s_1f(m))s_1\phi f'(0) - w_2 + R[Q'(s_2f(m))$

$s_2f'(m) - w_{12}] > 0$, and this defines a critical value w^*. The critical value

w^{**} at which the original insiders will be fully employed in period 1 is $Q'(s_2 f(m)) s_2 f'(m)$. It is easily checked that $w^* < w^{**}$ if and only if it is unprofitable for the firm to employ any outsiders from the standpoint of period 1 alone. But this conclusion now requires the subsidiary assumption that the firm may not or will not employ any outsiders in period 1 unless its initial group of insiders is fully employed. This leaves open the possibility of replacing insiders by outsiders.

(4) The two-period model is intended as a crude approximation to one with a long sequence of periods. A more detailed representation would have to find room for a number of facts of common observation. The ones that have occurred to me are (a) attrition of membership and the consequent need for recruitment of replacements, not necessarily equal in number; (b) the scheduling of layoffs in order of seniority; cf. Huizinga (1984); (c) the scaling of wages in order of seniority; (d) the gradual acquisition of skills with continued employment, and possibly the gradual deterioration of skills with prolonged unemployment; (e) the possibility that labor pools will differ in the relative weight they assign to employment security and high wages as objectives, including the likelihood that the weighting might be affected by the objective stability of demand; (f) the holding of inventories of goods as a short-run substitute for a larger labor pool. Modelling any or all of these might be very complicated. I suppose it is unlikely that any simple sharp results could survive all those complications. That may be just as well, because the simple sharp result found in the two-period model is probably too simple and too sharp. Nevertheless I would expect the general message to persist, with conflict

of interest between senior and junior members of the labor pool added to

conflict of interest between insiders and outsiders.

(5) If the two-period structure of the labor market is taken

literally, a time-consistency problem arises. Once the second period has

rolled around, it is too late for the firm to enlarge the pool of skilled

labor. If the insiders had, in period one, set a second-period wage

higher than they would otherwise prefer, in order to discourage

recruitment of outsiders, then at the beginning of period two they should

be happy to renegotiate a lower wage. At that stage the employers would

agree, but of course the anticipation of this outcome would react back on

their first-period decision, and the union's. If contracts made in the

first period are to be enforced, it will have to be done by a third party.

Alternatively one can informally assume that the unions follow through

because they are actually engaged in a many-period process and have to

maintain credibility. Admittedly it would be better to formalize these

considerations.

(6) The considerations discussed so far are all partial-equilibrium

in character, confined to the state of the labor market conditional on the

state of market demand. From a broader macroeconomic point of view the

state s_2 is endogenous, surely sensitive to employment decisions and

perhaps to wage decisions. If aggregate demand is more elastic with

respect to the level of employment than it is with respect to the wage

rate for seasoned workers, then the mechanism analyzed in this paper is

likely, on the whole, to be contractionary in its bias. But this ought to

be worked out precisely.

(7) In this model, wage flexibility is used by insiders to stabilize

employment.[3] For someone like me, who thinks that the main aggregative fact

to be explained about U.S. labor markets is the variability of employment and

the stability of real wages, this might be thought to be paradoxical, to

put it kindly. I do not take the implied criticism lightly; my tentative

response is that in a model of a segmented labor market, like this one, it

might not be out of line to have insiders stabilizing their own employment

at the expense of outsiders.

VI. A Bargaining Model

Models in which a union sets the wage unilaterally and an employer

decides the level of employment unilaterally have been criticized as

inefficient in the sense that other wage-employment combinations could

make both parties better off. Leontief (1946) pointed out that this

inefficiency could be removed if the parties were to bargain over both

wages and employment. The macroeconomic implications of wage-employment

bargaining have been explored by McDonald & Solow (1981). This idea

has in turn been criticized by Nickell & Andrews (1983) on the grounds

that one does not generally observe explicit bargaining about the level

of employment. McDonald & Solow suggested that intense bargaining over

"work rules", which is certainly observed, may amount to a device for

limiting the employer's discretion about employment. And explicit

bargaining about "job security" has now become common in the U.S.

Nickel & Andrews instead proposed that the employer's unilateral

control of employment be taken for granted, and that the parties

bargain over wages subject to that stipulation. This will

yield a certain "second-best" efficiency. I adopt that proposal here, to

see if it can reduce the barrier against employment of outsiders.

To do so, however, I have to cheat a little on the model. In any

straightforward application of bargaining theory, the parties' gains from

bargaining will include both periods. This adds a lot of complication;

what is worse, it implicates the first-period outcome essentially. That

will make it hard to compare the results with those of the earlier model,

where additive separability of each party's objectivity function

effectively isolated the second period. For example, second-period

strategies can be expected to depend on s_1, as they do not in the

wage-setting model. I try to evade this difficulty by looking only at the

second-period outcome. (And I therefore put the discount factor R=1.)

This is a genuine violation of the logic of the model, but I hope it will

give some indication of the direction in which a valid application of

bargaining theory would pull.

The underlying assumption is that the firm will react to the

negotiated wage, whatever it is, by employing the profit-maximizing

quantity of labor for the state s_2. The firm's realized profit is thus a

function of the negotiated wage, say $Z(w)$. The functional form of $Z(w)$

depends on the negotiated wage: it has one form if $w > s_2 f'(m)$, another if

$w^* < w < s_2 f'(m)$, and still a third form if $w < w^*$. (It will be recalled that

$w^* = s_1 \phi f'(0) - w_2 + s_2 f'(m)$, the highest wage at which it pays to employ

outsiders in period 1.) If we call these intervals Region 1, Region 2 and

Region 3, then

$$Z(w) = s_2 f(g(w/s_2)) - wg(w/s_2) \quad \text{in Region 1}$$
$$= s_2 f(m) - wm \qquad\qquad \text{in Region 2}$$

and

$$Z(w)=s_1\phi f(h(w))-w_2 h(w)+s_2 f(m+h(w))-w(m+h(w)) \text{ in Region 3.}$$

Here the equation

$$s_1\phi f'(e_{21})-w_2+s_2 f'(m+e_{21})-w=0$$

defines $e_{21}=h(w)$. Since $g(f'(m))=m$ and $h(w^*)=0$, $Z(w)$ is continuous

throughout. Moreover, since $Z(w)$ is a profit function, duality theory

applies and

$$Z'(w)=-g \quad \text{in Region 1}$$
$$=-m \quad \text{in Region 2}$$
$$=-(m+h) \text{ in Region 3.}$$

Thus $Z(w)$ is actually continuously differentiable.

As for $V(w)$,

$$V(w)=g(w/s_2)(w-w_0)m^{-1} \text{ in Region 1}$$
$$=w-w_0 \text{ in Regions 2 and 3}$$

so that

$$V'(w)=m^{-1}[g(w/s_2)+(w-w_0)g'(w/s_2)(1/S_2)] \text{ in Region 1}$$
$$=1 \text{ in Regions 2 and 3}$$

and $V(w)$ is continuous throughout, but not differentiable at $w=s_2 f'(m)$.

As usual I adopt the symmetric Nash solution to the bargaining

problem. Thus if the solution is determined by the first-order conditions

for a maximum of $Z(w)V(w)$, we need only consult the sign of $Z'(w)/Z(w) +$

$V'(w)/V(w)$ to see which way the wind is blowing. For the limited purposes

of this paper I propose only to show that it is possible for this

expression to be negative at $w=w^*$. Then it must be possible to cook up

cases in which the bargaining model leads to a negotiated wage at which

the firm hires some outsiders for training purposes even when it is not

instantaneously profitable to do so.

To see this, note that

$$V^{-1}V'+Z^{-1}Z' = (w-w_0)^{-1} - m[s_2 f(m)-wm]^{-1} \text{ in Region 2}$$

$$= (w-w_0)^{-1} - (m+h)[s_1 \phi f - w_2 h + s_2 f(m+h) - w(m+h)]^{-1} \text{ in Region 3.}$$

V and Z are both continuously differentiable at $w=w^*$, so we need only look

at the first of these expressions at w^*. Hence $V(w)Z(w)$ is decreasing at

w^* if

$$w^*-w_0 > s_2 f(m)/m - w^*$$

or if

$$w^* > \tfrac{1}{2}[s_2 f(m)/m + w_0].$$

Using the definition of w^*, this inequality boils down to

$$s_2[f'(m) - \tfrac{1}{2}f(m)/m] > \tfrac{1}{2}w_0 + w_2 - s_1 \phi f'(0). \tag{8}$$

Thus if $mf'(m)/f(m) > \tfrac{1}{2}$, which is not a very stringent requirement, (8)

will hold for all s_2 larger than a critical value. This condition is hard

to interpret; it is in any case special to the symmetric Nash solution to

the bargaining problem. But it says clearly that there will be a wide

class of cases in which unskilled workers will be employed in sufficiently

good "second" years.

Remember that this whole section is based on a corruption of the

model. Nevertheless I think it at least makes credible the proposition

that the wage-bargaining market form is more favorable than the

wage-setting market form to the employment of outsiders. This is

intuitively plausible because bargaining gives more power to the firm,

whose interest is in a large labor pool, and less to the insiders, whose

interest is in exclusiveness. In the class of "generalized Nash"

solutions to the bargaining problem, as one would expect, the outcome is

more favorable to outsiders the larger the bargaining-power parameter

associated with the employer's side. For instance, $\frac{mf'(m)}{f(m)}$ need only

exceed a if the Generalized Nash maximand is $Z^{1-a}V^a$. Of course, in a

model which, with more realism, gave the employer some longer-run

obligations to the members of the labor pool the situation would be more

complicated still.

VII. <u>Concluding Remark</u>

This is a very difficult and delicate part of macroeconomic theory.

It does not pay to demand too much of model-building in a field where

reality is so full of nuances, some of which may be important. I would be

happy to have made a credible case for the following proposition: one

reason for the persistence of unemployment over a wide range of

fluctuations of aggregate demand is the willingness and ability of

insiders to convert higher demand into higher wages for themselves

rather than into increased acces to jobs for outsiders.

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* Any interesting ideas in this paper are part of a larger project on which I am collaborating with Frank Hahn. The faulty execution is all mine. I thank Lars Calmfors, Henrik Horn, Andrew Oswald and the discussants for both helpful and disturbing comments. I have tried to take account of some of their suggestions, but have not had time to follow up all of them.

1) If this model is to be developed further, it would have to encompass a fairly large number of periods, of which all but the last few would count.

2) This is a simplification that could easily be dispensed with.

3) This was pointed out at the conference by Andrew Oswald.

4) I owe to Lars Calmfors and Henrik Horn the observation — raised at the conference — that the two-period bargaining problem can have alternative structures, and therefore alternative equilibria, depending on who plays when. For example, if the firm can pre-empt by hiring outsiders before the first-and second-period wage rates are determined, the firm becomes, at least in part, a Stackelberg leader. Intertemporal bargaining with wages and (two kinds of) employment at stake is bound to have a multi-stage structure, so there are many possibilities for leadership and followership.

Fig. 1a-b.

a

$v(w)$

w_0 w^* $s_2f'(m)$ w_{12}

b

$v(w)$

w_0 w^* w^{**} w_{12}