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INVOLUNTARY UNEMPLOYMENT AS AN

INSIDER-OUTSIDER DILEMMA

by

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According to the conventional macroeconomic wisdom, whenever

real wages are flexible, involuntary unemployment is at best a

transitional phenomenon. Given that economic agents set or

accept wages in accordance with their preferences, endowments and

technologies, the workers who are involuntarily unemployed

allegedly have an incentive to underbid the wages of those

currently employed and the employers have an incentive to accept

the lowest bids. Imperfect information, long-term contracts,

etc. may protract this process, but eventually the involuntary

unemployment tends to disappear. The existence of involuntary

unemployment - so the traditional story goes - implies

unexploited potential gains from trade and these cannot persist

indefinitely in a free-market economy.

This conventional wisdom is challenged in a new way here.

We represent involuntary unemployment as a condition which the

"insiders" (the currently employed workers) impose on the "out-

siders" (the currently unemployed workers). The insiders set

their wages above the minimal level at which the outsiders would

be willing to work, but the employers have no incentive to fire

the insiders and hire outsiders. The reason is that the employers face costs of firing and hiring which, in practice, are commonly quite substantial. Insiders take these costs into account in making their wage demands. Unionization may be explained as an effective way of doing so.

The article is organized as follows. Section 1 tells the intuitive story underlying our analysis. Section 2 analyses the behavior of individual firms and workers, behaving atomistically in the face of firing-hiring costs. In Sections 3 and 4, workers manipulate these costs to their advantage by unionizing to pose threats of strike and work-to-rule, respectively. When these various microeconomic components are used to construct a macro-economic model, an explanation of persistent involuntary unemployment emerges.

1. The Story

The activities of firing and hiring, along with their associated costs, take on many forms. For the firms, the hiring costs cover the entire sequence of events which firms must follow to find workers, check their skills, and make them qualified for the jobs they are to perform. Accordingly, hiring costs include the costs of advertising, screening, and training. The firing costs may include severance pay, the implementation of legally and socially acceptable firing procedures, the preparation for and possible conduct of litigation, and "bad will" on the part of the remaining employees (commonly manifested in their productivity).

Another crucial ingredient in our story is the observation that the activities of firing and hiring take time. Whereas screening can often be performed over a rather short time interval, training is frequently a lengthy process. Furthermore, the act of firing may be preceded by an extensive process of negotiation or litigation.

Consequently, from the vantage point of a particular firm, workers may be classified into three groups: (i) "insiders" (the current employees), (ii) "outsiders" (workers not employed by the firm), and (iii) "entrants" (workers who are in the process of being transformed from outsiders into insiders, e.g. trainees).

Insiders and entrants differ in two significant respects from the point of view of their employer:

(i) firing and hiring costs must be expended to exchange them, and

(ii) entrants are, as a rule, less productive than insiders.

These considerations give rise to bilateral monopoly power between firms and their insiders. It may be measured by the difference between the maximal wage which the firm would be willing to pay its insiders (before findig it worthwhile to replace them by entrants) and the minimal wage which the outsiders could be willing to accept for their labor services (i.e. their reservation wage). It is reasonable to assume that the insiders are able to capture at least some of this bilateral monopoly power.

Consequently, insiders drive the wage above the level at which the outsiders would be willing to work, but the firm has no incentive (up to a point) to hire the outsiders. As result, there is involuntary unemployment.

Is this unemployment persistent? It may be tempting to portray the firing and hiring costs as one-shot (i.e. non-recurrent) expenditures for the firm, whereas the cost saving from firing high-wage insiders and hiring low-wage outsiders is considered ongoing. In that case, the outsiders would fail to underbid the insiders only if the employers' time horizon were sufficiently short or their rate of time discount sufficiently high. This would indeed be a rather weak peg on which to hang a theory of persistent involuntary unemployment.

Our analysis does not rely on this argument. When an outsider is hired, he does not remain an outsider for long. He goes through a period of screening and training during which he is not as useful to the firm as an insider, but thereafter he becomes indistinguishable from an insider (with regard to both his productivity and his potential firing costs). The low wage at which the outsider was willing to gain employment is no longer in his best interests since he completes his training period. He has an incentive to renegotiate his wage in accordance with the costs of firing and hiring and his productivity advantage over the outsiders. If he succeeds in doing so, <u>he becomes an insider</u>.

In that case, the insiders are <u>not</u> competing with the outsiders whose wage demands are permanently lower. Rather, they compete with the entrants, whose wage demands are lower only for

the duration of the hiring-training period. The firm's cost
saving, like the cost, from firing-hiring activities is one-shot.

But could firms not prevent entrants from renegotiating
their wage? Could they not offer entrants a long-term contract
in which the wage remains permanently below that of the current
insiders? In practice, firms generally find such contracts
prohibitively costly to construct and implement. Principal-agent
problems (e.g. Harris and Raviv (1979)), impracticability of
assigning productivities to joint inputs, problems in monitoring
effort (e.g. Alchian and Demsetz (1972) and Malcomson (1981), and
"bounded rationality" reflecting the impossiblity to conceive of
all relevant contingencies (e.g. Simon (1979) and Williamson,
Wachter, and Harris (1975)) illustrate the formidable difficul-
ties in imposing long-term wage contracts. (This issue is
formally addressed in Lindbeck-Snower (1984b), where also the
existence of wage scales among "insiders" is analyzed.)

Accordingly, we assume that firms are unable to postpone
indefinitely the time when entrants turn into insiders. Out-
siders cannot promise firms to work for less remuneration than
insiders in perpetuity, since the outsiders would have no incen-
tive to keep this promise once they became insiders and the firms
could not enforce it.

Given this setup, it is clear that the wage which an
insider, bargaining atomistically, can achieve depends positively
on the firing-hiring costs of his firm. In Sections 3 and 4 we
show how labor unions can – among other strategies outlined –
enable their members to put these costs to more effective wage-

supporting use. The threat of strike and the threat of work-to-rule are both rationalized from this perspective. As result, both union activity and the size of union membership may be determined endogenously through the workers' individual interests.

It will be shown that the level of involuntary unemployment is higher under such union activities than it is when workers behave atomistically.

This, in short, is the skeleton "story" underlying our analysis. It is related to, but quite distinct from, the salient explanations of unemployment in the macroeconomic literature. Firing-hiring costs may be at least partially responsible for job search and "implicit contracts",[2] both of which have been adduced as possible causes of unemployment. As noted, the firing-hiring costs may give workers some monopoly power, which has been shown to imply unemployment as a by-product of allocatively inefficient trades.[3] However, the unemployment in all of these approaches is voluntary, whereas ours is involuntary.

Involuntary unemployment is sometimes explained in terms of different objectives of labor unions and their members.[4] In our story, on the other hand, involuntary unemployment occurs already without unions, and hence without such differences in objectives, though both approaches de facto create conflicts between those who are employed and those who remain involuntarily unemployed. In another approach, firing-hiring costs give firms an incentive to minimize employee quits and, in the absence of perfect information, firms may do so by setting a wage which generates

involuntary unemployment.[5] Yet our story does not rely on imperfect information.

It now remains to present the analytical building blocks of the story and to study some of its major implications for macroeconomic wage and unemployment theory.

2. The Behavior of Individual Economic Agents

The economy is composed of firms, households, and a government. There are three goods: a consumption good, labor, and another factor of production - say, "capital". The firms produce the consumption good by means of capital (which they own) and labor. The households buy the consumption good and may provide labor services to the firms. These are the flows of purchases.

The expenditure flows are straightforward. The firms use their revenues to remunerate labor and distribute what is left over to the households. The households use their non-wage incomes and their wage incomes (if they are employed) or their unemployment benefits (if they are unemployed) to make consumption purchases from the firms and pay taxes to the government. The government collects taxes from the households in order to pay unemployment benefits. The reason for giving the government such a limited role in the model is that we are not going to analyze the effects of government policy in this paper (in contrast to Lindbeck and Snower (1984a), where a wide variety of government policy actions are investigated).

Firms make the firing and hiring decisions. For simplicity, the firing-hiring costs are assumed to be given in terms of the

firms' output alone and not in terms of labor and capital as well. (The latter assumption can be relaxed in a straightforward way without affecting the qualitative conclusions.) Workers set the wages. The time span involved in formulating and implementing the wage and employment decisions is assumed to be exogenously given and identical for all workers and firms. It corresponds to the time period of our analysis.

For simplicity, we consider only the behavior of economic agents under stationary Nash equilibrium conditions. In the context of our analysis, this means that (a) firms' investment outlays are zero, (b) firms' employment decisions are made under the assumption that wages are at optimal levels for the workers, and (c) workers' wage-setting decisions are made under the assumption that employment is optimal for the firms.

2a. The Firms

The output of each firm is Q. K is its capital input. Two types of labor are available to the firm: entrant-labor, L , and insider-labor, L_2 (both measured in terms of numbers of people). There is no retirement from or entry into the labor force during the period of analysis. For simplicity (but without loss of generality for the purposes of our analysis), we make the following assumption about the firm's factor availability and technologies:

A1: The firm's supply of capital is fixed:

$$K = \bar{K} \ ,$$

where $\bar{K}$ is a positive constant. The firm's current

supply of insiders (L_2) is also fixed; yet it can

obtain as many entrants (L_1) as it requires.

The firm does not have a deficient supply of entrants, because
(as shown later) insiders set their wages so as to generate
involuntary unemployment.

A2: Insiders and entrants use the same amount of capital

per head, but insiders are more productive than

entrants:

(1) $Q = \alpha \cdot L_1 + L_2$

$L_1 + L_2 = v \cdot K$,

where the productivity of insiders is normalized to

unity and the productivity of entrants is α;

$0 < \alpha < 1$.

(This depiction of technologies is particularly convenient since
we aim to show how the behavior of insiders can give rise to
involuntary unemployment quite independently of their influence
on entrants' productivity and firm's capital-labor substitution.)

As shown below (Proposition 2), all insiders of the firm
receive the same real wage (W) and all entrants receive the same
real wage (R) as well. The firm's cost of hiring L_1' entrants is
$H(L_1')$ and its cost of firing L_2' insiders is $F(L_2')$, where $H(0) =$
$F(0) = 0$ and H', $F' > 0$. The firm seeks to maximize its cash
flow, $CF = Q - [R \cdot L_1 + wL_2] - H(L_1') - F(L_2')$, (i.e. its revenue
minus its variable costs), where $L_1' = L_1$ (since all workers hired
in the current time period remain entrants only during this time
period) and $L_2 \leq L_2$. (Since the firm's capital supply is fixed,
this is equivalent to profit maximization.)

In equilibrium, no firing or hiring takes place and only insiders are employed, since insiders do not find it worthwhile to post wages that are sufficiently high to occasion their dismissal, nor do they retire voluntarily from their jobs. Under these circumstances, the firm's maximization problem (for a single time period) becomes

(2) Maximize $CF = Q - w \cdot L_2$

   subject to $L_2 \geq Q$, $v \cdot \bar{K} \geq Q$.

Whenever $(1 - w) > 0$, the firm has a positive cash flow and thus its insider employment will be $L_2 = v \cdot \bar{K} = \bar{L}$. On the other hand, if $(1 - w) < 0$, then $L_2 = 0$.

3b. The Workers

   Each worker maximizes his utility subject to a budget constraint. His utility is a function of his consumption, C, and his labor, ℓ. For simplicity, we make the following assumptions about the worker's decision-making:

   A3: For each worker, work (measured in units of time) is an

      on-off activity. When $\ell = 0$, he is unemployed; when

      $\ell = 1$, he has a full-time job. There is no part-time

      employment. No worker can work more than $\ell = 1$.

   A4: Each worker's utility function may be expressed as $U =$

      $U(C, \ell)$, where $U_C > 0$ and $U_\ell < 0$. Utility is maximized

      over a single-period time horizon. All workers have

      identical preferences.

A5: Each worker's non-wage income is A, which is exogenous to his decision-making. An unemployed worker receives an unemployment benefit of B, which is also exogenous. All employed workers face a constant income tax rate of τ.

A6: Insiders capture all the available bilateral monopoly power.

The last-mentioned assumption means that insiders are wage setters. It is made for expositional simplicity only. The basic argument of this article requires only that insiders capture some of the bilateral monopoly power and that, the higher the maximal wage achievable by doing so, the higher the actual wage achieved; (see Lindbeck and Snower, 1984a, Appendix).

A7: There is perfect competition among the outsiders in the labor market.

This assumption is natural enough in an economy characterized by involuntary unemployment.

In addition, we make a further assumption which will be modified in Sections 3 and 4 (where union activity is introduced):

A8: In setting his wage, each insider behaves atomistically. In particular, his wage demands are not related to the firing or hiring of other workers.

Since the unemployed are perfect competitors, they offer to work at their reservation wage, R. This is defined as the wage at which workers are indifferent between employment ($\ell = 1$) and unemployment ($\ell = 0$):

(3) $\quad U\{R \cdot (1-\tau) + A, \ 1\} = U\{B + A, \ 0\}$

where U is a household's utility and the time horizon covers one period.

Each insider sets his wage so as to maximize his utility. This means that the wage is set as high as possible subject to two constraints:

(i) the zero-cash-flow constraint: the wage must not be so high that the firm achieves a negative cash flow (and consequently closes its operations); and

(ii) the firing-hiring constraint: the wage must not be so high that it is in the firm's best interest to fire the insider and hire an outsider (at wage R) instead.

Let W_{ZC} and W_{FH} be the wages corresponding to these two constraints, respectively.

From the firm's maximization problem (2), it is apparent that in equilibrium

$$(4) \quad W_{ZC} = 1 .$$

Furthermore, W_{FH} is the wage at which the cash flow generated by an insider $(1 - W_{FH})$ is equal to that generated by firing the insider and hiring an entrant $(\alpha - R - F(1) - H(1))$. Consequently,

$$(5) \quad W_{FH} = R + \left[(1-\alpha) + F(1) + H(1) \right] .$$

This condition indicates that the "wage spread" $(W_{FH} - R)$ is equal to the "productivity spread" $(1-\alpha)$ plus the firing-hiring cost per worker $(F(1) + H(1))$.

Thus, the wage which the insider actually demands is

$$(6) \quad W = \min(W_{ZC}, W_{FH}) .[6]$$

$W = W_{FH}$ is the case with which this article is primarily concerned. It is interesting to note that here all three deter-

minants of the insider wage – the reservation wage, the produc-
tivity spread, and the firing-hiring costs – may be influenced by
the insiders.

First, by being unfriendly and uncooperative to the
entrants, the insiders are able to make the entrants' work more
unpleasant than it otherwise would have been and thereby raise
the wage at which the latter are willing to work. In practice,
outsiders are commonly wary of underbidding the insiders. This
behavior pattern is often given an ad hoc sociological explana-
tion: "social mores" keep outsiders from "stealing" the jobs from
their employed comrades. Our line of argument, however, suggests
that these mores may be traced to the entrants' anticipation of
hostile insider reaction and that this reaction may follow from
optimization behavior of insiders.

Second, insiders are usually responsible for training the
entrants and thereby influence their productivity. Thus,
insiders may be able to raise their wage demands by conducting
the firm's training programs inefficiently or even disrupting
them.

Observe that if $W = W_{FH}$, then not only do insiders generate
a non-negative cash flow (i.e. $W \geq W_{ZC}$), but entrants do so as
well: $\alpha - R > 0$. This implies a positive lower bound on the
productivity of entrants. Unless this lower bound is exceeded,
the entrants would be unable to compete with the insiders and the
insiders, knowing this, would raise their wage until the firm's
profit were reduced to zero.

For this reason, firms have an incentive to supervise the
training of entrants and ensure that workers are productive
during their training period. In practice, firms may undertake

on-the-job training (rather than job-unrelated training) not only because this type of training may be the most effective way of raising an entrants' productivity and because (in the case of firm-specific training) it reduces entrants' incentive to switch to other firms, but also to dampen the wage demands of the insiders.

Third, insiders are commonly able to affect their potential firing and hiring costs. Threatening litigation and insisting on lengthy and expensive firing and hiring procedures are ways of doing this.

In sum, to raise his wage, an insider may find it worthwhile to threaten to become a thoroughly disagreeable creature, as summarized in the following proposition:

Proposition 1: Under the assumptions above, whenever a firm has a positive cash flow, each of its insiders has an atomistic incentive to be maximally uncoopertive towards entrants, to provide minimal training, and to make the process of firing and hiring as costly as possible.

Moreover, our model of wage setting suggests an explanation for a commonly observed labor market phenomenon:

Proposition 2: If insiders behave atomistically (Assumption A8) and firms differ with regard to their firing-hiring costs or their insider-entrant productivity differentials, then while there is equal pay for equal work within each firm (with positive cash flow), this is not so across such firms.

The analytical setup above enables us to portray involuntary unemployment as an insider-outsider dilemma. In firms with

positive cash flows, insiders are able to raise their wage above
the reservation wage (as shown by Equation (5)). Consequently,
the outsiders would prefer to have jobs than to be unemployed,
but they are unable to attract them. Thus, the outsiders are
involuntarily unemployed.

This unemployment is permanent since no matter what wage the
ousiders set, they either are unable to gain job offers or have
no incentive to accept these offers. Thus, the economy is in a
state of "involuntary unemployment equilibrium".

Now suppose that the amount of labor services offered by the
outsiders depends positively on the difference between the
insider wage and the reservation wage (i.e. the substitution
effect of a wage rise exceeds the income effects). Then, a rise
in the firing-hiring costs or the insider-entrant productivity
differential induces insiders to raise their wage relative to the
reservation wage and thereby they augment the level of
involuntary unemployment.

In sum,

Proposition 3: If all firms have positive cash flows, then
insiders set their wage at a level which generates involuntary
unemployment. The greater the firing-hiring costs and the
greater the insider-entrant productivity differential, the
greater the level of involuntary unemployment.

3. Union Activity: The Threat of Strike

Let "union activity" refer to any activity which workers
perform in unison in order to achieve an outcome which they could
not have achieved individually. Within the microeconomic context

outlined above, we rationalize this form of cooperative behavior by showing that insiders, acting together, can each achieve a higher wage than they could have done atomistically.

Ways of doing this can be inferred from Section 2 (pp. 13-14). With regard to firms with positive cash flows (i.e. ones whose firing-hiring constraints are binding), unions may be able to stimulate insiders' wages relative to the wage achievable atomistically by (i) raising the reservation wage (through threats of organized harassment of entrants), (ii) diminishing entrant productivity (through organized training disruption), (iii) capturing a greater share of the bilateral monopoly power (provided that they do not capture it all when bargaining atomistically), and (iv) raising the firms' firing-hiring costs. As the first three rationales are rather obvious, let us concentrate on the last one, which may be pursued by two very common union activities: the strike and work-to-rule.

Our explanations for both activities have a single root: both serve to make the productivity of insiders dependent on the firms' firing-hiring decisions and thereby make the process of firing and hiring more expensive for firms than when workers behave atomistically. Clearly, this can be done only if employees cooperate with one another and that, in short, is our basic approach to unionization.

In order for the strike and work-to-rule threats to operate in this manner, two conditions must be fulfilled:

A9: All firms have positive cash flow (i.e. their zero-

cash-flow constraints are not binding: $W < W_{ZC}$).

(Whenever a firm's zero-cash-flow constraint is binding, changes in firing-hiring costs have no effect on the insider wage.)

A10: The marginal firing and hiring costs (i.e. F' and H')

are increasing functions of the number of workers

fired and hired (i.e. F", H">0).

Provided that the revenues and costs of different firms are

independent of one another, unions issuing strike and work-to-

rule threats in our model will be firm-specific. Thus we

consider union activity within a single firm. (Workers have no

incentive in our model to form unions covering more than one firm

as long as firms act atomistically; thus, according to this

analysis, the incentives to form unions that cover workers in

several firms would rather be a reaction to the organization of

employers, in response to the organization of employees within

individual firms.)

This section is devoted to the threat of strike; the next is

concerned with the threat of work-to-rule.

Let the threat of strike be interpreted as the following
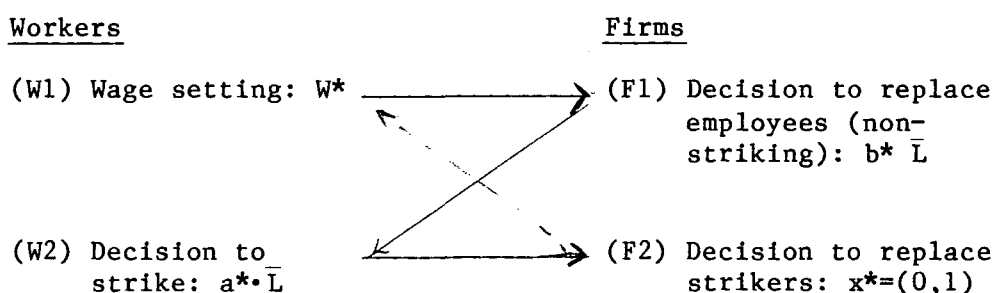
implicit contract which the union imposes on the firm:

Contract Cl: If a firm retains all its union members, then none

of them go on strike; yet if any of them are fired, then some

(possibly all) of the remaining ones strike.

Incorporating this union activity in the theoretical frame-

work of Section 2 broadens our analysis in three ways:

(i) it raises the number of control variables in the hands of

both the firm and the workers, (ii) it makes the analysis

inherently intertemporal, and (iii) it requires an explicit

representation of the firm's and its workers' behavior under

uncertainty. These complications are not expendable baggage;
they lie at the heart of the strike threat above.

In the model of Section 2, the firm and its workers each
have one control variable: the firm decides whether to replace
insiders and the insiders set their wages. Under Contract (C1),
by contrast, the interaction between workers and their firm may
be viewed as a sequence of events pictured in Figure 1. First,
workers set their wages (Decision W1). We assume that all the
members of a union demand the same wage. Second, in response,
the firm decides whether to replace (nonstriking) insiders
(Decision F1). Third, if workers have indeed been replaced, the
remaining insiders decide whether to strike (Decision W2).
Fourth, the firm decides whether to replace the strikers
(Decision F2). Then, given (F1) and (F2), workers reset their
wages and the process begins anew.

Workers   Firms

(W1) Wage setting: W* ⟶ (F1) Decision to replace
                                                employees (non-
                                                striking): b* $\overline{L}$

(W2) Decision to ⟶ (F2) Decision to replace
     strike: a*·$\overline{L}$ strikers: x*=(0,1)

W* = the utility-maximizing wage

a* = the utility-maximizing proportion of a firm's labor force
     which is on strike (given that the firm has replaced
     non-strikers)

b* = the profit-maximizing proportion of a firm's labor force
     which is replaced

x* = the profit-maximizing decison to replace (x=0) or retain
     (x=1) the strikers in a firm.

FIGURE 1: The Sequence of Wage-Setting, Strike, and Employment
           Decisions

We study the Nash equilibrium of this process. In other words, the firm's employment decisions (with regard to strikers and non-strikers) are exogenously given to the workers, and the workers' wage and strike decisions are exogenously given to the firm. At the equilibrium, the workers take into account employment decisions which maximize the firm's profits, and the firm takes into account wage and strike decisions which maximize the workers' utilities.

A union's strike activity and a firm's response to it are inherently intertemporal. Union members strike now in order to achieve something in the future. A firm's employment decisions are also forward-looking. Once the firm has precipitated a strike by firing some of its employees, there are three possible outcomes (in any given time period): (1) the union members win the strike, in which case all those who have been fired are rehired (at the insider wage); (2) the firm wins, in which case the fired workers irrevocably lose claim to their original jobs, and (3) the strike continues. Since the essence of the labor conflict can be captured in the context of two periods, let us assume that the workers and their firm have a two-period time horizon.

It lies in the nature of strike activity that its outcome is uncertain. A strike occurs only if the affected parties do not know how it will end. Thus, their subjective probabilities with regard to the possible outcomes become relevant to their strategies.

Let us now consider each of the decisions by the workers and their firm in turn. It is convenient to study these decisions in the reverse order from that which appears in Figure 1.

3a. Decision F2

Let δ^F be the firm's rate of time discount, ρ_w^F its perceived probability that the workers will win the strike, and ρ_ℓ^F its perceived probability that they will lose it. Assume that the firm is risk neutral and seeks to maximize the present value of its expected cash flow over two time periods.

If the firm decides to <u>hold all the strikers positions vacant</u> (F2: x=1), then this cash flow may be expressed as follows:[7]

$$(7) \quad CF_{x=1} = \underbrace{\left[\alpha - R\right] \cdot b \cdot \bar{L} - H(b \cdot \bar{L}) - F(b \cdot \bar{L})}$$

first-period cash flow generated by the entrants (net of firing hiring costs)

$$+ \underbrace{(1-a-b) \cdot \bar{L} \cdot \left[1-w\right] \cdot (1+\delta^F)}$$

cash flow generated by the non-striking insiders

$$+ \underbrace{\delta^F \cdot \rho_w^F \cdot \{(1-w) \cdot (a+b) \cdot \bar{L} - F(b \cdot \bar{L})\}}$$

additional second-period cash flow generated if the strikers win

$$+ \underbrace{\delta^F \cdot \rho_\ell^F \cdot \{(1-w) \cdot (a+b) \cdot \bar{L}\}}$$

additional second-period cash flow generated if the strikers lose

$$+ \underbrace{\delta^F \cdot (1-\rho_w^F - \rho_\ell^F) \cdot \{(1-w) \cdot b \cdot \bar{L}\}}$$

additional second-period cash flow generated if the strike continues

$$= (\alpha - R) \cdot b \cdot \bar{L} - (1 + \delta^F \cdot \rho_w^F) \cdot F(b \cdot \bar{L}) - H(b \cdot \bar{L})$$

$$+ (1-w) \cdot \{\bar{L} \cdot (1+\delta^F) - b \cdot \bar{L} - \alpha \bar{L} \cdot \left[1 + \delta^F \cdot (1 - \rho_w^F - \rho_\ell^F)\right]\}$$

On the other hand, if the firm decides to replace all the
strikers (F2: x=0), then (a+b)•$\bar{L}$ workers enter the firm in the
first time period and, in the second time period, these workers
are fired if the strikers win or turn into insiders otherwise.
It can then be shown that the present value of the firm's
expected case flow is

(8) $CF_{x=0}$ = $(\alpha-R) \cdot (a+b) \cdot \bar{L}$ - $(1+\delta^F \cdot \rho_w^F) \cdot F[(a+b) \cdot \bar{L}]$

$- H[(a+b) \cdot \bar{L}] + (1-w) \cdot \bar{L} \cdot [1 - (a+b) \cdot (1-\delta^F)]$

A comparison of Equations (7) and (8) leads to an
interesting result: In the Nash equilibrium, the Decision (F2:
x=0) – to replace all strikers – is never effective. The reason
is that if the firm decides to replace its strikers, it thereby
makes the Contract (Cl) ineffective: the workers lose their
incentive to strike and the firm has no strikers to replace.
(For an explanation of this result, see Lindbeck-Snower,
(1984a).)

Since the strike threat is not used when the firm replaces
all the strikers it is not necessary to consider this case
further. Instead, we can restrict our attention to the case in
which it is in the firm's best interests not to replace all the
strikers (i.e. x=1). In this case, of course, the marginal
effect on the cash flow ($CF_{x=1}$) of replacing non-strikers (b*•L)
is not the same as the marginal effect of going on strike (a*•L).

3b. Decision Fl
     Given that the firm decides to retain the strikers (x=1),
there remains only one decision variable for the firm to set: b.

The firm decides on how many of its non-striking employees to replace by maximizing its cash flow, $CF_{x=1}$, with respect to b (for an exogenously given value of W):

(9) $\dfrac{\partial CF_{x=1}}{\partial b} = \left[(w-R) - (1-\alpha) \right] \cdot \bar{L}$

$- H'(b* \cdot \bar{L}) \cdot \bar{L} - (1+\delta^F \cdot \rho_w^F) \cdot F'(b* \cdot \bar{L}) \cdot \bar{L} = 0$.

This equation is illustrated by the <u>firm's reaction function</u> b* = b*(W) (which can be shown to have an unambiguously positive slope) in Figure 2(a).

The fact that b* may be positive in the Nash equilibrium does not mean that non-striking insiders will actually be fired. In fact, the insiders set their wage so as to prevent this from happening. All that b* > 0 implies is that <u>if</u> the firm were to fire any of its non-striking insiders, it would be most profitable to fire $b* \cdot \bar{L}$ of them.

3c. Decision W2

The firing-hiring constraint which the workers face is not the same as that of Section 2. The constraint must be redefined to take into account the four instruments of workers and their firm, the two-period time horizon, and the uncertainty involved in posing the strike threat. At this constraint, the wage setting and strike decisions (decisions W1 and W2, respectively) are such that the firm's two-period cash flow from retaining all its insiders is equal to its two-period cash flow from its employment decisions (F1) and (F2) ($b \cdot \bar{L}$ and x=1, respectively):

(10) $\left[1 - w \right] \cdot (1+\delta^F) \cdot \bar{L} - CF_{x=1} = 0$.

w

firm's reaction
function:
b*=b*(w)

(for R=R^o)

equilibrium
credible-threat
constraint

w^e

insiders' reaction
function:

w*=w*(b)

(for R=R^o)

b

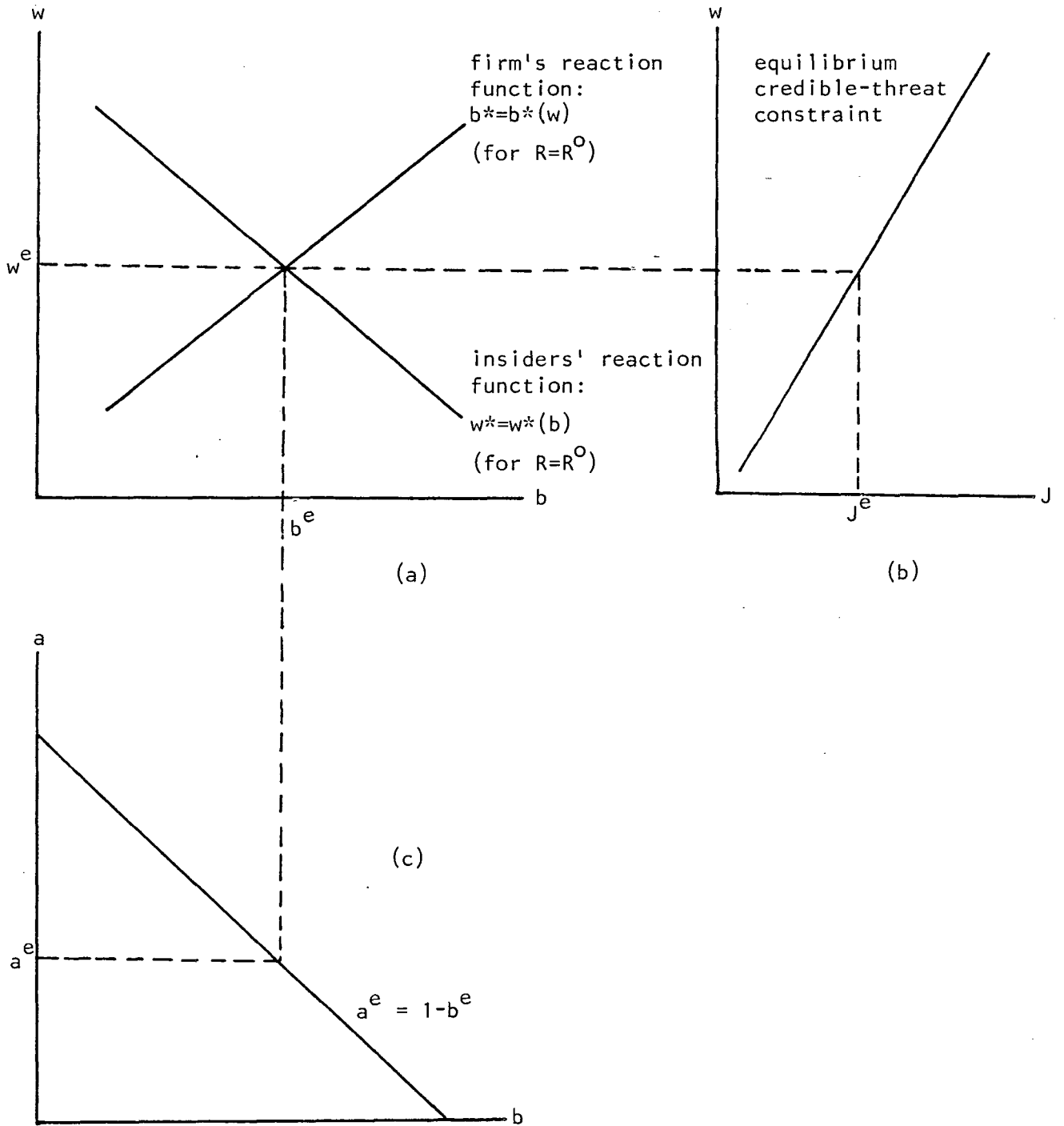b^e

(a)

J^e

J

(b)

a

(c)

a^e

a^e = 1-b^e

b

FIGURE 2:   The Nash Equilibrium under Threat of Strike

From this equation it can be shown that (dW/da) > 0 (for

given b, which is exogenous to the workers). Since the insiders

seek to maximize their wage, they set "a" as high as possible.

Recall that a + b ≤ 1. Thus, the optimal level of "a" illus-

trated in Figure 2(c), is

(11) a* = 1 - b.

This result may be summarized as follows:

Proposition 5: If it is in the firm's best interests to retain

all its strikers, then all the insiders of the firm have an

incentive to issue the strike threat of Contract C1.

In other words, Contract C1 may be reworded as follows:

Contract C1': If a firm retains all its insiders, then none of

them go on strike; yet if any of them are fired, then all of the

remaining ones strike.

The only union that can implement the above contract is a

firm-specific union of maximal size. In other words, insiders

have an incentive to join unions each of which cover the entire

workforce of a firm.

Once again, a positive value of a* does not mean that

workers actually go on strike. As noted, the insider wage is low

enough to discourage firms from firing non-strikers and conse-

quently the workers have no cause to strike (according the

Contract C1). A positive a* simply means that if the firm were

to fire b*·$\bar{L}$ non-strikers (where 0 < b* < 1), a*·$\bar{L}$ of the

insiders would have an incentive to strike.

3d. Decision W1

Substituting Equation (11) into (10), we obtain the
insiders' wage-setting decision (given the firm's employment
decisions, b·$\bar{L}$ and x=1):

$$(12) \quad w^* = 1 - \frac{(\alpha-R)\cdot b\cdot\bar{L} - \left[1+\delta^F\cdot\rho_w^F\right]\cdot F(b\cdot\bar{L}) - H(b\cdot\bar{L})}{\{b\cdot\bar{L} + (1-b)\cdot\bar{L}\cdot\left[1 + \delta^F\cdot(1-\rho_w^F\cdot\rho_\ell^F)\right]\}}$$

This equation is illustrated by the insiders' reaction function
W* = W*(b) in Figure 2(a), which can be shown to have an
unambiguously negative slope in the neighborhood of the Nash
equilibrium (see Lindbeck and Snower (1984a)).

3e. The Nash Equilibrium

Thus far we have considered the decision-making of the firm
and its insiders. It remains to analyze that of the outsiders.
As noted in Section 2, the outsiders are perfect competitors in
the labor market and thus they offer to work at their reservation
wage.

We assume that outsiders, like the insiders, have a
two-period time horizon. In that case (unlike the single-period
case) the reservation wage comes to depend on the insider wage.
The reservation wage relevant to our analysis of strike threat
may be defined as the wage at which workers are indifferent
between (a) unemployment in both time periods (i.e. ℓ=0 and
income of A+B in each period) and (b) employment as entrant in
the first period (i.e. ℓ=1 and income of R+A) and, in the second
period, unemployment if fired and employment as insider otherwise

(i.e. $\ell=1$ and income of $W+A$). Let δ^H be the workers' rate of time discount and b^H be their perceived probability of being fired in the second period. Then the reservation wage is given by

(13) $(1+\delta^H) \cdot U[B+A, 0]$

$$= U[R \cdot (1-\tau) + A, 1] + \delta^H \cdot b^H \cdot U[B+A, 0] + \delta^H \cdot (1-b^H) \cdot$$
$$U[w \cdot (1-\tau) + A, 1] ,$$

which implies that

(13a) $R = R(W, B)$.
$\quad\quad\quad (-)(+)$

In other words, the higher the insider wage which the outsider anticipates in the future, the lower the entrant wage for which he is willing to work at present; the higher the benefit he receives when unemployed, the greater the reservation wage he requires to compensate him for accepting employment.

In the Nash equilibrium, firms and their insiders not only take each other's decisions as exogenously given, but also the reservation wage of the outsiders above. Substituting this reservation wage (13a) into the firm's and the insiders' reaction functions (Equations (9) and (12) respectively), the Nash equilibrium may be characterized as the intersection of the corresponding reaction functions, as given by point (b^e, W^e) in Figure 2(a).

Provided that $b^e < 1$, a^e is positive, i.e. <u>the strike threat is ex ante desirable for each of the union members</u>. This means that, given the firm's employment decisons (F1) and (F2), each union member can achieve a higher wage by issuing the strike threat of Contract C1' than by foregoing this threat.

3f. Strike Credibility

Yet in order for the strike threat to be effective, it must be credible, i.e. the strike threat must be ex post desirable for each of the union members. Once the firm has fired some of the non-striking insiders, the remaining insiders - confronted with this fait accompli - must have an incentive to fulfill their strike threat. Clearly, such an incentive exists if and only if their ex post utility from striking exceeds their ex post utility from remaining on the job.

Recall that each worker's utility depends positively on consumption (which is purchased with the worker's income) and leisure. For simplicity, let the utility function be additively separable, normalize the utility from maximal leisure (viz. no employment: $\ell=0$) to zero, and let the utility from minimal leisure (viz. employment: $\ell=1$) be $-\Gamma$ (where Γ is a positive constant). Let ρ_w^H and ρ_ℓ^H be the worker's (households) perceived probabilities of winning and losing the strike, respectively, and b_1 be his perceived probability of being fired if he loses.

Suppose that if the worker does strike, then his only source .of non-profit income is a payment out of a strike fund. Let this payment be J (a positive constant) per time period. (Recall that his profit income is A, also a positive constant.)

Under these circumstances, the worker's ex-post utility from striking (i.e. his utility, given that the firm has engaged in firing activity) can be shown (Lindbeck and Snower (1984a)) to be

$$(14) \quad U_1 = U[J+A] \cdot \{1 - \delta_w^H \cdot (1 - \rho_w^H - \rho_\ell^H)\}$$

$$+ \{U[w \cdot (1-\tau) + A - \Gamma\} \cdot \{\rho_w^H + \rho_\ell^H \cdot (1-b_1)\} \cdot \delta^H$$

$$+ U[B+A] \cdot \rho_\ell^H \cdot b_1 \cdot \delta^H .$$

(This expression is derived in the same way, in principle, as Equation (7), viz. as the sum of all the worker's possible utilities, weighted by their respective probabilities.)

Let b_2 be the worker's perceived probability of being fired if he remains on the job. Then his ex post utility from not striking .can, in a parallel fashion, be shown to be

$$(15) \quad U_2 = \{U[w \cdot (1-\tau) + A] - \Gamma\} \cdot \{1 + \delta^H \cdot (1-b_2)\}$$

$$+ \delta^H \cdot b_2 \cdot U[B + A] .$$

As noted, the strike threat is credible if and only if $U_1 \geq U_2$, i.e.

$$(16) \quad -\{U[w \cdot (1-\tau) + A] - \Gamma - U[J + A]\} \cdot \{1 + \delta^H \cdot (1-\rho_w^H - \rho_\ell^H)\}$$

$$-\{U[w \cdot (1-\tau) + A] - \Gamma - U[B + A]\} \cdot \delta^H \cdot (\rho_\ell^H \cdot b_1 - b_2] \geq 0 .$$

This condition may be called the "credible-threat constraint".

It contains only two of the worker's decision variables: W and J. For any given value of W, there exists a minimal value of J, for which the condition (16) is satisfied as equality. Since the strike fund can be augmented only at the expense of insider income (and therefore also insider consumption), this is indeed the utility-maximizing value of J. Condition (16) as equality is illustrated in Figure 2(b).

In equilibrium, the strike fund is not in fact changed and thus strike-fund contributions do not enter the insiders' utility maximization problems. The sole purpose of the strike fund in equilibrium is to establish a credible threat. Consequently, the optimal equilibrium strategy for insiders is to set their wage as high as the firing-hiring constraint (12) will allow and then to set J high enough so that the credible-threat constraint (16) is just satisfied. In this sense, condition (16) implies the optimal equilibrium size of the strike fund.

3g. Macroeconomic Implications

Is the level of involuntary unemployment higher when insiders unionize to issue the strike threat than when they act atomistically? To make a valid comparison, consider two economies which are identical except that one is unionized in the sense above and the other is atomistic.

The firm's reaction function under atomistic wage setting is the same as that under the strike threat (Equation (9)), except that the firm's perceived probability of strikers winning their strike (ρ_w^F) is obviously zero in the former case and generally positive in the latter. Similarly, the insiders' reaction function under atomistic wage setting (Equation (5)) is the same as that under the strike threat (Equation (10)), except that the proportion of strikers (a) and the insiders' perceived probabilities of winning and losing the strike $(\rho_w^H$ and ρ_ℓ^H, respectively) are zero in the former case and generally positive in the latter.

Substituting the expression for the reservation wage (Equation (13)) into the firm's reaction function (Equation (9)), we find that, for any given value of the insider wage, the firm's

optimal firing under atomistic insider behavior $(b_{at} \cdot \bar{L})$ is less than that under the strike threat above $(b* \cdot \bar{L})$ (ceteris paribus).[8] Thus, the firm's reaction function is lower (in b-W space) for a non-unionized workforce than for a unionized one, as shown in Figure 3(a).

FIGURE 3: Involuntary Unemployment under Strike Threat and Atomistic Wage Setting

(a) (b) (c)
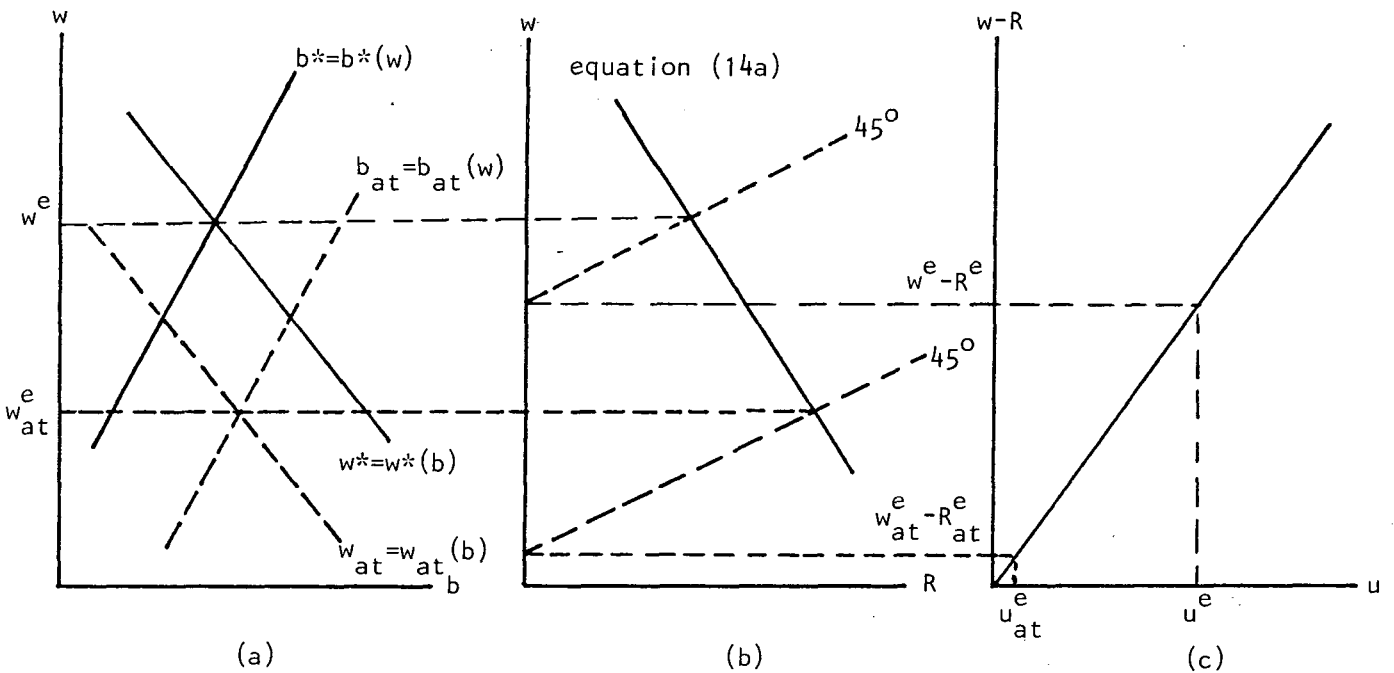
Furthermore, substituting the expression for the reservation wage (Equation (13)) into the insiders' reaction function (Equation (12)), we find that, for any given value of firm firing $(b \cdot \bar{L})$, the insider wage is lower under atomistic than under union conditions (W_{at} and $W*$, respectively). Thus, the insiders' reaction function is also lower in the former case than in the latter, as shown in Figure 3(a).

Consequently, an economy in which a fixed number of firms face atomistic insiders will display a lower insider wage (W^e_{at} in Figure 3(a)) than the one (W^e in Figure 3(a)) which emerges when all these firms face unions posing the strike threat (C1').

Recall that the reservation wage (Equation (14)), illustrated in Figure 3(b) for a given value of b^H) is inversely related to the insider wage. Thus, it is evident that the differential between the insider wage and the reservation wage must be larger under under unionization ($W^e - R^e$) than under atomistic behavior ($W^e_{at} - R^e_{at}$). Assuming (as in Section 2) that the amount of labor services offered by the outsiders depends positively on this differential (as pictured in Figure 3(c)), we arrive at the following proposition:

Proposition 6: The level of involuntary unemployment and the level of the insider wage are greater (ceteris paribus) when all insiders in the economy unionize to issue the strike threat (C1') than when they set their wages atomistically.

In Section 2 (Proposition 3), involuntary unemployment was portrayed as a phenomenon which the insiders, setting their wages individually, impose on the outsiders. Now we find that insiders can augment their wage claims by forming unions to pose strike threats and, as by-product, they raise the level of involuntary unemployment.

The macroeconomic implications of our union analysis may be clarified by various comparative static experiments.

Suppose that the productivity of entrants (relative to insiders (α)) rise exogenously. Then (by Equation (9)), the cash-flow-maximizing number of non-strikers to be fired ($b* \cdot \bar{L}$)

rises for every given insider wage and reservation wage; thus, the firm's reaction function (b*) shifts to the right in b-W space. In addition (by Equations (12) and (13)), the utility-maximizing insider wage falls for every given value of b (as the reservation wage rises) - thus, the insiders' reaction function (w*) shifts downwards as well. However, the credible-threat constraint remains unchanged. These effects are shown in Figure 4 and may be summarized as follows:

Proposition 7: When unions issue the strike threat (Cl'), an increase ·in the productivity of entrants (α) leads to a reduction in the equilibrium levels of the insider wage and the strike fund.

(With regard to the insider wage, this effect of entrant productivity is qualitatively the same as that in the world of atomistic wage setting (see Equation (5)).

The effect of an increase in the firm's perceived probability that the strike will persist $(1 - \rho_w^F - \rho_\ell^F)$ is pictured in Figure 5. The firm's reaction function (b*) remains unchanged; that of the insiders (w*) shifts upwards; and the credible-threat constraint shifts to the right.

Proposition 8: When unions issue the strike threat (Cl'), an increase in the firm's perceived probability that the strike will persist $(1 - \rho_w^F - \rho_\ell^F)$ leads to a rise in the equilibrium levels of the insider wage and the strike fund.
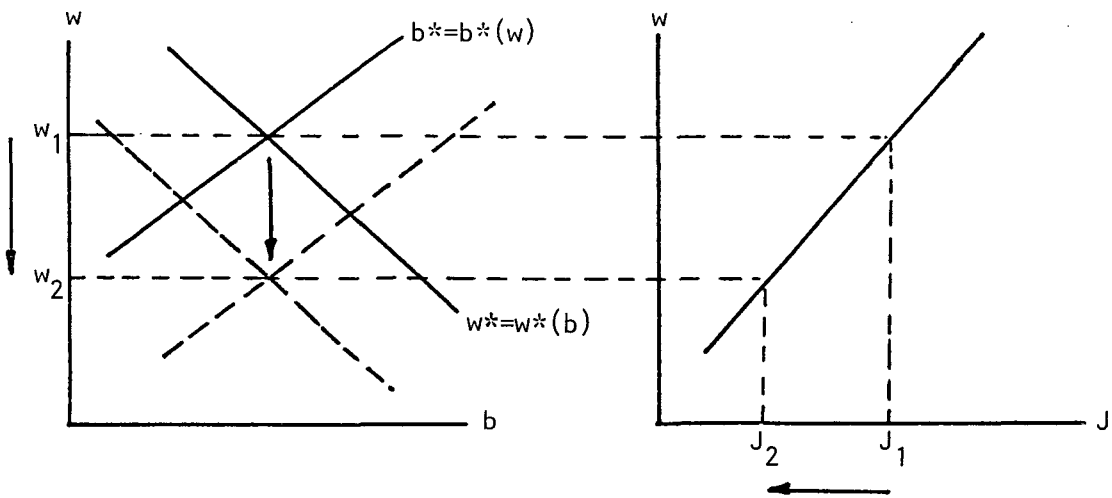
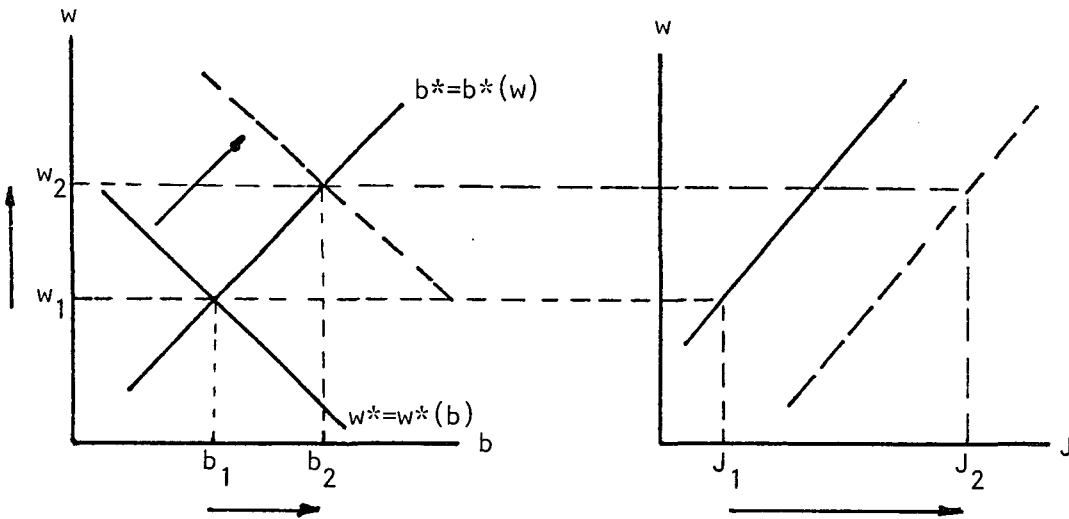FIGURE 4: The Effect of an Increase in Entrant Productivity

FIGURE 5: The Effect of an Increase in the Firm's Perceived
Probability that the Strike will Persist

Figures 6 and 7 are concerned with the effects of an

increase in firing or hiring costs, in lump-sum (F or H) and

marginal (F' or H') terms, respectively. They illustrate the

following comparative statics result:

Proposition 9: When unions issue the strike threat (Cl'), both a

lump-sum and a marginal increase in the costs of firing or hiring

leads to a rise in the equilibrium levels of the insider wage and

the strike fund.

(In the world of atomistic wage setting, a lump-sum increase

in firing-hiring costs also raises the insider wage, but a

marginal increase in these costs has no effect.)

It is also obvious that the macroeconomic consequences of a

rise in the unemployment benefits (B) may be summarized as

follows:

Proposition 10: A rise in unemployment benefits (B) raises the

reservation wages and the insider wages. Under atomistic wage-

setting, there is no effect on unemployment; under union wage-

setting the unemployment effect is ambiguous.

4. Union Activity: The Threat of Work-to-Rule

The threat of work-to-rule provides another rationale for

unionization. Clearly, this threat can be operative only when

firms are able to observe a particular minimal effort level which

workers can be monitored and remunerated to attain, but are

unable remunerate workers in accordance with effort expended

beyond this level. If this were not the case, there could be no

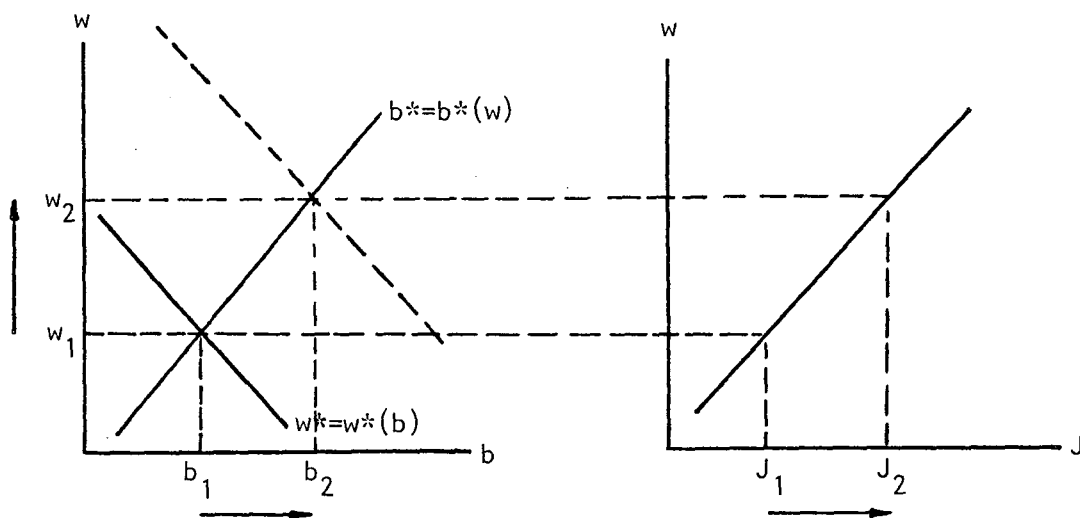"rule" which constitutes the basis of "work-to-rule" and there

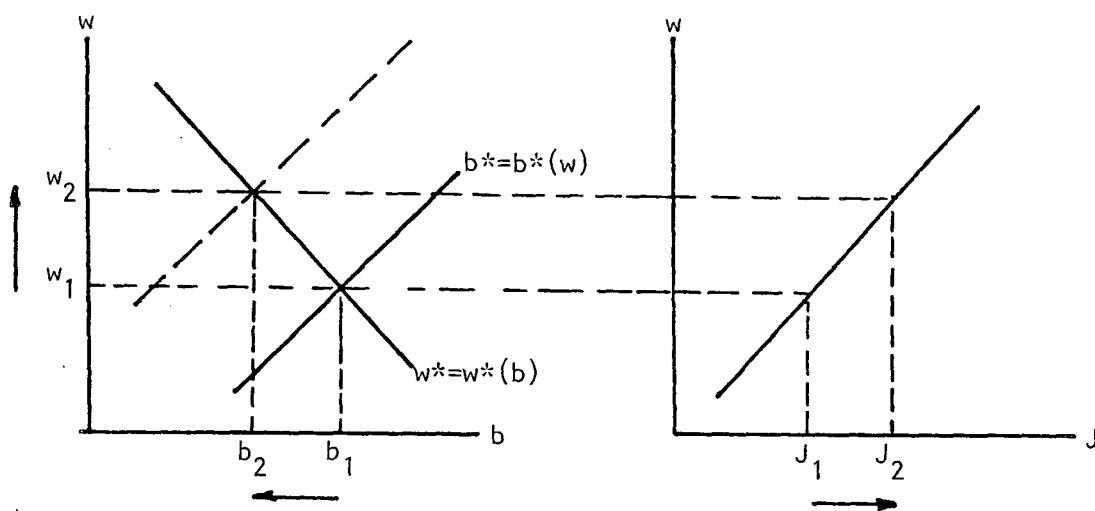FIGURE 6: The Effect of a Lump-Sum Increase in Firing or Hiring Costs

FIGURE 7: The Effect of a Marginal Increase in Firing or Hiring Costs

could be no threat associated with doing so. The most common reason why firms may be unable to pay insiders in accordance with the above-minimal effort they expend is that they may be unable to observe such effort.

Accordingly, suppose that a minimal effort level is readily observed (e.g. the presence of a worker interacting with a machine), whereas effort in excess of this level (e.g. the worker's degree of concentration, accuracy, or delicacy) can only be observed at prohibitive cost. Thus, the employer finds it worthwhile to ascertain whether each of his workers provides minimal effort, but does not monitor the effort beyond that.

In this context, consider the following implicit contract:

Contract C2: If all union members retain their jobs, then all of them will devote a particular, above-minimal level of effort to their jobs; yet if any of them are fired, then some (possibly all) of the remaining ones will work-to-rule (i.e. work at the minimal effort level).

If this contract is effective, then workers use effort as an "employer disciplining device" (to preserve their jobs).

The interaction between workers and their employer under Contract C2 is pictured in Figure 8. First, workers set their wages (Decision (W1'). Second, the firm decides whether to replace any of its non-shirkers (i.e. workers providing an above-minimal level of effort) (Decision (F1'). Third, if workers have been replaced, the remaining insiders decide whether to work-to-rule (Decision (W2'). Fourth, the firm decides whether to replace the shirkers (Decision (F2')). We are concerned with the Nash equilibrium of this process.

<u>Workers</u>   <u>Firms</u>

(W1) Wage setting: W* ⟶ (F1) Decision to replace
                                          non-shirkers: b*·L̄

(W2) Decision to work- ⟶ (F2) Decision to replace
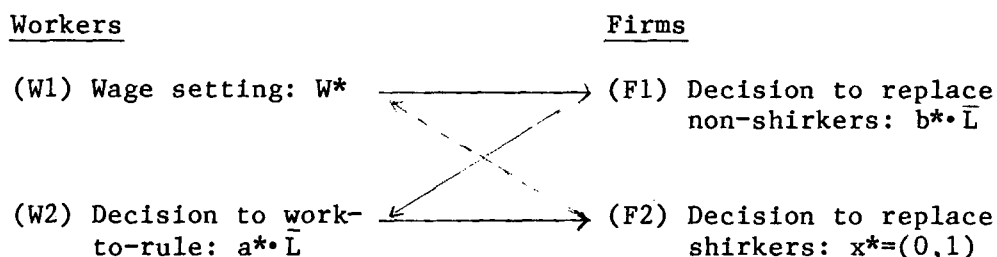   to-rule: a*·L̄   shirkers: x*=(0,1)

FIGURE 8: The Sequence of Wage-Setting, Work-to-Rule, and
           Employment Decisions

In this setup, the threat of work-to-rule operates
analogously to the threat of strike.

Let E be the above-minimal effort level which non-shirkers
provide and let the minimal effort level be normalized to unity.
Let us redefine ρ_w^F and ρ_ℓ^F to be the firm's perceived probabili-
ties that the shirkers will win and lose the work-to-rule
confrontation (respectively).

Then the firm's expected cash flow from retaining all the
shirkers (F2: x=1), $\widetilde{CF}_{x=1}$, may be defined[9] analogously to that
from retaining all the strikers (see the previous section).
Similarly for its cash flow from replacing all the shirkers (F2:
x=0). As in the case of strike threat, it can be shown that, in
the Nash equilibrium, the decision to replace all the shirkers is
never effective (since then workers would lose their incentive to
use the work-tu-rule threat).

Now, if it is in the firm's interest to retain all shirkers
(i.e. $\widetilde{CF}_{x=1} > \widetilde{CF}_{x=0}$), then its reaction function is given by

$$(17) \quad \frac{\partial \widetilde{CF}_{x=1}}{\partial b} = \left[(w-R) - E\cdot(1-\alpha) \right]\cdot\bar{L}$$

$$- H'(b*\cdot\bar{L})\cdot\bar{L} - (1+\delta^F\cdot\rho_w^F)\cdot F'(b*\cdot\bar{L})\cdot\bar{L} = 0 \ .$$

Thus, the firm's reaction function under the threat of work-to-rule is quite similar to that under the threat of strike (Equation (9)).

The insider's reaction function, however, is a different matter. As in the case of strike threat, the insider faces two constraints: a firing-hiring constraint and a credible-threat constraint. The former is

$$(18) \quad (E - W) \cdot (1+\delta^F) \cdot \bar{L} - \tilde{CF}_{x=1}(w, b^*) \geq 0 .$$

It can be shown (Lindbeck and Snower (1984a)) that the credible threat constraint is invariably satisfied and thus will be ignored in what follows.

But how, it may be asked, can insiders give themselves the incentive to provide above-minimal effort? How can they prevent themselves from becoming free riders? One particularly plausible answer is that although the employer cannot monitor above-minimal effort of an insider, the insider's colleagues can usually do so. Workers are usually in a much better position to supervise each other than be supervised by their employer. Furthermore, workers in the present context have an incentive to alert their employer to any on-the-job shirking, since otherwise the employer would become aware of the existence of shirkers through comparing overall outputs and labor inputs and then it would be in his best interests to fire insiders (since the firing-hiring constraint would be violated).

The insiders set W and E so as to maximize utility subject to the firing-hiring constraint:

(19) Maximize $(1+\delta^H) \cdot \{U[w \cdot (1-\tau) - A] - \Gamma(E)\}$

   subject to (18).[10]

Here the disutility of work (Γ) is taken to depend on the amount
of effort (E) expended. We assume that U', $\Gamma' > 0$, $U'' < 0$, and
$\Gamma'' > 0$.

Analogously to the case of strike threat, it can be shown
that, for any given level of E, $(dW/da) > 0$. In other words, a
rise in the proportion of insiders who work-to-rule (when non-
shirkers have been fired) increases each worker's income (and
thus consumption) without requiring increased effort. Hence,
each worker has an incentive to join a union which covers the
entire workforce of the firm. Once again, $a^*=1-b$.

For a given value of b, the solution to the insider's
maximization problem (19) is pictured in Figure 9. (The firing-
hiring constraint is unambiguously upward sloping in E-W space.)
Now suppose that b rises. It can be shown (see Lindbeck and
Snower (1984a)) that, in response, the firing-hiring constraint
shifts downwards and becomes flatter in E-W space, as illustrated
in the figure. Thus, there is an unambiguous drop in the insider
wage (and E's direction of movement depends on the relative
importance of the income and substitution effects). In sum, the
insiders respond to a rise in b by reducing their wage; hence,
the insiders' reaction function ($w^* = w^*(b)$) in Figure 11 is
downward-sloping. The firm's reaction function ($b^* = b^*(w)$,
Equation (17) is upward-sloping. The intersection of these two
functions denotes the Nash equilibrium, analogously to (b^e, W^e) in
Figure 2(a).

FIGURE 9:   The Insider's Response to a Rise in the Firm's Firing
Activity
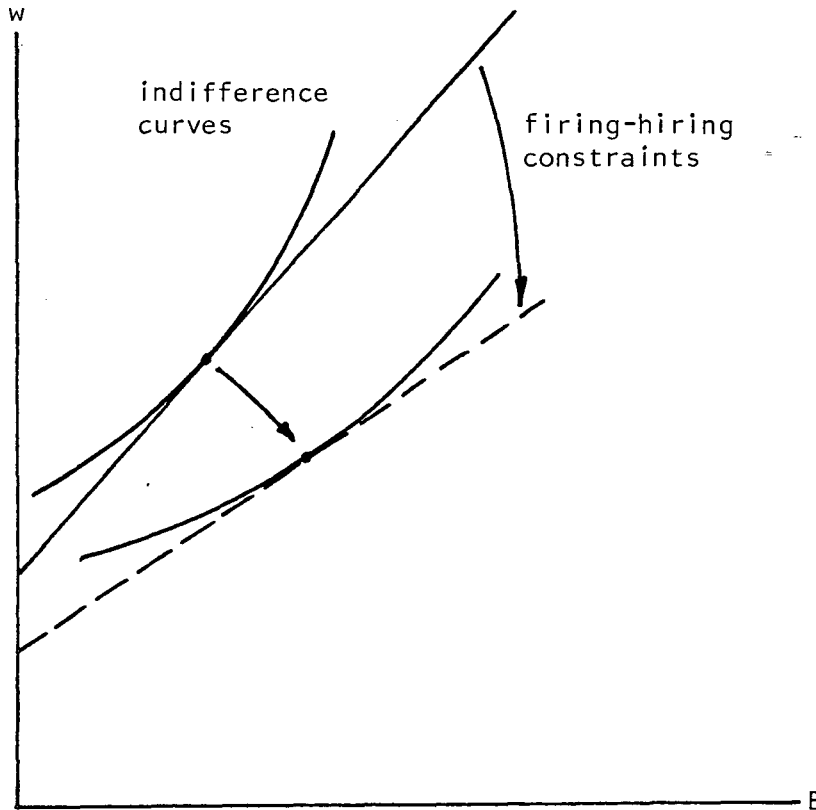
As in the case of strike threat, it can be shown that both

the insider wage and the level of involuntary unemployment are

higher when all the insiders in the economy unionize to issue a

work-to-rule threat (C2) than when they set their wages atomisti-

cally.   The effects of exogenous changes in entrant productivity,

the firm's perceived probability that the strike will persist,

and lump-sum and marginal firing-hiring costs are also qualita-

tively the same as in the case of strike threat (see Propositions

7-9).

5. Epilogue

Persistent involuntary unemployment is explained in this article as a consequence of the employed workers ("the insiders") exploiting the monopoly power that they obtain in wage setting as a result of the costs of hiring and firing. The unemployed workers ("the outsiders") are unable to undercut the "monopoly wages" of the insiders, not only due to conceivably existing "social mores" against such attempts, but also because the firms would have no incentives to fire the insiders and hire the outsiders. Thus, although the resulting involuntary unemployment is a disequilibrium market phenomenon in the sense the excess supply for labor exists, there is no tendency for the situation to be rectified, as neither the firms nor the employed workers (possibly acting through unions) have an incentive to change their behavior.

Involuntary unemployment of this type exists even in atomistic labor markets, although (as shown) unions serve to raise their members' wage levels and thereby the involuntary unemployment is amplified. In this vein, our analysis provides a rationale for the existence of unions and for their use of threats of strike and work-to-rule, operating in the interests of the insiders and against those of the outsiders.

By formalizing these notions on choice-theoretic foundations, we have shown that the size of insiders' real wages, as well as the size of involuntary unemployment, depends positively on the reservation wage of workers (which the unions may raise through threats and harassment of potential entrants, as well as

via the build-up of "social mores" against the undercutting of
existing wages of the insiders), on the hiring and firing costs
of firms (which unions may be able to raise by bargaining and by
lobbying for legislation), and negatively on the entrants produc-
tivity (which unions may keep down by being uncooperative in the
training of entrants). Thus, the insider wage and the level of
involuntary unemployment are greater (ceteris paribus) when the
insiders are unionized to issue strike threats than when they set
their wages atomistically. Of course, unions may also, along
well-known lines, be able to seize a larger share of the poten-
tial monopoly gains that arise from the existence of hiring and
firing costs, by strengthening the bargaining position of the
insiders through threats to strike and work-to-rule.

The formalization in the paper also allows a number of
comparative statics exercises concerning the effects on real
wage rates and unemployment of changes in parameters. For
instance, an exogenous increase in the productivity of entrants
results in a reduction in the equilibrium level of both the
insider wage and in the strike fund that is chosen by unions. An
increase in the firms' perceived probability that a strike will
persist leads to a rise in the equilibrium level of both the
insider wage and the strike fund. An increase in either the
lump-sum or the marginal costs of firing or hiring have the same
qualitative effects.

Finally, a rise in unemployment benefits raises the reserva-
tion wages and the insider wage; under atomistic wage-setting,
there is no effect on unemployment, while under union-setting the
unemployment effect is ambiguous. The model, appropriately

amplified, also lends itself to an analysis of the effects on real wages and involuntary unemployment of other types of economic policy actions, such as changes in government employment and government tax policy; (see Lindbeck-Snower, (1984a)).

FOOTNOTES

1. In the search models of Alchian (1970), Gronau (1971), Lucas and Prescott (1974), McCall (1970), Parsons (1973), Phelps and Winter (1970), Siven (1974), and others, the marginal benefit from search accrues from sampling a given wage-price distribution, whereas the marginal cost of search may be partially traceable to firing-hiring activities (e.g. Okun (1981)).

2. Labor mobility may be costly on account of firing-hiring costs and thus workers must decide in advance to which firms they offer their labor over an extended period of time. Consequently, firms may make competitive "implicit contracts" which may imply incomplete utilization of the labor force under some possible states of nature. This is the analytical setup of Azariadis (1975), Azariadis and Stiglitz (1983), Baily (1974), Grossman and Hart (1981) and others.

3. This is the world of Hart (1982), McDonald and Solow (1981), and Snower (1983).

4. This approach is conspicuous in the recent literature on union behavior, e.g. Corden (1981), McDonald and Solow (1981), Oswald (1982), and Lindbeck and Gylfason (1983).

5. Here unemployment is explained as a problem of adverse selection. This approach is found in the work of Stiglitz (1974), based on related contributions by Phelps (1970), Salop (1973, 1979) and others.

6. The insider wage must also be sufficiently low to discourage the firm from firing the insider and leaving his position

vacant. For the purpose of Equation (6), however, this constraint can be ignored, since it can be shown (see Lindbeck and Snower (1984a)) that it holds whenever the zero-profit constraint is satisfied.

7. Regardless of whether a marginal insider is fired or goes on strike, he is replaced by an entrant in the first period (and the associated firing-hiring costs are expended); in the second period, he is rehired if the strikers win, irrevocably loses his job if the strikers lose, and remains on strike if the strike continues.

8. For ease of comparison, we assume that, in determining the reservation wage (Equation (13)), the outsiders' perceived probability of being fired in the second period (b^H) is the same under atomistic and unionized wage setting. With regard to the firm's reaction function (Equation (9)), given that $\rho_w^F = 0$ in the atomistic case but $\rho_w^F > 0$ in the unionized case and given that $(\partial^2 CF_{x=1}/\partial b^2) < 0$, it is evident that $b_{at} < b*$ (ceteris paribus).

9. The relevant cash flow (see Lindbeck and Snower (1984a)) is

$$\widetilde{CF}_{x=1} = (\alpha \cdot E - R) \cdot b \cdot \bar{L}$$

$$+ (1-W) \cdot a \cdot \bar{L} \cdot \{1 + \delta_w^F \cdot (1 - \rho_w^F - \rho_\ell^F)\}$$

$$+ (E-W) \cdot \{\bar{L} \cdot (1+\delta^F) - a \cdot \bar{L} \cdot [1 + \delta^F (1 - \rho_w^F - \rho_\ell^F)] - b \cdot \bar{L}\}$$

$$- H(b \cdot \bar{L}) - (1 + \delta^F \cdot \rho_w^F) \cdot F(b \cdot \bar{L}) .$$

10. Since the insider's choice of (W, E) satisfies the firing-hiring constraint, he will not be replaced by the firm. His utility function is formulated accordingly.

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