

Lindbeck, Assar; Snower, Dennis J.

Working Paper — Digitized Version

Strikes, lock-outs and fiscal policy

Seminar paper, Institute for International Economic Studies, University of Stockholm, No. 309

Provided in Cooperation with:

Kiel Institute for the World Economy – Leibniz Center for Research on Global Economic Challenges

Suggested Citation: Lindbeck, Assar; Snower, Dennis J. (1984) : Strikes, lock-outs and fiscal policy, Seminar paper, Institute for International Economic Studies, University of Stockholm, No. 309, Institute for International Economic Studies, University of Stockholm, Stockholm

This Version is available at:

<https://hdl.handle.net/10419/431>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

ISSN 0347-8769

Seminar Paper No. 309

STRIKES, LOCK-OUTS AND FISCAL POLICY

by
Assar Lindbeck
and
Dennis Snower



1985 B 172

Seminar Papers are preliminary material circulated to stimulate discussion and critical comment.

December, 1984

Institute for International Economic Studies
S-106 91 Stockholm
Sweden

STRIKES, LOCK-OUTS AND FISCAL POLICY

by Assar Lindbeck* and Dennis Snower**

1. Introduction

Strikes and lock-outs have remained remarkably unexplored in the theory of labour markets, even though the former are an important element of union activity and the latter are a constituent of the employers' response. Much of the current theory of union behaviour is devoted to the ways in which union preferences and constraints (especially labour demand constraints) affect wage and employment determination; strikes and lock-outs have received little attention in this context. Their impact on the effectiveness of government policies is noted persistently in the news media, but has been largely ignored in the theoretical literature.

A number of fundamental questions need to be tackled, however, before strikes and lock-outs can be incorporated into a theoretical analysis of employer and employee behaviour. What purpose do strike and lock-out threats serve and why are they acted on? What makes them credible? Why do employers take notice of strike threats? Why don't they simply exchange their striking workers with non-striking ones? Similarly, what gives lock-out threats their bite.

In the literature on bargaining in labour markets, various rationales for strikes have been suggested: they may be

- (a) an "information gathering device" in situations where employers and employees are not perfectly informed about each other

* Institute for International Economic Studies, University of Stockholm, S-106 91, Stockholm, Sweden.

** Birkbeck College, University of London, 7/15 Gresse Street, London W1P 1PA, England.

preferences or about market conditions (e.g. Bishop (1964), Cross (1965), Harsany (1956), Hayes (1984), Reder and Newman (1980);

- (b) an "expectations revising device" when union management seeks to convince its rank and file that its wage demands are unacceptably high to employers (e.g. Aschenfelter and Johnson (1969), Farber (1978))
- (c) a "job-preserving device" when unions try to prevent employers firing workers, given the unions' wage proposals (see Lindbeck and Snower (1984b)).

The reasons for lock-outs have received far less attention in the theoretical labour market literature. Moreover, the questions concerning what makes strike and lock-out threats credible and why non-union members do not underbid the union wages have remained largely neglected.

This paper deals with these questions in a particularly simple way. It suggests that the clout of strike threats may come from various costs of hiring and firing, which can be quite substantial in practice. Employers who exchange striking workers for non-striking ones must pay these costs. They will not do so if the costs exceed the expected costs of the strike. In that event, they have an incentive to "bribe" their workers not to strike. The bribes may take the form of wage increments. Thereby strike threats become a method whereby workers can capture economic rent from their productive activities.

In our analysis, strike threats are a "wage preserving device" whereby the unions attempt to induce the employers to accept their

wage proposals (as explained in Section 4).

In this analysis, union wage demands depend not only on their preferences and labour demand constraints, but also on the effectiveness of the strike threat. Another essential ingredient turns out to be threat credibility. We assume that unions only issue strike threats which their members have an incentive to fulfill, should the conditions of the threat be met. (We do not deal with situations where union leadership induces members to strike against their own wills.)

We examine strike threats in conjunction with the countervailing threats of lock-out. According to our story, employers have three potential responses to a strike: (i) retaining the strikers in anticipation that the conflict will be resolved, (ii) staging a lock-out, and (iii) exchanging the strikers for non-strikers and paying the associated hiring-firing costs. Since the third response is comparatively rare in practice, we concentrate on the first two. We derive conditions under which each of these responses is chosen and show how the effectiveness of the strike threat varies from one case to another. This is immediately relevant to the formulation of unions' wage demands.

Our analysis uses the costs of hiring and firing not only as a rationale for strike and lock-out threats, but also as a source of involuntary unemployment. The costs create bilateral monopoly power between the employer and his employees. If workers are able to capture some of this power, they can push their wage above the level at which the unemployed would be willing to work, without giving the employer an incentive to exchange them for the unemployed. The resulting unemployment is involuntary in the sense that the unemployed

are willing to perform the going jobs for less than the going wage, but are unable to do so. Here, unemployment is due to a conflict of interest not between employers and unemployed workers (as in the efficiency wage theories and some implicit contract theories), but rather between employed and unemployed workers.

In this context, we find an as yet unexplored channel whereby government policy affects wages and employment. Variations in fiscal instruments - such as unemployment benefits, payroll and income taxes and public employment - have an impact on the effectiveness and credibility of strike threats, and this has implications for wages and employment which are quite separate from the standard fiscal policy channels in the literature. The results are striking: whereas under certain, well-defined conditions, fiscal policies operate in the conventional ways, under others, the effects run in the opposite directions. In this manner, our analysis suggests that strike threats (with and without lock-out threats) may be an essential determinant of how fiscal policies work.

Naturally, hiring and firing costs are not the only source of effective strike threats, but they do appear to be a practically significant and logically illuminating one. They provide a possible rationale for why strike threats may be in the interests of individual union members, why firms pay attention to these threats, and why non-union members may be unable to undermine the threats. To show this as clearly and simply as possible, we rest our case on the hiring-firing costs alone.

The existing literature on the theory of labour markets does consider these costs, but it does not associate them with strikes, lock-outs, wage determination and involuntary unemployment. The costs

are present in the standard theories of job search¹; yet there the emphasis is primarily on voluntary unemployment in the face of given wage distributions.² In the standard implicit contract theories,³ these costs explain (at least in part) why employees must commit themselves in advance to provide labour to particular employers, but once this labour immobility has been established, the costs have no further role to play. There is also a small literature⁴ on how employers use wages as a screening device for the quit behaviour of their employees, thereby mitigating the employers' hiring-firing expenses. Again, however, this literature does not deal with the relation between strikes and lock-outs (on the one hand) and wages and unemployment (on the other).

2. The Model Economy

The costs of hiring and firing cover a diverse and financially significant set of items. With regard to the hiring costs, employers may incur them by searching for workers as well as testing and screening their skills. Employees may encounter analogous costs in job search and evaluation of work environments. In addition, both parties bear costs of negotiation about wages and other employment conditions. (Job training costs could justifiably be included among the hiring costs as well, but for expositional simplicity we ignore them. They are taken into account as such in Lindbeck and Snower (1984a)).

The firing costs cover negotiation and litigation costs for both employers and employees. Furthermore, employers may have to provide severance pay, implement costly firing procedures, and possibly also forego profits due to firing-induced decline in morale (and thereby

productivity) of the remaining employees. The employees may have to go through a painful process of censure, isolation and disillusionment accompanying dismissal (though they may be partially compensated by severance pay).

Given these hiring-firing costs, workers may be divided into three groups:

- (i) "Insiders" have been hired in the past, their full hiring costs already expended. Their dismissal would occasion the expenditure of the entire range of firing costs.
- (ii) "Entrants" are in the process of being hired. Thus, their full hiring costs have not been paid and their dismissal would not give rise to the full firing costs.
- (iii) "Outsiders" are currently unemployed.

Insiders, entrants and outsiders, differ with regard to their rent from the hiring-firing costs they may seize. We assume that the insiders capture some of their rent; thus, their wage lies above their reservation wage. The entrants have some, but less, rent to exploit. Thus, the entrant wage lies between the insiders wage and the reservation wage. Finally, the outsiders have no rent at all.

Since the process of hiring takes time, entrants remain such for a finite period of time, which we shall call the "initiation period".

We assume that wage contracts are implementable only for a limited span of time, say, the span of the initiation period. Thus, at the end of the initiation period, the bargaining position of the entrants is the same as that of the insiders. In fact, the entrants become insiders, receiving the new, higher insider wage. This wage is

determined by a bargaining procedure in which the insiders capture at least some of the rent from their hiring-firing costs. (For a fuller discussion of the characteristics of insiders, entrants, and outsiders, see Lindbeck and Snower (1984)).

Our economy comprises a government and a fixed number of workers, rentiers and firms. The firms produce a non-durable consumption good by means of labour and capital. They distribute their profits to the workers and rentiers. Both the workers and rentiers buy the consumption good; the former provide labour services, the latter capital services. There are no entries or retirements from the labour force. The government employs workers to produce public services.

Employment and production decisions are made by the firms and the government. Workers and rentiers decide how much to consume; rentiers decide how much capital to supply. We will analyse these decisions under stationary Nash equilibrium conditions. What this means in our model is that (a) the capital stock is constant and (b) each private agent sets his decision variables under the assumption that all other agents have set their decision variables optimally with regard to their objectives and constraints.

The activities of the various agents may be described as follows.

2a. The Government

The government has four policy instruments:

- (i) public employment (L_G);
- (ii) unemployment benefits (B per unemployed worker);
- (iii) the payroll tax rate (t); and
- (iv) the income tax rate (τ).

Each instrument is parametrically fixed.

For simplicity we assume that there is no difference between insiders and entrants in public employment (in particular, the government faces no firing-hiring costs), and that the government offers each of its employees the insider wage prevailing in the private sector.

2b. The Firm

The firm is a profit maximiser. It produces a homogeneous consumption good (Q) and has three factors of production at its disposal: insider labour (L_I), entrant labour (L_E) and capital (K). Let the period of analysis (over which the flows of inputs and outputs are measured) be equal to the initiation period.

Since we are not concerned with factor substitution, let us assume that there are diminishing returns to capital and a fixed proportion between total labour input and output:

$$(1) \quad Q = L_I + L_E = v(K), \quad v' > 0, v'' < 0.$$

Let $H(n)$ and $F(n)$ be the firm's cost of hiring n entrants and firing n insiders, respectively, where we assume that $F', H'; F'', H'' > 0$. Since workers remain entrants for only one time period, the firm's hiring cost must be $H(L_E)$. Its firing cost must be $\max [0, F(L_I^0 - L_I)]$, where L_I^0 is the number of insiders employed by the firm at the beginning of the current time period (i.e. $L_I^0 = L_I^{-1} + L_E^{-1}$, where all superscripts refer to time). Moreover, since workers do not retire and all entrants turn into insiders after one time period, $L_I^0 = v(K^{-1})$. In the stationary equilibrium (where the firm's stock of insiders, entrants, and capital is constant), $L_I^0 = v(K)$ and the associated firing cost is $F[v(K) - L_I]$. (There are firing costs

in equilibrium wherever the firm's equilibrium stock of insiders falls short of its total labour force).

In making its production and employment decisions (viz, Q , L_I , L_E and K), the firm faces an exogenously given insider wage W , entrant wage R , user cost of capital r , and payroll tax t . For simplicity, assume that the firm has a finite time horizon and a time discount factor of unity.⁵ Then its profit maximization problem can be expressed in terms of a single time period:

Its profit maximization problem is

$$(2) \quad \text{Maximize } \pi = Q - W \cdot (1 + t)L_I - R \cdot (1 + t)L_E - H(L_E) \\ - F[v(K) - L_I] - r \cdot K \text{ subject to (1)}$$

(where the revenue and costs are all evaluated in terms of the consumption good).

The first order conditions are

$$(3a) \quad (W - R) \cdot (1 + t) = H' + F' \quad 6$$

$$(3b) \quad v' = R \cdot (1 + t) \cdot v' + (H' + F') \cdot v' + r.$$

By the former condition, the firm's employment of insiders should be sufficient to ensure that the insider-entrant wage spread (gross of the payroll tax) is equal to the sum of the marginal hiring and firing costs. By the latter condition, the firm's use of capital should be such that its marginal product is equal to its user cost plus the associated labour costs.

2c. The Worker

Each worker's utility is a function of consumption (C) and labour (ℓ): $U = U(C, \ell)$, where $U_C > 0$ and $U_\ell < 0$. Work is taken to be a discrete activity: each employee provides one unit of labour ($\ell = 1$),

each outsider provides none ($\ell = 0$). The worker consumes his entire income.

Every worker (whether employed or unemployed) receives the same exogenous, lump-sum profit income, $\sigma \cdot \pi$, where $\sigma (< 1)$ is the ratio of firms to employees. An outsider's disposable income is $(B + \pi) \cdot (1 - \tau)$, that of an insider is $(W + \sigma \cdot \pi) \cdot (1 - \tau)$; and that of an entrant is $(R + \sigma \cdot \pi) \cdot (1 - \tau)$.

As noted, each outsider and entrant offers to work at the reservation wage, R , which may be defined as follows:

$$(4) \quad U[(R + \sigma \cdot \pi) \cdot (1 - \tau), 1] = U[(B + \sigma \cdot \pi) \cdot (1 - \tau), 0],^7$$

2d. The Rentier

We use the "rentier" as an analytical device to generate a very commonplace macroeconomic idea, namely to distinguish between a "short run" in which the supply of capital goods (K_S) is constant and a "long run" in which it is responsive to the user cost of capital. In other words,

$$(5) \quad K_S = K_S(r), \quad K'_S > 0$$

Obviously, there are many ways of telling the appropriate microeconomic story. Here is a particularly simple one. In the short run, the rentiers provide a fixed amount of capital services to the firms, contractually determined in the past. However, in the long run, each rentier adjusts his capital supplies in accordance with the principles of budget-constrained utility maximization. He owns a large⁸ supply of capital goods, which must be serviced by him before it can be used by the firms. Yet this servicing requires his labour.

The greater his labour input (λ), the greater the supply of usable capital goods (K): $K_S = \phi(\lambda)$, where $\phi' > 0$.

His income is $r \cdot K$, where r is the user cost of capital. Like the worker, he devotes all his income to consumption. Let his utility function be $V = V(r \cdot K, \lambda)$ where $V_1 > 0$, $V_2 < 0$. He maximizes this subject to the previous equation (where the second-order conditions are assumed satisfied). The first-order condition yields the capital supply function (5).

3. The Labour Market under Individualistic Bargaining

For the model economy above, suppose that the insider wage is determined through individualistic bargaining. In other words, the insider wage is the outcome of a bargaining process between the firm and its insiders, where each insider acts independently of all other insiders. We describe the equilibrium wage and employment levels and examine how these are affected by the government's various fiscal policy instruments.

3a. Insider Wage Determination

We require that the wage bargain satisfy two properties:

- (i) insiders capture some of the economic rent generated by the firing-hiring costs, and
- (ii) the greater this rent, the greater their wage.⁹

For simplicity, consider a particularly transparent special case: the insider wage is maximized subject to the constraint that the insider is not fired, given the current use of capital.

Under individualistic bargaining, each insider's rent is that arising from the costs of firing one insider (namely the worker in

question) and hiring one outsider in his place. Hence, the insider wage is

$$(6) \quad W_i = R + \left(\frac{1}{1+t} \right) \cdot [H(1) + F(1)]$$

(where the subscript "i" stands for "individualistic" bargaining).

3b. The Labour Market Equilibrium

All the firms, workers and rentiers in our economy are alike. This, together with the assumption that there are fixed numbers of these agents, means that each microeconomic variable in our model is simply a fixed fraction of its corresponding macro variable. We denote macroeconomic variables as boldface versions of their micro counterparts.

Let us distinguish between a short-run labour-market equilibrium, in which wages are endogenously determined, given the employment of labour and capital; and a long-run equilibrium, where both wages and employment are endogenous.

The firms are assumed to have short-run contracts with the rentiers, in which a particular level of capital services is purchased at a particular cost. When firms face an unexpected change in their economic environment (e.g. an unexpected government policy change), they continue to employ the previously contracted level of capital services, because the marginal product of capital is positive and the contracted user cost of capital must be paid in any case.

However, in the long-run equilibrium, the above contracts do not bind. Here, the user cost of capital (r) is such that the capital market clears. On the basis of this market-clearing level of the

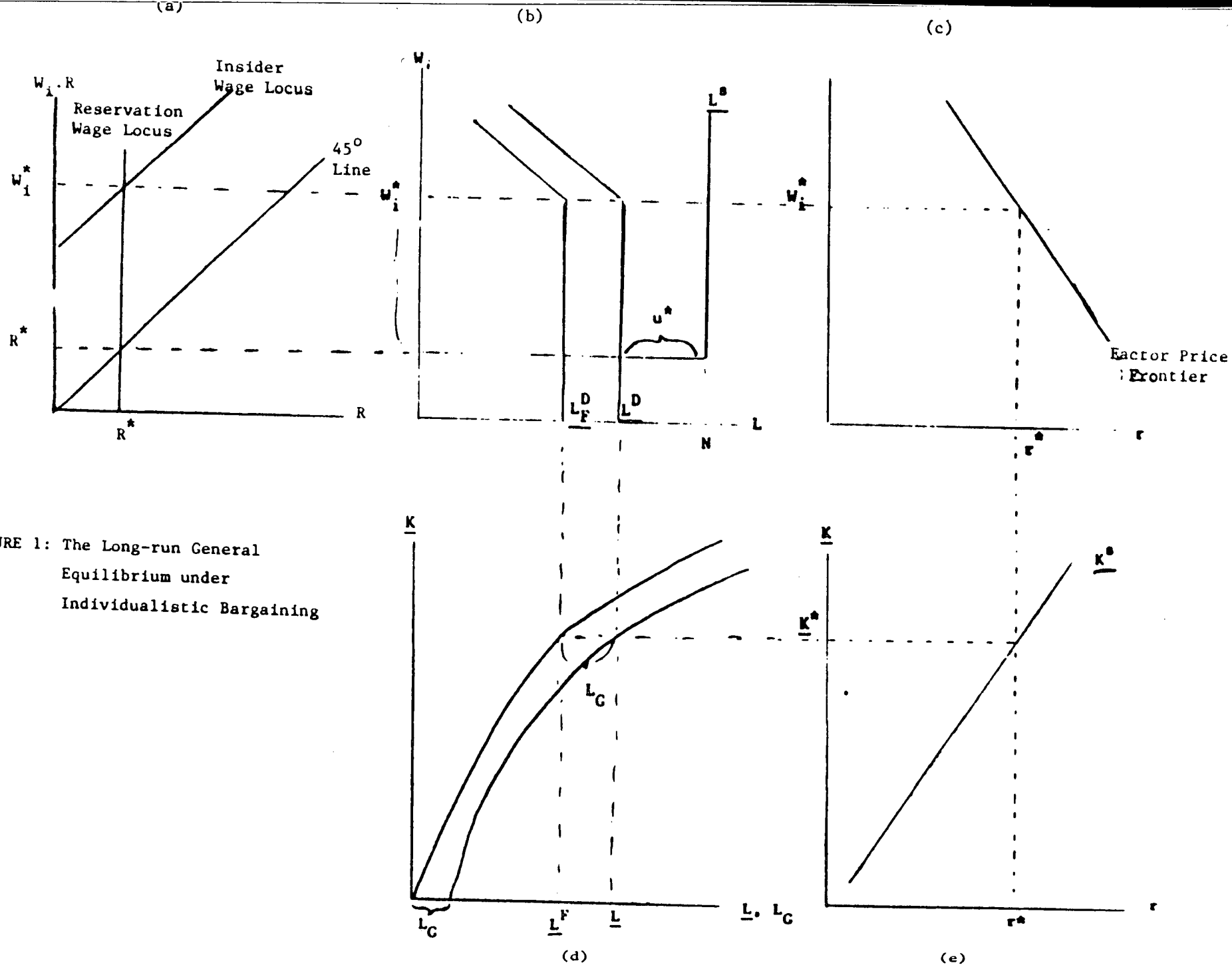


FIGURE 1: The Long-run General
Equilibrium under
Individualistic Bargaining

capital stock, the long-run employment decisions are made.

The short-run general equilibrium is described by the given capital stock (\bar{K}), the reservation-wage equation (4), the insider-wage equation (6), the short-run equilibrium profit function:

$$(2') \quad \pi = v(\bar{K}) - W^*(1+t) \cdot v(\bar{K}) - r \cdot \bar{K}$$

and the government policy parameters.

Substituting (2') into (4), we obtain the reservation-wage locus of Figure 1a. For simplicity (but without any significant loss of generality) we let $U_{CC}, U_{CL} = 0$ in the worker's utility function, and thereby this locus becomes vertical (since the reservation wage is now independent of profit income). Equation (6) yields the insider-wage locus of Figure 1a. The short-run equilibrium wage levels W^* and R^* are given by the intersection of these loci.

In the long run the capital market clears. Substituting (3b) into (3a), we obtain the capital demand function:

$$(7) \quad v'(K_D) \cdot [1 - W^*(1+t)] = r,$$

and recalling that $v'' < 0$, this implies that

$$(7') \quad K_D = K_D[W^*(1+t), r]$$

$$(-) \quad (-)$$

Setting capital demand (7') equal to capital supply (5), we obtain the downward-sloping factor price frontier of Figure 1c.

Hence, given the long-run general equilibrium insider wage W_i^* the general-equilibrium user cost of capital must be r^* . The latter is associated with the capital stock \underline{K}^* , as illustrated through the aggregate capital supply curve in Figure 1(e).

The technological relation between aggregate labour and capital

in the private sector is $\underline{L} = \underline{v}(\underline{K})$, as implied by the production function (1). Given \underline{K}^* , the long-run equilibrium level of employment by firms is L_F as shown in Figure 1(b). Adding government employment L_G , yields the economy-wide employment \underline{L} .

Our specification of insider wage determination implies that all these employees must be insiders. Recall that the number of insiders carried forward from the previous period is $\underline{v}(\underline{K})$ and the insider wage is set at the maximal level which ensures the continued tenure of these insiders. Thus, the firms' aggregate demand curve for insiders coincides with their aggregate demand for labour, as illustrated by the L_F^D curve in Figure 1(b). Shifting this curve rightwards by the amount of government employment generates the economy-wide labour demand curve \underline{L}^D . Here, for the long-run general equilibrium reservation wage R^* , the bargaining process gives rise to the insider wage W^* (as indicated by equation (6)).

The aggregate labour supply curve, \underline{L}^S in Figure 1(b), specifies how much the labour force is willing to work at every wage. Since work is taken to be a discrete activity, this curve is L-shaped: all workers in the economy (say, N of them, each with a labour endowment of unity, as shown in Figure 4(a)) are willing to work at or above the reservation wage and none below it.

At the insider wage W_i , N people seek employment, but only \underline{L}^D are granted it. In this sense, there is persistent unemployment, denoted by u^* in Figure 4(b).

3c. The Effects of Fiscal Policies

Let us now inquire how the labour market above reacts to a change in the government's policy instruments. We are concerned with how

fiscal policies affect the labour market directly, but not indirectly via other markets, such as the product market.¹⁰ The reason for this emphasis on the labour market is that we intend to compare the impact of fiscal policies in the presence and absence of strikes and lock-outs and these forms of work disruption have their proximate influence on the labour market.

Our labour market analysis can be embedded in various alternative specifications of the entire macroeconomy. The interpretation of our policy exercises depends on which specification is chosen, as the following digression shows:

Alternative 1:

Assume (as we have done above) that there are only three commodities in the economy: consumption goods, capital goods, and labour. In addition, let the government's decisions satisfy a government budget constraint (just as the workers, rentiers, and firms' decisions satisfy their respective budget constraints). Then all policy exercises must be balanced-budget changes. These changes affect the purchases and sales in the labour and capital markets. The equality of these purchases and sales in their respective markets implies (by Walras' Law) that the consumption good market must clear ex post as well. Hence, it is not necessary to consider this market in analysing fiscal policy effects.

Alternative 2:

Let our economy contain money, so that the prices of the consumption goods, capital goods and labour may all be given in nominal terms. However, assume that the insider wage and reservation wage are set in real terms (e.g. through escalator clauses). Here the policy changes need not be balanced-budget changes. Given that the consumption good market clears, the only way in which fiscal policy effects could run through it to the labour market is via the price level (of consumption goods). Yet this price level can have no effect on wages which are set in real terms. Consequently, fiscal policies have no effect on the labour market via the consumption goods market.

Alternative 3:

Assume (as in Alternative 2) that the prices of consumption, capital and labour are given in nominal terms, but now the insider and reservation wages are set in nominal terms as well. Here a fiscal influence on the price level can affect the real wage and thereby employment. In this context, the crucial assumption for the validity of our policy exercises is that when the nominal wage and price level move in the same direction, the former change is proportionately larger. Here the direct fiscal effects on the labour market via the nominal wage dominate the indirect effects via the price level.

We now turn to the policy exercises themselves. With regard to public employment (L_G), it is instructive to make a distinction regarding the security of job tenure which it provides.

At one extreme is "permanent" public employment, where the available government jobs remain in the hands of an identifiable invariant group of workers (viz, permanent tenure). At the other extreme is "rotating" employment, where the government jobs rotate randomly among the outsiders, so that each applicant has an equal chance of receiving such a job (viz, limited tenure). Clearly, these two policies serve different purposes. The former is concerned only with the use of workers who are not employed in the private sector; the latter is aimed at equalising the distribution of income across these workers as well.

Suppose there is an increase in permanent government employment ($\Delta L_G > 0$). It is evident that this policy has no effect on the (W, r) locus which clears the capital market and the reservation wage.¹¹ Thus, there is no effect on the insider wage. The private-sector labour demand curve L_F^D remains unchanged. All that happens is that the economy-wide labour demand curve \underline{L}^D shifts rightwards by the amount ΔL_G . The level of employment (u) falls by that amount. In other words, the government employment multiplier is unity.

Now let there be an increase in rotating government employment. In this case, all workers who are not employed in the private sector face the probability $\theta = [L_G / (L_F + L_G)]$ of employment. Recall that if the government employs them, they receive the insider wage. Let all workers be risk neutral. Then, the reservation wage relevant to the wage bargain in the private sector must be redefined as that which sets the utility of accepting a job offer in the private sector equal

to the expected utility of rejecting that offer:

$$(4') \quad U[(R + \sigma \cdot \pi) \cdot (1 - \tau), 1] \\ = \theta \cdot U[(W + \sigma \cdot \pi)(1 - \tau), 1] + (1 - \theta) \cdot U[(B + \sigma \cdot \pi) \cdot (1 - \tau), 0]$$

Observe that now the reservation wage (R) is positively related to the insider wage (W). (The greater the wage which the worker has a chance of receiving in public employment, the greater the bribe necessary to induce him to work in the private sector).

In the short run, a rise in rotating government employment raises θ , and consequently (by (4') and (6)) the insider wage (W) and the reservation wage (R) increase as well.¹²

In the long-run equilibrium, the rise in the insider wage is compatible with the clearing of the capital market only if the user cost of capital (r) falls. Hence, the supply of capital falls and private-sector employment falls as well. Thus, the private sector demand for labour curve (pictured in Figure 1b) shifts upwards and leftwards. Government employment crowds out private sector employment.

Proposition 1: Under the individualistic bargaining procedure above, a rise in permanent government employment leaves the insider wage and private sector employment unchanged, whereas a rise in rotating government employment raises the insider wage and reduces private sector employment.

A rise in the level of unemployment benefits operates in a similar vein as rotating public employment. It raises the reservation wage as well as the insider wage. This precipitates a fall in the user cost of capital (in the long run) and, with it, a fall in capital supply and overall employment.

Proposition 2: Under individualistic bargaining, a rise in unemployment benefits (B) raises the insider wage, reduces employment, and increases unemployment.

Now turn to the tax instruments. A rise in the payroll tax rate (t) has no effect on the reservation wage (R) or the insider wage (W , which has been defined net of the payroll tax),¹³ but it does increase the cost of an insider to the firm. Thereby the demand for capital is reduced and the market-clearing user cost of capital (r) falls. In conjunction, employment falls and unemployment rises.

A rise in the income tax rate (τ) raises the reservation wage (R) (by (4)) and thereby also the insider wage (W , which has been defined gross of the income tax) (by (6)). Once again, K and r fall, and with them, employment falls and unemployment rises.

Proposition 3: Under individualistic bargaining, an increase in the payroll or income tax rate reduces employment and raises unemployment. The former tax leaves the inside wage unchanged; the latter raises it.

None of these fiscal policy results are very surprising. This picture changes considerably when we turn to wage bargaining which involves the threat of strike.

4. Labour Union Activity

Let a "union" simply be a collectivity of workers engaged in some well-defined economic activity. Since we have assumed that insiders have more market power than other workers, it is natural for us to restrict our attention to unions consisting only of insiders. We endeavour to explain the behaviour of such unions in terms of their members' individualistic interests. (The underlying presumption is that a union which is not beneficial to its members is unlikely to persist).

We consider only one type of union activity: the strike. This is given one purpose, namely, to back up the union's wage demands. In other words, the strike is a "wage-preserving device". (By contrast, Lindbeck and Snower (1984a) examine the strike as a job-preserving device). In particular, we suppose that the union, consisting of all the insiders of a firm, makes a wage proposal to that firm and it is the firm's rejection of this proposal that provokes the strike. The strike is "won" by the workers if the firm is induced to accept the proposal after all; it is "lost" if the proposal is irrevocably rejected, in which case the wage remains beneath the union's asking price.

We also consider a common counter-move available to the firm: the lock-out. We focus on one purpose for this activity: the lock-out enables the firm to deplete the union's strike fund and thereby diminish the union's bargaining power and moderate its wage proposals. (Lindbeck and Snower (1984b) isolate another purpose: to enable the firm to avoid paying for labour services (of the non-stickers) which have become unprofitable).

The union's strike threat may be defined in terms of the following implicit contract between the firm and its insiders:

If the firm accepts the union's wage proposal, then none of the employees will strike; yet if the proposal is rejected, then some (possibly all) of the employees will strike.

The steps in the bargaining process under this contract may be set out as follows (see Figure 2). First, the union makes a wage proposal, W . Second, the firm decides whether to accept or reject this proposal. If it is accepted, W becomes the insider wage. Third, if the proposal is rejected, the union decides what proportion (a) of the firm's workforce is to be called out on strike. Fourth, the firm decides whether or not to undertake a lock-out in response to the strike. Fifth, each union member decides whether to observe or break the strike (given the lock-out decision).

The strike and lock-out decisions are inherently intertemporal. A strike is conducted with a view to achieving a particular wage in the future; a lock-out is imposed in order to reduce the union's wage demands in the future. We can capture the essence of the problem in two time periods. Suppose that the firm and the union have a two-period time horizon and that both are risk-neutral. Let both parties expect a strike, once begun, to last for only one time period. Moreover, let the "short run" extend for at least two periods, so that the capital stock is constant over that time horizon. p is each party's subjective probability that the union will win the strike (which is exogenously given).¹⁴

We assume that p is inversely related to the size of the union's

wage proposal: $\rho = \rho(W)$, $\rho' < 0$.

If the strike is observed, the union member receives a strike-fund payment, J , in the first period. His remuneration in the second period depends on whether the strike is won or lost. With probability ρ , he expects to receive W ; with probability $(1 - \rho)$, he expects to receive a lower wage - call it w . Thus, the present value of his expected income is $J + [\rho \cdot W + (1 - \rho) \cdot w]$, as shown in Figure 2.

On the other hand, if the strike is broken (i.e. the union members do not respond to the strike call), then the wage is also lower. For simplicity, we let this lower wage also be w .

The upper bound of w is the union's wage proposal, W ; the lower bound of w is the wage which insiders could achieve through individualistic bargaining, W_i (of Equation (6)). We make the plausible assumption that $w = g(W, W_i)$, where $W_i < w < W$ and $g_1, g_2 > 0$.

As in the model economy of Section 2, the firm is a profit maximizer. The union is assumed to pursue the same wage objectives as those of the individual insiders it represents,¹⁵ but - given its ability to threaten a strike - it will now be able to do so more effectively. In other words, the union aims to maximize the insider wage subject to the constraint that no insiders are fired.

We will examine the Nash equilibrium of the bargaining process above. In other words, the firm's decisions are exogenously given to the union and vice versa. We assume that this equilibrium has the following properties:

(a) The equilibrium strike threat is credible. This means that if the firm rejects the union's wage proposal, the union members have an incentive to observe (rather than break) the strike.

(b) The equilibrium wage proposal is not rejected by the firm and hence does not provoke a strike.

The prerequisites for condition (a) will be examined below. Those for (b) are given in Appendix A. Whereas condition (a) is plausible and straightforward, condition (b) reflects the selective focus of this paper. We are here concerned only with strike threats; the actual conduct of strikes is easy to examine within the framework of our analysis, but for the sake of brevity we do not do so.¹⁶ (Our perspective is analogous to that of oligopolistic entry deterrence, where entry into the industry is effectively eliminated: threats are made but need not be carried out). Of course, the bargaining strategies of the firm and the union depend on their subjective probabilities about the strike outcome; yet since the strike is not provoked, these probabilities do not have objective counterparts. For our purposes, they are exogenously given.

As shown below, the strike threat gives the union more bargaining power than it would otherwise have and thereby permits the achievement of higher wages than under individualistic bargaining. Since the strike threat is not carried out, the counterveiling lock-out threat cannot be either. Both parties are assumed to have perfect information about the circumstances under which the threats take effect and both recognise whether the threats are credible.

It is well to observe that the lock-out threat is not the only conceivable response by the firm to the strike threat. Another is the threat of replacing all the strikers with new entrants. In practice, this replacement strategy is hardly ever followed. Presumably the reason is that the firing-hiring costs associated with this strategy are usually so high that lock-outs or no response at all represent a

smaller drain on firms' profits. President Reagan's replacement of air traffic controllers in 1982 is a rare exception. In this case, the availability of military personnel with the requisite skills meant that the associated firing-hiring costs were manageable. In the light of its rarity, we omit an analysis of the replacement strategy.¹⁷

5. The Wage Proposal and the Lock-Out Decision

The lock-out decision described above is a discrete one: either the firm locks out its non-striking union members or it does not. Let us first examine the union's wage proposal when the firm chooses the former option in response to the strike threat, then see what happens to this wage proposal under the latter option, and finally show how the firm makes its lock-out decision.

5a. Strike Threat with Lock-Out Threat

Suppose that whenever some insiders strike, the firm locks out the rest. Recall that the union's wage proposal (W) is such that the firm has no incentive to fire any insiders (so that the number of insiders are $\bar{L} = v(\bar{K})$ in the short run). Thus, if the firm accepts the wage proposal, then the present value of its profits is

$$(8) \quad \pi^a = 2 \cdot [1 - W \cdot (1 + t)] \cdot \bar{L} - r \cdot \bar{K}. \quad 17$$

(In the stationary equilibrium, if the firm has an incentive to accept the wage proposal in the first period, then it will continue to do so in the second period. Thus, we need not consider the case of first-period acceptance and second-period rejection.)

On the other hand, if it rejects this proposal, then the union calls a strike, whereupon the firm locks out all the remaining insiders. In that case, the firm's first-period profit is zero. In the second period, the union either wins the strike (in which case the insider wage is W) or it loses it (in which case the insider wage is w). Hence the expected present value of the firm's profit when the union's wage proposal is rejected is

$$(9) \quad \pi^l = \rho \cdot [1 - W \cdot (1 + t)] \cdot \bar{L} + (1 - \rho) \cdot [1 - w \cdot (1 + t)] \cdot \bar{L} - r \cdot \bar{K}$$

(where the superscript "ℓ" stands for the case of "lock-out" threat).

We can now specify the union's wage proposal. The wage is set as high as possible, subject to three constraints: (i) no strike is provoked, (ii) the strike threat is credible, and (iii) no insiders are fired. Let the maximal wage satisfying the first constraint (given the lock-out threat, ℓ) be called the "proposal acceptance wage", w_{PA}^{ℓ} . Let the maximal wage satisfying the second constraint be the "credible threat wage", w_{CT}^{ℓ} . The third constraint is simply a non-negativity condition on the present value of profit and the maximal wage associated with it is the "zero-profit wage", w_{ZP}^{ℓ} .

Hence, the union's wage proposal must be

$$(10) \quad w^{\ell} = \min(w_{PA}^{\ell}, w_{CT}^{\ell}, w_{ZP}^{\ell}).$$

The zero-profit wage is not analytically interesting; so let us assume that it is never binding: $w_{ZP}^{\ell} > \min(w_{PA}^{\ell}, w_{CT}^{\ell})$.

The proposal acceptance wage (w_{PA}^{ℓ}) sets $\pi_a > \pi_{\ell}$. Thus,

$$(11) \quad [1 - w_{PA}^{\ell} \cdot (1 + t)] \cdot \bar{L} \cdot \{1 + (1 - \rho)\} > [1 - w \cdot (1 + t)] \cdot \bar{L} \cdot (1 - \rho)$$

We call this the "proposal-acceptance constraint" in the event of a lock-out.

Observe that the union's decision regarding the proportion of strikers in the firm's workforce (a) is not relevant to the proposal acceptance wage. Since the firm locks out all the non-strikers, variations in the proportion of strikers have no effect on π^{ℓ} .

The credible-threat wage (W_{CT}^L) is such that, if the union's wage proposal is rejected, then each union member has an incentive to carry out the strike threat. This is the case only if the worker's ex-post utility from striking (i.e. his utility once the proposed wage is rejected) is greater than his ex-post utility from not striking.

Let X be the (exogenously given) portion of the union's total strike fund made available to the union members in the current time period. Let J be the payment per worker from these available funds. Since both the strikers and the lock-out victims are entitled to the payments, $J = (X/\bar{L})$.

Suppose that the workers observe the strike. Then, in the first period, they each receive the strike fund payment (J) and profit income ($\sigma \cdot \pi$); in the second period, they receive W if they win or w if they lose the strike, in addition to profit income ($\sigma \cdot \pi$). Thus, each worker's ex-post utility from observing the strike is

$$(12a) \quad U^S = U\{(J + \sigma \cdot \pi) \cdot (1 - \tau), 0\} + \rho \cdot U\{(W^L + \sigma \cdot \pi) \cdot (1 - \tau), 1\} \\ + (1 - \rho) \cdot U\{(w + \sigma \cdot \pi) \cdot (1 - \tau), 1\}.$$

Now suppose that the workers break the strike. Then they receive w in both periods. The associated ex-post utility is

$$(12b) \quad U^N = 2 \cdot U\{(w + \sigma \cdot \pi) \cdot (1 - \tau), 1\}$$

The strike threat is credible if and only if

$$(13) \quad U^S - U^N > 0.$$

Let us call this the "credible-threat constraint".

For expositional purposes, it is convenient to think of credibility as a matter of degree and let $\Omega = U^S - U^N$ measure how

credible the strike threat is (viz, the greater Ω , the "more credible" the threat). In these terms, it is clear that a rise in J makes the threat more credible, since the utility from observing the strike is increased while the utility from breaking it remains unchanged:

$$(\partial\Omega/\partial J) = U_C \cdot (1 - \tau) > 0.$$

On the other hand, a rise in the wage proposal (W) has counterveiling effects on credibility:

$$\frac{\partial\Omega}{\partial W_{CT}^L} = U_C \cdot (1 - \tau) \cdot [\rho + (1 - \rho) \cdot g_1 - 2 \cdot g_1] + \rho^1 \Gamma$$

where $\Gamma = U\{(W_{CT}^L + \sigma \cdot \pi) \cdot (1 - \tau), 1\} - U\{(W + \sigma \cdot \pi) \cdot (1 - \tau), 1\} > 0$.

For a given probability of winning the strike (ρ), U^S rises when the strike is won (by the amount $\delta \cdot U_C \cdot (1 - \tau)$) and when the strike is lost (by the amount $U_C \cdot (1 - \tau) \cdot g_1$). U^n rises as well (by the amount $2 \cdot U_C \cdot (1 - \tau) \cdot g_1$). Moreover, ρ falls and this reduces U^S (since the chance of receiving W falls relative to the chance of receiving w).

The relative strength of these influences depends (among other things) on the magnitude of ρ^1 and g_1 . The smaller ρ^1 (i.e. the stronger the impact of W_{CT}^L on ρ) the more U^S falls relative to U^n and the less credible the strike. The greater g_1 (i.e. the stronger the impact of W on w), the more U_n rises relative to U^S (since there is a greater chance of receiving w when the strike is broken than when it is observed) and the more credible the strike.

In general, a rise in the wage proposal (W) makes the strike threat less credible (i.e. $(\partial\Omega/\partial W_{CT}^L) < 0$) when

$$g_1 > \frac{\rho^1 \cdot \Gamma}{U_C \cdot (1 - \tau) \cdot (1 + \rho)} + \frac{\rho}{(1 + \rho)}$$

and the threat becomes more credible when the inequality runs the other way.

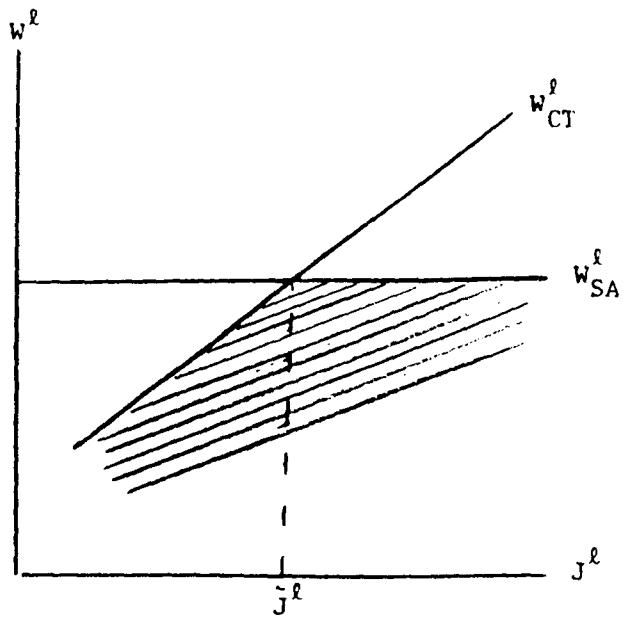
In sum, there are two possible ways in which the wage can affect strike threat credibility.

- (a) The "credibility-reducing wage": When the wage falls, workers have a greater inducement to observe the strike, on the grounds that they are more likely to win the strike. We call this the "bird-in-the-hand" case, because the reasoning above is that "one bird in the hand is worth two in the bush".
- (b) The "credibility-enhancing wage": When the wage rises, workers have a greater inducement to observe the strike, on the grounds that their wage income is higher when they win the strike. We call this the "pie-in-the-sky" case, because the workers are being induced to strike through the chance of "a pie in the sky".

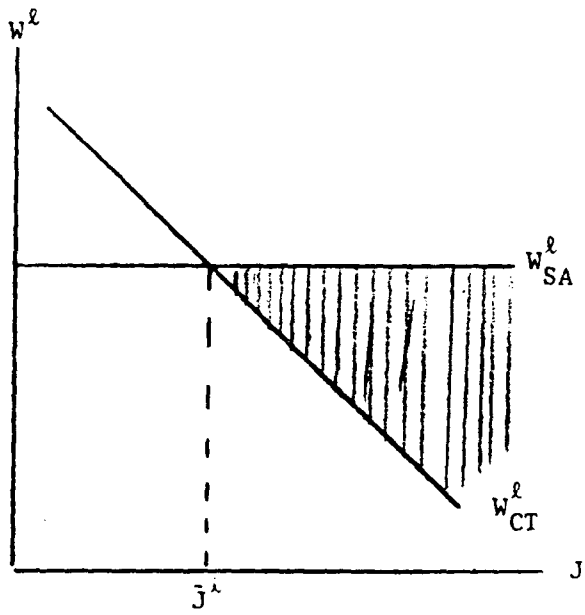
Figure 3a illustrates the "bird-in-the-hand" case. The credible-threat constraint (W_{CT}^l of Equation (13)) is upward-sloping since W reduces credibility whereas J raises it:

$$(\partial W_{CT}^l / \partial J^l) = -(\partial \Omega / \partial J^l)(\partial \Omega / \partial W_{CT}^l) > 0.$$

The proposal-acceptance constraint (W_{PA}^l , of Equation (11)) is pictured as well. (It is horizontal since J has no direct effect on the firm's profit.) The union's feasible region is given by the shaded area. The wage proposal which the union makes depends on what the existing level of J is. If $J^l < \tilde{J}^l$, then $W^l = W_{CT}^l$; and if $J^l > \tilde{J}^l$, then $W^l = W_{PA}^l$.



a



b

FIGURES 3: The Wage Proposal in the Event of a Lock-Out

Figure 3b deals with the "pie-in-the-sky" case. Here the credible-threat constraint is downward sloping since W and J both raise credibility:

$$(\partial W_{CT}^{\ell} / \partial J) = (\partial \Omega / \partial J) / (\partial \Omega / \partial W_{CT}^{\ell}) < 0$$

(Once again, the feasible region is the shaded area). If the union's strike fund is so small that $J^{\ell} < \tilde{J}^{\ell}$, then it is impossible to establish threat credibility (i.e. $\Omega < 0$). If $J^{\ell} > \tilde{J}^{\ell}$, then $W^{\ell} = W_{PA}^{\ell}$. Note that the credible-threat constraint is never binding in this case.

5b. Strike threat without lock-out threat

Now suppose that the firm does not decide to impose a lock-out. In the event of a strike, the firm keeps all the remaining employees on the production line. As above, if the firm accepts the union's wage proposal (W), the present value of its profit is given by π^a of Equation (8). Yet if it rejects this proposal, the union now calls a \bar{L} of the firm's workforce out on strike. As result, the firm's first-period profit is generated wholly by the remaining employees. These workers receive a wage lower than the one the firm rejected; for concreteness, we have assumed this wage to be w . In the second period, all employees receive W if the union wins the strike or w if the union loses. Thus, the expected present value of the firm's profit, after rejection of the union's wage proposal, is

$$(14) \pi^n = [1 - w \cdot (1 + t)] \cdot (1 - a) \cdot \bar{L} + \rho \cdot [1 - W \cdot (1 + t)] \cdot \bar{L} \\ + (1 - \rho) \cdot [1 - w \cdot (1 + t)] \cdot \bar{L} - r \cdot \bar{K}.$$

(where the superscript "n" stands for the case of "no lock-out")

threat).

Once again, the proposal-acceptance wage (w_{PA}^n) ensures that $\pi^a > \pi^n$. Consequently, the proposal-acceptance constraint in the absence of a lock-out is

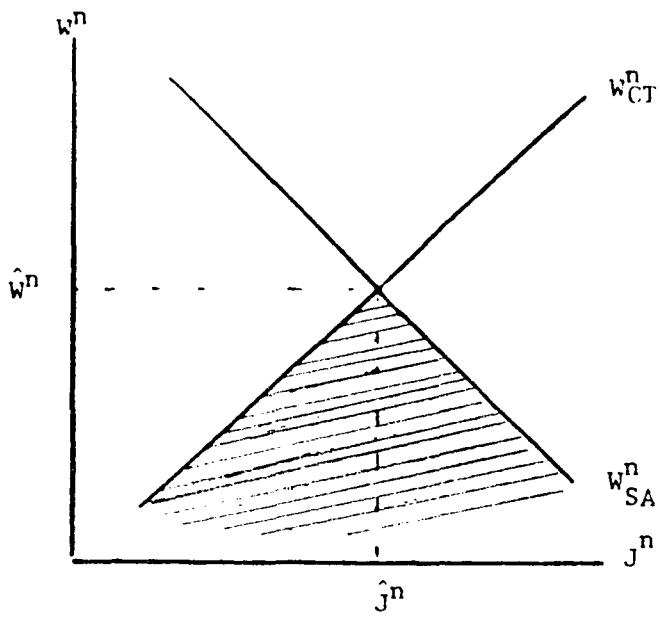
$$(15) \quad [1 - w_{PA}^n \cdot (1 + t)] \cdot \bar{L} \cdot \{1 + (1 - \rho)\} > \\ [1 - w \cdot (1 + t)] \cdot \bar{L} \cdot \{1 - a + (1 - \rho)\}.$$

In contrast to the lock-out case, the number of workers threatening to strike makes a difference to the proposal-acceptance wage. The greater ($a \cdot \bar{L}$), the smaller the firm's first-period profit in the event of a strike, and thus the higher w_{PA}^n (at which the firm is indifferent between accepting and rejecting the wage proposal). Furthermore, the greater ($a \cdot \bar{L}$), the smaller the strike fund payment (J) (for recall that $J = [X / (a \cdot \bar{L})]$, where X - the overall strike fund available to union members in the current period - is exogenously given). Thus, there is an inverse relation between w_{PA}^n and J as pictured in Figures 4. Whereas J is fixed in the case of lock-out at $J^L = (X / \bar{L})$, it is now endogenous to the union's decision making.

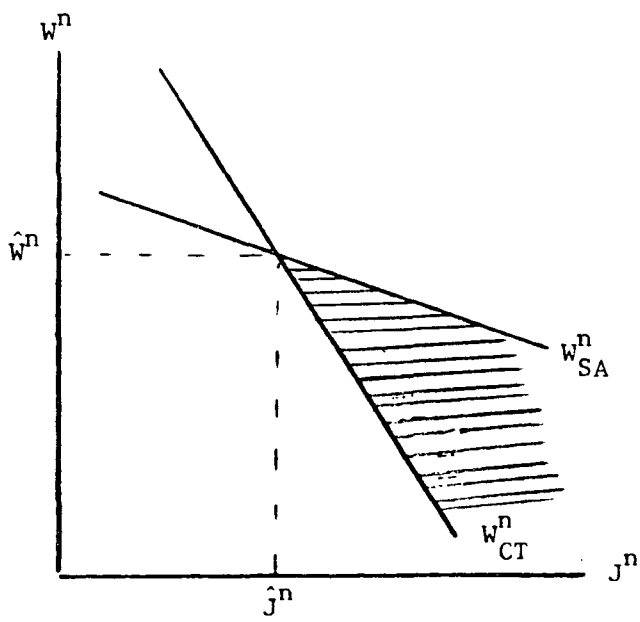
The credible-threat constraint remains the same as in the case of lock-out; viz (13). (Thus $w_{CT}^n = w_{CT}^L$). Figure 4a depicts the "bird-in-the-hand" case and Figure 4b is about the "pie-in-the-sky" case. (The latter figure is illustrative only, since the proposal-acceptance constraint need not be flatter than the credible-threat constraint.)

The shaded areas in the figures are the union's feasible regions for the wage proposal. The union chooses the maximal attainable wage, lying at the intersection of the two constraints in Figures 4a and b:

$$w^n = \hat{w}^n. \quad 19$$



a



b

FIGURES 4: The Wage Proposal in the Absence of a Lock-Out

5c. The Lock-Out Decision

Having examined the union's wage proposal in the presence and absence of the lock-out threat, we now find the conditions under which this threat will and will not be used.

We first consider the "bird-in-the-hand" case. In Figure 5a, the proposal-acceptance and the credible-threat constraints in the presence of lock-out are superimposed on their counterparts in the absence of lock-out. As noted, the credible-threat constraint is the same in both cases.

Now observe that if $a=1$, then $W_{PA}^l = W_{PA}^n$. This is intuitively obvious. The firm's profit is the same regardless of whether all its employees strike or whether some strike and the rest are locked out. Thus, the proposal-acceptance wage must be the same in both cases as well. Moreover, at $a = 1$, the strike fund payment J reaches its minimal level, J^l . Accordingly, in Figure 5a the proposal-acceptance constraints W_{PA}^l and W_{PA}^n meet at $J = J^l$.

A firm which stages a lock-out earns less profit in the current period than one which does not. (In fact, the former firm earns no current profit, while the latter generates some through the non-strikers.) Consequently, the firm can be induced to lock-out union members only if this provides a future profit advantage which outweighs the current profit loss. The only conceivable future advantage lies in the possibility that the lock-out threat may enable the firm to achieve a lower insider wage than it could otherwise have done. There is only one way for this to work, namely, that the lock-out would reduce the strike fund payment J and thereby reduce the union's strike-threat credibility which, in turn, would moderate the union's wage proposal.

In the practical conduct of labour conflict, this is a well-known rationale for the lock-out: it is meant to reduce the union's ability to support their members during the conflict and consequently make it more desirable for these members to break the strike than to observe it. In order for the union to re-establish its strike-threat credibility (i.e. to convince the firm that a strike call would be heeded), the wage proposal is reduced.

In the idiom of Figure 5a, the firm imposes a lock-out only if this induces a downward movement along the W_{CT} curve. In such a movement, the firm is trading off a lower current profit for a higher future profit. Clearly, the firm's lock-out threat is credible only under these circumstances. And since we assume that the firm makes only credible threats, the induced downward movement along the W_{CT} curve becomes a necessary condition for making the threat.

In sum,

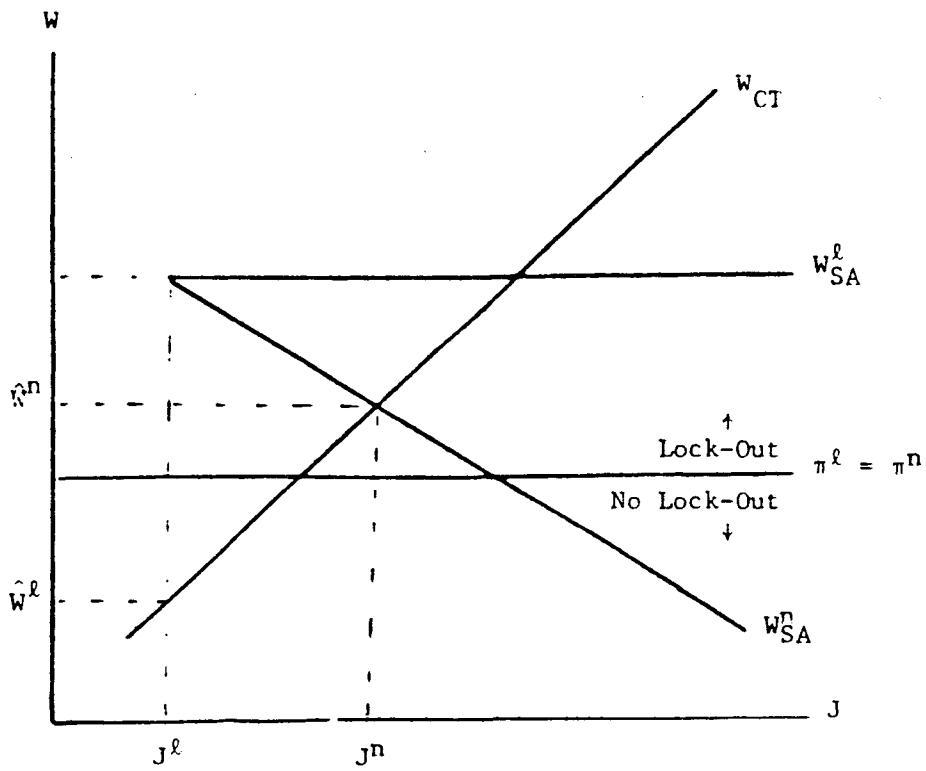
Proposition 4a: In the bargaining process above, the lock-out threat is used only if the credible-threat constraint (13) is binding, i.e.
 $W = W_{CT} < W_{PA}$.

Thus, in studying wage determination under the joint threats of strike and lock-out, we can ignore the proposal-acceptance constraint (in Figures 3) and take account of the credible-threat constraint alone.

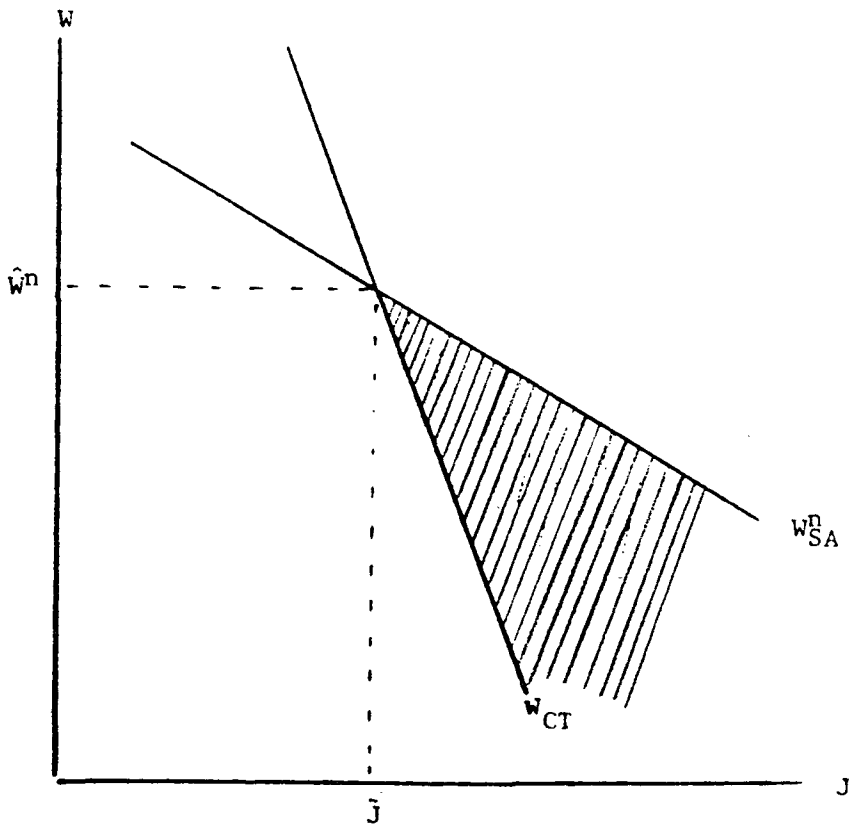
Recall that the firm's profit under the lock-out threat is π^l (of Equation (9)) and that in the absence of the lock-out threat is π^a (of Equation (8)). The threat is used if $\pi^l > \pi^a$, which implies that

$$(16) \quad W^n > W^l \cdot \left(\frac{\rho}{2} \right) + \left(\frac{(1 - \rho)}{2} \right) \cdot w + \left(\frac{1}{2 \cdot (1 + t)} \right)^{20}$$

This condition is contained in Figure 5a. When W^n lies above the



a



b

FIGURE 5: The Lock-Out Decisions and the Corresponding Wage Proposals

$\pi^l = \pi^n$ line, the lock-out threat is operative; otherwise it is not.

(As Figure 5a happens to be drawn, W^n is above the $\pi^l = \pi^n$ line and thus the threats of strike and lock-out occur together. In this case, the credible-threat constraint (W_{CT}) is binding and, given the strike fund payment J^l , the insider wage is W^l . On the other hand, had the $\pi^l = \pi^n$ line passed above the intersection of the constraints W_{CT} and W_{PA} , then there would have been no lock-out and therefore the insider wage would have been \hat{W}^n .)

Now consider the "pie-in-the-sky" case. We ignore the trivial circumstance where, for the given current level of J , the union is unable to make the strike threat credible. This means that, at the current J , the feasible regions of Figures 3b and 4b are nonempty. We also ignore the implausible circumstance where the union's optimal strike fund payment is zero. This means that the credible-threat constraint must be steeper than the strike-avoidance constraint (see footnote 19).

Recall that the proposal acceptance wage in the presence of the lock-out threat is greater than that in the absence of this threat (since the firm foregoes revenue by imposing a lock-out):

$W_{PA}^l > W_{PA}^n$ (since the firm is hurt more by the strike when all workers are idle than when only some are idle). Furthermore, the lock-out threat has no compensating advantages for the firm, since a lock-out induced fall in J reduces credibility, which can be restored only by raising the wage (i.e. by giving the workers a chance of "a pie in the sky"). Consequently, it is not in the firm's best interest to use the lock-out threat. As result, $W = W_{PA}^n$.

Proposition 4b: In the bargaining process above, the firm uses the lock-out threat when the wage is credibility-reducing (the "bird-in-the-hand" case) but not when the wage is credibility-enhancing (the "pie-in-the-sky" case).

The credible-threat constraint (denoted by w_{CT}) and the proposal-acceptance constraint (denoted by w_{PA}^n) are pictured in Figure 5b, where we have assumed that the former constraint is steeper than the latter and $J > \tilde{J}$. The union's optimal strategy is to reduce the strike fund payment to \tilde{J} and to make a wage proposal of \hat{w}^n .



6. The Labour Market under Unionised Bargaining

Having completed our model of union behaviour, we now incorporate it into our model of the labour market and examine the effectiveness of fiscal policies in this context. Suppose that for the model of Section 2, the insider wage is determined through unionised bargaining, i.e. bargaining between each firm and its insiders, as described in Sections 4 and 5.

From Figures 5 it is clear that there are two separate cases to be considered:

(i) The insider wage under the combined threats of strike and lock-out: this is the "bird-in-the-hand" case (i.e. the wage is credibility-diminishing) and $W = W_{CT}$

(ii) The insider wage under the threat of strike alone. Here W is given by the intersection of the proposal-acceptance constraint (15) and the credible-threat constraint (13) (regardless of whether the wage is credibility-diminishing or enhancing).

Our analysis now becomes sufficiently unconventional to call for an intuitive preview of our major results:

(A) According to the traditional analysis, expansionary fiscal policies operating directly on the labour market (rather than indirectly via the product market) stimulate wages and reduce private-sector employment. The usual rationale is that these policies shift the labour supply curve to the private sector upwards (by raising reservation wages) while the private-sector labour demand curve remains unchanged. Thus, employers pay higher wages for their workers and employ less of them. These results are confirmed in our analysis of the labour market under

individualistic bargaining. Here, as in the standard literature, the wage level is inherently related to the marginal product of labour (suitably adjusted for hiring-firing costs, strike and lock-out threats, and relative market power). In particular, insider wages are bid up to the point at which insiders are just as profitable (on the margin) as outsiders.

- (B) Where there is unionised bargaining, however, the effects of fiscal policies may be radically different. Now there are two independent considerations - marginal productivity and strike credibility - which are potential determinants of wages. When the threats of strike and lock-out occur together, strike credibility is the dominant influence on wage determination for the following reasons. As we have seen, a lock-out threat is not made in our economy unless it succeeds in reducing the union's strike threat credibility and thereby reduces the insider wage. Here marginal productivity considerations lose their influence over wage determination: even if it were possible to raise the wage without inducing firms to replace insiders with entrants (*ceteris paribus*), unions nevertheless do not do so in order to preserve the credibility of their strike threat. Now, it is interesting to observe - in fact, this is a punch-line of our analysis - that the expansionary fiscal policies above reduce strike threat credibility. The reason is that, by raising the individualistic wage (i.e. the wage achievable under individualistic bargaining), these policies improve the expected remuneration the insiders would receive in the event of losing a strike. Thus, the utility from observing the strike falls

relative to the utility from breaking it. In order to regain strike threat credibility, the unions must reduce their wage demands. This, in turn, leads firms to increase employment (over the long run).

- (C) When the strike threat occurs alone in our economy, (viz. in the absence of the lock-out threat), the effects of fiscal policies are different again. Now the union's decision concerning the number of potential strikers becomes important. In the case of simultaneous strike and lock-out threats, this decision had no influence on wage determination: no matter how many workers are called out on strike, the firm locks out the rest. Thus, variations in the number of potential strikers make no difference to the firm's expected profits or the union's strike fund payments, in the event of a strike. Now, however, when the strike threat is made in the absence of the lock-out threat, a rise in the number of potential strikers reduces expected profits as well as the strike fund payments (*ceteris paribus*) when a strike occurs. The lower these expected profits (viz, the higher the cost of the strike to the firm), the greater the wage which the firm is willing to pay. The lower the strike fund payments, the less credible is the strike, and the lower the wage which the union can credibly demand. Here the union faces a tradeoff. It will set the number of potential strikers so that the wage gain from threatened profit reduction is exactly offset by the wage loss from credibility reduction. In this manner, both marginal productivity and strike credibility considerations become relevant to wage determination. The expansionary fiscal

policies above stimulate the individualistic wage and thereby they (a) reduce strike credibility and (b) reduce expected profit (by raising the reservation wage). The first effect lowers the union's wage demand; the second stimulates it. The overall fiscal policy impact on wages (and employment) depends on which of these effects is dominant.

In sum, we will be studying three regimes. In the first, marginal productivity considerations are relevant in wage determination. This situation occurs under individualistic bargaining. Here expansionary fiscal policies stimulate wages and reduce private-sector employment. In the second regime, strike credibility considerations alone determine wages. This regime obtains when strike and lock-out threats occur together. Here the policies above have the paradoxical impact of reducing wages and increasing private-sector employment. Finally, in the third regime, both marginal productivity and strike credibility considerations are relevant, and here the fiscal policy impact is ambiguous.

6a. Fiscal Policies under Combined Strike and Lock-Out Threats

The short-run equilibrium is described by the given capital stock (\bar{K}), the reservation wage equation (4), the profit function (2'), and the credible-threat wage (W_{CT} , given by the constraint (13) satisfied as equality). The long-run equilibrium includes these equations (except that the profit function (2) is substituted for (2')) and also the firm's production function (1) and the capital market clearing equation (by (5) and (7)).²¹ Recall that the government's fiscal policy instruments are permanent and rotating government employment

(L_G), unemployment benefits (B), the payroll tax rate (t), and the income tax rate (τ). We consider how each of these affect wages and employment.

An increase in permanent government employment (as shown in Section 3c) leaves the individualistic wage (w_i , the wage attainable through individualistic bargaining) unchanged. Thus, it has no effect on the union wage (W) either. Private-sector employment also remains unchanged in the long run.

An increase in rotating government employment raises the employment probability of all workers who are not employed in the private sector. Thereby it raises the individualistic wage (w_i) and the reservation wage (R) (see Proposition 1).

Recall that when the strike and lock-out threat occur together, $W = w_{CT}$ and the proposal-acceptance constraint is redundant. This means that the union members (working in the private sector) do not face a prospect of dismissal; they are only concerned about whether to observe a strike (and be retained while they do so) or to break it. Consequently, rotating government employment has no direct influence on them (because there is no change that they will be fired and seeking government employment). The only way in which this policy instrument can affect the union wage (W) is via the individualistic wage (w_i).

The union wage (W) sets each worker's utility from observing a strike equal to the utility from breaking it. The individualistic wage (w_i) influences these utilities via w . As noted, workers who break the strike receive w in both periods, whereas workers who break the strike receive w only in the second period and only if the strike is lost. In sum, strike breakers are more likely to receive w than

strike observers. A rise in the individualistic wage (W_i) raises w and this, in turn, increases the utility of the strike breakers by more than that of the strike observers.

In this manner, the government's policy robs the strike threat of credibility. Initially, the strike threat was on the borderline of being credible (viz, $\Omega = 0$, since $W = W_{CT}$) and after the rise in rotating government employment it is no longer credible (viz, $\Omega < 0$). The only way for the union to restore credibility is by reducing its wage demands. (This is effective since the wage is credibility-diminishing).

In short, a rise in rotating government employment leads to a fall of the insider wage. This is the opposite of what occurs under individualistic bargaining. In the long run, private-sector employment increases in response (through the channels outlined in Section 3c).

Proposition 5: Under unionised bargaining in the presence of strike and lock-out threats, a rise in permanent government employment leaves wages and private-sector employment unchanged; but a rise in rotating government employment reduces the insider wage and stimulates private-sector employment.

An increase in the level of unemployment benefits (B) operates in a similar way. It raises the reservation wage (by (4)) and thereby also the individualistic wage. This eliminates strike threat credibility, which the union can regain by reducing its wage proposal.

Proposition 6: Under unionised bargaining in the presence of strike and lock-out threats, a rise in unemployment benefits reduces the insider wage and (in the long run) raises private-sector employment.

An increase in the payroll tax rate (t) has no impact on wages in the short run, but reduces employment in the long run. An increase in

the income tax rate (τ) raises the reservation wage (by (4)), which leads to a rise in the individualistic wage and a fall in the union wage. In addition, this policy instrument has a direct, negative impact on credibility, leading to a further fall in the union wage. Once again, employment increases in the long run.

Proposition 7: Under unionised bargaining in the presence of strike and lock-out threats, a rise in the payroll tax rate leaves wages unaffected and reduces employment (in the long run). A rise in the income tax rate reduces the insider wage and (in the long run) stimulates employment.

These are startling results. The macroeconomic impact of rotating government employment, unemployment benefits, and income tax under strike and lock-out threats is the opposite of that under individualistic bargaining. The reason is that whereas these policy instruments stimulate wages under individualistic bargaining, they also reduce strike threat credibility under unionised bargaining. Under strike and lock-out threats, the union's need to maintain credibility imposes a binding upper bound on the union's wage demands. Accordingly, when credibility is reduced, these wage demands must be moderated.

6b. Fiscal Policies under Strike Threat Alone

Figures 5 show that when the strike threat occurs in the absence of the lock-out threat, the insider wage is given by the intersection of the credible-threat constraint of w_{CT} and the proposal-acceptance constraint of w_{PA}^n . Under these circumstances, the fiscal policy instruments above do not, for the most part, have the same qualitative impact on wages and employment.

An increase in permanent government employment once again leaves

wages and employment unchanged.

An increase in rotating government employment stimulates the individualistic wage (w_1). As we have seen, when the wage is credibility-diminishing, the credible-threat wage (w_{CT}) falls in response. On the other hand, the proposal-acceptance wage (w_{PA}^n) rises (because the increase in w_1 means that the firm's profit from rejecting the union's wage proposal falls relative to its profit from accepting the proposal). ²¹ The upshot is that, in Figure 5a, the w_{CT} constraint shifts downwards and the w_{PA}^n shifts upwards. Hence J increases unambiguously. In words, the increase in permanent government employment induces the unions to lower the number of strike-threatening workers ($a \cdot \bar{L}$) and consequently the strike fund payment (J) to each striker is able to rise. Yet the effect on the insider wage is ambiguous.

When the wage is credibility-enhancing, the credible-threat wage (w_{CT}) rises in response to the rotating government employment policy. (The reason is that the policy reduces strike threat credibility and thus the wage must rise in order to restore it.) By implication, in Figure 5b, the w_{CT} constraint shifts upwards, while the w_{PA}^n constraint rises as well. Here we have an unambiguous rise in both the insider wage (w) and the strike fund payment (J).

Proposition 8: Under unionised bargaining in the presence of strike threat without lock-out threat, a rise in permanent government employment leaves wages and private-sector employment unchanged. A rise in rotating government employment reduces the number of strike-threatening workers and (when the wage is credibility-enhancing) increases the insider wage and (in the long run) reduces employment.

An increase in the level of unemployment benefits (B), like the increase in rotating government employment, affects the insider wage

through a single channel: the individualistic wage. Thus, the qualitative effects of this policy are the same as those above.

Proposition 9: Under unionised bargaining in the presence of strike threat without lock-out threat, a rise in unemployment benefits reduces the number of strike-threatening workers and (when the wage is credibility-enhancing) increases the insider wage and (in the long run) reduces employment.

An increase in the payroll tax (t) rate has no effect on the credible-threat wage (W_{CT}), but it does reduce the proposal-acceptance wage (W_{PA}^n). (Since the firm has a higher expected wage bill when it accepts the union's wage proposal than when it rejects it, the policy reduces the profit from accepting relative to the profit from rejecting. Thus, the union must reduce its wage proposal to ensure that it will be accepted.)²³ In sum, the proposal-acceptance constraint of Figures 5 shifts downwards, while the credible-threat constraint remains unchanged. For Figure 5a (where the wage is credibility-diminishing), this means a fall in the insider wage (W) and the strike fund payment (J). For Figure 5b (where the wage is credibility-enhancing), the fall of the insider wage is associated with a rise in J .

Proposition 10: Under unionised bargaining in the presence of strike threat without lock-out threat, a rise in the payroll tax rate reduces the insider wage and (in the long run) stimulates employment. When the wage is credibility-diminishing, the number of strike-threatening workers falls; and when the wage is credibility-enhancing, the opposite happens.

An increase in the income tax rate (τ), as we have seen, raises the individualistic wage. Thereby it also raises the proposal-acceptance wage (W_{PA}^n) (because the firm's profit from rejecting the union's wage proposal falls relative to its profit from

accepting the proposal). Thus, the proposal-acceptance constraint of w_{PA}^n shifts upwards in Figures 5. As shown above, this income tax policy reduces the credible-threat wage (w_{CT}) when the wage is credibility-diminishing. On the other hand, when the wage is credibility-enhancing, w_{CT} rises (because the policy reduces strike threat credibility and the wage rises to restore it). Thus, the credible-threat constraint of w_{CT} shifts downwards in Figure 5a and upwards in 5b. As result,

Proposition 11: Under unionised bargaining in the presence of strike threat without lock-out threat, a rise in the income tax rate reduces the number of strike-threatening workers. When the wage, if credibility-enhancing, rises and (in the long run) employment falls; yet if it is credibility-diminishing, the effect on the wage and employment is ambiguous.

7. Concluding Remarks

This paper has spelled out a rationale for strikes and lock-outs and has examined the implications for wage determination and the effectiveness of fiscal policies. We have shown that when hiring-firing costs generate economic rent, strike threats may be explained as a rent-seeking device. Then a union's wage demands depend not only on its preferences and its labour demand constraint, but also on the mechanics of the strike threat. Lock-out threats have also been described as a rent-seeking device and we have examined how the strike and lock-out threats condition one another. Furthermore, we have analysed how this wage determination process affects employment and involuntary unemployment.

In this context, the effects of fiscal policies are quite different depending on whether there is individualistic bargaining, unionised bargaining in the presence of strike and lock-out threats, or unionised bargaining in the presence of strike threat alone. Individualistic bargaining generates all the conventional results. The unconventional results under unionised bargaining all stem from a single source: the union's manipulation of wages so as to preserve strike threat credibility. Since the mainstream literature on wage formation does not take the issue of strike threat credibility into account, it is not surprising that its conclusions differ.

With regard to the practical applications of our analysis, a word of warning is vital. We have concentrated on economies in which wages are determined entirely through individualistic bargaining, or entirely through unionised bargaining under strike and lock-out threats, or entirely through such bargaining under strike threats alone. However, real-world economies comprise many sectors in

which bargaining proceeds in different ways. In some sectors the bargaining is individualistic; in others it is unionised. In some instances (in West European countries rather than the United States) employers make regular use of lock-out threats; in others they do not. The macroeconomic effectiveness of fiscal policies in economies with such sectoral differences lies beyond the scope of this paper. Moreover, our analysis has considered only a limited set of functions for the strike and lock-out threats. As noted, strike threats may be more than wage preserving devices and lock-out threats may be aimed at more than depleting unions' strike funds. The other plausible functions also lie beyond the paper's scope. Finally, we have concentrated on fiscal policies operating directly on the labour market (rather than those operating indirectly via other markets). This, too, is a simplification of possibly limited practical validity. In view of these caveats, our analysis should be seen as only a first step in exploring the effectiveness of fiscal policies when unions play an active role in wage determination.

APPENDIX A

o

The following are sufficient conditions for the absence of strikes for the Nash equilibrium.

As shown in Sections 6 and 7, whenever the union's wage proposal exceeds a critical value - call it W^* - the firm rejects it (and thereby provokes a strike); and whenever the proposal lies beneath W^* , the firm accepts it.

Given that the strike threat is credible, rejection of the proposal implies that the insider receives an expected income of $Y = J + [\rho \cdot W](1 - \rho) \cdot W$. We assume that $\rho' < -[1/(W - w)]$, so that $(\partial Y / \partial W) < 0$. In other words, whenever the firm rejects the wage proposal, the union has an incentive to reduce the proposal wage.

Let $Y^* = J + [\rho \cdot W^* + (1 - \rho) \cdot w]$. We assume that the levels of J , w , and ρ are such that $Y^* < W^*$. In other words, the maximal labour income under rejection of the wage proposal falls short of the maximal income under acceptance.

Under these circumstances, the union has an incentive to make a wage proposal which does not provoke a strike. The relation between the worker's expected income and the wage proposal is pictured in the following figure:

Footnotes

1. See, for example, Alchian (1970), Gronau (1971), Lucas and Prescott (1974), McCall (1970), Parsons (1973), Phelps and Winter (1970) and Siven (1974).
2. However, in Snower (1983), the costs of job search serve to determine wages. Yet these (in contrast to this article) the wage determination does not rest on the ability of workers to capture at least some of the bilateral monopoly power generated through these costs.
3. See, for example, Azariadis (1975), Azariadis and Stiglitz (1983), Baily (1974), and Grossman and Hart (1981).
4. A prominent example is Stiglitz (1974).
5. This assumption has no substantive effect on the conclusions of our analysis. For time discount factors between zero and unity, the firm's optimization problem becomes inherently intertemporal and the stationary states of L_I and L_E have the same qualitative properties as the values of these variables in our static model.
6. This condition holds for $L_I < v(K)$. At $L_I = v(K)$, the condition expresses the left-hand derivative, but the right-hand derivative is $-(W - R) \cdot (1 + t) + H'$.
7. For simplicity, we ignore the hiring cost incurred by the worker. We also assume that the worker has a one-period time horizon. In the case of a multi-period time horizon, the reservation wage is inversely related to the insider wage. For example, for two periods (and a zero rate of time discount), the reservation wage satisfies

$$U[(R + \sigma \cdot \pi) \cdot (1 - \tau), 1] + U[(W + \sigma \cdot \pi) \cdot (1 - \tau), 1] \\ = 2 \cdot U[(B + \sigma \cdot \pi) \cdot (1 - \tau), 0].$$

Thus, the reservation wage locus of Figure 1 becomes downward sloping. Nevertheless, the qualitative conclusions of our analysis are not affected. For this reason we retain the assumption of the one-period time horizon.

8. It is "large" in the sense of not being exhausted by the existing demand for capital.
9. The Nash bargaining solution fulfills these conditions.
10. Given the policy instruments above, the latter effects could originate from a change in product demand induced by a change in the income tax or a change in labour income (before tax).
11. The job opportunities of the remaining outsiders do not change and therefore the reservation wage remains the same.
12. We assume that the government policy is unexpected by the private sector, for otherwise this policy would have been taken into account in the provision of the fixed capital supply.
13. This result is not weighty. It is due to our special assumption that $U_{CC} = 0$, so that the worker's profit income cannot affect his reservation wage (by (4)). Had we assumed that $U_{CC} < 0$, then a rise in the payroll tax (like the income tax) would have stimulated the reservation wage and thereby also the insider wage.
14. Letting the firm and the union have different subjective probabilities makes no substantive difference to our conclusions.

15. Recall that all insiders are alike. Thus, we are not concerned with conflicts of interest within the union.
16. For the case in which expected worker income is maximized when $W > W^*$ (see Appendix A), the relevant optimality condition replaces the "proposal-acceptance wage" in our subsequent analysis.
17. This analysis can be provided upon request.
18. Here we assume that the union members derive only a negligible proportion of their profit income from the firm for which they work or whose products they consume. In addition, they make the Nash equilibrium assumption that all other unions do not call strikes. Thus, their profit income is taken to be independent of their strike activity and equal to what they would earn in the absence of strikes.
19. Note that if the credible-threat constraint is flatter than the proposal-acceptance constraint, the maximal wage is attained at $J = 0$. If there are multiple intersections between the two constraints, the union chooses either the one associated with the highest wage (whenever the credible-threat constraint is steeper than the proposal-acceptance constraint at $J = 0$) or the one associated with $J = 0$. As shown below, these possibilities make no difference to our qualitative conclusions.
20. Here two short-run equilibria are compared for identical r and K .
21. We assume that the availability of strike funds remains fixed at X in the long run. The reason for this assumption is apparent. Firms use the threat of lock-out because it enables them to reduce J beneath the level it would otherwise attain. Thereby the union's strike threat

credibility (as measured by Ω) is reduced and the union therefore must reduce its wage demands. Now if X were allowed to vary in the long run, the unions could augment this strike fund - and thereby the strike payment J - sufficiently to eliminate the firm's incentive to threaten lock-out. So if we are to define a long-run general equilibrium with both strike and lock-out threats, we must hold J fixed at an appropriately low level.

22. By Equation (15),

$$\frac{\partial w_{SA}^n}{\partial w_i} = \frac{g_2 \cdot \{1 - a + (1 - \rho)\}}{1 + (1 - \rho)} > 0$$

23. By Equation (15),

$$\frac{\partial w_{SA}^n}{\partial t} = - \frac{(w_{SA}^n - w) \cdot \{1 + (1 - \rho)\} - a \cdot w}{(1 + t) \cdot \{1 + (1 - \rho)\}} < 0$$

REFERENCES

- Alchian, A.A. (1970). "Information Costs. Pricing and Resource Unemployment," in E. Phelps et al., eds., Microeconomic Foundations of Employment and Inflation Theory, New York: Norton 1970.
- Ashenfelter, O., and G. E. Johnson. "Bargaining Theory. Trade Unions, and Industrial Strike Activity," American Economic Review, 59(1), 1969, 35-49.
- Azariadis, C., "Implicit Contracts and Underemployment Equilibria," Journal of Political Economy, December 1975, 83, 1183-202.
- Azariadis, C. and Stiglitz, J.E., "Implicit Contracts and Fix-Price Equilibria," Quarterly Journal of Economics, 98, 1983, 1-22.
- Baily, M.N., "Wages and Employment Under Uncertain Demand," Review of Economic Studies, 41, 1974, 37-50.
- Bishop, R. L., "A Zeuthen-Hicks Model of the Bargaining Process," Econometrica, 1964, 411-417.
- Cross, J. G., "A Theory of the Bargaining Process," American Economic Review, 1965, 66-94.
- Farber, H. S., "Bargaining Theory, Wage Outcomes, and the Occurrence of Strikes," American Economic Review, 68(3), 1978, 262-71.
- Gronau, R., "Information and Frictional Unemployment," American Economic Review, June 1971, 61(3), 290-301.
- Grossman, S. and Hart, O., (1981), "Implicit Contracts, Moral Hazard, and Unemployment," American Economic Review, 71, 301-07.
- Harsanyi, J. C., "Approaches to the Bargaining Problem Before and After the Theory of Games," Econometrica, 1956, 144-157.
- Hayes, Beth, "Unions and Strikes with Asymmetric Information," Journal of Labor Economics, 1984, 57-83.
- Lindbeck, A. and Snower, D. (1984a), "Involuntary Unemployment as an Insider-Outsider Dilemma", Seminar Paper, Institute for International Economic Studies, University of Stockholm.
- _____, (1984b), "Wage Rigidity and the Threats of Strike and Work-to-Rule," mimeo.
- Lucas, R.E. and Prescott, E.C. "Equilibrium Search and Unemployment," Journal of Economic Theory, February 1974, 7,(2), 188-209.

McCall, J.J. "Economics of Information and Job Search." Quarterly Journal of Economics. February 1970. 84.(1). 113-126.

Parsons, D.O. "Quit Rates Over Time: A Search and Information Approach." American Economic Review. June 1973. 63(3). 390-401.

Phelps, E.S. and Winter, S.G. "Optimal Price Policy under Atomistic Competition." in Phelps et al.. Microeconomic Foundations of Employment and Inflation Theory. New York: Norton. 1970.

Reder, M., and G. R. Neumann. "Conflict and Contract: The Case of Strikes," Journal of Political Economy. 88(5), 1980. 867-86.

Siven, C-H.. "Consumption, Supply of Labor and Search Activity in an Intertemporal Perspective," Swedish Journal of Economics, March 1974, 7(1), 44-61.

Snower, D.J. (1983), "Search, Flexible Wages and Involuntary Unemployment," Birkbeck College Discussion Paper No. 132.

Stiglitz, J.E. "Wage Determination and Unemployment in L.D.C.'s," Quarterly Journal of Economics, May 1974, 88, 194-227.

