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Working Paper — Digitized Version Cooperation, harassment, and involuntary unemployment

Seminar paper, Institute for International Economic Studies, University of Stockholm, No. 321

Provided in Cooperation with:

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Suggested Citation: Lindbeck, Assar; Snower, Dennis J. (1985) : Cooperation, harassment, and involuntary unemployment, Seminar paper, Institute for International Economic Studies, University of Stockholm, No. 321, Institute for International Economic Studies, University of Stockholm, Stockholm

This Version is available at: https://hdl.handle.net/10419/432

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Seminar Paper No. 321

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AND INVOLUNTARY UNEMPLOYMENT

by Assar Lindbeck and Dennis D. Snower

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

April, 1985

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COOPERATION, HARASSMENT, AND INVOLUNTARY UNEMPLOYMENT

by Assar Lindbeck^{*} and Dennis D. Snower^{**}

1. Introduction

Of the numerous prize questions in the theory of unemployment, the following two have an especially fine pedigree, in terms of both age and fundamental importance:

- (i) Why do involuntarily unemployed workers not succeed in underbidding their employed counterparts?
- (ii) Why do employed workers accept being laid off (when times are bad) rather than take reductions in their wages?

Of course, the unemployed workers and layoff candidates sometimes accept, or even bring about, lower wages; yet whenever involuntary unemployment persists and layoffs are common, the process is not complete. This phenomenon appears to be sufficiently common to have given the non-market-clearing behaviour of wages the status of stylized fact.

The two questions above reflect our view that the absence of underbidding lies at the heart of persistent involuntary unemployment and layoffs. If the unemployed has the willingness and ability to attract jobs by offering to work for less than the prevailing wages, unemployment could not persist. If the workers facing dismissal had

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the willingness and ability to retain their jobs by doing the same, there could be no layoffs.

In the context of free-market economies, an answer to these questions can proceed along one (or both) of two routes:

- (a) it can explain why the employers have no incentive to accept lower wage bids; or
- (b) it can show why the unemployed and laid-off workers have no incentive to underbid.

The efficiency wage hypothesis (e.g. Malcomson (1981), Snower (1983), Weiss (1980)) focuses on the former route alone: those who offer to work for less than the efficiency wage reveal themselves to be of unprofitably low expected ability (in the case of adverse selection) or to exert an unprofitably low expected level of effort (in the case of moral hazard) and thus the employers do not accept such low-wage bids. Much of the labour union literature which has bearing on unemployment and layoffs (e.g. Corden (1981), Gylfason and Lindbeck (1984), Oswald (1982)) takes the latter route: the union sets the wage in accordance with its objectives and constraints. This wage may generate involuntary unemployment and layoffs, but the workers experiencing these problems are bound by the union's decisions and thus do not underbid the employed workers. The literature on implicit contracts (e.g. Azariadis (1975), Grossman and Hart (1981)) pursues both routes: employers and employees are institutionally confined to long-term contracts, made in the absence of perfect information about the future. Under particular information structures, Pareto-efficient contracts involve spells of unemployment and layoff.

This paper offers another approach to both routes. It attempts

to capture the notion that

- workers might not try to underbid their fellow workers, because they believe that the latter would respond by making their working life unpleasant for them and
- (2) firms may refuse to accept the wage offers of under bidders since they expect the remaining employees to withdraw cooperation from the underbidders in the process of production.

To begin with, our analysis starts from the premise that the employees of a firm can cooperate with and harass one another, thereby affecting their productivities and their disutilities of work. Furthermore - and this is the critical point in our analysis - <u>the</u> <u>cooperation and harassment do not occur automatically; they lie within</u> <u>the control of the employees themselves</u>. These activities are used to support the employees' wage demands. The wages are set above the level at which the unemployed would be willing to trade places with the employees, but the cooperation and harassment activities prevent this from happening. In this manner, persistent involuntary unemployment can arise. Moreover, when workers are laid off, the remaining employees adjust their cooperation and harassment activities to keep the laid off workers from underbidding. Thus layoffs can take place without wage reductions.

Section 2 discusses the underlying rationale for this story and Section 3 presents a rigorous statement of how worker cooperation is related to unemployment. Section 4 explores the implications of this model for layoffs, wages and employment over the course of business fluctuations. We examine a number of distinct possibilities: expected expansions and declines, as well as unexpected ones which take place

in the presence of long-term wage and employment contracts (which are made before the prevailing business conditions are known) and short-term contracts (undertaken after these conditions are known). Section 5 provides a model of how worker harassment is related to unemployment and layoffs. Finally, Section 6 is devoted to concluding remarks.

2. The Underlying Rationale

The activity of cooperation and harassment make workers' productivities and disutilities of work interdependent. It is this interdependence among workers - subject, within limits, to the workers' own control - that is the focus of this paper. It is convenient to consider the two types of interdependence separately. To that end,

- let "cooperation" refer to activities in which workers help one another in the process of production and thereby raise each other's productivities; and
- let "harassment" comprise activities whereby workers make each other's jobs more disagreeable and thereby raise their disutilities of work.

We assume that the workers' decisions regarding these activities are made on individualistic grounds. Each worker seeks to maximize his own utility; no altruism or collusion is involved in his decisions. Through this "individualistic" approach, we make involuntary unemployment independent of the existence of labor unions, though labor union activities may influence the magnitude of involuntary unemployment.

Workers differ with regard to the cooperation and harassment activities they are able to perform. Those who have spent a long time at their jobs are generally more effective than their newly-arrived counterparts. The ability to be helpful to fellow workers in the production process depends on detailed knowledge of the particular process at hand; such knowledge takes time to acquire. Similarly, the ability to be disagreeable to fellow workers often requires

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understanding the work schedules, administrative schemes, and monitoring procedures and this, too, takes time to learn.

For simplicity, we abstract from differences in workers' learning abilities as cooperators and harassors and assume that these depend on time alone. Furthermore, for analytical convenience, we suppose that learning takes place in discrete jumps: when workers enter their firms, they are assumed to have a limited, given cooperating and harassing ability. After a given period of on-the-job learning which we call the "initiation period" - they achieve a higher ability.

This criterion allows us to distinguish among three different types of workers:

- (i) the "insiders", who are currently employed and able to engage in the full range of cooperation and harassment activities;
- (ii) the "entrants", who are in the process of being hired and trained and have only a limited range of these activities at their disposal; and
- (iii) the "outsiders", who are unemployed and thus have no access to these activities.

We assume that the workers within each of these groups are identical. Outsiders are perfect competitors for jobs; they offer to work at the reservation wage. The entrants and insiders may gain market power through their cooperation and harassment activities (as shown below). We assume that wage contracts are not indefinitely enforceable. In particular, we assume that entrants make wage contracts for the duration of the initiation period, after which renegotiation is possible. At this point, entrants gain full access to the available cooperation and harassment activities and they turn into insiders.

Cooperation and harassment among workers are characteristically associated with a significant asymmetry of information: generally these activities can be observed more readily by the workers engaged in them than by the employers. Accordingly, let us make the extreme assumption that firms are completely unable to monitor cooperation and harassment; all they can observe is the number of people they employ and the overall productivity of this workforce. Thus, wages cannot be made contingent on the cooperation and harassment activities.

In our analysis, <u>cooperation</u> underlies an explanation of involuntary unemployment and layoffs via the first route above (i.e. employers refuse to accept market-clearing wage bids) and <u>harassment</u> underlies an explanation of these problems via the second route above (i.e. workers without jobs or continued job prospects refuse to make market-clearing wage bids). Let us consider each in turn.

With regard to cooperation, the asymmetry of information between the firm and its employees implies that insiders potentially have more market power than entrants. When insiders cooperate with each other but not with entrants, they make themselves more productive than the entrants. In that event, a firm that exchanges one of its insiders for an entrant must bear a cost (viz, the loss of revenue from reduced productivity). This cost is associated with economic rent, to be divided between the firm and its insiders in the process of wage determination.

We assume that the insiders capture some of this rent. Thus, the insider wage is set above the entrant wage, but the firm nevertheless has no incentive to fire insiders and acquire entrants instead.

Moreover, the entrants might conceivably be in an analogous

position vis-a-vis the outsiders, so that the entrant wage lies above the reservation wage without inducing the firm to substitute outsiders for entrants. There are various reasons why this may be so.

For example:

- (a) When a firm's current entrants cooperate with each other but refuse to cooperate with any additional recruits which the firm might hire, the entrants become more productive than the outsiders potentially are. In that event, the firm again faces a cost of exchanging an entrant for an outsider. If the entrants capture some of the available rent, then the entrant wage will exceed the reservation wage.
- (b) The greater the insider wage, the lower the reservation wage (since workers who gain employment anticipate that they will be insiders after their initiation period is over). If the reservation wage is sufficiently low and if worker's borrowing ability is limited, then workers may be unable to achieve their reservation wage. Then, the firm may have no choice but to let the entrant wage exceed the reservation wage.
- (c) The firm may set the entrant wage above the reservation wage for reasons relating to the efficiency wage hypothesis. In other words, the productivity gains from letting the entrant wage exceed the reservation wage by a specified amount are greater than the associated increase in labor cost.

For the purposes of our analysis it is not important for what specific reason the entrant wage exceeds the reservation wage, so long as it actually happens. For expositional simplicity, however, we use reason, (a) (and do not bother to motivate borrowing constraints or an efficiency wage hypothesis). Thus, it is entrants' market power that makes them better off than outsiders, much as it is insiders' market power which makes them better off than entrants.

When all firms in the economy offer insider wages greater than entrant wages which, in turn, are greater than the reservation wage and when these firms also lack the incentive to exchange high-wage for low-wage employees, there is persistent involuntary unemployment. (The nature of this unemployment is examined in Section 3.)

For reasons analogous to those above, workers who are laid off may be unable to regain their jobs by accepting a wage reduction. If the remaining employees withdraw cooperation from them, then their productivity falls, through no fault of their own. In consequence, there may be no wage above their reservation wage which could compensate their firms for this productivity loss. The remaining employees may have a motive to make this happen, because they can thereby protect their own wage incomes. Here a decline in business prospects leads to layoffs rather than to wage declines.

Now turn to harassment. Here, too, insiders can gain market power by treating themselves differently from entrants. When they harass all workers except themselves, they manage to keep their disutility of work below that of the other workers. Consequently, the insider reservation wage is less than the entrant reservation wage.

Thus, the insiders can raise their wage above their own reservation wage without losing their jobs. So long as the insider wage does not exceed the entrant reservation wage, the entrants have no incentive to underbid.

(We assume that the firm does not find it worthwhile to fire all its insiders and replace them by the (less beligerent) entrants, since the former are required to train the latter.)

Moreover, entrants might also have an opportunity to drive their wage above their own reservation wage, without risk of dismissal. (If they do not subject each other to harassment but threaten to harass any additional recruits, their reservation wage falls beneath that of the outsiders.) For brevity, however, we will not consider this possibility here.

This wage setting behavior by entrants is not a necessary

9

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condition for unemployment in our model. As noted, there are several other reasons why the entrant wage may exceed the entrant reservation wage. Regardless of which reason we opt for, the outsiders may be unwilling to accept work at the entrant wage, since they expect to be harassed (by the insiders, if not also by the entrants) upon entering the workforce. In this sense, their unemployment is voluntary. However, they would be eager for jobs which have the same characteristics as those of the current employees, namely, the same wage and absence of harassment. In this sense, they are involuntary unemployed.

Layoffs in the absence of wage cuts may be explained in the same spirit. To preserve their own incomes, the current employees threaten to harass all laid off workers who attempt to regain their jobs through underbidding. As result, the laid off workers may no longer have an incentive to accept work at any wage below their previous wage (which now may fall short of their new reservation wage).

This, in short, is the intuitive rationale underlying our explanation of why unemployed and laid-off workers are either unable or unwilling to underbid the employed workers. Our model rests within the framework of insider-outsider analysis (e.g. Lindbeck and Snower (1984a, b) and Solow (1985)), where involuntary unemployment is the outcome of a conflict of interest between the employed and unemployed workers. The source of the conflict is economic rent associated with productive services. When the employed workers capture it (in whole or in part) and thereby raise their wages, they automatically discourage their employers from offering jobs to those currently unemployed. The rent may take a variety of forms. Whereas it arises from cooperation and harassment activities in this paper, it comes

from hiring, training and firing costs in Lindbeck and Snower (1985a, b) and from effort variations in Lindbeck and Snower (1985c).

The critical respect in which our paper departs from the standard literature on labour markets is that it allows cooperation and harassment activities to be decision variables of employees.

The literature thus far has assumed that whenever workers have opportunities to cooperate in the process of production, these will automatically be exploited. Accordingly, the standard production functions have represented a unique relation between labour input and final output (given the availability of all other factors of production): the more hours of work (possible adjusted for "effort") are provided, the more output is produced (e.g. Q = f(L), f' > 0). Within this framework, whenever cooperation among employees have been taken into account explicitly as in the theory of teams (e.g. Alchian and Demsetz (1972) and Marschak and Radner (1972), this has been done by letting the work of different employees enter the production functions separately and assuming the cross-partial derivatives of output with respect to labour to be non-zero (e.g. $Q = f(L_1, ..., L_n)$) and $\frac{\partial^2 Q}{\partial L_i}$, $\frac{\partial L_i}{\partial J_i} \neq 0$ for $i \neq j$. The message from such production functions is clear: if one employee, through his labour services, can affect the marginal product of another employee, he will invariably do so.

Furthermore, the standard literature has either neglected harassment among employees or assumed it to be exogenously given, so that each employee's disutility of work depends solely on his own decisions. By contrast, in our analysis, employees can choose whether to cooperate with or harass one another. Not only are their

11

productivities and disutilities of work interdependent, but they are also objects of choice.

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3. A Model of Cooperation and Unemployment

Our economy is inhabited by a fixed number of firms and workers as well as a government. The firms use labour to produce a non-durable consumption good. The workers buy the good and offer labour services. The government levies an income tax on the employed workers and provides unemployment benefits to the unemployed workers. Let us consider the behaviour of the firms and the workers in turn.

The firm has two variable factors of production at its disposal: insider labour (L_I) and entrant labour (L_E). The former receive the insider wage, W_I and the latter receive the entrant wage, W_E . These wages are exogenously given to the firm.

The firm's level of output is Q. Let it have a production function, Q = $\epsilon \cdot f(\phi_I \cdot L_I + \phi_E \cdot L_E)$, with three parameters:

- (i) ε , standing for business conditions (e.g. the level of product demand, the state of technology, or the availability of fixed factors),
- (ii) ϕ_{I} , representing the level of cooperation among insiders, and (iii) ϕ_{E}^{\dagger} ; representing the level of cooperation between insiders and entrants.

The first parameter may be understood as a proxy for various macroeconomic developments which are exogenously given to the firm: secular trends or random fluctuations in tastes, technologies, or endowment. The second and third parameters may be defined as the insiders' and entrants' output per head (respectively) relative to what it would be in the absence of any cooperation with the other insiders of the firm. These parameters take on a minimal value of unity (in the absence of cooperation) and a finite, maximal value of "a" (a > 1, when there is full cooperation). Like ε , they are

exogenously given to the firm.

Observe that our specification of the production function implies that insiders and entrants are equally productive in the sense that if they were to work under identical production conditions (i.e. using the same production function and shift parameters and joining a workforce of the same size) then they would make the same contribution to output. We make this assumption to achieve an unambiguous notion of involuntary unemployment, viz, workers unsuccessfully offering to work at the prevailing wages and employment conditions in jobs for which they are just as qualified as the current employees.¹ (Note that the insiders and entrants are equally productive even when their wages differ. Thereby we exclude the efficiency wage hypothesis from our explanation of unemployment).

The production function displays diminishing returns to labour: f' > 0, f'' < 0. The period of analysis coincides with the initiation period. The firm is assumed to maximize its profit (π). Without substantive loss of generality² we assume that it has a one-period time horizon:

 $\pi = \varepsilon^{\bullet} f(\phi_{I} \cdot L_{I} + \phi_{E} \cdot L_{E}) - W_{I} \cdot L_{I} - W_{E} \cdot L_{E},$

where the firm's endogenous variables are L_I and L_E (i.e. the firm makes employment decisions unilaterally). The firm's stock of insiders which it inherits from the pasts is m (a constant). There are no retirements. In the current period, the firm can reduce this stock (by firing some insiders) but it cannot increase it (since nearly all newly hired workers are taken to be entrants). Thus, $L_I <$ m. Assuming that the firm invariably finds it profitable to employ some insiders (i.e. $L_I > 0$) the first-order conditions³ are

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(1)
$$\frac{\partial \pi}{\partial L_{I}} = \varepsilon \cdot \phi_{I} \cdot f' - W_{I} > 0, \qquad \frac{\partial \pi}{\partial L_{I}} \cdot (m - L_{I}) = 0;$$

(2) $\frac{\partial \pi}{\partial L_{E}} = \varepsilon \cdot \phi_{E} \cdot f' - W_{E} < 0, \qquad \frac{\partial \pi}{\partial L_{E}} \cdot L_{E} = 0;$

Each worker maximizes his utility (U), which is related positively to his consumption and negatively to his labour. Labour is taken to be discrete: it is 0 for an unemployed worker and 1 for an employed one. All income is consumed. Each worker receives, additional to his labour income, a lump-sum profit income and is subject to a proportional income tax rate, τ . For simplicity, we assume utility to be linear in consumption and labour: $U = C - \ell$. (There is no substantive loss of generality here – only the convenient implication that the reservation wage is independent of profit income and thus the latter may be ignored in our analysis).

Whereas the firm's time horizon could be limited to one period without affecting the qualitative conclusions of our analysis (see footnote 2), this is not so with regard to the household. Setting the household's time horizon at one period provides, arguably, an overly simplistic way of rationalizing involuntary unemployment. This may be shown as follows.

Whether households are involuntarily unemployed depends on whether firms are able to charge them a full "entry fee" upon being hired into the workforce. This payment (for the privilege of becoming an insider in the future) is sufficiently large so as to leave the entrant indifferent between employment and unemployment, i.e. it reduces the entrant wage to the level of the reservation wage. If households had a one-period time horizon, entry fees could not be charged (since future income would be valueless to them). The same

would be true, if households time horizons extended over less than their entire working lives. However, as we have seen, there are other reasons why a full entry fee might not be charged. To be able to take them into account, we assume a two-period horizon for each household.

Then, the reservation wage may be defined as follows:

(3)
$$(R + \delta^* W_T)^* (1 - \tau) - 1 = B^* (1 + \delta)^* (1 - \tau)$$

where δ is the household's rate of time discount. Here R varies inversely with W_I (and for a sufficiently large W_I, R is negative).

Through appropriate variations in their cooperative activities, the insiders are able to generate economic rent. In particular, by cooperating more with each other than with entrants, the insiders can raise their relative productivity, and consequently they have the possibility of driving their wage above the entrant wage without inducing their dismissal. The resulting economic rent may be measured as the difference between the maximal wage an insider can demand without inducing dismissal (on the one hand) and the entrant wage (on the other).

We assume that the insider wage is the outcome of a bargaining process between each individual insider and his firm,⁴ whereby they share the available rent. Our analysis requires only that this process satisfy two properties:

(1) the insider captures some of the rent and

(2) the greater this rent, the greater the insider wage. Yet this paper is not concerned with the structure of the bargaining process whereby wages are determined. So, for simplicity, we assume that the insider wage absorbs <u>all</u> the rent (i.e. the insider wage is equal to the maximal wage beyond which the insider becomes

unprofitable to the firm).

In this context, each insider has three decision variables:

- (1) the level of cooperation with entrants, ϕ_E^i (where the superscript "i" denotes the i'th insider), defined as the entrants' output per head relative to what it would be in the absence of the i'th insider's cooperation (ceteris paribus),
- (2) the level of cooperation with other insiders, ϕ_{I}^{i} , defined as the other insiders' output per head relative to what it would be in the absence of the i'th insider's cooperation (ceteris paribus), and
- (3) the insider wage (W_1^i) .

(In general, ϕ_E^i depends not only on whether insiders cooperate with entrants, but also on whether entrants cooperate with insiders. For simplicity, we assume that the latter effect is negligible.) We consider the Nash equilibrium value of these variables (where each agent sets his decision variables given the decision variables of all other agents).

We can divide the insider's decision-making problem into two parts:

- maximizing W_I^i , given ϕ_E^i and ϕ_I^i , and - finding the optimal ϕ_E^i and ϕ_I^i .

We consider each part in turn.

The following proposition concerns the Nash equilibrium level of the insider wage:

<u>Proposition 1</u>: Given that $W_{I}^{i} > R$ and given any fixed levels of insider-entrant cooperation (ϕ_{I}) and insider-insider cooperation (ϕ_{E}), the Nash equilibrium insider wages $(W_{I}^{i} \text{ for all insiders } i = 1, ..., m)$ satisfy

(1a)
$$W_{I}^{i} = W_{I}^{*} = \varepsilon \cdot \phi_{I} \cdot f'(\phi_{I} \cdot m + \phi_{E} \cdot L_{E}).$$

(In other words, condition (1) holds as equality, with $L_{I} = m$.)

<u>Proof</u>: All insiders are alike and each takes the wages of all other insiders as given. No insider offers a wage which induces his own dismissal. Thus, any vector of insider wages (W_I^1, \dots, W_I^m) which induces the firm to employ less the m insiders cannot be in the Nash equilibrium. Thus, $W_I^i < W_I^\star$. Moreover, if $W_I^i < W_I^\star$, it is possible to raise the i'th insider's wage without inducing his dismissal. Since the insider captures all the available economic rent (by assumption), this W_I^i is not in the Nash equilibrium.⁵ QED

Now turn to insider-entrant cooperation, ϕ_E^i , and insider-insider cooperation, ϕ_I^i . It can be shown that these two forms of cooperation have opposing impacts on the insider's wage. A rise in ϕ_E^i makes entrants more productive, thereby inducing further employment of entrants which, in turn, lowers the insider wage (on account of the diminishing return to labor). On the other hand, a rise in ϕ_I^i makes insiders more productive and thereby raises the insider wage (since the stock of insiders is fixed over the period of analysis). If these wage effects of cooperation have a stronger influence on each insider's utility than the other utility effect cooperation may have, then each insider will cooperate minimally with entrants (viz, $\phi_E^i = 1$) and maximally with other insiders of the firm (viz, $\phi_I^i = a > 1$).

This result is specified in the following proposition.

Proposition 2: Assume that:

- (a) insider i's cooperation with entrants and other insiders has a significant, positive effect on the productivity of these latter workers (i.e. $(\partial \phi_E / \partial \phi_E^i)$, $(\partial \phi_I / \partial \phi_I^i) > 0$ and not negligibly close to zero and
- (b) variations in cooperation with entrants and other insiders affect insider i's utility primarily via the insider wage.

Then insider i does not cooperate with entrants (i.e. $\phi_E^i = 1$), but cooperates fully with other insiders (i.e. $\phi_I^i = a$).

<u>Proof</u>: The greater ϕ_E^i , the greater the marginal profitability of entrants, and (by condition (2)) the more entrants will be hired: $(\partial L_E / \partial \phi_E) \cdot (\partial \phi_E / \partial \phi_E^i) > 0.6$

The more entrants are hired (ceteris paribus), the lower the marginal profitability of insiders, and the lower the insiders wage:

 $(\partial W_{T}/\partial L_{E}) < 0$, by Condition (1a).

The greater ϕ_{I}^{i} , the greater the marginal profitability of insiders and (by Condition (la)) the greater the insider wage:

 $(\partial W_{\tau}/\partial L_{\tau}) \cdot (\partial \phi_{\tau}/\partial \phi_{\tau}^{i}) > 0.$

If the dominant effect of the insider's cooperative activity on his utility operates via his wage, then the insider will minimize ϕ_E^i and maximize ϕ_T^i .

Since this paper is primarily concerned with the influence of labor cooperation on wage formation (and thereby on employment), it is natural to focus attention - as we have done - on the relation between ϕ_E^i and ϕ_I^i (on the one hand and utility from W_I (on the other). Nevertheless, it is important to note that these cooperative activities may influence the insider's welfare in other ways as well. Consider a few possibilities.

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(a) There may be direct utility gains from cooperation: an insider may prefer to work in cooperation with entrants or other insiders than to work in isolation. (If so, the gains are likely to be greater for insider-insider cooperation than for insider-entrant cooperation, since working together tends to be more satisfying among people who have already been associated with one another.) On the other hand, direct utility losses from cooperation are conceivable as well, since an insider who cooperates may expand more "effort" than one who does not. (If so, the losses are likely to be greater for insider-entrant cooperation, since working with newcomers tends to be more strenuous.)

1. 11

(b) There may be indirect wage benefits when cooperative behavior is reciprocated: the more Worker A cooperates with Worker B, the more A may expect B to cooperate with him. (If so, the gains are likely to be greater for insider-insider cooperation, since insiders may be more capable of reciprocating.) On the other hand, there may also be indirect wage losses from cooperation. Cooperating with other workers and doing one's own job may be mutually exclusive activities at any point in time: then, the more A cooperates with B, the less time A has left for his own productive services. (If so, the productivity-induced wage losses are likely to be greater for insider-entrant cooperation, since this - when normalized for productivity - generally requires more time.)

These considerations suggest that the net benefits (to any insider i) from insider-insider cooperation exceed those from insider-entrant cooperation. For the purposes of our analysis we need to assume, in addition, that the former is positive whereas the latter is negative.

Given Propositions (1) and (2) and supposing that W_I , $W_E > R$, the marginal profitability conditions (1) and (2) may be rewritten as follows:

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(1')
$$\frac{\partial \pi}{\partial L_{T}} = \varepsilon \cdot a \cdot f'(a \cdot m + L_{E}) - W_{I}^{*} = 0$$
 for $W_{I}^{*} >$

(2') $\frac{\partial \pi}{\partial L_E} = \varepsilon \cdot f'(a \cdot m + L_E) - W_E \leq 0$ $\frac{\partial \pi}{\partial L_E} = 0.$

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By implication,

(4)
$$W_{I}^{\star} = a^{\star}W_{E}$$
 for $L_{E} > 0$,
 $W_{I}^{\star} < a^{\star}W_{E}$ for $L_{E} = 0$.

This provides the key to how the insider wage is determined in our analysis. For the moment we take W_E and R as exogenous constants and show how W_I depends on the historically given size of the insider workforce (m). Since there are diminishing returns to labor, the larger is m, the smaller are the marginal products of insiders and entrants. There are three cases to be considered:

(I) <u>A "small" insider workforce</u>: $0 < m < \underline{m}$. Here the insider workforce is sufficiently small so that not only insiders, but also entrants are marginally profitable: $\varepsilon^{f'(m)} > W_E$. Thus, entrants are hired: $L_E > 0$. The insiders cannot drive their wage (W_I) up to the point at which their marginal profitability is zero $(\varepsilon^{a} \cdot f'(m) = W_I^1)$, since the firm would then find it worthwhile to replace some insiders with entrants (since $(\partial \pi / \partial L_I) = 0$ and $(\partial \pi / \partial L_E) > 0$). Rather, the insiders raise their wage to the level at which their marginal profitability is equal to that of entrants: $W_I = a^*W_E$. In Figure 1b, this is called the "relative profitability locus".

Let us distinguish between a "short run" in which the insider workforce is given a "long run" in which it varies (given ε). Then every point on the segment E_0E , (in Figure 1b) represents a short-run equilibrium. However, with the passage of one time period, the entrants turn into insiders and the insider workforce expands so that entrants are no longer marginally profitable. (Then ε 'f'(m) = W_E , with m = m). Thus, the long run equilibrium is at point E¹.





21a

(11) <u>A "large" insider workforce</u>: $\underline{m} < \overline{m}$. Here the insider workforce is large enough for entrants to be unprofitable at W_E , but small enough for the insiders to be marginally profitable at that wage: $L_E = 0$ and $L_I > 0$. Thus, the outsiders cannot compete for jobs with the insiders. Accordingly, the insider wage is driven up to the level at which the marginal profitability of the insiders is zero: $\varepsilon^*a^*f'(m) = W^*$. In Figure 1b, this is called the "insider profitability locus".

Every point on the segment E_1E_2 is both a short-run and a long-run equilibrium. Any current stock of insiders in the range $\underline{m} < \underline{m} < \overline{m}$ perpetuates itself.

(III) <u>An "unsustainably large" insider workforce</u>: $m > \overline{m}$. Here the insider workforce is so large that both entrants and insiders are marginally unprofitable at the reservation wage, R. Since no worker is willing to work for less than this wage, no entrants are hired $(L_E = 0)$ and some insiders are fired, so that the insider workforce is reduced to \overline{m} (for which $\varepsilon^*a^*f'(\overline{m}) = R$). In that event, the insider wage is set equal to the reservation wage: $W_{\overline{I}}^* = R$, as shown in Figure 1b. This is the long-run and short-run equilibrium, denoted by point E_2 .

To close this model of the labor market, W_E and R must be determined endogenously. By (3), the reservation wage is inversely related to the insider wage (the more the worker expects to earn in the future, the less he is willing to accept at present):

(3')
$$R = -\delta^* W_I + B^* (1 + \delta) + (1/(1 - \tau))$$

Regarding the entrant wage, we have seen that there may be

various reasons for it to exceed the reservation wage. But to fix ideas, we assume that, whatever the number of entrants hired by the firm, these entrants cooperate with each other and refuse to do so with additional recruits the firm may subsequently consider employing. As result, let the ratio of the marginal products of outsiders to entrants be a constant b, 0 < b < 1. Assuring that entrants capture all the associated rent,

(5)
$$W_{\rm E}^{\star} = (1/b)^{\cdot}R.$$

Figures 1a and b illustrate the simultaneous determination of $\mathtt{W}^{}_{\rm I},$ $\mathtt{W}^{}_{\rm E},$ and R.

For a "small" insider workforce $(0 < m < \underline{m})$, the insider, entrant and reservation wages are given by the intersection of the line $W_{I}^{\star} = a \cdot W_{E}^{\star} = (a/b) \cdot R$ and the reservation wage locus (3). (See point E, in Figure 1a.)

For a "large" insider workforce, $(\underline{m} < m < \overline{m})$, the insider wage is given by the insider profitability locus (in Figure 1b), whereas the reservation wage is given by the reservation wage locus (3) (along the segment E_1E_2 in Figure 1a).

For an "unsustainably large" insider workforce $(m > \overline{m})$, $W_I = R$, given by the intersection between the reservation wage locus (3) and the 45° in Figure 1a.

The level of W_E is of interest only when the insider labor force is "small", for only then are entrants hired. At any point on the segment E_0E_1 (in Figure 1b) - but not including point E_1 itself entrants have an incentive to exploit whatever market power they may have to keep W_E above R. (If they would not do so, their wage would be lower and more entrants would be hired; but the latter effect is of

no concern to those entrants who would be hired in any case.) However, at point E_1 , no entrants would be hired, although the marginal potential entrant could gain enployment by accepting a reduction in his wage. His best move is to let his wage be $W_E^{\star} - e$, where e is a positive infinitesimally small number. Once he has gained employment at that wage, he has no incentive to cooperate with further entrants. (For if he does so they will enter the firm and drive down the wage.) Thus, the equilibrium at $L_I = \underline{m}$ lies within an e- neighborhood of point E_1 .

The function $E_0E_1E_2$ may be understood as a labor demand curve, whereas the function RR can be seen as a labor supply curve. (Figure 1b omits the obvious fact that this labor supply curve must turn vertical when L_I is equal to the entire stock of workers available to the firm.) The points on E_0E_1 represent short-run wage-employment equilibria; the long-run equilibria are given by the continuum of points along E_1E_2 . Only at point E_2 is there full employment.

The macroeconomic implications of this analysis are strightforward. Recall that our economy contains a fixed number (n) of identical firms. Suppose that the total number of workers in the economy is s, where $s > n \cdot \overline{m}$. Then, if the current aggregate level of employment is less then $n \cdot \overline{m}$, there is persistent unemployment.

In what sense is this unemployment involuntary? To what is the involuntariness due? The answers to these questions clearly depend on how we define "involuntary unemployment".

Suppose we define the term as "a state in which there exist workers who prefer any form of employment (viz, as entrants or insiders) at the prevailing wages to unemployment, but who are unable

to find work". The above unemployment is involuntary in this sense. It stems from one source: the differential between the entrant wage and the reservation wage. If firms could capture the entire economic rent from the employment of entrants (so as to bring the entrant and reservation wages into equality), then workers would be left indifferent between entrant employment and unemployment.

Another way of looking at this issue is in terms of "entry fees" which firms charge their workers for the privilege of gaining employment. In our analysis, the entry fee is $(W_I - W_E)$. Let a "full entry fee" be one which leaves entrants with no rent: $(W_I - R)$. If firms charge full entry fees, there can be no involuntary unemployment (as defined above).

In the standard literature on the theory of labor markets, full entry fees need not necessarily be positive. Let V be the wage which would make a worker indifferent between employment and unemployment over one time period.⁷ Clearly, if all wages which workers receive would be equal to V, then the full entry fee would be zero. In particular, if $W_I = V$, then there is no charge that entrants would be willing to pay for the privilege of becoming an insider; consequently, a full entry fee implies that $W_F = V$.

The significance of insider-outsider analysis for involuntary unemployment (as defined above) is that it provides a rationale for an insider wage in excess of V. By implication, the full entry fee must be positive. If this full entry is not charged for some reason e.g. entrant market power, entrant borrowing constraints, efficiency-wage setting by firms - then involuntary unemployment emerges. In short, our insider-outsider analysis makes positive (conceivably very large) entry fees a necessary condition for avoiding

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involuntary unemployment.

Now suppose we define "involuntary unemployment" as "a state in which there exist workers who would prefer the jobs of current employees - given the wages and employment conditions which these employees face - to being unemployed, but who are unable to find such jobs". In other words, the unemployed would be willing to do the work of some current employees at the prevailing employment conditions for less than their wages, but they cannot do so.

By this definition, our analysis generates involuntary unemployment even in the presence of full entry fees. Suppose that $W_E = R$ and aggregate employment is less than n[•]m. Then there exist unemployed workers who would be just as productive as the insiders if given the same degree of cooperation, who would prefer to be insiders, but who are unable to gain insider positions at wages less than W_T .

The source of this form of involuntary unemployment is not the absence of full entry fees, but rather the ability of insiders to cooperate with each other and not with entrants. Thereby the insiders generate rent which enables them to raise W_I above W_E , without inducing firms to replace them with entrants.

In sum, when the historically given insider workforce is too small to absorb all the outsiders, it remains too small. In other words, the economy can get stuck in a state of persistent involuntary unemployment (defined in either of the two ways above), illustrated by the points E_1E_2 in Figure 1b. The insiders do not reduce their wage, because that would not be in their own best interests. They keep their wage high enough to take advantage of their cooperative activity and low enough to prevent the outsiders from underbidding. Lacking

the cooperation of the insiders, the outsiders remain unprofitable at any wage in excess of their reservation wage.

Quite naturally, the lower the level of cooperation among insiders (i.e. the lower "a"), the lower the insider wage, the greater the long-run labor demand and the lower the level of involuntary unemployment.

<u>Proposition 3</u>: For the economy above, whenever insiders are able to withdraw cooperation from their fellow workers (so that a > 1) and whenever the historically given workforce falls short of its market clearing level (so that m < m),

then there is a continuum of equilibria characterised by involuntary unemployment.

There is an upper bound on the insider wage (given by $W = a^R$) and a lower bound on the long-run level of employment (given by n^m).

This result concerning persistent involuntary unemployment continues to hold even when insiders do not capture all the rent generated through their cooperation activity. As long as they have power of some of this rent, they can raise the insider wage above the reservation wage. Clearly, the greater their market power, the greater this wage differential and the greater the level of involuntary unemployment.

4. Business Variations, Wage Dynamics and Layoffs

In the context of our model of insider cooperation, we now examine the effect of variations in business conditions - product demand, technology and fixed-factor availability - on wages and employment. We capture these variations through changes in the shift parameter, ε . Not surprisingly, the effect of the variations depends on whether or not they have been anticipated in the wage and employment decisions.

In practice, they tend to be anticipated in the behavior of agents when they occur as part of a secular trend or when the decisions can be revised promptly. Obversely, the more randomness in the changes and the more long-term the wage and employment contracts, the less likely are the variations to be taken into account.

Accordingly, we investigate three behaviourally distinct scenarios, depending on whether variations are

- (i) anticipated in both the wage and employment decisions,
- (ii) anticipated in the employment decision but not the wage decision
- (iii) unanticipated in the employment decisions (regardless of whether they are anticipated in the wage decision).

Our analysis need not be interpreted solely as "macroeconomic". The "economy" under consideration need not span national boundaries; it could equally well be seen as a set of firms which can draw on a fixed supply of labour, i.e. an "industry". All that is necessary is that the size of the available labour force is well-defined, so that the concept of unemployment applies. This means that labour must be immobile between the set of firms above and other firms (in the "rest of the world").

The basic reason why macroeconomies and industries are interchangeable in our analysis is that we do not consider feedback effects running from employment to product demand and back to employment. Since our shift parameter ε stands, in part, for product demand, it is not appropriate to explain such feedbacks within the model. It would of course be possible to broaden the model by including these feedbacks. Insofar as these feedbacks operate in the Keynesian fashion (e.g. consumption depending on labor income), there would be multiplier effects, but the qualitative conclusions of our analysis would remain unchanged.

We consider each of these scenarios in turn.

Scenario (i): Business Variations anticipated in the Wage and Employment Decisions

Here the value of ε is known to the firms and workers before the wage and employment decisions are made. As it turns out, the wage employment effects of a rise and a fall in ε are not symmetric. We will consider first a fall, then a rise in ε .

For the moment, assume that <u>all firing is governed by a seniority</u> <u>system</u>. Thus, when ε falls by a particular amount, each insider knows with certainty whether or not he will be fired.

In Figure 2, a fall in ε is illustrated by a downward shift of the insider profitability locus.⁸ Suppose that the economy was initially in long-run equilibrium, depicted by a point on the segment $E_1'E_2'$. After the decline in business activity, the long-run equilibria lie on E_1E_2 . The firms no longer have an incentive to employ the original insider workforce at the original insider wage.





2: Wage-Employment Decisions in Scenario (i) under Seniority. If the seniority system is "rigid", i.e. cannot be broken through lower wage bids, it is easy to see what will happen. The designated number of insiders will be laid off and all the remaining insiders remain employed at the original insider wage. So an economy which, say, starts at Point e_1 finishes at Point e_2 .

Now suppose that the seniority system is "flexible": it specifies an order in which insiders with equal wages are fired, but it is not upheld in the presence of underbidding (viz. the insiders with the highest wage are fired first, then the insiders with the next-highest wage, and so on). Then, provided that the original insider wage (call it W_0) exceeds R, the laid off workers will attempt to regain their jobs by offering to work at a lower wage (call it W_1) where $R < W_1 < W_0$). (Since $W_1 > R$, the laid off workers prefer the lower wage to the prospect of unemployment.)

How will the remaining insiders respond? They have two options: (1) they may match the lower bids or

(2) they can maintain their original wage and withdraw cooperation from the underbidders.

If they pursue option (1), the insider wage will fall until either the, reservation wage level is attained (in Figure 2, a downward movement from a point on $E_1'E_2'$ to the $W_I^* = R$ line) or the firms find it profitable to employ the entire original workforce (in Figure 2, a downward movement from a point $E_1'E_2'$ to a point of E_1E_2). If they pursue option (2), then the laid off workers acquire the same productivity as the entrants (since both must work without the cooperation of the remaining insiders).⁹ Thus, the firms have no incentive to employ the laid off workers for any wage in excess of R.

Assuming (in accordance with Proposition 2) that each insider's

cooperative activities affect his utility primarily via his wage, the second option leaves each of the remaining insiders unambiguously better off. Thus, the second option will be chosen. As result - once again - there are layoffs in the absence of wage reductions.

(It may be objected that, in practice, that workers do find cooperation with their long-time colleagues socially desirable and thus the survivors of a shakeout may well be hesitant to withdraw this cooperation from the candidates for dismissal. But this hesitancy may well depend on whether underbidding takes place. If the latter workers do not underbid the prevailing insider wage, they will be fired in any case (for even in the presence of cooperation they are no longer profitable). On the other hand, if they do underbid, the remaining insiders may become resentful about the prospect of losing wage income and it is this which may cause them to withdrawal of cooperation. Clearly, the formal condition for the withdrawal of cooperation is that the utility loss from the prospective wage fall exceed the utility loss from withdrawing cooperation).

Now let business conditions improve: ε rises and the insider profitability locus (of Figure 2) shifts upward. Let there be a "large" insider workforce initially such that $L_E = 0$ and $W_I < a \cdot W_E$. Then, were the insiders to retain their original wage, they would not be exploiting all their available economic rent: $\varepsilon \cdot a \cdot f'(m) > W_I$. Hence, the insiders find it worthwhile to raise their wage. This process continues until either their marginal profitability is reduced to zero (viz, the new insider profitability locus is reached: $\varepsilon \cdot a \cdot f'(m) = W_I$) or entrants' marginal profitability becomes equal to that of the insiders (viz, the new relative profitability locus is reached: $W_I = a \cdot W_E$.

The former case is exemplified by a movement from Point e_2 to e_3 (in Figure 2). Here employment remains constant in the face of a wage rise. In the latter case, the insider wage does not rise above a^*W_E . Entrants are hired until their marginal profitability is reduced to zero. This is illustrated by the long-run movement from Point e_4 to E_1 '. Here both employment and the wage level increase.

Suppose that there is a "small" insider workforce initially, so that $W_I = a^*W_E$. Here the insiders cannot raise their wage, for that would induce the firm to replace them with entrants. But the improvement in business conditions does make entrants profitable. Thus employment increases in the long run while the wage level remains constant, as shown by the movement from Point E₁ to E₁'.

From this, we can see that fluctuations in business conditions (viz, a succession of upward and downward movements in ε) give rise to the following movements in employment and wages:

<u>Proposition 4</u>: For the economy above under Scenario (i) (i.e. business fluctuations anticipated in employment and wage decisions), if there is a seniority system governing the order of dismissals in each firm, there is a "bounded wage-employment ratchet" of the following form:

- For $W_I < a^*W_E$, each business downswing is charaterised by layoffs at constant wages and each upswing by rising wages at constant employment.
- For $W_I = a^*W_E$, business fluctuations are characterised by employment swings at constant wages.

This intertemporal development is pictured by the arrows of Figure 2. Thus far, we have assumed a seniority system where, for any given decline in ε , all workers know who will be dismissed and who will remain employed. In that event, the remaining employees can identify the workers with whom they must stop cooperating in order to maintain their wages. Furthermore, since they are sure of retaining

their jobs, it is clearly unnecessary to protect these jobs by accepting lower wages. This is no longer true in the <u>absence of a</u> <u>seniority system</u>. Let us consider the extreme case where all workers face an equal probability of retention. (Clearly, there are also intermediate cases, in which different insiders face different retention possibilities, but the qualitative conclusions are analogous to those for equal probabilities.)

Once again, we assume that the economy is initially in a long-run equilibrium (characterised by the values ε_0 , m_0 and W_0), whereupon ε falls to ε_1 ($\varepsilon_1 < \varepsilon_0$). It is evident that, at the new equilibrium (in the long-run and short-run), no entrants are hired.¹⁰ Thus, employment is confined only to insiders and, from among the insiders, only to that number who are marginally profitable: ε_1 a f'(m) = W (by Condition (1')). Rewriting this equation, the new stock of insiders is $m_1 = g[W/(\varepsilon_1 \cdot a)]$, where $g = (f')^{-1}$. Thus, each insider's retention probability is $\rho = [(m_0 - m_1)/m_0]$ for $m < m_0$, and $\rho = 1$ for $m > m_0$.

Imagine, for the moment, what would happen if the insider wage remained at its original level in the face of a finite drop in ε . Then the retention probability would fall below unity by a finite amount, since the new insider workforce would be

 $m_1 = g[W_o/(\varepsilon_1 \cdot a)] < m_o = g[W_o/(\varepsilon \cdot a)].$

Recall that each insider takes the wages of his colleagues as exogenously fixed. Now, if the i'th insider were to reduce his wage to $W^1 = W_0 - e$ (where e is a positive and infinitesimally small number), then his retention probability would rise to unity. Since the rise in ρ is finite whereas the fall in W^1 is infinitesimal, his expected income would rise. Thus, $W = W_0$ cannot characterise the new Nash equilibrium.

33

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In fact, as we can see, insiders have an incentive to underbid until either

- (a) their retention probability rises to an e-neighbourhood beneath unity (at which point, an infinitesimal drop in W^{i} is matched by an infinitesimal rise in ρ) or
- (b) the insider wage falls to the level of the reservation wage.

In the former case, the new Nash equilibrium can be approximated by that insider wage (call it W) at which the insider workforce remains at its original level (m_0) : $\hat{W} = \epsilon_1 \cdot a \cdot f'(m_0)$ (where $\hat{W} < W_0$ since $\epsilon_1 < \epsilon_0$). This is illustrated by the arrow from Point e_1 to e_2 in Figure 3. In the latter case, the reservation wage provides a floor to the decline in the insider wage, as illustrated by the arrow from Point e_3 to e_4 .

On the other hand, when there is a business upswing - i.e. ε rises - insider wages react in the same way as under a seniority system¹¹: at the initial m_o and W_o, the insiders marginal revenue product rises relative to their marginal cost and - provided that entrants are less profitable, on the margin, than insiders - the insider wage will rise. This rise will continue until W_I = a[•] W_E (i.e. the relative profitability locus is reached) or until the insiders' marginal revenue and marginal cost are brought into equality (i.e. the insider profitability locus is reached).

Hence, variations in ε now generate the following wage employment dynamics:

<u>Proposition 5</u>: For the economy above under Scenario (i), if there is no seniority system, there is "bounded wage flexibility", in the following sense:

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For $W < a^R$, business fluctuations are characterised by insider





34 a

wage swings at constant employment.

If W reaches the level of a'R in the course of an upswing, the insider wage remains at that level while employment expands.
 The former possibility is illustrated by the movement between Points e1 and e2 (or Points e3 and e4) in Figure 3; the latter is illustrated by the movement from e to e1.

These conclusions suggest that the presence or absence of a seniority system may have an important bearing on the movements of wages and employment over the business cycle.

Scenario (ii): Business Variations Anticipated in the Employment, but not the Wage, Decision

Here the value of ε is anticipated by the firms in their employment decisions, but not by the employees in their wage demands. We assume that the employees know the distribution of ε - which is assumed to have a constant mean and variance - but not its realised value. To start, let there be a "rigid" seniority system (where the order in which members of a firm's workforce are dismissed is not affected by the relative magnitudes of their wages).

The situation which insiders now face is radically different from Scenario (i). There, they set their wages knowing that, whereas some of their previous colleagues would be dismissed, their own jobs were safe (and even underbidding by the dismissal candidates would not present a danger if cooperation from the underbidders was withdrawn). Now, none of the insiders know the magnitude of ε before the wage is set, and thus none of their jobs is entirely secure.

In this light, consider how the i'th insider of a firm sets his wage (W_i) . Given his rank in the seniority scale, he knows that he will be dismissed whenever the firm's employment of insiders (m) falls

below a critical value m_i , where $0 \le m_i \le m_o$ or the insider wage exceeds a^*W_F .

Clearly, the more "senior" the worker is, the lower his $m_{i^* + i^*}$ Furthermore, he knows that the firm's employment of insiders is given ... by its insider profitability locus: $\varepsilon^*a^*f'(m) = W_*^{12}$ Thus, the **i**'th insider's retention probability is

$$\rho_{i} = \Pr \left\{ \varepsilon > \frac{W_{i}}{a \cdot f'(m_{i})} = \Gamma_{i} \right\}$$

The density of ε , G(ε), is illustrated in Figure 4, and ρ^{1} is given by the shaded area:

(4)
$$\rho_i = \int_{\Gamma_i}^{\overline{\epsilon}} G(\epsilon) d\epsilon$$
,

where, $\overline{\epsilon}$ is exogenous, and m_i is exogenously given by the seniority rule. We assume that $G(\epsilon) > 0$ for $\underline{\epsilon} < \epsilon < \overline{\epsilon}$ (where $\underline{\epsilon}$ and $\overline{\epsilon}$ are the lower and upper bounds on ϵ , respectively) and therefore $(d\rho_i/d\Gamma) = \rho'_i < 0$.

For simplicity, let each insider be risk neutral. His aim is to set his wage so as to maximise his expected income:

$$Y_{i} = \rho_{i}W + (1 - \rho_{i}) \cdot B,$$

where B is the unemployment benefit he receives in the event of being dismissed. The first-order condition is

(6)
$$\frac{\partial Y_i}{\partial W_i} = \rho_i + \frac{\rho_i}{a \cdot \rho'} \cdot (W_i - R) = 0.$$

If the second-order condition is satisfied, the internal optimum is







FIGURE 5: Wage-Employment Decisions in Scenario (ii) under "Rigid" Seniority.

36a



FIGURE 6: Wage-Employment Decisions in Scenario (ii) in the Absence of "Rigid" Seniority.

 W_i^{\star} , given the insider's position of the seniority scale (i.e. given his m_i). Insiders with different seniority will demand different wages. In particular, we let w_i^{\star} rise as seniority increases (i.e. as m_i falls).¹³

The wage-employment decisions regarding the i'th insider are pictured in Figure 5. The insider profitability constraint is given by $\varepsilon^{a}(m) > W$ and the relative profitiability constraint is given by $W_{I} < a^{*}W_{E}$. If the i'th insider's W_{i}^{*} and m_{i}^{*} satisfy this constraint, he is retained, otherwise he is fired.

Fluctuations in business conditions are mirrored in shifts of the insider profitability constraint (e.g. a rise in ε is associated with a rightward shift of the constraint). Throughout these fluctuations, the wage scale for insiders (viz, the wage of every insider) remains constant while employment adjusts.¹⁴

The same qualitative conclusions hold when there is a "flexible" seniority system or none at all. In these cases, each of the current insiders faces an equal chance of retention ex ante (i.e. before the realized value of ε is known and the associated employment decision occurs). For any historically given insider workforce, the insiders choose their wage as follows:

$$W_{I}^{\star} = \min(W_{I}, a^{\star}W_{E})$$

where W_{T} is given by

$$\frac{\partial Y}{\partial W} = \rho + \frac{\rho'}{a \cdot f'} \cdot (W_I - B) = 0 \text{ and}$$

$$\rho = P_r \{ \varepsilon > \frac{\tilde{W}_I}{a \cdot f(m)} = \Gamma \} = \int_{\Gamma}^{\varepsilon} G(\varepsilon) d\varepsilon.$$

This insider reaction function is pictured in Figure 6, along with an insider profitability constraint. Shifts in this constraint induce

variations in employment at a constant insider wage, 15

These results may be summarised as follows:

<u>Proposition 6:</u> For the economy above under Scenario (ii) (i.e. business fluctuations anticipated in the employment decisions but not the wage decisions), business flucutations are characterised by employment swings while the wages distribution remain unchanged.

Scenario (iii): Business Variations Unanticipated in the Employment Decisions

Here the value of ε is not anticipated by the firms in their employment decisions. Assume that the firms are risk neutral. Then their employment of insiders in the short run is given by the condition

$$\begin{split} \mu(\varepsilon)^*a^*f'(L_I) &= W & \text{for } L_I \leq m \\ \mu(\varepsilon)^*a^*f'(L_I) > W & \text{for } L_I > m, \end{split}$$

where $\mu(\varepsilon)$ is the mean of ε .

Given a current insider workforce of m, the insider wage will be set so that

 $\mu(\varepsilon)^*a^*f'(m) = W,$

as long as $W \leq a^R$. At this wage, all the current insiders remain employed.

Since the employment decision does not depend on the realised value of ε , the wage decision does not either. Thus, regardless of whether workers are able to anticipate the business fluctuations, the employment of insiders and their wage is invariant with respect to these fluctuations.

Proposition 7: For the economy above under Scenario (iii) (i.e. business fluctuations are not anticipated in the employment decisions), then business fluctuations leave wages and employment of insiders unchanged. The wage-employment responses to business fluctuations under out three scenarios are summarised in Table 1.

Employment Decisions Wage Decisions	Anticipated	Unanticipated
Anticipated	For seniority system, bounded wage - employment ratchet. For no seniority system, bounded wage flexibility	Constant wages and employment
Unanticipated	Constant wages and flexible employment.	Constant wages and employment

Table 1: Business Fluctuations and Wage-Employment Decisions

5. A Model of Harassment, Unemployment and Layoffs

Our treatment of harassment is logically distinct from - but not exclusive of - our analysis of cooperation. As noted, we distinguish between the two by applying the former to the disutility of work and the latter to productivity. Nevertheless, the implications for unemployment and layoffs are so similar that harassment can now be dealt with quite briskly.

We conceive of harassment as an activity which workers can perform alongside and independently of their consumption and labour activities. Harassment affects workers in two separate ways: on the one hand, there is the disutility of performing the activity (which is akin to the disutility of providing labour); on the other, there is the disutility of work as result of being subjected to it.

Let h_{I}^{i} and h_{E}^{i} be the levels of harassing activity performed by the i'th insiders, directed at other insiders and entrants, respectively. We assume that the i'th insider directs an equal amount of harassment at all insiders in the firm and an equal amount at all entrants. Let H_{I}^{i} and H_{E}^{j} be the harassment levels to which the i'th insider and j'th entrant (respectively) are subjected. In particular, we measure harassment performed (h_{I}^{i}, h_{E}^{i}) in terms of harassment endured (H_{I}^{i}, H_{E}^{j}) :

<u>Definition</u>: h_{I}^{i} : The harassment level endured by each insider except the i'th (H_{I}^{k} , for all insiders k \neq i) relative to what it would be in the absence of the i'th insider's harassment performed. (Thus, $H_{I}^{i} = \sum_{k \neq i} h_{I}^{k}$.)

<u>Definition</u>: h_E^j : The harassment level endured by each entrant (H_E^j) , for all entrants j) relative to what it would be in the absence of the

i'th insider's harassment performed. (Thus, $H_E^j = \sum_{\neq i} h_E^i$.)

As in our model of cooperation, we consider a Nash equilibrium in which each insider sets the maximal insider wage compatible with his remaining employed, taking the decision variables of all other insiders and entrants as given.

The i'th insider has three decision variables: h_{I}^{i} , h_{E}^{i} , and W_{I}^{i} . We divide his decision-making problem into two parts:

- maximizing W_I^i , given h_I^i and h_E^i , and - finding the optimal h_I^i and h_E^i .

First consider the wage-setting decision. Each firm's production function is now simply $Q = \epsilon \cdot f(L_I + L_E)$. Given that some insiders are employed (0 < L_I < m), the first-order conditions for profit maximization are:

- (7) $\frac{\partial \pi}{\partial L_{I}} = \varepsilon \cdot f' W_{I} > 0, \qquad \frac{\partial \pi}{\partial L_{I}} \cdot (m L_{I}) = 0;$
- (8) $\frac{\partial \pi}{\partial L_E} = \varepsilon \cdot f' W_E < 0, \qquad \frac{\partial \pi}{\partial L_E} \cdot L_E = 0.$

In this context, the analogue of Proposition 1 holds:

<u>Proposition 7</u>: Given $W_{I}^{i} > R$ and given any fixed levels of insider-entrant harassment (h_{E}^{i}) and insider-insider harassment (h_{I}^{i}) , The Nash equilibrium insider wages (W_{I}^{i}) , for all insiders i = 1, ...,m) satisfy

(7a)
$$W_{I}^{1} = W_{I}^{*} = \varepsilon \cdot f'(m + L_{E})$$

By implication,

(9) $W_{I}^{\star} = W_{E}$ for $L_{E} > 0$, $W_{I}^{\star} < W_{E}$ for $L_{E} = 0$.

Clearly, the i'th insider does not stand to gain by harassing other insiders (since the act of harassing is disagreeable to him and there are no counterveiling gains¹⁶). Hence, $h_{I}^{i} = 0$. If all insiders act accordingly, then $H_{I}^{i} = 0$.

Since each insider has the same utility function and is in the same bargaining position vis-a-vis the firm and since (as shown below) the Nash equilibrium is unique in h_E^i (for all i), $h_E^i = h_E$ (for all i).

Recalling that all income is consumed and that workers have a two-period time horizon, the insider reservation wage (R_I , which is the same for all insiders) may be defined as follows:

(11a)
$$(R_{T} + \delta W_{T})(1 - \tau) - (1 + \delta) - (1 + \delta)h_{E} = B(1 + \delta)(1 - \tau)$$

Analogously, the entrant reservation wage $(R_E^{}$, which is the same for all entrants) may be expressed in this way:

(11b)
$$(R_E + \delta W_I) \cdot (1 - \tau) - (1 + \delta) - [H_E + \delta h_E] = B \cdot (1 + \delta) \cdot (1 - \tau)$$

For simplicity, we assume that entrants are not capable of harassing other workers. Thus they have no rent to exploit in our model; consequently, $W_E = R_E$. Moreover, we assume that h_E has a finite, positive upper bound, \overline{h}_E .

As the firm's insider workforce rises, the marginal profitability of entrants falls (ceteris paribus). To determine wages and harassing activity in our model, there are three cases to be considered (as in our model of cooperation);

(I) <u>A "small" insider workforce</u>: The insider workforce is sufficiently small ($0 < m < \underline{m}$) so that some entrants are marginally profitable: $\varepsilon \cdot f'(\underline{m}) > W_E$. Hence, $L_E > 0$. Consequently, insiders raise their wage until they are just as profitable as the entrants. By (9), this implies that $W_I^{\star} = W_E$. This equality is illustrated by the "relative profitability locus" in Figure 7a.

Since entrants capture no economic rent, $W_E = R_E$. Thus, $W_I^* = R_E$. Furthermore, by (11b), the entrant reservation wage (R_E) varies inversely with the insider wage (W_I) , for any given level of harassment. This is illustrated by the "entrant reservation wage locus" in Figure 7b.

Each insider takes the harassing activity of all other insiders as given. Thus, we may write

(12)
$$H_E = \overline{H}_E + h_E$$
,

where \overline{H}_E is the harassment which an entrant endures from all insiders except the i'th. The intersection of the relative profitability locus and the entrant reservation wage locus yields the insider's wage (W_I) as a function of his harassing activity (h_F)

(13) $(W_{I} - B)^{*}(1 + \delta)^{*}(1 - \tau) - (1 + \delta) - [\overline{H}_{E} + h_{E}^{*}(1 + \delta)] = 0$, as shown in Figure 7a.

Finally, by the utility function (10), we find that $(\partial u^{1}/\partial h_{E}) > 0$ and thus $h_{E} = \overline{h}_{E}$. Given this level of harassing activity, we obtain the equilibrium wage level of insiders and entrants: $W_{T}^{\star} = WE = RE^{\star}$

• <u>•</u> ... ••





44a

In Figure 7b, every point on segment E_0E_1 represents a short-run equilibrium. The long-run equilibrium (at which there is no tendency for the insider workforce to change) is at point E_1 .

(II) <u>A "large" insider workforce</u>: The insider workforce is sufficiently large ($\underline{m} < m < \overline{m}$) so that entrants are not marginally profitable at $W_E = R_E$: $\varepsilon \cdot f'(m) < W_E$. Thus, $L_E = 0$. Consequently insiders raise their wage until their marginal profitability is zero: $\varepsilon \cdot f'(m) = W^*$. This equation is represented by the "insider profitability locus" in Figure 7b. Every point on the segment E_1E_2 is a long-run equilibrium.

(III) <u>An "unsustainably large" insider workforce</u>: The insider workforce is so large ($m > \overline{m}$) that insiders are marginal unprofitable at the insiders reservation wage (R_I). By (11a) and (11b), $R_I < R_E$ (since $H_E > h_E$). Thus, no entrants are willing to work at R_I .

The firm reduces its insider workforce to \overline{m} (at which $\varepsilon^{f'}(m) = R_{T}$). The long-run equilibrium is at point E₂.

Recalling that the economy contains n identical firms, we find that if aggregate employment is less than $n \cdot \overline{m}$, there is persistent involuntary unemployment in the sense that

- the outsiders would be willing to work under the same non-harassment conditions as the insiders and
- the outsiders and insiders are equally productive, but
- the outsiders are unable to gain insider positions (for any wage in excess of $\rm R_{\rm F})$.

In sum,

Proposition 8: For the economy above, whevever insiders are able to

harass entrants ($H_E > 0$) and thereby able to impose more damage on the entrants than on themselves (so that $R_E > R_I$), and whenever the historically given workforce falls short of its market-clearing level (so that m < m), there is a continuum of equilibria characterised by involuntary unemployment. There is an upper bound on the insider wage (given by $W = R_E$) and a lower bound on the level of employment (given by n^*m).

In this context, the reactions of wages and employment to business fluctuations (viz, variations in ε) are qualitatively the same as those in our analysis of cooperation.

6. Concluding Remarks

This paper has examined how workers' cooperation and harassment activities may give rise to involuntary unemployment. We have also explored the implications of these activities for wage and employment decisions over the business cycle.

Insiders, entrants and outsiders were all assumed to have the same job characteristics, in the sense that they would be equally productive and have the same reservation wages under identical colleagueship conditions (i.e. identical states of cooperation and harassment). However, insiders (and possibly also entrants) behave in such a way as to ensure that these conditions will not be identical. Through cooperation and harassment activity, insiders can make themselves more productive and their work less disagreeable than entrants and outsiders. (Entrants may have a limited ability to do this as well vis-a-vis outsiders.) Consequently, the workers who are unemployed or laid off do not underbid their employed counterparts, because they are unable or unwilling to do so.

In the standard literature on clearing labor markets, underbidding by unemployed or laid off workers induces firms to

- replace their insiders by entrants or

- add entrants to their workforce,

thereby bringing labor demand into equality with labor supply. By means of cooperation and harassment activities, insiders are able to deactivate both of these mechanisms.

FOOTNOTES

1. They are just as "qualified" in the sense of being equally productive under identical conditions of inter-workers cooperation.

2. Suppose that the firm sought to maximise its discounted stream of profit over two time periods. Recalling that entrants turn into insiders after one period, the firm's problem may be expressed as

Maximize
$$\sum_{i=1}^{2} \delta^{i} \cdot [\varepsilon_{i} \cdot \phi_{i} \cdot f(L_{I,i} + L_{E,i}) - W_{i} \cdot L_{I,i} - R \cdot L_{E,i}]$$

subject to $L_{I,2} \leq L_{I,1} + L_{E,1}$, where δ is the discount factor and the subscripts i = 1,2 denote the time periods. If the constraint is not binding, this problem has the same solution as the one period problem of the text. If it is binding, then all insiders (m) are retained and no entrants are hired in either period only if

$$(\varepsilon_1 + \delta \cdot \varepsilon_2) \cdot a \cdot f'(m) \ge W_1 + \delta \cdot W_2$$

 $(\varepsilon_1 + \delta \cdot \varepsilon_2) f'(m) \le R_1 + \delta \cdot W_2$
 $\varepsilon_2 f'(m) \le R_2$

Substituting the discounted stream of insider wages $(W_1 + \delta W_2)$ for the one-period insider wage in the text, our analysis can procedd unchanged.

3. For simplicity, we assume at "a" is a constant. Our analysis does, however, allow "a" to be an increasing function of L_I, (i.e. the more insiders there are, the greater the potential for cooperative production activity) provided that the marginal product of insiders diminishes as more insiders are hired.

 $\frac{\partial(a^{f'})}{\partial L_{I}} = a^{f''} + a^{f'} < 0.$

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This ensures that the demand curve for insider labour is downward-sloping (i.e. $(\partial L_T / \partial W) < 0$).

4. Collusion among the insiders of the firm would not affect the qualitative conclusions or our analysis.

5. If we were to assume that the insider captures only a positive fraction of the available rent, then W_{I}^{\star} would be a positive fraction of $\varepsilon \cdot \phi_{I} \cdot f'(\phi_{I} \cdot m + \phi_{E} \cdot L_{E})$ and the proof would proceed along similar lines.

6. $(\partial L_E / \partial \phi_E) > 0$ whenever $L_E > 0$ (so that the first part of Condition (2) holds as an equality. Whenever $L_E = 0$ the question of whether to cooperate with entrants does not arise.

7. By Equation (3),
$$\overline{V} = B + \{1/[(1 + \delta) \cdot (1 - \tau)]\}$$
.

8. We assume that the fall in ε is sufficiently small so that some insiders remain profitable at the original insider wage. (As above, we make the simplifying assumption that the value of "a" is not affected by a fall in L_T ; but see footnote 3).

9. There is, of course, a crucial difference between entrants and laid off workers: whereas the former are unable (by assumption) to have a significant influence on the productivity of insiders, the latter are able to do so. Entrants have limited cooperative skills, but laid off workers have access to the full range of cooperative activities. If option (2) is pursued, the firm must choose between (a) employing only the remaining insiders at W₁ and (b) employing only the lay-off candidates at W₂ (where the workers within each group cooperate fully). The

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profitability of choosing the latter depends not only on the differential $(W_1 - W_2)$, but also on the relative size of the two groups of workers. For simplicity, we assume that the fall in ε sufficiently small (and consequently that the size of the latter group is sufficiently small), so that (a) is more profitable.

10. Recall that entrants are unprofitable at the original equilibrium and thus (by Condition (2')) they cannot be profitable after ε has fallen.

11. Clearly, the existence of a seniority system makes no difference to our wage determination mechanism in the face of a business upswing. By definition, our seniority system specifies the order in which different employees of a firm are to be dismissed, but there are no dismissals in the upswing.

12. Note that the insider knows that the firm knows the value of ε before the employment decision is made (in accordance with the information structure underlying Scenario (ii)). Thus, ε appears as an exogenous parameter in the insider profitability locus.

13. Let $\theta_i = (\partial Y_i / \partial W_i)$.

Then

$$\frac{\partial W_{i}}{\partial m_{i}} \Big|_{\substack{\theta_{i} = 0}} = - \frac{\partial \theta_{i} / \partial m_{i}}{\partial \theta_{i} / \partial W_{i}}$$

In order for the second-order conditions to be satisfied $(\partial \theta_i / \partial W_i) < 0$, which implies that

$$\frac{\rho_{i}}{\rho_{i}}'' \cdot (\frac{W_{i} - B}{a'f'}) > -2.$$

Furthermore,

$$\frac{\partial \theta_{\mathbf{i}}}{\partial m_{\mathbf{i}}} = - \frac{\rho_{\mathbf{i}}'f''}{a^{*}(f')^{2}} \cdot \left[2^{*}W - B - \frac{\rho_{\mathbf{i}}''}{\rho_{\mathbf{i}}'} \cdot \frac{W_{\mathbf{i}}}{a^{*}\rho'} \cdot (W_{\mathbf{i}} - B)\right],$$

From these two expressions we obtain a positive upper bound for $(\partial \theta_i / \partial m_i): [\rho_i' \cdot f''B]/]a \cdot (f')^2] > 0$. Thus we are free to make the plausible assumption that $(\partial \theta_i / \partial m_i) < 0$.

14. The rises and falls in employment do not occur with equal speed. The firms are able to fire insiders immediately, but they can gain them only by hiring entrants first.

15. The portion the insider's reaction function described by (6') is downward sloping, in accordance with the assumption of footnote 13. This portion is assumed to be flatter than the firm's employment constraint (in Figure 6) for correspondence principle reasons. (See footnote 14.) Recall that firms can fire insiders instantaneously, but can acquire new insiders only after the initiation period has elapsed. If the initiation period is longer than the time span between changes in ε , the variations in employment may not occur.

16. We have assumed that the other insiders' harassment activities are taken as fixed by insider i. If we were to relax this assumption and allow for retaliation, h_{I}^{i} would be even more harmful to insider i.

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