COOPERATION, HARASSMENT, AND INVOLUNTARY UNEMPLOYMENT:
AN INSIDER-OUTSIDER APPROACH

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February 1987

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25 February 1987
ABSTRACT

We present a theory of involuntary unemployment which explains why the unemployed workers ("outsiders") are unable or unwilling to find jobs even though they are prepared to work for less than the prevailing wages of incumbent workers ("insiders"). The outsiders do not underbid the insiders since, were they to do so, the insiders would withdraw cooperation from them and make their work unpleasant (i.e. "harass" them), thereby reducing the productivity and increasing the reservation wages of the underbidders. The resulting labor turnover costs create economic rent which the insiders tap in wage setting and, as result, involuntary unemployment may arise.
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Cooperation, Harassment and Involuntary Unemployment:  
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Introduction

In order to understand how free-market economies may suffer from protracted spells of involuntary unemployment, it is important to explain why underbidding is not a preponderant feature of labor markets. We take "underbidding" to mean an agreement between a worker and a firm that a particular job be performed at less than the prevailing wage. (Whether the low wage offer is made by the worker, the firm, or both, is immaterial in this context). If underbidding would occur whenever unemployed workers were willing to work for less than the prevailing wages (normalized for any productivity differences), then involuntary unemployment would either disappear or be accompanied by the empirically unobserved phenomenon of persistent wage deflation.

In the absence of government intervention, underbidding failures can be rationalized by showing

(a) why firms have no incentive to agree on low wage bids in the presence of involuntary unemployment, or

(b) why workers lack this incentive.

The recent theoretical literature on unemployment has pursued both of these routes. The efficiency wage theories (e.g. Akerlof (1982), Bulow and Summers (1986), Malcomson (1981), Shapiro and Stiglitz (1984), and Weiss (1980)) have focused on route (a), and much of the labour union literature which has bearing on unemployment and layoffs (e.g. McDonald and Solow (1981), Oswald (1982)) takes route (b).

This paper offers another approach to both routes. It attempts to provide a rationale for what many people regard as a well-established social norm, namely, that workers should not "steal" jobs from their fellow workers
by agreeing to work for lower wages, and that employers should not permit such "job theft."

Our analysis pursues two avenues (corresponding to the two routes above):

Route (i): Firms may refuse to replace incumbent employees with workers who wish to underbid because they realistically expect that, if they would do so, the remaining incumbents would withdraw cooperation from the underbidders in the process of production.

Route (ii): Unemployed workers may not agree to underbid because they realistically expect that, if they thereby succeeded in replacing some incumbents, their personal relations with the remaining incumbents would be unpleasant (i.e. they would be "harassed" by the incumbents).

In the standard literature on the theory of labor markets, harassment has received little attention, while the theory of teams (e.g. Alchian and Demsetz (1972), Marschak and Radner (1972)) recognizes employees' productivities to be interdependent. However, the crucial, distinctive feature of our analysis is that cooperation and harassment activities do not occur automatically; rather, they lie within the control of the employees, especially the incumbents.

In describing the causes and consequences of incumbents' cooperation and harassment activities, we adopt an "insider-outsider" approach to the labor market. The basic idea underlying this general approach is that labor turnover costs generate economic rent which incumbent workers ("insiders") exploit in the process of wage determination. In doing so, the insiders primarily take account of their own interests. The unemployed workers are disenfranchised in the process of wage negotiation and, as shown below, persistent involuntary unemployment may occur.

The insider-outsider approach has been outlined in general terms in
Lindbeck and Snower (1984a, 1985, 1986a). Shaked and Sutton (1984) provide a bargaining rationale (one of many conceivable ones) for insider market power. The approach has been extended to a two-period framework by Solow (1985) and its implications for time-dependence of unemployment (i.e. dependence of current unemployment on past unemployment) were developed by Blanchard and Summers (1986), Gottfries and Horn (1986), and Lindbeck and Snower (1986b). Gregory (1986) has given some preliminary empirical support (from Australia) for the notion that wages are influenced more by firms' internal conditions than by external conditions in the labor market.

In this paper, the insiders are assumed to create a special, potentially important, variety of labor turnover cost by withdrawing cooperation from and even harassing the entrants who attempt to underbid. As a result, the insiders are able to raise their wages above the market-clearing level without inducing underbidding.

At these wages, the unemployed workers ("outsiders") would prefer to trade places with the insiders (i.e. they would prefer to be employed for insider wages under insider conditions of work rather than to be unemployed), but they do not have this option. They are victims of discrimination, because whenever they gain employment through underbidding, they receive less cooperation and more harassment than the insiders do. In fact, the outsiders may be willing to work for sufficiently less than the insider wages so as to compensate the firms for their more limited cooperation skills, but they may nevertheless be unable to find jobs. Given that the outsiders find themselves with lower productivity and higher disutility of work than the insiders, there may exist no wage which both induces firms to hire outsiders and induces outsiders to work. This is the sense in which involuntary unemployment can arise in our analysis.

In the literature on unemployment theory, the "insider-outsider"
approach may be regarded as an alternative (though complementary rather than mutually exclusive) to the "efficiency wage" approach. Whereas the former explains unemployment through insiders' market power which is used to exploit the rent from labor turnover costs in the process of wage determination, the latter approach explains unemployment through asymmetric information and firms' market power in wage determination (see Lindbeck and Snower (1986c) for a comparison of the two approaches). Among the contributions to the efficiency wage literature, Akerlof's (1982) "gift exchange model" is closest in spirit to our approach here, in that his analysis describes how employers' wage offers may be used to promote their workers' cooperation and effort.

Section 1 deals with the microeconomic behavior of workers and firms in our model. Section 2 describes the equilibrium of a single firm and its employees. In Section 3, we incorporate this equilibrium in a macroeconomic analysis of the labor market and examine how persistent involuntary unemployment can occur in this context. Section 4 deals with potential objections to our analysis. Finally, Section 5 contains our concluding remarks.

1. The Behavior of Economic Agents

A. The Underlying Setup

Though our explanation of persistent involuntary unemployment rests on two distinct, logically independent arguments (one of which focuses on cooperation, the other on harassment), for brevity, the formal model in the next two sections deals with these arguments simultaneously.

The cooperation and harassment activities, which the insiders use to protect themselves against underbidding, may be defined as follows. "Cooperation" refers to all those activities in which workers help one another in the process of production and thereby raise their productivity.
"Harassment" stands for all those activities whereby workers make each other's jobs more disagreeable (primarily by damaging their personal relations) and thereby raise their disutility of work.

In practice, those workers who have spent a long time at their jobs are often more capable of cooperation and harassment than their newly-arrived counterparts. We capture this observation roughly by supposing that when workers first enter their firms, they are unable to cooperate with or harass other workers, but after a fixed period of time -- call it the "initiation period" -- they all gain identical access to these ability.

Within this context, we identify three homogenous groups of workers:

(i) insiders, the "experienced" employees who are able to engage in the full range of cooperation and harassment activities,

(ii) entrants, the "inexperienced" employees who have no access to these activities, and

(iii) outsiders, the unemployed workers.

In this section, we build a simple model which captures the role of insiders' cooperation and harassment activities in the formulation of wage and employment decisions within a firm. Our model is based on the following salient structural assumptions:

- Wage decisions: Each employees' wage is negotiated for one period at a time, where (for simplicity) the length of the period is assumed equal to the initiation period.\(^1\)

- Outsiders are perfect competitors for jobs. Thus, when an outsider is hired (and thereby turns into an entrant), his entrant wage is equal to his reservation wage (for the duration of the initiation period).

- Insiders have some market power. Each insider sets his wage "individualistically" (taking the strategies of all other agents as given).\(^2\)

- An insider's wage cannot be made contingent on his cooperation and
harassment activities, since the firm is unable to monitor these activities directly. (All that the firm can observe is its output and the number of insiders and entrants it employs).\(^3\)

- Employment decisions: these are made unilaterally by the firms.
- Sequence of decisions: In the first stage of the decision-making process, the insider wage and the cooperation and harassment levels are set, taking into account how these decisions affect employment. The entrant wage is determined as well. In the second stage, the firms make the employment decisions, taking the insider and entrant wages, as well as the cooperation and harassment levels, as given.

B. The Firm

Consider a firm which has two variable factors of production: insiders \((L_I)\) and entrants \((L_E)\). Let \(a_I\) represent the level of cooperation among insiders (measured as the actual number of insiders divided into the number that would be required to produce the same output in the absence of cooperation among insiders), and let \(a_E\) stand for the level of cooperation between insiders and entrants (measured as the actual number of entrants divided into the number that would be required to produce the same output in the absence of cooperation from insiders). We will call \(a_I\) and \(a_E\) the "labor endowments" of the insiders and entrants, respectively. The firm is assumed to know the levels of these endowments but it cannot observe the cooperation activities of individual workers. We write the firm's production function as

\[ Q = f(a_I L_I + a_E L_E), \quad f' > 0, \quad f'' < 0, \]

where \(Q\) is the level of output.

Let \(W\) be the insider wage and \(R_E\) be the entrant wage (which is equal to the entrants' reservation wage). (All insiders are identical and receive the same wage, and similarly for entrants). The firm can observe \(W\) and \(R_E\), but it cannot observe the harassment activities which are reflected in the
level of $R_E$.

Within the two-stage decision-making process specified in Section 1 (with wages, cooperation, and harassment decisions made in the first stage and employment decisions made in the second), the firm's problem is to maximize its profit with respect to $L_I$ and $L_E$, taking the insider and entrant wages, the overall cooperation and harassment levels as well as the production function $f$ as given. To present our analysis in the simplest possible way, we assume that the firm has a one-period time horizon.$^4$

Let $m$ be the firm's "incumbent workforce," i.e. its the stock of insiders carried forward from the past. Since we assume that cooperation and harassment skills are firm-specific and that entrants acquire them only after they go through the initiation period, it is clear that $L_I \leq m$.

Thus, the firm's profit maximization problem is

$$\text{(1) Maximize } \pi = f(a_I L_I + a_E L_E) - W L_I - R_E L_E$$

subject to $L_I \leq m$; $L_I, L_E \geq 0$.

Let $\lambda = a_I L_I + a_E L_E$ be the firm's effective workforce (i.e. its workforce in efficiency units of labor). Then the first-order conditions may be expressed as follows:

$$(2a) \quad \frac{\partial \pi}{\partial L_I} = a_I f'(\lambda) - W \geq 0, \quad \frac{\partial \pi}{\partial L_I} (m - L_I) = 0;$$

$$(2b) \quad \frac{\partial \pi}{\partial L_E} = a_E f'(\lambda) - R_E \leq 0, \quad \frac{\partial \pi}{\partial L_E} L_E = 0$$

where we ignore$^5$ the non-negativity constraint on $L_I$ and we assume that the firm is able to hire all the entrants it demands at the wage $R_E$. 

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C. The Workers

Insider \( i \) has the following decision variables:

- The level of his harassing activity directed at entrants: 
  \( h^i_E \) (implicitly assuming that the insider harasses all entrants in equal measure). Besides, he does not harass other insiders.\(^6\)

- The levels of his cooperative activities directed at other insiders and entrants: \( a^i_I \) and \( a^i_E \) respectively, defined analogously to \( a^i_I \) and \( a^i_E \) above. (We assume implicitly that he cooperates with all the other insiders in equal measure, and similarly for all the entrants).

- The insider \( i \)'s wage: \( W^i \).

The insider makes these decisions "individualistically," i.e. he takes the optimal cooperation, harassment, wage-setting and employment strategies of all other agents as given. Let us examine the role of each of these decision variables in the context of the insider's decision-making problem.

Since we are primarily concerned with the effect of insiders' cooperation and harassment activities on their wages and employment, it is natural to make the simplifying assumption that the insider \( i \)'s cooperation and harassment activities do not affect his own utility directly, but only indirectly via the wage he is able to achieve.\(^7\) In other words, the insider is assumed to regard the activities \( h^i_E, a^i_I \) and \( a^i_E \) as neither desirable nor undesirable per se and therefore (as shown below) he uses them only to support his wage claims.

We specify insider \( i \)'s utility function quite simply as

\[ \Omega^i = C^i - \lambda^i, \]

where \( C^i \) is his consumption and \( \lambda^i \) is his labor (in units of time). Labor is taken to be a discrete activity, with \( \lambda = 1 \) for an employed worker and \( \lambda = 0 \) for an unemployed one. We assume that each worker consumes his entire income in each period. For insider \( i \), this means that \( C^i = W^i \).
The insider's reservation wage, $R_i^i$, is defined as that wage which makes him indifferent between employment (yielding utility $W_i - 1$) and unemployment (yielding utility 0):

\( (3a) \quad R_i^i = R_i = 1 \quad \text{for all } i. \)

Let entrant j's utility be $\Omega^j = c_j - y_j - H_E$, where $H_E$ stands for his disutility from being harassed by the insiders. Naturally, we assume that

\( (3b) \quad \left( \frac{\partial H_E}{\partial h_i} \right) > 0 \quad \text{for any insider } i. \)

Thus the entrant's reservation wage is

\( (3c) \quad r_j^E = R_E = 1 + H_E \quad \text{for all } j. \)

We assume that each insider's harassing activity ($h_e^i$) is bounded from above and below, so that each entrant's disutility from being harassed ($H^j_E$) is also bounded:

\( (3d) \quad 0 \leq H^j_E \leq H, \)

where $H$ is a nonnegative constant (described in Footnote 17, below).

We now turn to the insider i's cooperation activities and specify how they affect the productivities of the other insiders and the entrants. We wish to ensure, quite plausibly, that an insider is able to raise the marginal products of workers by cooperating with them. For this purpose, we make the following two assumptions:

\( (4a) \quad \frac{\partial a_i}{\partial h_i} > 0, \quad \frac{\partial a_E}{\partial h_i} > 0. \)

and

\( (4b) \quad 0 < \eta_i, \eta_E < 1, \)

where $\eta_i = -(f''/f')a_i \cdot L_i$ and $\eta_E = -(f''/f')a_E \cdot L_E$ are the elasticities of the marginal product of labor with respect to the insider and entrant workforces. Thus, when an insider increases his cooperative activity with other insiders and entrants, the marginal products of the insider and entrant workforces rise:
Assumption (4a) means that the jobs within the firm are sufficiently interdependent so that an individual insider’s cooperation with other insiders or entrants has a significant, positive effect on their labor endowments. This assumption is unnecessary to our analysis whenever insiders, acting through a union, can influence \( a_I \) and \( a_E \) directly. Indeed this suggests that, in large plants with little job interdependence, insiders may have a special incentive to form a union. An insider-outsider explanation for the emergence of unions is to be found here.

We let each insider’s cooperating activities \((a^i_I \text{ and } a^i_E)\) be bounded from above and below, so that the labor endowments of insiders and entrants \((a_I \text{ and } a_E)\) are bounded as follows:

\[
\begin{align*}
1 & \leq a_I \leq A, \\
1 & \leq a_E \leq A,
\end{align*}
\]

where \(A\) is a constant greater than unity.2/

Finally, we turn to the insider’s influence over his wage \(W^i\). To reach our qualitative conclusions, we only need to assume that (a) each insider’s wage captures at least some of the economic rent generated through his cooperation and harassment activities and (b) the greater this rent, the higher his wage. These properties hold in a variety of well-known bargaining games (e.g. Shaked and Sutton (1984)) and are in accord with common-sense ideas on wage setting processes. However, to make our exposition as simple as possible, we consider only the extreme case in which each insider sets his own wage individualistically (as noted in Section 1). This means that each insider takes the wages and employment of all other insiders as given.
Consequently, if he wishes to retain his job, he must set his wage so that the firm has an incentive to employ him in addition to all the other insiders it is employing. In other words, each insider regards himself as the marginal worker in the firm's employment decisions.

The insider $i$ faces two wage-setting options: (i) he may set his wage at some level $V_i$ which is sufficiently low to ensure his continued employment, or (ii) he may achieve his reservation wage $R_i$ by choosing not to be employed. Clearly, the first option will be chosen only if the maximum achievable wage $V_i$, denoted by $V_{i\text{max}}$, is at least as great as the reservation wage; otherwise, the second option is preferable:

$$W_i = \max\{R_i, V_{i\text{max}}\}.$$  

$V_{i\text{max}}$ may be inferred from the firm's employment behavior as described by the first-order condition (2a) and (2b). If entrants are not employed, then only (2a) is relevant for determining the maximum achievable wage: $W_i \leq a_i \cdot f'(\lambda)$ and thus $V_{i\text{max}}$ is the maximum of $[a_i \cdot f'(\lambda)]$ with respect to $a_i$ and $a_E$. On the other hand, if entrants are employed (in addition to insiders), then both (2a) and (2b) are relevant and the first parts of (2a) and (2b) hold as equalities:

$$f'(\lambda) = f'(a_i \cdot m + a_E \cdot L_E) = \frac{V_i}{a_i} = \frac{R_E}{a_E},$$

and thus $V_{i\text{max}}$ is the maximum of $[(a_i/a_E) \cdot R_E]$ with respect to $a_i$, $a_E$, and $h_E$.

In short, $V_{i\text{max}}$ may be expressed as follows:

$$V_{i\text{max}} = \max_{a_i, a_E, h_E} \left[ \min \left\{ \frac{1}{a_i} f'(a_i \cdot L_i), \frac{a_i}{a_E} \cdot R_E \right\} \right].$$

Substituting (5b) into (5a), and recalling that $R_I = 1$ and $R_E = 1 + H_E$, we obtain insider $i$'s wage:

$$W_i = \max_{a_i, a_E, h_E} \left[ 1, \min \left\{ \frac{1}{a_i} f'(a_i \cdot L_i), \frac{a_i}{a_E} \cdot (1 + H_E) \right\} \right].$$
2. The Microeconomic Equilibrium: The Firm and Its Employees

We now show how the equilibrium levels of wages, employment, and cooperation and harassment activities are determined through the interaction of a firm and its employees. Our concept of equilibrium (for the two stage decision making process described above) may be specified as follows:

Definition: In the Nash equilibrium of the firm and its employees,

(a) each insider i maximizes his utility with respect to his decision variables $W_i$, $a_i$, $a_E$, and $h_E$, taking the strategies of the firm and the other employees as given and

(b) the firm maximizes its profit with respect to its decision variables $L_I$ and $L_E$, taking the strategies of its employees as given.

Let us now turn to the characteristics of this equilibrium.

A. Cooperation

Under equilibrium conditions, each insider cooperates fully with other insiders, but does not cooperate with entrants.

Intuitively, the reason is that (a) by cooperating with the other insiders, the insider raises the marginal product of the firm's incumbent workforce and is thereby able to achieve a higher wage and (b) by refusing to cooperate with entrants, the insider reduces the marginal product of the entrant workforce, and consequently reduces the number of entrants hired, thereby raising the marginal product of the incumbent workforce and achieving a higher wage.

This can be shown formally by deriving the cooperation activities $a_{I}^*$ and $a_{E}^*$ which permit the insider i to earn his maximum achievable wage $v_{i}^{\text{max}}$.

By the $v_{i}^{\text{max}}$ equation (5b), the insider's optimal (equilibrium) levels of cooperation are $(a_{I}^*) = \text{max}(a_{I})$ and $(a_{E}^*) = \text{min}(a_{E})$, so that

(6a) $a_{I}^* = A$ and $a_{E}^* = 1.$
B. Harassment

Under equilibrium conditions each insider harasses maximally all workers who enter the firm.

Intuitively, we see that by doing so, the insider maximizes the entrants' reservation wage and thereby discourages them from entering the firm, so that a minimal number of entrants are hired. Thus, the marginal product of the incumbent workforce is maximized, so that the insider achieves the highest possible wage.

Formally, the \( V^1_{\text{max}} \) equation (5b) implies that the insider's equilibrium level of harassment (which permits him to earn his maximum achievable wage) is \( (h^i_E)^* = \max(h^i_E) \), so that

\[
(6b) \quad H^*_E = H
\]

(recalling that, by (3d), \( H \) is the upperbound of \( H_E \)).

C. Wage Determination

Substituting the optimal cooperation levels (6a) and the optimal harassment level (6b) into the \( W^i \) equation (5c), we obtain the following wage equation:

\[
(7) \quad (W^i)^* = W^* = \max\{1, \min[A\cdot f'(A\cdot L_i), A\cdot(1+H)]\} \quad \text{for all } i.
\]

This equation has a straightforward interpretation. If the insider's reservation wage \( (R^i = 1) \) falls short of his maximum wage achievable through employment, \( (\min \{A\cdot f'(A\cdot L_i), A\cdot(1+H)\}) \), then the insider sets his wage with two independent considerations in mind: \( W^i \) must be sufficiently low so that

- the insider remains profitable (or at least does not become unprofitable) to the firm, i.e.

\[
(8a) \quad W^i \leq A \cdot f'(A \cdot m)
\]

(for otherwise he would be dismissed) and
the insider remains more profitable (or at least does not become less profitable) then the marginal entrant, i.e.

\[(8b) \quad W^i \leq A \cdot (1 + H)\]

(for otherwise he would be replaced by the entrant). We call \(8a\) the "absolute profitability constraint" (APC) and \(8b\) the "relative profitability constraint" (RPC) on the insider wage.

D. Employment Determination

Whether the insider wage is given by the reservation wage, the APC, or the RPC depends on the size of the firm's incumbent workforce, \(m\). Recall that the firm faces diminishing returns to labor (i.e. \(f' < 0\)) and thus the larger the incumbent workforce, the lower the incumbent's marginal product. There are three possible scenarios:

(I) A "large" incumbent workforce: Here the incumbent workforce is so large that its marginal product is less than the insiders' reservation wage \(R_i\). In particular, \(m > \bar{m}\), where \(\bar{m}\) is the "maximum sustainable incumbent workforce" (i.e. the largest possible number of incumbents which the firm may have an incentive to employ) and \(\bar{m}\) is given by \[10/\]

\[(9) \quad A \cdot f'(A \cdot \bar{m}) = 1.\]

When the incumbent workforce is greater than its maximum sustainable level (\(m > \bar{m}\)), it is clear that the firm finds it worthwhile to reduce employment. What remains to be examined is how large the new workforce will be and whether some insiders will be replaced by entrants.

To this end, note that in this scenario the insider wage will be set equal to the reservation wage:

\[(10a) \quad W^* = R_i = 1, \quad \text{for } m > \bar{m}.\]
The reason is that if \( W \) were set beneath this level, then some insiders would have an incentive to quit; while if \( W \) were above this level, then insiders would be dismissed even though they prefer employment to unemployment and these insiders would consequently have an incentive to opt for a lower wage.

Given that the insider wage is at its minimum level \( W = 1 \), then (by (2a) and (9)) the firm employs the maximum sustainable incumbent workforce:

\[
L_1^* = \bar{m}, \quad \text{for } m > \bar{m}.
\]

Since the insiders' marginal product is equal to their reservation wage \((A \cdot f'(A \cdot L_1) = 1)\), the marginal product of an entrant (hired in addition to the insiders) must be less than his reservation wage \((f'(A \cdot L_1^*) < 1 + H)\).

Thus, the firm hires no entrants:

\[
L_E^* = 0, \quad \text{for } m > \bar{m}.
\]

II. An "intermediate" incumbent workforce: Here the incumbent workforce is (a) small enough so that its marginal product exceeds the insiders' reservation wage, but (b) large enough so that the marginal product of entrants (hired in addition to incumbents) falls short of the entrants' reservation wage. In particular, \( m \leq m \leq \bar{m} \), where \( \bar{m} \) is the "minimum sustainable incumbent workforce" (i.e. the smallest possible number of incumbents which the firm could employ without having an incentive to hire entrants). \( \bar{m} \) is given by

\[
f'(A \cdot \bar{m}) = 1 + H.
\]

Under these circumstances, the firm hires no entrants:

\[
L_E^* = 0, \quad \text{for } m \leq m \leq \bar{m},
\]

since (by (11)) the marginal product of an entrant is less than the entrant's reservation wage \((f'(A \cdot m) < 1 + H = R_E^*)\).

Consequently, in setting his wage, each insider is constrained not by the need to remain at least as profitable as the entrants (since entrants are never profitable in this scenario), but only by the need to keep his absolute
profitability from falling below zero. In other words, the binding constraint on the insider wage (given by the wage equation (7)) is the APC (Constraint (8a)), while the RPC (Constraint (8b)) is redundant. This means that each insider sets his wage equal to the marginal product of the incumbent workforce:

\[ W^* = A \cdot f'(A \cdot m), \quad \text{for } m < m_0. \]

At this wage, the firm retains all its incumbents:

\[ L^*_I = m, \quad \text{for } m \leq m_0. \]

III. A "small" incumbent workforce: Here the incumbent workforce is sufficiently small so that the marginal products of both the incumbents and some entrants (hired in addition to the incumbents) exceed their respective reservation wages. In particular, \( m \leq m_0 \).

Under this scenario, the insiders cannot completely exclude the outsiders from getting jobs (regardless of their cooperation and harassment activities). Thus, each insider must set his wage with a view to his profitability vis-a-vis the entrants, i.e. the binding constraint on the insider wage is the RPC (Constraint (8b)). By the wage equation (7), this means that the insider wage is a mark-up (by the factor A) over the entrants' equilibrium reservation wage \( (R^*_E = 1 + H) \):

\[ W^* = A \cdot (1 + H), \quad \text{for } m < m_0. \]

In other words, at this wage, the marginal incumbent is just as profitable as the first entrant (hired in addition to the incumbent workforce): \( \frac{\partial \pi}{\partial L^*_I} = A f'(A \cdot m) - W^* = \frac{\partial \pi}{\partial L^*_E} = f'(A \cdot m) - (1 + H) \). Since the incumbent workforce is "small", the first entrant generates positive profit; thus, the marginal incumbent does so, too. Consequently, the firm retains all its incumbents:

\[ L^*_I = m, \quad \text{for } m < m_0. \]
provided (as shown below) that the firm lacks the incentive to replace all its incumbents by entrants.

Moreover, entrants are hired until their marginal product is brought into equality with their reservation wage: \( A \cdot L_I^* + L_E^* = A \cdot m \) (by (11)) and thus

\[
L_E^* = A \cdot (m - m).
\]

We now inquire under what conditions the firm has no incentive to replace all its incumbents by entrants. If the firm were to pursue this replacement strategy, it would encounter a loss and a gain: the loss would arise because the entrants (unlike the incumbents) could not cooperate with one another, and the gain would emerge because the entrants (in the absence of incumbents) would not be subject to harassment. For the loss to exceed the gain, the harassment level \( H \) must fall within an upper bound, which is easily derived.\(^{17}\)

E. The Microeconomic Equilibrium

Our results above are summarized in the following proposition:

Proposition 1:
For the Nash equilibrium, the insiders' cooperation and harassment activity levels are

\[
a_I^* = A,
\]

\[
a_E^* = 1 \text{ and } h_E = H \text{ whenever } L_E^* > 0.
\]

Let the firm's incumbent workforce \((m)\) be exogenously given. Then the equilibrium wage and employment levels may be characterized as follows:

(I) If \( m > \bar{m} \), then \( W^* = 1 \)

\[
L_I^* = \bar{m}, \quad L_E^* = 0.
\]

(II) If \( m < \bar{m} < m \), then \( W^* = A \cdot f'(A \cdot m) \)

\[
L_I^* = m, \quad L_E^* = 0.
\]
(III) If \( m < m \), then \( W = A \cdot (1 + H) \), \( R_E^* = 1 + H \),
\[ L_I^* = m, \quad L_E^* = A \cdot (m - m). \]

This proposition is illustrated in Figure 1. The figure contains two demand curves:
- an "insider demand curve", along which the insiders' marginal product is equal to the insider wage, assuming that only insiders are employed: \( A \cdot f'(A \cdot m) = W \), and
- an "entrant demand curve", along which the entrants' marginal product is equal to the entrant wage, assuming that only entrants are employed: \( f'(L_E) = R_E^* \).

Observe that the insider demand curve lies above the entrant demand curve (by a factor of \( A \)), because the insiders cooperate with each other but are not prepared to cooperate with entrants. The point at which the \( W = 1 \) line crosses the insider demand curve yields (by (5a)) the maximum sustainable incumbent workforce (\( A \cdot \bar{m} \), in efficiency units). Similarly, the intersection of the \( R_E^* = 1 + H \) line and the entrant demand curve yields (by (5b)) the minimum sustainable incumbent workforce (\( A \cdot \bar{m} \), in efficiency units).

The RPC is denoted by the uppermost horizontal line in the figures. The APC coincides with the insider demand curve (since the APC is the locus of wage-employment points at which the absolute profitability of the marginal insider is zero).

In the figure, Scenario II is depicted by the thick segment along the insider demand curve. In other words, there is a continuum of equilibrium points, each corresponding to a different incumbent workforce:
\[ [W^*(II), \lambda^*(II)] = [A \cdot f'(A \cdot m), (A \cdot L_I^* + L_E^*)] = [A \cdot f'(A \cdot m), A \cdot m]. \] Here the insiders prevent all entry into the firm through their cooperation and harassment activities and set their wage so as to exploit all their marginal rent (\( W^*(II) = A \cdot f'(A \cdot m) \)) and retain their jobs.
Figure 1: The Microeconomic Equilibrium

RPC: $W^*(\lambda) = \rho R^*_e = \rho A(1+H)$
Insider Demand Curve: $A\rho^*(\lambda) = W^*$
Entrant Demand Curve: $f(\lambda) = R^*_e$

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Scenario I is pictured by the lowest point on the thick line segment: \[ [\hat{w}^*(I), \lambda^*(I)] = [R_I^*(A\cdot L_I^* + L_E^*)] = [1, A\cdot m]. \]
Here the incumbent workforce is sufficiently large so that the insiders receive only their reservation wage, and, in response, the firm employs only the maximum sustainable incumbent workforce.

Finally, Scenario III is illustrated by the highest point on the thick line segment: \[ [\hat{w}^*(III), \lambda^*(III)] = [A\cdot (1 + H), (A\cdot L_I^* + L_E^*)] = [A\cdot (1+H), A\cdot m]. \]
Here the incumbent workforce is sufficiently small for some entrants to be profitable at their reservation wage. Thus, the insider wage is set so that the marginal incumbent is just as profitable as the marginal entrant \((\hat{w}^*(III) = A\cdot (1+H))\). In response, the firm retains all its incumbents and hires entrants until their marginal product (given by the entrant demand curve in the figure) is equal to their reservation wage (given by the line \(R_E^* = 1 + H \) in the figure). Thus the firm's total workforce, in efficiency units, is equal to what it would be if the minimum sustainable incumbent workforce were employed \((\lambda^*(III) = A\cdot m)\).

Figure 1 shows quite simply what the insiders' cooperation and harassment activities are meant to achieve. By cooperating with other insiders, each insider raises the insider demand curve (in the figure) and is thereby able to achieve a higher wage than would otherwise have been possible. This is true for one of two reasons: (i) when entrants are not profitable (in Scenario II) so that the insider wage is equal to the marginal product of the incumbent workforce \((\hat{w}^*(II) = A\cdot f'(A\cdot m))\), then cooperation among insiders raises this marginal product; and (ii) when entrants are profitable (in Scenario III) so that the insider wage is a markup over the entrant wage \((\hat{w}^*(III) = A\cdot (1+H))\), then cooperation among insiders raises the firm's cost of replacing an insider by an entrant and thereby increases the mark-up between the insider wage \((\hat{w})\) and the entrant wage \((R_E)\).
When the insider withdraws cooperation from potential entrants', he lowers the potential entrant demand curve (in the figure) and, once again, raises the cost of replacing insiders by entrants.

Finally, when the insider increases his harassment of potential entrants, he raises the entrants' reservation wage, which is the basis on which the insider wage is marked up.

Observe that the equilibrium described in Proposition 1 is subgame perfect: Once the firm has hired entrants in the second stage of the decision making process, each insider has an incentive to ratify the wage-setting, cooperation, and harassment decisions that were made in the first stage. To see this, suppose that the firm has hired a fixed amount, \( L_E \), of entrants and that this labor intake is accepted as a fait accompli by the insiders. Then it will still be in each insider's interests to withdraw cooperation from these entrants because, in doing so, he causes a reduction in \( a_E \) and thereby also reduces the firm's effective workforce \( (\lambda = a_I^* \cdot L_I^* + a_E \cdot L_E) \); as result, he is able to raise his marginal product and his wage (i.e. for given \( L_E \), \((\partial W^i_L / \partial a_E^i) = a_I^* \cdot f''(\partial a_E^i / \partial a_E^i) < 0 \) for any insider \( i \)). Furthermore, each insider still has an incentive to harass entrants who could be profitable to the firm because, in doing so, he raises their reservation wage and is thereby able to achieve a higher wage for himself. Finally, given that his cooperation and harassment incentives remain the same from the first stage of decision making to the second, his wage claims must remain unchanged as well.

3. The Macroeconomic Equilibrium: Involuntary Unemployment

We now shift the focus of our attention from the microeconomic equilibrium within a firm to unemployment in the labor market. Consider an economy which contains a fixed number \( (n) \) of identical firms and a fixed
number (s) of workers. The wage and employment decisions are made in a
decentralized fashion within each firm, along the lines indicated in the
previous section.

Aggregate labor market activity may be described in terms of three
building blocks:

(i) The aggregate labor demand curve, denoted by $N^D$ (the thick
downward-sloping curve) in Figures 2a-c. These figures picture the labor
market under Scenarios I-III, respectively. When aggregate labor demand ($N^D$, in
efficiency units) is less than or equal to the aggregate incumbent
workforce ($A \cdot m \cdot n$, also in efficiency units) employment decisions are made
along the aggregate insider demand curve:

$$D \cdot k \cdot N = n \cdot g(W/A), \text{ for } 0 \leq N^D \leq A \cdot m \cdot n,$$

(by (2a), with $a_I = A$) \text{ where } g = (f')^{-1}. \text{ Yet when aggregate labor demand}
exceeds the aggregate incumbent workforce, employment decisions are given by
the aggregate entrant demand curve:

$$D \cdot k \cdot N = n \cdot g(R^*_E), \text{ for } N^D > A \cdot m \cdot n.$$

(by (2b), with $a_E = 1$).

(ii) The aggregate labor supply curve, denoted by $N^S$ (the dashed step
function) in Figures 2a-c:

$$W = R^*_I, \text{ for } 0 \leq N^S \leq A \cdot m,$$

$$W = R^*_E \text{ for } A \cdot m < N^S \leq \tilde{s},$$

where $N^S$ is measured in terms of efficiency units of labor and $\tilde{s}$ is the
labour force in efficiency units ($\tilde{s} = A \cdot m + (s - m)$).

(iii) The wage setting curve, denoted by $W^*$ (the dotted horizontal lines)
in Figures 2a-c. When the aggregate incumbent workforce is "large" (Figure
2a), insiders receive their reservation wage:

$$W^* = 1, \text{ for } N^D > A \cdot m \cdot n.$$

When this workforce is "intermediate" (Figure 2B) they receive their marginal
When it is "small" (Figure 2c), they receive a mark-up over the entrant wage (which is equal to the entrants' reservation wage):

\[ W^* = A \cdot R^*_E = A \cdot (1 + H), \text{ for } 0 \leq N^D < A \cdot m \cdot n. \]

Figures 2a-c are drawn so that the labor force \( \tilde{s} \) exceeds the demand for labor at the equilibrium insider wage \( W^* \); thus, some workers remain unemployed. The question concerning us in this section is whether this unemployment is involuntary.

Clearly, it is not involuntary in Scenario I (Figure 2a). Here the wage-setting curve \( (W^*) \) passes through the intersection of the aggregate labor demand curve \( (N^D) \) and supply curve \( (N^S) \). Employment (in efficiency units) is \( A \cdot m \cdot n \), leaving \( (\tilde{s} - A \cdot \tilde{m} \cdot n) \) workers unemployed - voluntarily so, since the incumbents who lose their jobs (\( (m - \tilde{m}) \) in number) prefer to be unemployed than to work for their marginal product \( (W^* = R^*_I > A \cdot f(A \cdot m)) \) and the outsiders (\( (s - m) \) in number) would be unwilling to work at the prevailing wage even if they were not harassed \( (R^*_E > R^*_I = W^*_I) \).

In Scenarios II and III, the nature of unemployment is a more complex matter. The reason is that insiders and outsiders in our labor market have different employment opportunities. The difference is twofold:

a. They do not face "identical conditions of employment" (ICE), i.e. job attributes lying outside the worker's control. Insiders are able to work under full cooperation and without harassment from the other insiders, whereas outsiders do not have this option.
Figures 2: The Macroeconomic Equilibrium

Figure 2a: Scenario I

NP: Aggregate Labor Demand Curve (-----)
NP: Aggregate Labor Supply Curve (-----)
W*: Wage Setting Curve (*****)

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Figure 2b: Scenario II
Figure 2c: Scenario III

[Graph depicting economic scenarios with labeled axes and curves indicating involuntary unemployment constraint, insider demand curve, and entrant demand curve.]
b. Even under ICE, insiders and outsiders are not equally productive.

Even if insiders and outsiders would receive equal cooperation from their colleagues, the outsiders would still be less productive since they (unlike the insiders) are unable to engage in cooperative activities with others.

These differences suggest that, in order for unemployment to be involuntary, it is not sufficient for workers to be unsuccessful in finding jobs at less than the prevailing wage. Differences in ability should be included in our conception of involuntary unemployment, but differences in conditions of employment (lying beyond the workers' control) should be excluded.

Let the prevailing "efficiency wage" be defined as the prevailing wage normalized for differences in productivity. Then, we propose the following definition of involuntary unemployment:

A worker is involuntarily unemployed over a particular period of time if he does not have a job during that period, even though he would wish to work at an efficiency wage which is less than the efficiency wage of a current employee, provided that he had the opportunity to be employed under identical conditions of employment (ICE) as that employee.18/

Our definition of involuntary unemployment is meant to capture the idea that outsiders are out of work because they have a smaller choice set -- in terms of wages received per efficiency unit of labor -- than the insiders. In our model, an insider's efficiency wage is \((W/a_I)\). Under identical conditions of employment (ICE), an outsider's efficiency wage is \((R_{ICE}/a_{ICE})\). If outsiders are involuntarily unemployed, then their choice set is smaller than that of the insiders in the sense that

\[(18a) \quad (R_{ICE}/a_{ICE}) < (W/a_I).\]
Defining \( x = \frac{a_E^{ICE}}{a_I} \) as the ratio of an entrants' and insider's labor endowments under identical conditions of work, our condition for involuntary unemployment becomes
\[
W > x \cdot R_E^{ICE} = x \cdot R_I^* = x.
\]

This means that, under identical conditions of employment, an outsider would be cheaper (in terms of efficiency wages) than an insider. (An outsider's labor costs, normalized for productivity differences is \( x \cdot R_E^{ICE} \), whereas an insider's labor cost is \( W \).) The reason why the firms in our analysis nevertheless do not replace insiders by outsiders is that these workers do not in fact face identical conditions of employment. Under actual conditions of employment (in which insiders receive cooperation and no harassment, whereas potential entrants receive harassment and no cooperation), an outsider is more expensive (in terms of efficiency wages) than an entrant. There is no underbidding because insiders rob their firms of the incentive to employ outsiders.

Our definition of involuntary unemployment sheds light on the nature of unemployment in Scenarios II and III, pictured in Figures 2b and 2c (respectively). Observe that, in both figures, the wage-setting curve (pictured by the dotted horizontal line \( W^* \)) crosses the \( ND \) curve to the left of the intersection of the \( ND \) and \( N^S \) curves. This implies that the outsiders \( (s - A \cdot m \cdot n) \) are willing to work for less than the prevailing insider wage \( (W^*) \), but are unable to do so. In order for this unemployment to be involuntary, we require that condition (18c) be satisfied, so that the insider wage lies above the "involuntary unemployment constraint" \( (W^* = x) \) in Figures 2b and 2c.\(^{20}\)

The wage \( W = x \) corresponds to a particular size \( (\tilde{m}) \) of the firm's incumbent workforce:
\[
x \equiv A \cdot f^* (A \cdot \tilde{m}).
\]
Thus, we see that the outsiders (s-A.m.n) are involuntarily unemployed only if the aggregate incumbent workforce is less than $n\bar{m}$. It is easy to show that

$$m < \ddagger m < \ddagger \bar{m}. \quad \text{(20)}$$

This means that when the aggregate incumbent workforce is "small" (Scenario I), all the unemployment is involuntary. However, when the aggregate incumbent workforce "intermediate" (Scenario II) the unemployment is involuntary when $m < \ddagger m$ and voluntary when $m \geq \ddagger m$. (As Figure 2b is drawn, it is involuntary).

The workers who enter the firm in Scenario III face a similar form of discrimination as the outsiders, in that they have a smaller choice set (in wage/efficiency-labor space) than the insiders. In particular, if the entrants and insiders faced identical conditions of employment, then each entrant's compensation per efficiency unit of labor would be less than that of each insider \( \left( R_E^{ICE}/a_E^{ICE} \right) < (W/a_I) \). Hence, in Figure 2c the distance $(A\cdot n \cdot (\ddagger \bar{m} - m))$ may be called "job discrimination."

Our conclusions concerning the existence of persistent involuntary unemployment are summarized in the following proposition:

**Proposition 2:** Consider a labor market described by (15a) - (17c) with an aggregate incumbent workforce $m \cdot n$, which is historically given. If this workforce happens to fall short of a particular critical level $\ddagger \bar{m} \cdot n$, then the labor market gets stuck in a state of persistent involuntary unemployment.

Although our model deals with the simultaneous performance of cooperation and harassment activities, our explanation of involuntary unemployment may rest on each of these activities alone. If insiders engage in cooperation but no harassment activities, then the equilibrium within the firm is given by Proposition 1 with $H=0$ and involuntary unemployment arises under
the condition in Proposition 2. When harassment but no cooperation activities are performed, we must not only set $A=1$ in Proposition 1, but we must also assume that the firm faces some costs of replacing insiders by outsiders. The reason is that, in the absence of such costs, the firm would always find it worthwhile to fire all its harassing insiders and hire entrants who (by assumption) are incapable of harassing. 22/

4. Some Potential Objections

We now turn to some potential objections to our explanation of wages, employment, and unemployment.

A. Labor Turnover

If incumbent workers are able to restrict labor turnover of their firms, why do firms often have large labor turnover rates in practice? Is our analysis inapplicable whenever a firm's workforce has large simultaneous inflows and outflows?

When our model is extended to include quits and retirements of employees, it is able to account for simultaneous inflows and outflows. In particular, suppose that $r \cdot m$ randomly chosen 23/ incumbents in each firm quit or retire at the end of each time period (where $0 < r < 1$). If the incumbent workforce initially exceeds its minimum sustainable level ($m > m^*$), then the separations cause this workforce to shrink. As it does so, the insider wage ($W$) and the marginal product of the insiders and potential entrants rise. However, once the incumbent workforce falls beneath $m^*$, the marginal product of potential entrants is so high that the insiders are no longer able to prevent all outsiders from being hired. Consequently, workforce inflows and outflows occur simultaneously. In the stationary equilibrium, they are of equal magnitude. It can be shown 24/ that these flows are

$$r \cdot L^*_I = L^*_o = (r \cdot A \cdot n \cdot m)/(r + A),$$

and the associated level of unemployment is

$$u = s - L^*_I - L^*_E = s - (1 + r) \cdot (A \cdot n \cdot m)/(r + A).$$
Now turn to another reason why insiders' discriminatory activities do not preclude labor turnover. Suppose that a firm employs "teams" of heterogeneous workers who are complementary to one another in the production process. In this context, insiders have no incentive to prevent the replacement of workers who have quit or retired. On the contrary, since all members of a team are complementary, it is in the insiders' interest to cooperate with and avoid harassing new entrants who fill vacancies on the team. In this light, it becomes clear that our analysis of differential cooperation and harassment activities applies not to labor turnover within teams, but rather to turnover of teams (viz., the replacement of a team of insiders by a team of entrants).

B. Creation of Firms

Does our explanation of involuntary unemployment hinge on an assumption that the number of firms in the economy is fixed? Would free entry of firms lead to the elimination of this unemployment?

When considering these questions, note that in practice the creation of firms is often a lengthy process. Thus, even if free entry would eventually permit full employment to be achieved, the involuntary unemployment may nevertheless last a long time.

Moreover, the existence of involuntary unemployment does not necessarily generate an incentive to create new firms. The mere fact that insiders keep outsiders from being hired by the existing firms does not mean that new firms would find it profitable to hire these outsiders. Observe that new firms, in our analysis, are at a disadvantage vis-a-vis the existing firms, since new firms can employ only entrants (who are unable to cooperate with one another) whereas existing firms also employ insiders (who do cooperate with one another). There are of course many other reasons why new firms may be unprofitable even when existing firms are not, e.g., set-up costs, capital market imperfections, scarcity of entrepreneurial skills,
reduction of product prices due to entry of firms. Hence, the involuntary unemploy ment of Section 4 may persist even after all profitable opportunities for entry of firms have been exhausted.

C. Output-Related Wage Contracts

Does our explanation of involuntary unemployment hinge on our assumption that time-rate wages are the only form of labor remuneration? Could output related wage contracts be used to bribe the insiders not to discriminate against entrants, thereby making the employed and unemployed workers as well as the firms better off and eliminating the unemployment?

Although Pareto-superior alternatives to time-rate wages may exist under some circumstances, they may not be available in others. In fact, they are never available for unemployment generated through differential harassment activities. The reason is that the firm is unable to infer the performance of these activities from the variables it can observe — viz., its total output, its employment of insiders and entrants, and its wages — and thus it has no opportunity to reward insiders for foregoing harassment of entrants.

The matter is not quite so simple for cooperation activities. Although the firm cannot observe these activities directly, it is able to observe its total output. Thus, it may be able to reward its insiders for cooperating with entrants by sharing the proceeds of its output with these insiders. This could take the form of profit- or revenue-sharing.

Yet, there are a variety of obstacles to designing and implementing such output-related large contracts. Consider the following three significant ones (which are analyzed formally in Appendix B):

(i) The Monitoring-Cost Difficulty: Since profit and revenue-sharing schemes are generally costly for workers to monitor, managers may have an incentive to use their superior position in composing profit or revenue figures to their own advantage. In response, the employees may have
an incentive to implement monitoring procedures (and possibly also engage in litigation). The gains from profit- or revenue-sharing may not fully compensate the firm and its employees for these monitoring costs.

(ii) The Risk-Aversion Difficulty: Profit- and revenue-sharing schemes inevitably involve the imposition of risk on employees. If these employees are risk-averse, then they thereby suffer a utility loss. The firm may be unable to compensate them for this loss without robbing itself of the incentive to implement such schemes.

(iii) The Market-Power Difficulty: When an insider decides to cooperate with entrants, he loses something and gains something: (a) he loses market power vis-a-vis the entrants and thus his time-rate wage sinks towards the reservation wage; and (b) he gains some of the profit or revenue which accrues as a result of his cooperation with the entrants. In order for the output-related wage contract to induce insider-outsider cooperation, the second effect must outweigh the first. However, that will happen only if the firm relinquishes at least a certain amount of its gross profit. Yet if the firm does so, it may find that its net profit is lower than in the non-cooperative equilibrium, and then it has no incentive to implement the contract.

These difficulties, and perhaps others, help explain why output-related wage contracts do not play a particularly prominent role in nowadays' labor markets. However, there is no reason to believe that the difficulties are necessarily insuperable; indeed, the model of differential cooperation activities surely suggests that there is a real-world case to be made for seeking alternatives to time-rate contracts. Be that as it may, time rate wages are in fact the predominant form of labor remuneration and our analysis indicates how involuntary unemployment may arise when they are used.
D. Economic Recovery

Given that insiders can prevent outsiders from getting jobs, does our analysis imply that they can prevent employment from recovering after a recession? In particular, suppose that there has been an upswing in business conditions, shifting the insider and entrant demand curves in Figure 1 to the right. Does our analysis lead to the counterfactual implication that insiders invariably take advantage of such an upswing by raising their wages so that employment remains unchanged?

To see why this potential objection does not hold, let us consider how our macroeconomy responds to an upswing in each of the three scenarios. (Appendix C contains a formal analysis of how our macroeconomy responds to business variations.) To begin with, note that the minimum and maximum sustainable incumbent workforce (\( \underline{m} \) and \( \bar{m} \) respectively) rise in an upswing, so that the dividing lines between the three scenarios in Figure 1 shifts to the right. If the incumbent workforce is "large" (before and after the upswing), then the insider wage remains at \( W^*(I) = R_1^* = 1 \) and more insiders are retained on account of the upswing. If the incumbent workforce is "intermediate" (before and after the upswing), the insiders raise their wage \( W^*(II) \) by the full amount of the upward shift of the insider demand curve (without thereby encouraging entry of new employees) and, as a result, employment remains unchanged. Finally, if the incumbent workforce is "small" (before and after the upswing), the insiders are unable to raise their wage, for otherwise they would induce the firm to replace them by entrants. Consequently, the insider wage remains at \( W^*(III) = A.(1+H) \) and the firm hires more entrants on account of the upswing.

In short, under Scenarios I and III, insiders do not prevent employment from rising in an upswing, but they do have this effect under Scenario II. In this connection, it is important to mention that if insider
wages are assumed to be the outcome a bargaining process which splits the marginal rent between the insiders and their employers, then an upswing will lead to a rise in employment even under Scenario II.

The degree to which an upswing leads to higher wages versus higher employment depends on the size of this upswing. Consider, for example, a labor market suffering from unemployment and stuck in Scenario II. If the upswing is "small", so that the labor market remains in this scenario, then employment will continue to stagnate while insider wages rise. Yet if the upswing is "large", so that the labor market moves into Scenario III, then insider wages rise to a particular markup over entrants' reservation wages and employment expands (the larger the upswing, the greater the expansion). Here we observe that a large business stimulus reduces the level of unemployment whereas a small stimulus is unable to do so.

As another example, consider a labor market in Scenario I. Here a "small" upswing (which maintains the existence of Scenario I) keeps wages stable and induces firms to fire fewer incumbents than they would have done in the absence of the upswing. Yet if the upswing is large enough to put the labor market into Scenario II, then all incumbents are retained and wages rise.

6. Concluding Remarks

This article outlines how insiders' cooperation and harassment activities may give rise to unemployment. The central idea is that firms find it costly to substitute outsiders for insiders, and that insiders manage to capture at least some of the associated economic rent in the process of wage determination. Consequently, insiders raise their wages above the level at which outsiders would be willing to work, but firms nevertheless lack the incentive to replace insiders by outsiders or to add outsiders to their workforces.
In general, the insider-outsider turnover cost can come in many guises (e.g. hiring, training and firing costs (Lindbeck and Snower (1984a)), morale effects of labor turnover (Lindbeck and Snower (1984b)) and this paper explores another one: the insiders' ability to cooperate with and harass some workers but not others. This ability enables them to create rent and thereby drive up their wages.

In this context involuntary unemployment can arise in the sense that outsiders are unable to find work even though they would be just as profitable to the firms as the insiders, provided that they faced identical conditions of employment. Yet the insiders' cooperation and harassment activities ensure that these conditions are not the same for insiders and outsiders.
APPENDIX A: AN INTERTEMPORAL MODEL

In the following two-period, overlapping generations model, we take into account two salient features which are not present in the one-period model of the text:

(a) all workers must enter employment as entrants (lacking cooperation and harassment capability as well as market power in the wage determination process) and only become insiders after having completed their "initiation period" (which is assumed to last for one period of analysis) and

(b) in making their employment decisions, firms take into account the prospect that entrants in the current period will become insiders in the next period.

1. Behavior of the Firm

The firm is assumed to maximize the present value of its profit over two time periods, subject to the constraints that \( L_I \) and \( L_E \) in each period are non-negative and that employment of insiders in each period cannot exceed the incumbent workforce in that period (where the incumbent workforce in the first period is \( m \) and in the second period is \( L_E^1 \)). (For simplicity, but without loss of generality, we assume a zero rate of time discount).

The firm's problem is

\[
(A1) \quad \text{Maximize} \quad PV \\
= f(a_E \cdot L_E^1 + a_I \cdot L_I^1) + f(a_E \cdot L_E^2 + a_I \cdot L_I^2) \\
- w^1 \cdot L_I^1 - w^2 \cdot L_I^2 - R^1 \cdot L_E^1;
\]
We define the firm's effective workforce in each period as \( \lambda^1 = a_E \cdot L_E^1 + a_I \cdot L_I^1 \) and \( \lambda^2 = a_E \cdot L_E^2 + a_I \cdot L_I^2 \). Then the first order conditions may be written as follows:

\[(A2a) \quad \frac{\partial PV}{\partial L_I^1} = a_I \cdot f' (\lambda^1) - W^1 \leq 0, \quad \frac{\partial PV}{\partial L_I^1} \cdot (m - L_I^1) = 0; \]

\[(A2b) \quad \frac{\partial PV}{\partial L_I^2} = a_I \cdot f' (\lambda^2) - W^2 \leq 0, \quad \frac{\partial PV}{\partial L_I^2} \cdot L_I^2 = 0; \]

\[(A2c) \quad \frac{\partial PV}{\partial L_E^1} = a_E \cdot f' (\lambda^1) - R^1 + \frac{\partial PV}{\partial L_I^2} \leq 0, \quad \frac{\partial PV}{\partial L_E^1} \cdot L_E^1 = 0; \]

\[(A2d) \quad \frac{\partial PV}{\partial L_E^2} = a_E \cdot f' (\lambda^2) - R^2 = 0, \quad \frac{\partial PV}{\partial L_E^2} \cdot L_E^2 = 0, \]

where we ignore the nonnegativity constraint on \( L_I^1 \).

2. Behavior of the workers

In our two-period, overlapping generations context, we must distinguish between "young" and "old" workers. We extend the utility maximization problem in the text to two periods and simply assume (as in our description of the firm) that the rate time discount is zero. An insider's reservation wage is \( R_I = 1 \); an old entrant's reservation wage is \( R_E^0 = 1 + H_E \); and a young entrant's reservation wage is \( R_E^Y = 2 + H_E - W^2 \) if the entrant remains employed in the next period and \( R_E^Y = 1 + H_E \) if he is laid off in the next period.

We assume that \( W^1, W^2 \geq 1 \) (because otherwise the firm would not be able to attract any workers). Thus, it is evident that if entrants remain employed in
the next period, then $R_E^Y < R_E^0$ and consequently the firm will hire only young entrants (given that a sufficient number of such workers are available).

3. The Microeconomic Equilibrium

We define the minimum and maximum first-period incumbent workforce as follows:

$$(A3a) \quad f'(A \cdot m) = R_E^Y$$

$$(A3b) \quad A \cdot f'(A \cdot \bar{m}) = R_I$$

respectively. Then it can be shown that the microeconomic equilibrium is characterized as follows: The insider's cooperation and harassment activity levels are

$$a_I^* = A,$$

$$a_E^* = 1 \text{ and } h_E^* = H \text{ whenever } L_E^* > 0;$$

and the wage and employment levels are

(I) if $m > \bar{m}$, then $W^{1*} = 1$,

$$L_I^{1*} = m, \quad L_E^{1*} = 0,$$

$$L_I^{2*} = 0, \quad L_E^{2*} = g(1 + H);$$

(II) if $m \leq m \leq \bar{m}$, then $W^{1*} = A \cdot f'(A \cdot m)$,

$$L_I^{1*} = m, \quad L_E^{1*} = 0,$$
$L^*_2 = 0, \quad L^*_E = g(1 + H);$

(III) if $m < \bar{m}$, then $w^1 = w^2 = A(2 + H)/(1 + A),$

$R^*_E = (2 + H)/(1 + A)$ (the reservation wage of a young entrant in the first period),

$L^*_1 = m, \quad L^*_E = A(m - m) = L^*_1; \text{ and}$

if $m / \bar{m} > (A - 1) / A$, then $L^*_E = A(m - L^*_1) > 0,$

$R^*_E = (2 + H)/(1 + A)$ (the reservation wage of a young entrant in the second period), and

if $m / \bar{m} \leq (A - 1) / A$, then $L^*_E = 0.$

Observe that the microeconomic equilibrium in Scenarios I, II and possibly also III is characterized by employment fluctuations:

(a) in the current period, insiders restrict entry of new workers into the firm;
(b) thus, the insider workforce in the second period is smaller than in the first period;
(c) consequently, the marginal product of any given number of entrants is higher in the second period than in the first and for this reason the firm hires more entrants in the second period than in the first;
(d) this means that the insider workforce in the third period is larger than in the second period; and in this fashion the employment fluctuations
continue.

Extending our model to include quits and retirements at a constant rate \( r \) (as described in Section 4A), it can be shown that the greater \( r \), the smaller the amplitude of the employment fluctuations above.

Finally, comparing our intertemporal model above with the single-period model in the text, we can see that the salient qualitative conclusions of our analysis - regarding differential cooperation and harassment activities, the existence of involuntary unemployment, and the effect of the incumbent workforce on wage setting - continue to hold.
APPENDIX B: OUTPUT-RELATED WAGE CONTRACTS

The following are illustrative formal arguments about why firms and their insiders might not find output-related remuneration schemes preferable to time-rate wages. In the real world, both output-related and time-rate schemes do exist, but the latter are prevalent. Accordingly, the analysis below is not meant to demonstrate the nonexistence of output-related schemes, but rather to present particularly simple models which indicate how difficulties in running such schemes could arise.

The Monitoring-Cost Argument

We extend our analysis to take into account that the firm faces a random lump-sum cost of production: with probability $\theta$ ($0 < \theta < 1$) this cost is $T_1$ and with probability $(1 - \theta)$ it is $T_2$, where $T_2 > T_1 > 0$. We consider a profit-sharing scheme in which the insiders receive a fixed proportion $\lambda$ ($0 < \lambda < 1$) of the firm's profit. (An analogous monitoring-cost argument can be made for the case in which just revenue is being shared.) Each insider receives an equal share of the profit. We assume all agents to be risk-neutral.

Suppose that the firm does not have to pay any penalty when it is caught misrepresenting its fixed cost. Then it is clearly in the firm's best interests always to announce a fixed cost of $T_2$. For when the actual fixed cost is $T_1$, the firm will understate its profits and thereby have a chance to retain a larger profit share than it could have achieved by telling the truth.

Suppose that the insiders, on their part, have the option of monitoring the firm's fixed cost. The monitoring costs are assumed to rise with the proportion of fixed-cost events which the insiders succeed in observing objectively. Let $\rho$ stand for this proportion and let the associated monitoring costs be $c = c(\rho)$; $c(0) = 0$, $c' > 0$, $c'' > 0$. 
Suppose that insiders' gain from monitoring simply lies in this: when the fixed cost is $T_1$ and when the insiders have succeeded in observing it, the firm is obliged to accept this figure in the computation of profits. In this manner, the monitoring activity enables the insiders to gain a larger profit share than they could otherwise have achieved. Measuring the monitoring activity via $\rho$, the insiders' opportunity cost of imperfect information may be expressed as $\lambda \cdot (T_2 - T_1) \cdot \theta \cdot (1 - \rho)$.

Thus, the total opportunity cost associated with monitoring is $\tau = \lambda \cdot (T_2 - T_1) \cdot \theta \cdot (1 - \rho) + c(\rho)$. The first term is an expected transfer from the insiders to the firm; the second term may be interpreted as a resource cost. The insiders choose a monitoring level $\rho = \rho^*$ which minimizes $\lambda$. Assuming for simplicity that complete monitoring ($\rho = 1$) is not worthwhile, the relevant first-order condition (for an interior optimum) is

$$\frac{\partial \lambda}{\partial \rho} = \lambda \cdot (T_2 - T_1) \cdot \theta + c'(\rho^*) \geq 0, \quad \frac{\partial \lambda}{\partial \rho} \cdot \rho = 0.$$

Let us now turn to the overall opportunity set of the firm and its insiders under profit sharing. The firm's expected net profit is

$$\pi = (1 - \lambda) \cdot \pi^G + \lambda \cdot (T_2 - T_1) \cdot \theta \cdot (1 - \rho)$$

where gross profit under truth telling is

$$\pi^G = f(a_I \cdot L_I + a_E \cdot L_E) - W \cdot L_I - R \cdot L_E - \theta \cdot T_1 - (1 - \theta) \cdot T_2.$$

$R$ is now defined as the reservation wage under profit-sharing, and $W$ is now defined as the time rate component of the insider's pay.

The overall expected pay of an insider is

$$\Omega = W + (1/L_I) \cdot \sigma \cdot \pi^G - \sigma \cdot (T_2 - T_1) \cdot \theta \cdot (1 - \rho) - c(\rho).$$
By maximizing $\Omega$ subject to $\pi \geq \text{constant}$, with respect to the arguments $L_I$, $L_E$, $a_I$, $a_E$, and $\rho$, it can be shown that, for any given incumbent workforce $(m)$ and profit-sharing coefficient $(\lambda)$, the Pareto efficient wage-employment combinations (which we will denote by "*") involve full insider-insider and insider-entrant cooperation ($a_I = a_E = A$), no monitoring ($\rho = 0$), and full employment ($W = R$). The associated combinations of $\hat{\pi}$ and $\hat{\Omega}$ (where $\hat{\pi} = (1 - \lambda) \cdot \hat{\Theta} + \lambda \cdot (T_2 - T_1) \cdot \Theta$, and $\hat{\Omega} = \hat{R} + (1/m) \cdot \lambda \cdot \hat{\Theta} - \lambda \cdot (T_2 - T_1) \cdot \Theta$) are pictured by the wage-profit frontier $WP_1$ in Figure A1. As $\lambda$ is raised from zero to unity, we move from $\alpha$ to $\beta$.

In the non-cooperation equilibrium the firm's profit is $\pi_n = f(A \cdot m) - W_n \cdot m - \Theta \cdot T_1 - (1 - \Theta) \cdot T_2$ and the insider's pay is $W_n$ (where "n" stands for "non-cooperative equilibrium"). This is depicted by Point $E_n$.

Now consider the profit-sharing equilibria corresponding to the feasible values of $\lambda$. For the sake of argument, suppose that the profit-sharing scheme "works" in the sense that it induces the insiders to cooperate fully with each other and with entrants (so that $a_I = a_E = A$ and $W = R$). If in addition $\rho = 0$, then the Pareto-efficient wage-profit frontier is the same as that under profit-sharing. The reservation wage is denoted by $R(\rho = 0)$ in Figure A1.

Can the firm find a $\lambda$ such that a point on the Pareto-efficient wage-profit frontier can be attained? Clearly not, if $\rho^* > 0$, because a positive $\rho$ means that the insider bears a positive cost of monitoring ($c(\rho^*) > 0$) and thus the wage-profit frontier shifts to the left. Furthermore, the total opportunity cost of monitoring ($\tau$) must be lower when $\rho = \rho^* > 0$ than when $\rho = 0$; hence, the locus $\hat{R}(\rho^*)$ lies beneath $\hat{R}(\rho = 0)$ in Figure A1.
FIGURE A1: Profit Sharing and the Non-cooperative Equilibrium
If the leftward shift of the wage-profit frontier is sufficiently large—as illustrated by WP_2 in Figure Al—then no points on this frontier will be Pareto-superior to point E_n.

The Risk-Aversion Argument

As in the monitoring-cost argument, we suppose that the firm faces a random fixed cost, but now it is not necessary to describe its distribution except to specify that it has a constant mean (\mu_T) and variance (\sigma_T^2). The firm is assumed to be risk-neutral, whereas each worker is risk-averse.

We consider a profit-sharing scheme of the sort described above (although the basic underlying idea of the risk-aversion argument also holds when there is revenue-sharing or when \lambda depends on profit or revenue.) We assume that the scheme succeeds in encouraging full cooperation. Then the firm's profit will be \hat{\pi} = (1 - \lambda) \cdot \pi^G, where \pi^G = f(A \cdot m + A \cdot L_E) - R \cdot (m + L_E) - \mu_T, and the insider's expected pay is \hat{\Omega} = R + (1/m) \cdot \lambda \cdot \pi^G. By varying \lambda, we trace out a wage-profit frontier, say, WP_1 in Figure Al. As above, the profit-sharing scheme will be implemented only if \hat{\pi} > \pi_n.

Moreover, let \sigma_T be the insider's measure of the riskiness of the fixed cost. Then the risk which the insider must bear under the profit-sharing scheme is \sigma_\hat{\Omega} = (\lambda/m) \cdot \sigma_T. The insider is assumed to have a well-defined utility function U = U(\hat{\Omega}, \sigma_\Omega), U_1 < 0, U_2 < 0. The more risk-averse the insider is, the higher is reservation wage for any given level of \hat{\Omega}. If the reservation wage at every \lambda is sufficiently high—as illustrated by \hat{R} in Figure Al—then there exists no \lambda such that the insider receives at least the reservation wage and the firm receives at least \pi_n.
The Market-Power Argument

This argument examines the conditions under which a profit-sharing scheme can induce insiders to cooperate fully with entrants (as well as with each other). (It is straightforward to make an analogous argument with regard to revenue-sharing.) For simplicity, we ignore the fixed costs above and consider a profit-sharing scheme of the sort described above. We will consider nonlinear schemes below.) Let the firm's net profit be

$$\pi = (1 - \lambda) \cdot \{f [a_1 \cdot L_1 + a_i \cdot L_i] - W \cdot L_i - R \cdot L_E\}$$

and the insider's pay be

$$\Omega = (1 - \lambda) \cdot W + (1/L_i) \cdot \{f - R \cdot L_E\}$$

In the non-cooperative equilibrium with retirements, the firm's time-rate wage bill is $R \cdot (A \cdot m + L_E^*)$. By (2b),

$$\frac{\partial \pi}{\partial L_E} = f'(A \cdot m + L_E^*) - R = 0. \text{ Thus, } A \cdot m + L_E^* = g(R).$$

Substituting this into $\pi_n = f(A \cdot m + L_E^*) - R \cdot (A \cdot m + L_E^*)$ yields

$$\pi_n = f[g(R_n)] - R_n \cdot g(R_n),$$

where $g = \left(f'\right)^{-1}$. Furthermore, under full cooperation, gross profit is

$$\pi_c^E = f[A \cdot (m + L_E^*)] - R \cdot (m + L_E^*) \text{ (since the insiders' time-rate wage falls to the reservation wage when there is full cooperation). By (2b),}$$

$$\frac{\partial \pi_c^E}{\partial L_E} = A \cdot f'(A \cdot (m + L_E^*)) - R = 0. \text{ Thus, } m + L_E^* = \frac{1}{A} \cdot g(R/A) \text{ and the maximum gross profit becomes}$$
\[ \pi_c^g = f[g(R_c/A)] - (R_c/A) \cdot g(R_c/A), \]

where \( R_c \) is the reservation wage under full cooperation.

The profit-sharing scheme will be put into operation only if the following two conditions are met:

(i) The firm earns at least much net profit under profit-sharing as in the non-cooperation equilibrium, i.e. \( (1 - \lambda) \cdot \pi_c^g \geq \pi_n \).

(ii) The insiders have an incentive to cooperate fully with the other employees, i.e. \( (\partial \phi/\partial a_i^I), (\partial \phi/\partial a_E^i) > 0 \).

(A further condition, which however plays no role in the analysis below, is that the insider's pay is at least as large under profit-sharing as in the non-cooperation equilibrium.)

From the expressions for \( \pi_n \) and \( \pi_c^g \), it is clear that condition (i) holds only if \( \lambda \) falls short of some positive critical value:

\[ \lambda < \lambda_1. \] (Proof: Let \( \phi = \pi_c^g (1 - \lambda) - \pi_A \). Then \( (\partial \phi/\partial \lambda) < 0 \).

Moreover, \( \phi < 0 \) when \( \lambda = 1 \), and \( \phi > 0 \) when \( \lambda = 0 \). In other words, the firm has an incentive to institute profit sharing only if the profit-sharing coefficient is "sufficiently small".}

To investigate condition (ii), we begin by specifying the insider \( i \)'s decision-making problem.

Maximize \[ \Omega^i = (1 - \lambda) \cdot W_i + (1/L_i) \cdot [f[a_i^L \cdot L_i + a_E^L \cdot L_E] - W_i \cdot L_i - R \cdot L_E] \]

subject to \( (1 - \lambda) \cdot a_i^I \cdot f' - W \geq 0 \)

\( (1 - \lambda) \cdot a_E^i \cdot f' - R \leq 0 \)

and where \( (\partial a_i^I/\partial a_i^I), (\partial a_E^i/\partial a_E^i) > 0 \). Recognizing that the constraints imply that \( W_i \leq (a_i^I/a_E^i) \cdot R \), which must hold as equality when \( W_i \) is maximized, the problem above reduces to
Maximize

\[
\frac{a_i}{a_I^*, a_E^*} = (1 - \lambda) \frac{a_I}{a_E} + \frac{\lambda}{m} \cdot \left\{ \frac{R}{a_E} \cdot (1 - \lambda) - \frac{R}{a_E} \cdot g\left( \frac{R}{a_E} \cdot (1 - \lambda) \right) \right\}
\]

Clearly, \( \partial \Omega^i / \partial a_I^i > 0 \) and thus, in the Nash equilibrium, \( a_I^* = A \). Moreover,

\[
\frac{\partial \Omega^i}{\partial a_E^i} = -\frac{A^2 a_I^i}{2 a_E^i} \cdot R - \frac{1}{m} \cdot g' \cdot R \cdot \left( \frac{\lambda^2 a_E^i}{2 a_E^i} \cdot f' \right)
\]

This tells us that, as insider-entrant cooperation is increased, there are two offsetting effects on the insider's pay:

- his economic rent from cooperative activity falls and, with it, his time rate wage (the first right-hand term above), and
- the rise in entrants' productivity raises the profit-sharing component of his pay (the second right-hand term above).

Whether or not the profit-sharing scheme can induce insiders to cooperate with the entrants depends on the relative magnitudes of these two effects. Moreover, \( \partial \Omega / \partial a_E > 0 \) only if \( \lambda > \lambda_0 \), where \( 1 > \lambda_0 > 0 \).

(Proof: \( \frac{\partial \Omega^i}{\partial a_I^i} > 0 \iff \phi = A + \frac{g'}{m} \cdot \left( \frac{\lambda^2}{1 - \lambda} \right) \cdot f' < 0 \) and \( \partial \phi / \partial \lambda < 0 \). Moreover,

\( \phi = \rightarrow -\infty \) when \( \lambda \rightarrow 1 \), \( \phi > 0 \) when \( \lambda = 0 \).) In other words, the insiders have an incentive to cooperate with the entrants only if the profit-sharing coefficient is "sufficiently large".
APPENDIX C: BUSINESS VARIATIONS, WAGE DYNAMICS, AND LAYOFFS

Consider the effect of variations in business conditions - product demand, technology and fixed-factor availability - on wages and employment by including a shift parameter $\varepsilon$ in each firm's revenue function:

$$\varepsilon \cdot f(a_I \cdot L_I + a_E \cdot L_E).$$

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. Conversely, 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 regimes, 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 labor, i.e., an "industry". All that is necessary is that the size of the available labor force is well-defined, so that the concept of unemployment applies. This means that labor 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 \( \epsilon \) 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 the above regimes in turn.

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

Here the value of \( \epsilon \) 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 \( \epsilon \) are not symmetric.

We first consider a fall in \( \epsilon \). For the moment, assume that all firing is governed by a seniority system. Thus, when \( \epsilon \) falls by a particular amount, each insider knows with certainty whether or not he will be fired.

In Figure A2, a fall in \( \epsilon \) is illustrated by a downward shift of the economy-wide insider demand curve from IDC to IDC'. Suppose that the economy was initially in a stationary equilibrium, depicted by a point segment \( E_1 E_2 \) (Regime II). After the decline in business activity, the firms no longer have an incentive to employ the original insider workforce at the original insider wage.

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. Thus, an economy which, say, starts at point \( e_1 \) finishes at point \( e_2 \).
FIGURE A2: Wage-Employment Decisions in Regime (1) under Seniority.
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 $R_I$, the laid off workers will attempt to regain their jobs by offering to work at a lower wage (lying between $W_0$ and $R_I$).

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 A2, a downward movement from a point on $E_1E_2'$ to the $R_I^*$ line) or the firms find it profitable to employ the entire original workforce (in Figure A2, a downward movement from a point on $E_1'E_2'$ to a point on $E_1E_2$). 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). Thus, the firms have no incentive to employ the laid off workers for any wage in excess of $R_I^*$.

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 a result — once again — there are layoffs in the absence of wage reductions.

(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 $W_0$, and
(b) employing only the lay-off candidates at a wage $W_1$, which is less than $W_0$,

where the workers within each group cooperate fully. The profitability of choosing the latter depends not only on the differential $(W_0 - W_1)$, but also on the relative size of the two groups of workers. For simplicity, we assume that the fall in $\varepsilon$ sufficiently small (and consequently that the size of the latter group is sufficiently small), so that (a) is more profitable.)

It may be objected that, in practice, 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 withdraw 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: $\varepsilon$ rises and the insider demand curve (Figure A2) shifts upward from IDC' to IDC. As explained in Section 5D, the insiders will find it worthwhile to raise their wage until either their marginal profitability is reduced (as shown by the arrows from $e_0$ to $e_1$, and from $e_2$ to $e_3$ in Figure A2), or entrants' marginal profitability becomes equal to that of the insiders (as shown by the arrow from $e_4$ to $E_1$ in the Figure).
From this, we can see that fluctuations in business conditions (viz., a succession of upward and downward movements in \( \epsilon \)) give rise to the following movements in employment and wages.

**Proposition:** For the economy above under Regime (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 \( W^*_I < A \cdot (1+H) \), each business downswing is characterised by layoffs at constant wages and each upswing by rising wages at constant employment.
- For \( W_I = A \cdot (1+H) \), business fluctuations are characterised by employment swings at constant wages.

This intertemporal development is pictured by the arrows of Figure A2.

Thus far, we have assumed a seniority system where, for any given decline in \( \epsilon \), 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 absence of a seniority system. 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 stationary equilibrium (Scenario II, characterised by the values \( \epsilon_0, m_0 \) and \( W_0 \)), whereupon \( \epsilon \) falls to \( \epsilon_1 (\epsilon_1 < \epsilon_0) \). It is evident that, at the new equilibrium (in the long-run and short-run), no entrants are hired. Thus, employment is confined only to insiders and, from among the insiders, only to that number who are marginally profitable: \( \epsilon_1 \cdot a \cdot f'(m) = W \). Rewriting this equation, the new stock of insiders is \( m_1 = g[W/(\epsilon_1 \cdot a)] \) where \( g = (f')^{-1} \).
Thus, each insider's retention probability is
\[ \rho = \frac{(m_0 - m_1)/m_0}{m} \] for \( m < m_0 \), and \( \rho = 1 \) for \( m \geq m_0 \).

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

\[ m_1 = g\left[\frac{W_0}{\varepsilon_1 \cdot a}\right] < m_0 = g\left[\frac{W_0}{(\varepsilon \cdot a)}\right]. \]

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 \( W^i = W_0 - Z \) (where \( Z \) is a positive and infinitesimally small number), then his retention probability would rise to unity. Since the rise in \( \rho \) is finite whereas the fall in \( W^i \) is infinitesimal, his expected income would rise. Thus \( W = W_0 \) cannot characterise the new Nash equilibrium.

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

(a) their retention probability rises to a \( Z \)-neighbourhood beneath unity (at which point, an infinitesimal drop in \( W^i \) is matched by an infinitesimal rise in \( \rho \)), 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 \( \hat{W} \)) at which the insider workforce remains at its original level (\( m_0 \)): \( \hat{W} = \varepsilon_1 \cdot a \cdot f'(m_0) \) (where \( \hat{W} < W_0 \) since \( \varepsilon_1 < \varepsilon_0 \)). This is illustrated by the arrow from Point \( e_1 \) to \( e_2 \) in Figure A3. 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. $e$ rises - insider wages react in the same way as under a seniority system: at the initial $m_0$ and $W_0$, 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 $W_I = A \cdot (1+H)$ (i.e. the RPC is reached) or until the insiders' marginal revenue and marginal cost are brought into equality (i.e. the insider demand curve is reached).

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

**Proposition:** For the economy above under Regime (i), if there is no seniority system, there is "bounded wage flexibility", in the following sense:

- For $W < A \cdot (1+H)$, business fluctuations are characterised by insider wage swings at constant employment.

- If $W$ reaches the level of $A \cdot (1+H)$ in the course of an upswing, the insider remains at that level while employment expands.

The former possibility is illustrated by the movement between Points $e_1$ and $e_2$ (or Points $e_3$ and $e_4$) in Figure A3; the latter is illustrated by the movement from $e_0$ to $e_1$.

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.

**Regime (ii): Business Variations Anticipated in the Employment but not the Wage Decision:**

Here the value of $e$ 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 $e$ (which is assumed to have a constant
FIGURE A3: Wage-Employment Decisions in Regime (i) in the Absence of Seniority.
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 Regime (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 \( \varepsilon \) 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 \( 0 \leq m_i \leq m_0 \) or the insider wage exceeds \( A \cdot (1 + H) \).

Clearly, the more "senior" the worker is, the lower his \( m_i \). Furthermore, he knows that the firm's employment of insiders is given by its insider profitability locus: \( \varepsilon \cdot a \cdot f'(m) = W_i \). (Note that the insider knows that the firm knows the value of \( \varepsilon \) before the employment decision is made (in accordance with the information structure underlying Scenario (ii)). Thus, \( \varepsilon \) appears as an exogenous parameter in the insider profitability locus).

Thus, the \( i \)'th insider's retention probability is

\[
\rho_i = \Pr \{ \varepsilon > \frac{W_i}{a \cdot f'(m_i)} = \Gamma_i \}
\]

The density of \( \varepsilon \), \( G(\varepsilon) \), is illustrated in Figure A4, and \( \rho_i \) is given by the shaded area:

\[
(A1) \quad \rho_i = \int_{\Gamma_i}^{e} G(\varepsilon) \, d\varepsilon,
\]
where, \( \bar{\epsilon} \) is exogenous, and \( m_i \) is exogenously given by the seniority rule. We assume that \( G(\epsilon) > 0 \) for \( \underline{\epsilon} < \epsilon < \bar{\epsilon} \) (where \( \underline{\epsilon} \) and \( \bar{\epsilon} \) are the lower and upper bounds on \( \epsilon \), 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:

\[
Y_i = \rho_i W + (1 - \rho_i) B,
\]

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

\[
(A2) \quad \frac{\partial Y_i}{\partial W_i} = \rho_i + \frac{\rho_i}{a \cdot \rho_i} \cdot W_i - R_i = 0.
\]

If the second-order condition is satisfied, the internal optimum is \( W_i^* \), given the insider's position of the seniority scale (i.e., given his \( m_i \)). Insiders with different seniority will demand different wages.

We let \( W_i^* \) rise as seniority increases (i.e., as \( m_i \) falls). In particular,

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

Then

\[
\frac{\partial W_i}{\partial m_i} \bigg|_{\theta_i = 0} = - \frac{\partial \theta_i / \partial m_i}{\partial \theta_i / \partial W_i}.
\]

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

\[
\rho_i'' \cdot W_i - B \cdot \frac{1}{a \cdot f_i} > -2.
\]
Furthermore:

\[ \frac{\partial \theta_i}{\partial m_i} = - \frac{\rho_i'f''}{a(f')^2} \cdot \left[ 2 \cdot W - B - \frac{\rho_i''}{\rho_i'} \cdot \frac{W_i}{a'p'} \cdot (W_i - B) \right], \]

From these two expressions we obtain a positive upper bound for

\[ (\frac{\partial \theta_i}{\partial m_i}) \cdot [\rho_i'f''(B)]/[a(f')^2] > 0. \]

Thus we are free to make the plausible assumption that \( (\frac{\partial \theta_i}{\partial m_i}) < 0 \), so that \( (\frac{\partial W_i}{\partial m_i})|_{\theta_i=0} < 0 \).

The wage-employment decisions regarding the i'th insider are pictured in Figure A5. The insider profitability constraint is given by

\[ \varepsilon \cdot a \cdot f'(m) \geq W \]

and the relative profitability constraint is given by

\[ W_i \leq a \cdot W_E. \]

If the i'th insider's \( W^* \) 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 \( \varepsilon \) 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. (However, note that 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.)

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 \( \varepsilon \) is known and the associated employment decision occurs). For any historically given insider workforce, the insiders choose their wage as follows:
FIGURE A4: The Insider's Relative Probability

FIGURE A5: Wage-Employment Decisions in Regime (ii) under "Rigid" Seniority.
\[ \hat{W}_I^* = \min (\tilde{W}_I, \lambda \cdot (1 + H)) \]

where \( \tilde{W}_I \) is given by

\[ \frac{\partial Y}{\partial W} = \rho + \frac{\rho'}{a \cdot \pi} \cdot (\tilde{W}_I - B) = 0 \]

\[ \rho = \Pr \{ \varepsilon > \frac{\tilde{W}_I}{a \cdot f(m)} = \Gamma \} = \int_{\Gamma}^{\infty} \tilde{G}(\varepsilon) d\varepsilon. \]

This insider reaction function is pictured in Figure A6, along with an insider profitability constraint. Shifts in this constraint induce variations in employment at a constant insider wage.

These results may be summarised as follows:

**Proposition:** For the economy above under Regime (ii) (i.e., business fluctuations anticipated in the employment decisions but not the wage decisions), business fluctuations are characterised by employment swings while the wages distribution remain unchanged.


Here the value of \( \varepsilon \) 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

\[ \mu(\varepsilon) \cdot A \cdot f'(L_I) = W \quad \text{for} \quad L_I \leq m \]

\[ \mu(\varepsilon) \cdot A \cdot f'(L_I) > W \quad \text{for} \quad L_I > m, \]

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

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

\[ \mu(\varepsilon) \cdot A \cdot f'(m) = W, \]
as long as \( W \leq A \cdot (1+H) \). At this wage, all the current insiders remain employed.

Since the employment decision does not depend on the realised value of \( \varepsilon \), 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:** For the economy above under Regime (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 our three scenarios are summarised in Table 1.
## Table A1: Business Fluctuations and Wage-Employment Decisions

<table>
<thead>
<tr>
<th>Employment Decisions</th>
<th>Anticipated</th>
<th>Unanticipated</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wage Decisions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anticipated</td>
<td>For seniority system, bound wage - employment ratchet.</td>
<td>Constant wages and employment</td>
</tr>
<tr>
<td></td>
<td>For no seniority system, bounded wage flexibility</td>
<td></td>
</tr>
<tr>
<td>Unanticipated</td>
<td>Constant wages and flexible employment.</td>
<td>Constant wages and employment</td>
</tr>
</tbody>
</table>
1/ In other words, there are no "long-term" wage contracts (extending over the lifetimes of the employees). If such contracts are possible and if employees lack market power on entering the firms, then involuntary unemployment cannot exist.

2/ The assumption of wage setting by insiders is made only for expositional simplicity, as noted in Section 2B.

3/ Our conclusions would not be substantively affected if we would make the more general assumption that the firm (through supervision of its employees) monitors the cooperation and harassment activities imperfectly.

4/ This turns out not to be a restrictive assumption. Naturally, if the firm has a multi-period time horizon, it faces an inherently intertemporal problem, since the entrants hired in one period become insiders in the next. Appendix A extends our model to a two-period, overlapping-generations setting.

5/ Since $L_I \leq m$, the marginal incumbent may generate positive profit, as shown by the inequality in (2a). Since $L_B \geq 0$, the marginal potential entrant may generate negative profit, as shown by the inequality in (2b).

Finally, we assume that $A.f'(0) > 1$ so that — as shown in Proposition 1 — it is always profitable to the firm to employ some insiders: $L^*_I > 0$.

6/ This assumption could be derived from more basic postulates. For example, we could assume that each insider finds it disagreeable to harass the other insiders and then show that, in the Nash equilibrium (described below), no insider is able to achieve a higher wage by harassing other insiders. Thus, each insider chooses not to harass the other insiders.
Allowing the insider's cooperation and harassment activities to affect his utility directly has self-evident implications for our results. In practice, of course, this direct utility effect might be positive or negative. Whereas it is usually safe to assume that harassment activities are disagreeable to the harassors, the same cannot be said of cooperation activities. For example, there are direct utility gains from cooperation when an insider prefers to work in cooperation with entrants or other insiders than to work in isolation. On the other hand, direct utility losses from cooperation are conceivable as well, since an insider who cooperates may expend more "effort" than one who does not.

Recall that the entrants, unlike the insiders, are unable to perform harassment activities. Furthermore, note that \( H_E \) is the same for every entrant (since we have assumed that each insider harasses all entrants in equal measure).

The assumption that \( A \) is a constant is merely an expositional simplification. Our analysis could be easily be extended to cover the possibility that \( A \) is an increasing function of \( L_I \) (i.e. the more insiders there are, the greater the potential for cooperative activity). In that case, we would require that the marginal product of insiders (in the Nash equilibrium described below) diminishes as more insiders are hired.

\[
\frac{\partial (a \cdot f')}{\partial L_I} = A \cdot f'' + A' \cdot f' < 0.
\]

(This assumes that the demand curve for insider labor is downward sloping).

Proof: If the firm is not constrained by \( L_I \leq m \) in its maximization problem (1), then (by the first-order condition (2a)), its demand for insiders \( L^*_I \) rises with \( a_I \) and falls with \( W \). By (3a) and (4c), \( \max (a_I) = A \) and \( \min(W) = R_I = 1 \). Substituting these values into the
insider demand function (2a), as equality, yields (9a).

11/ The firm has no incentive to replace some (but not all) of its insiders by entrants, since the profit contribution from replacing one insider by one entrant is

\[ \phi = \frac{\partial \pi}{\partial L_E} - \frac{\partial \pi}{\partial L_I} = (W - R_E) - (A-1)\cdot f'(\lambda) < 0, \]

by (2a) and (2b), and

\[ \frac{d\phi}{dL_E} \bigg|_{dL_E = -dL_I} = (A-1)^2 \cdot f'' < 0. \]

Clearly, this applies to all three scenarios.

12/ The firm has no incentive to replace all of its insiders by entrants for the following reason. In the equilibrium for Scenario I, the firm's profit is

\[ \pi^*(I) = f[g(1/A)] - (1/A)\cdot g(1/A). \]

If the firm replaced all its insiders by entrants, its profit would be

\[ \hat{\pi} = f[g(1)] - g(1) \]

(since entrants do not harass one another and thus \( R_E = 1 \)).

\[ \pi^*(I) \] (which is described by the area under the insider demand curve and above the \( W^*(I) = 1 \) line in Figure 1 below) is greater than \( \hat{\pi} \) (which is described by the area under the entrant demand curve and above the \( W^*(I) = 1 \) line in the same figure).

13/ Proof: If \( m = m \), then \( L_E^* = 0 \), provided that \( a_E = 1 \) and \( R_E = 1+H. \)

(The reason is that, by (2b), \( \frac{\partial \pi}{\partial L_E} = -f''(A \cdot \overline{m}) - (1 + H) = 0. \)) If \( m < m \), then \( L_E^* > 0 \), for any feasible \( a_E \) and \( R_E \). (The reason is that

\[ \frac{\partial \pi}{\partial L_E} = a_E \cdot f''(A \cdot \overline{m}) - R_E > 0 \] for any feasible \( a_E \) and \( R_E \).

14/ Formally, this may be shown as follows. Since \( m \leq \overline{m} \) then, (by 11),
\( f'(A \cdot m) \leq 1 + H \). Since \( m \leq \bar{m} \), then (by (9)) \( A \cdot f'(A \cdot m) \geq 1 \). Therefore, \( 1 \leq A \cdot f'(A \cdot m) \leq A \cdot (1 + H) \). By the wage equation (7), we obtain (12b).

15/ The firm has no incentive to replace all of its insiders by entrants, for the following reason. In the equilibrium for Scenario II, the firm's profit is \( \pi^*(II) = f(A \cdot m) - A \cdot f'(A \cdot m) \cdot m \). In the equilibrium for Scenario III, the firm's profit is \( \pi^*(III) = f[g(1+H)] - A \cdot (1+H) \cdot m - (1+H) \cdot A \cdot \{(1/A) \cdot g(1+H) - m\} \). Observe that in Figure 1 below, \( \pi^*(II) \) and \( \pi^*(III) \) are described the areas under the insider demand curve, above the \( W^*(I) = 1 \) line, and to the left of the incumbent workforce \( m \) (where \( m \leq \bar{m} \leq \bar{m} \) for \( \pi^*(II) \) and \( m < m \) for \( \pi^*(III) \)). Clearly \( \pi^*(II) > \pi^*(III) \). The upper bound on \( H \), given in Footnote 17, implies that \( \pi^*(III) > \pi^* \). Consequently, \( \pi^*(II) > \pi^* \).

16/ Formally, it follows from \( m < \bar{m} \) that \( f'(A \cdot m) > 1 + H \). Thus, \( A \cdot f'(A \cdot m) > A \cdot (1+H) > 1 \). By the wage equation (7), we obtain (13a).

17/ Thus, we assume that \( 0 \leq H \leq H^C \), where \( H^C \) is the harassment level at which the profit from retaining all the incumbents and additionally hiring the profit-maximizing number of entrants \( \pi^*(III) \), defined in footnote 15 \) is equal to the profit from firing all the incumbents and hiring the profit-maximizing number of entrants instead \( \pi^* \), defined in footnote 12 \). In particular, \( H^C \) is a constant implicitly given by
\[
f[g(1+H^C)] - A \cdot (1+H^C) \cdot A \cdot \{(g(1+H^C)/A) - m\} = f[g(1)] - g(1), \text{ where } g = (f^-)^{-1}
\]

18/ Note that the length of the period under investigation is an important constituent of this definition. For example, an unemployed worker may be prepared to work for less than a current employee (under ICE) over a one-year period, but not a forty-year period. Suppose that our model were extended to depict workers who choose their wages and cooperation and harassment activities so as to maximize their lifetime utility, and suppose that the time period covered by our definition covered the entire lifetime of an entrant.
Then the entrant cannot be involuntarily unemployed in our analysis, simply because he receives his reservation wage in his first period of work and thus, he cannot prefer employment to unemployment under ICE.

19/ The ratio of the insiders' and entrants marginal products under identical conditions of employment is 
\[ \frac{\left( a_i \cdot f'(\lambda) \right)}{\left( a_E^{ICE} \cdot f'(\lambda) \right)} = \frac{a_i}{a_E^{ICE}} \]

20/ Clearly, \( 1 < x < A \), because the insider is able to engage in cooperative activity whereas the entrant is not. (If insiders and entrants had equal cooperative abilities, then \( x = 1 \); when insiders cooperate fully with each other but not at all with potential entrants, then \( \frac{a_E}{a_i} = A \).)

21/ Proof: \( \tilde{m} < \bar{m} \), since \( x > 1 \) (by footnote 20) and given the definition of \( \tilde{m} \) (in (19)) and \( \bar{m} \) (in (9)). Furthermore, \( \tilde{m} > \bar{m} \), since \( x < A \) (by footnote 20) and given the definitions of \( \tilde{m} \) and \( \bar{m} \) (in (11)).

22/ Formally, by Equation (14b), if \( a = 1 \), then \( \hat{H} = 0 \) and thus, by Footnote 17, \( H = 0 \). This implies that the insiders would be unable to erect entry barriers against the outsiders and thus there could be no involuntary unemployment.

23/ The assumption of random choice is made only for expository simplicity, guaranteeing that all workers have the same reservation wage. Had we assumed that workers retire after reaching a particular age, (a) the reservation wage would rise with age; (b) the firm would hire the youngest entrants available; and (c) it is the reservation wage of these entrants that is relevant to insider wage determination.

24/ Suppose that the incumbent workforce is \( \hat{m} (< \bar{m} ) \) when it first falls short of \( m \). In that period of time, the firm hires \( L^*_E = A \cdot (m - \hat{m}) \). Then, in the next period, the incumbent workforce becomes \( (1-r) \cdot \hat{m} + A \cdot (m - \hat{m}) \).
In general, \( m_t = (1-r) \cdot m_{t-1} + A \cdot (m - m_{t-1}) \). Assuming that \( r + A < 1 \), the incumbent workforce rises monotonically to its stationary level \( (A \cdot m) \cdot (r+A) \).
25/ We assume that firms do not know what the outsiders' reservation wages would be in the absence of harassment (e.g., they do not know whether these reservation wages are the same as those of the insiders). Thus they cannot infer the presence of harassment by observing the entrant wages (in the event that Scenario III obtains).

26/ For instance, managers often have considerable latitude in their choice of profit and revenue accounting practices (e.g., how to price intermediate goods and inventories, how to evaluate the firm's debt in real terms, how to treat depreciation and obsolescence).
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