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Labour turnover, insider morale and involuntary unemployment

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Seminar Paper No. 310

LABOUR TURNOVER, INSIDER MORALE AND
INVOLUNTARY UNEMPLOYMENT

by
Assar Lindbeck
and
Dennis Snower

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LABOUR TURNOVER, INSIDER MORALE AND INVOLUNTARY UNEMPLOYMENT

Assar Lindbeck* and Dennis Snower**

1. Introduction

A basic question in the theory of unemployment is why the unemployed workers do not succeed in underbidding those who are employed. The failure must lie with either the sellers or the buyers in the labour market (or both). On the one hand, the unemployed may not find it in their best interests to offer work at less than the prevailing wages; on the other, the employers may have no incentive to accept such offers. One or the other case must be made before persistent involuntary unemployment can be explained as the outcome of free market behaviour.

This paper responds to the challenge by developing a simple idea - one that is commonplace in business circles, but usually neglected in economic theory: if employers were to exchange their current employees with comparatively low-wage outsiders, this would have a significant, adverse effect on the morale of the workforce. The resulting loss in productivity could more than outweigh the saving of labour cost. For this reason the employers do

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not permit indiscriminate underbidding. As a consequence, the current employees (the "insiders") - being aware of their employers' restraint - are able to raise their wages above what is necessary to induce the unemployed to work, without themselves facing prompt dismissal.

We build a theory of persistent involuntary unemployment on this foundation. Needless to say, it is not meant to be a complete explanation; yet it does appear to have a powerful intuitive appeal as a building block within the large edifice of unemployment theory.

1a. Related Literature

The standard literature on involuntary unemployment has had varying degrees of success in passing the test posed by the underbidding problem. In the "wage rigidity approach",¹ where the wage is assumed fixed at a level generating excess labour supply, we are not told why employers adhere to this wage. There is cheaper labour about; so why don't they use it? They may, of course, be subject to wage-price controls, but in that case the involuntary unemployment does not arise from free-market behaviour.

The "labour union approach"², in its simplest guises, is not a complete explanation either. Naturally, labour unions may be responsible for setting wages which are incompatible with full employment. But why do employers not exchange the unionised workers for their non-unionised counterparts? In much of the literature on unions and unemployment, the entire labour force is assumed to be unionised so that there are no non-unionised workers around to do the underbidding. In that case, however, the unemployment is not wholly involuntary. Union power over its membership ensures that no one is willing to work for less than the prevailing wage, although some (the

unemployed) would be happy to do so in the absence of their union affiliation. Thus, the unemployment is (in Corden's terms³) "union-voluntary" and "membership-involuntary".

Yet if non-unionised workers are admitted to exist, the question why they do not replace the union members must be faced directly. In Lindbeck and Snower (1984a and b) unions are able to retaliate for the dismissal of their members and this threat eliminates the employers' incentive to hire the underbidders. Here the union wage depends not only on the union's objectives and the labour demand function, but also on the mechanics of this threat.

Aside from the labour union approach, there are two further - and logically successful - candidates as free-market explanations of involuntary unemployment: the "efficiency wage approach" and the "insider-outsider approach". The former is concerned with the conflict of interest between employers and workers; the latter with that between employed and unemployed workers.

The "efficiency wage approach" starts from the premise that employers have less information about the productivities of their individual employees than these employees do. The employers are assumed to set wages and they use them as a screening device for productivity. If the asymmetric information problem is one of adverse selection⁴, then a rise in the employer's wage offer attracts workers of higher productivity (on average). On the other hand, if moral hazard⁵ is the culprit, then a wage rise induces workers to put more effort into their jobs and thereby raise their productivity. In either case, profit-maximizing employers will set the wage so that the marginal revenue from a wage rise (via productivity) is equal to the associated marginal cost. This profit-maximizing wage is compatible

with involuntary unemployment. The employers may have no incentive to accept the lower wage offers of those who are out of work, because if they did so they might reduce their marginal revenue by more than their marginal cost.

The "insider-outsider approach" sees involuntary unemployment as a problem which the "insiders" (the employed workers) impose on the "outsiders" (the unemployed workers). It is not malice, but simply self-interest, that makes them do so. The employer must pay a cost whenever he exchanges an insider for an outsider. This turnover cost generates bilateral monopoly power and the insiders are assumed to capture at least some of it. Consequently, the insiders receive a wage above that at which the outsiders would be willing to work, but the outsiders do not succeed in underbidding the insiders on account of the turnover cost.

In Lindbeck and Snower (1984a and b) the turnover cost takes the form of firing and hiring expenditures as well as insider-outsider productivity differentials (due to on-the-job training). The present paper also adopts the insider-outsider approach, but now the turnover cost is quite different. As noted, it is to be found in the effect of labour turnover on the morale of employees.

Both the efficiency-wage and the insider-outsider approaches rest on ideas which appear to be in agreement with the practical reactions of business people to unemployment. When asked why they don't fire more of their costly insiders and hire some cheap outsiders instead, they offer a number of staple replies:

- The high-quality employees would seek employment elsewhere while the low-quality employees would stay.

- The remaining insiders, if unionised (formally or informally) would retaliate by strike or work-to-rule.
- The costs of firing and hiring (including those of training) are too high.
- The morale of the remaining workers would sink and thereby also their productivity.

The first three replies have been rationalised by particular variants of the efficiency wage approach, the union approach, and the firing-hiring approach, respectively. This article deals with the fourth reply.

1b. The Morale Effect of Labour Turnover

We assess a worker's morale in terms of the effort he puts into his job. The critical issue underlying our analysis is why this effect should be related to labour turnover. Our answer hinges on the employers' imperfect information about the effort of their employees and the consequent remuneration package which the employees receive.

Since employers cannot monitor effort accurately or instantaneously, they remunerate workers in accordance with their output (rather than their effort) and this remuneration is given in response to past (rather than present) job achievements. We consider a remuneration package which contains three elements: (i) a "time-rate" component, (ii) a "piece-rate" component, containing an indirect effort reward in the form of productivity premia or promotions, and (iii) a cut-off productivity (i.e. a minimum productivity level which the worker must achieve to retain his job).

Our point of departure is that effort in one time period is stochastically related to output in the next period. A worker who exerts enough effort in one period to pass the cut-off productivity is rewarded by receiving a time-rate wage and a piece-rate premium in the next period. Yet a worker who falls short of this mark loses both. The employers determine labour turnover within their firms by varying the cut-off productivity (voluntary quits are not considered). Thus changes in labour turnover generate changes in the rewards which workers receive for their effort.

It is for this reason that effort depends on labour turnover. The employers, accordingly, use their turnover rates as a screening device for effort.

The relation between effort and turnover hinges on a substitution and an income effect. Suppose that the employer raises the turnover and thereby reduces the marginal effort reward. By the substitution effect, work effort falls: an employee who is more likely to be fired is less likely to reap the effort reward and thus will work less hard than heretofore. The income effect pulls in the opposite direction: the extra risk of losing his job frightens the employee into working harder, in order to stabilize his expected income.

According to our story, the outsiders are successful in underbidding the insiders until either (a) the insider wage falls to the level of the reservation wage, so that involuntary unemployment disappears, or (b) the overall effect of effort on turnover is negative (with the substitution effect dominating the income effect). In the latter case, the firm faces a turnover cost, namely, the foregone effort of its employees.

In this latter case, we have persistent involuntary unemployment.

Even if the insiders receive a wage package in excess of that at which the outsiders would be willing to work, employers have no incentive to exchange all their insiders for outsiders, on account of the turnover cost. A profit-maximising employer sets the turnover rate so that the marginal revenue from retaining an insider (via insider morale) is equal to the marginal cost of doing so (i.e. the difference between the insider wage and the wage required by an outsider). At this point, the outsiders cannot underbid the insiders. The resulting employment is involuntary in the sense that outsiders unsuccessfully seek jobs at the prevailing wage and are identical to insiders in terms of their potential job performance.

Section 2, which follows, provides a skeleton model of our rationale for involuntary unemployment. We then proceed to cover the skeleton with flesh and blood. Section 3 shows how the firms use labour turnover as a screening device for effort. On this basis, Section 4 gives a choice theoretic explanation of the morale effect of labour turnover. Section 5 shows how firms take this effect into account in their employment decisions. Section 6 describes the labour-market equilibrium with involuntary unemployment. Section 7 spells out what our analysis has to say about the influence of job security on worker productivity. Finally, Section 8 contains concluding remarks.

2. A Skeleton Model

To get a bird's eye view of the phenomenon we are isolating, let us simply presuppose the morale effect of labour turnover and examine how this may generate involuntary unemployment. Our aim here is to provide a transparent analytical argument, which may serve as backdrop to rationales and refinements introduced later.

Our economy contains three groups of workers:

- (i) "insiders" (who are currently employed and receive a "high" insider wage),
- (ii) "entrants" (who have just been employed and have committed themselves to a "low" entrant wage for a limited time period), and
- (iii) "outsiders" (who are unemployed).

The critical difference between insiders, entrants and outsiders lies in the degree of competition they face and hence their bargaining strength. The insiders and entrants are capable of affecting their firms' output by varying effort, whereas outsiders have no such possibility. When firms raise their labour turnover rate, the insiders and entrants may reduce their effort and this possibility gives them potential monopoly power. We assume that they are able to exploit at least some of this power and thus drive the insider wage above the reservation wage.

Let there be no inherent differences in skills among insiders, entrants and outsiders. The outsiders seek to gain jobs by offering to work - over a limited period of time which we call his "initiation period" - for an entrant wage less than the insider wage. The entrants (like the insiders) exploit some of the potential monopoly power which come with their jobs and thus the entrant wage (like the

insider wage) exceeds the reservation wage.

Once an outsider has been hired by a firm (and thereby turns into an entrant) he faces precisely the same imperfectly competitive environment as an insider. Consequently, he has the same incentives as an insider: it is no longer in his best interests to work at the entrant wage; rather, he now aims for the insider wage. Once his initiation period is over, he becomes an insider.

Let e be effort (per worker per unit of time) for both insiders and entrants and let σ be a worker's perceived job retention probability. Then presupposing a negative morale effect of labour turnover, we write:

$$(1) \quad e = e(\sigma), \quad e' > 0,$$

and we also assume that $e'' < 0$.

As noted, labour remuneration contains a "time-rate" and a "piece-rate" component. Let the former be W for an insider and R for an entrant. Let the latter component, for an entrant and an insider, be the productivity premium $a \cdot e_{-1}$, where e_{-1} is the previous period's effort and " a " is a positive constant. (In our skeleton model, we gloss over the difficulty that effort is not accurately monitored and thus the productivity premium should be related to the average, rather than the actual, value of the random variable e_{-1} . This matter is given explicit attention in the subsequent sections). One unit of effort in the present period generates one unit of output in the following period. For simplicity, we assume that the initiation period and the lag between effort and output both coincide with the period of our analysis. The wage payments are measured in real terms, viz, units of the produced good.

Observe that we have let entrants and insiders respond

identically to labour turnover and receive identical productivity premia (received, in each case, after a one-period lag). These assumptions are dictated by our approach to involuntary unemployment. If entrants and insiders would not have identical job characteristics (e.g. if they would differ in terms of their productivities or their associated costs of training and firing), then the outsiders seeking work at the prevailing wage would not be offering the same labour services as the insiders. Thus, it would be open to dispute whether the outsider's unemployment is involuntary. In present analysis, however, entrants and insiders have identical job characteristics, in the sense that if they were given the same employment opportunities, they would behave in exactly the same way. Yet it turns out that they do not receive the same opportunities, because employers realise that exchanging insiders for entrants would adversely affect worker morale.

Let the wage rates R , W and a be determined through a bargaining process between employers and their employees. Our analysis is not concerned with the precise nature of the bargain, provided that it satisfies two general conditions:

$$(2a) \quad W + a \cdot e_{-1} > R$$

$$(2b) \quad (1 - a) > 0.$$

The first (viz, that insider income exceeds entrant income) gives entrants an incentive to turn into insiders. (Note that, in any particular time period t , the streams of income for the insiders and the entrants beyond period t are identical. We will assume that insiders and entrants have identical utility functions, which depend on income and effort, and we will show that they put equal effort into their jobs.) The second, (viz, that any provision of effort

generates more revenue to the firm than labour cost) gives the firms an incentive to encourage effort. We opt for the particularly simple assumption that R , W and a are constants, satisfying (2a) and (2b). (It is worth emphasising that our argument does not depend on this assumption. Our analysis could be grafted onto any bargaining model which satisfies (2a) and (2b) above.)

Each firm maximizes its profit subject to a production function. Let L_I be the number of insiders retained and L_E the number of entrants hired by the firm in the course of one time period. Over this period, the output of the firm is $e \cdot (L_I + L_E)$ and its labour cost is $(W + a \cdot e_{-1}) \cdot L_I + R \cdot L_E$.

Since our analysis centres on the implications of replacing insiders by outsiders, rather than on those of expanding or contracting the firm's workforce as a whole, it is convenient to assume that the size of each firm's workforce is fixed. To this end, suppose that the firm has an exogenously given fixed factor - call it "capital" - and that the relation between this factor supply and the number of workers is characterised by fixed coefficients:

$L_I + L_E = v \cdot K = \bar{L}$ (where K is the fixed capital supply and v is a positive constant).

To make our unemployment analysis free of systematic expectational errors, we assume that each worker has rational expectations, so that the perceived and actual probabilities of job retention are equal. Since $e'' < 0$ (in Equation (2)), each firm has an incentive to equalize the job retention probabilities of its employees. Thus, its choice of insiders to be dismissed is random. Consequently

$$(3) \quad \sigma = (L_I / \bar{L}).$$

The firm's decision variables are L_I and L_E . For simplicity, we assume static equilibrium conditions in which employment and effort remain constant through time and we also suppose that the firm maximises profit over a finite time period at a zero rate of time discount. Then the firm's optimisation problem can be stated in terms of a single time period:

$$(4) \text{ Maximise } \pi = e \cdot (L_I + L_E) - (W + a \cdot e_{-1}) \cdot L_I - R \cdot L_E$$

$$\text{subject to } L_I + L_E = \bar{L}.$$

Under static effort conditions where $e = e_{-1}$, the first-order condition for optimality (for an interior solution, $0 < L_I < \bar{L}$) reduces to

$$(5) \quad e' \cdot [1 - a \cdot \sigma] = (W + a \cdot e) - R.^6$$

Here the marginal revenue from retaining an insider (rather than replacing him with an outsider) is set equal to the associated marginal cost. The right-hand term is the insider-entrant income differential, which has been assumed positive (condition (2a)). The left-hand term describes the morale effect of labour turnover. By retaining an insider, the firm raises the retention probability of each of its workers and thereby their work effort. This, in turn, raises the firm's revenue and - to a lesser extent (by condition (2b)) - its labour cost (due to the greater productivity premium).

This optimality condition implies the firm's demand schedule for insiders:

$$(6) \quad L_I^* = L_I^*(W, R, a).^7$$

$$(-) (+) (-)$$

In other words, the greater the insider wage or the smaller the reservation wage, the more insiders are replaced by the firm. Thus, some outsiders may succeed in underbidding the insiders, but not all of them do so. Moreover, the smaller the gains from effort gleaned by the firm $(1 - a \cdot \sigma)$, the greater the number of insiders who are replaced.

Let there be m identical firms and n identical households in the economy. Then, even if $n > m \cdot \bar{L}$ and $W + a \cdot e_{-1} > R$, the unemployed workers may still not be able to underbid their employed counterparts (and thereby generate full employment) on account of the morale effect of labour turnover. (However, in the absence of this effect - viz, $e' = 0$ in Equation (5) - the firms would continue to exchange insiders for outsiders as long as $W + a \cdot e_{-1} - R > 0$.)

It is important to observe that the existence of involuntary unemployment above rests on more than just the morale effect of labour turnover. The assumed income structure among insiders, entrants and outsiders is necessary as well.

Entrants must be able to commit themselves to work for less than the insider wage for a limited initiation period. For otherwise the firms would gain nothing by exchanging an insider for an outsider and consequently the outsiders would be unable to compete for jobs at all. Moreover, the existence of involuntary unemployment would be in question, since no one would effectively be offering to do the available work for less than the insider wage.

Accordingly, the workers in our model are assumed to bear renegotiation costs and it is these which enforce their wage commitment over the initiation period.

Moreover, the initiation period must cover less than the

entrant's working lifetime. For otherwise the firm would, with the retirement of its current insiders, be able to acquire a workforce receiving only the entrants' wages. Thus the entrants must not only be able to commit themselves for work for less than the insider wage during a limited period of time, but they must also be unable to commit themselves thereafter.

Finally, the firms in our model must be unwilling or unable to extract the entire economic rent of the entrant by charging them a full "entry fee" (viz, a charge, upon entering the labor force, which is sufficiently high to make the entrants indifferent between employment and unemployment). This is a prerequisite for the existence of involuntary unemployment not only in our model, but in general. Clearly, whenever firms are able to impose such a entry fee, involuntary unemployment must disappear.

The recent macroeconomic literature offers a variety of rationales for the non-implementation of longterm labor contracts and the absence of full entry fees. Thus, we leave them outside the purview of our analysis. Suffice it to say that the morale effect of labor turnover suggests one possible reason for the absence of full entry fees, namely, that they may reduce a firm's marginal revenue (via the morale effect) by more that they reduce labor cost. (In this sense, the morale effect provides a conceivable logical foundation for the efficiency wage hypothesis.) However, other reasons for deficient entry fees, such as credit constraints, serve our purposes equally well. For rationales of short-term labor contracts in the context of our insider-outsider analysis, see Lindbeck and Snower (1984c).

3. Monitoring of Effort

Having sketched the overall contours of our theory, we now scrutinize each of its individual components. In this section we examine how the firm uses the turnover rate as a screening device for work effort.

As noted, we assume that firms cannot monitor work effort accurately or instantaneously. If this were not the case, then labour remuneration could be made contingent on and coincident with the provision of effort. Then there would be no reason for a worker's effort to depend on his perceived probability of retaining his job. Over every period of time, the worker could first observe whether he is retained or fired, and then make his effort decision and reap the effort reward. The chances of being fired tomorrow would be irrelevant to his effort today.

In practice, however, work effort hardly ever lends itself to perfect, instantaneous observation. In jobs where output can be ascribed to individual workers, employers commonly monitor a worker's effort in terms of the output which they perceive that worker to have produced. In general, the relations

- (i) between this effort (e) and the associated output (q) and
- (ii) between the output (q) and the associated employer's perception of output (Q)

are lagged and stochastic. The provision of effort precedes output and the employer's monitoring of output usually takes time. Moreover, employers are usually not in a position to observe e , or even Q , accurately.

To fix ideas, let the effect of e on Q (via q) for a particular worker take the following simple form:

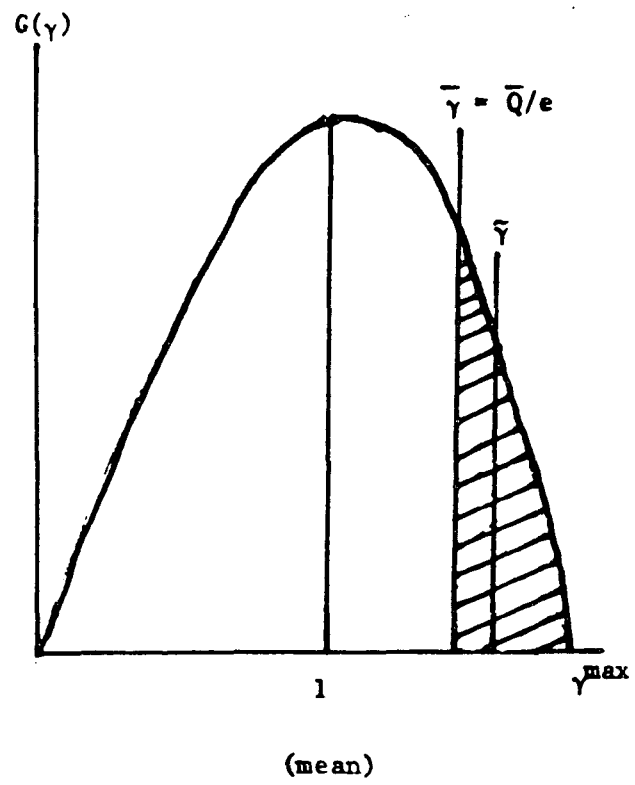
$$(7) \quad Q^{+1} = e \cdot \gamma,$$

where Q^{+1} is next period's perceived output and γ is a random variable with a mean of unity and constant variance. Let the γ 's of different workers be identically and independently distributed, so that our analysis can proceed in terms of a representative worker. The employer is assumed to have rational expectations, in the sense of knowing (7) and the distribution of γ , but not the realised value of γ .

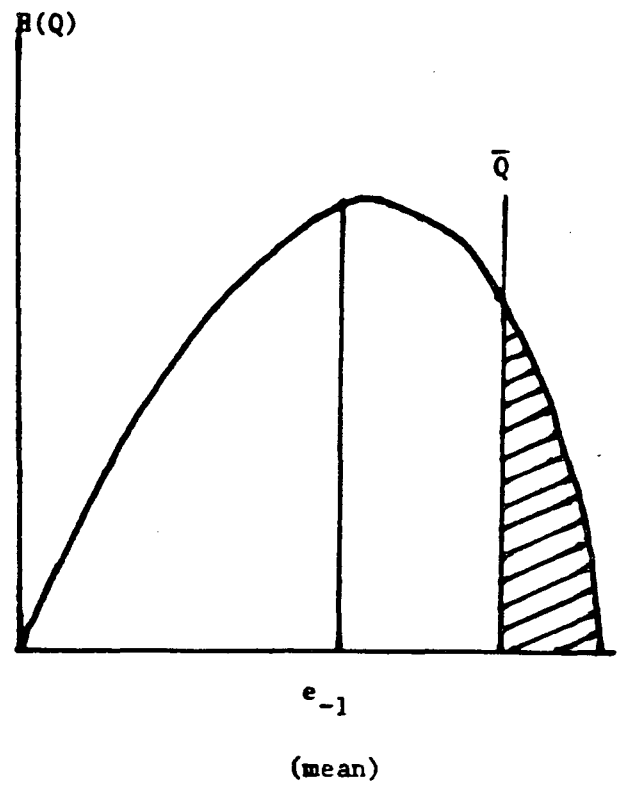
Given this information structure, the employer makes the hiring and firing decisions in such a way as to provide an effort incentive: he chooses a "cut-off productivity", \bar{Q} , such that a worker whose \bar{Q} falls short of it is fired, but otherwise is retained. Such a procedure is widespread in practice; workers frequently face minimal performance standards which they must meet to retain their job. (Of course, in the real world there are many reasons for dismissal other than substandard performance; but our analysis focuses on just this one).

In this spirit, we abandon the simplistic assumption of the last section that the employer unilaterally controls each worker's retention probability, σ . Instead, we now suppose that this probability is determined jointly by the employer (via \bar{Q}) and the worker (via e).

The density of γ (the output-effort coefficient of Equation (7)), $G(\gamma)$, and the corresponding density of Q , $H(Q)$, (for a given level of effort, e) are pictured in Figures 1a and 1b. It is apparent that the retention probability is given by the shaded areas of these figures:



a



b

FIGURES 1: The Worker's Retention Probability

$$(8) \quad \sigma = \int_{\bar{Q}}^{\infty} Q \cdot H(Q) \, dQ = \int_{\bar{\gamma}}^{\infty} e_{-1} \cdot G(\gamma) \, d\gamma$$

where $\bar{\gamma} = (Q/e_{-1})$. For non-degenerate densities, i.e. $G(\gamma) > 0$ for $0 < \gamma < \gamma^{\max}$, (where γ^{\max} is the highest attainable level of γ), we find that the worker's retention probability depends positively on the worker's level of effort and negatively on the cut-off productivity:

$$(9) \quad \sigma = \sigma(e_{-1}, \bar{Q})$$

(+) (-)

Thus, a worker's productivity in the current period is rewarded in the subsequent period, provided that this productivity is greater than or equal to \bar{Q} . This reward comes in the form of the "time rate" wage, W , and the "piece rate" wage, R . It is a stochastic remuneration for effort. However, a worker whose productivity is less than \bar{Q} is fired and foregoes the effort reward.

Although the employer cannot control effort, or even observe it accurately, he can influence it indirectly. By varying \bar{Q} - for a given e_{-1} - he affects the retention probability and thereby the effort reward. Work effort responds, as described in the following section. By (9), this response has a feedback effect on the retention probability. The employer is assumed to know this nexus of effects and in this manner uses \bar{Q} as a screening device for effort.

4. The Behaviour of Workers

All three types of workers - insiders, entrants and outsiders - are assumed to have identical preferences, their utility depending on consumption and effort. Their time horizon spans T periods ($T > 1$). We investigate their behaviour under static conditions (viz, all the exogenous determinants of their decision making are constant through time). In each period, they consume all their income. This income is affected by a government, which levies an income tax (at the fixed rate τ) on each employed worker, and provides a lump-sum unemployment benefit (B) to each of the rest.

Consider the behaviour of an insider. His income in the current period ($t = 1$) is $(W + a \cdot Q_0) \cdot (1 - \tau)$, where $a \cdot Q_0$ is the productivity premium.⁸ Let his utility be a function of income and effort. Then his current-period utility is

$$(10a) \quad U_1 = U[(W + a \cdot Q_0) \cdot (1 - \tau), e_1],$$

where we let U_Y (the marginal utility of income) be positive and U_e (the marginal utility of effort) be negative, and $U_{YY}, U_{ee} < 0$, $U_{Ye} = 0$.

Whereas his current income is certain (since W , a , and his productivity at $t = 0$ are all known at $t = 1$), his income in the next period is not.⁹ If he is retained, his income is $(W + a \cdot e_1 \cdot \gamma) \cdot (1 - \tau)$. Yet if he is fired, he receives $R \cdot (1 - \tau)$ should he find another job, and B otherwise.

Suppose that all workers seeking jobs have an equal probability of employment, ρ . Then, an insider's expected utility in the second period is

$$\begin{aligned}
 (10b) \quad U_2 = & \int_{\bar{\gamma}}^{\gamma^{\max}} U[(W + a \cdot e_1 \cdot \gamma) \cdot (1 - \tau), e_2] \cdot G(\gamma) d\gamma \\
 & + (1 - \sigma) \cdot \{ \rho \cdot U[R \cdot (1 - \tau), \eta_2] + (1 - \rho) \cdot U[B, 0] \},
 \end{aligned}$$

where η_2 is his effort, given that he has been fired and rehired.¹⁰

His utility in all subsequent periods can be defined analogously. We assume that the insider maximises the present value of his expected utilities: $PV = U_1 + U_2 + \dots + U_T$ (where, for simplicity, we let the rate of time discount be zero). Maximising PV with respect to e_1 , we obtain the first-order condition

$$\begin{aligned}
 (11) \quad U_e + & \int_{\bar{\gamma}}^{\gamma^{\max}} U_Y \cdot a \cdot \gamma \cdot (1 - \tau) \cdot G(\gamma) d\gamma \\
 & + \bar{\gamma}_e \cdot \frac{\partial}{\partial \bar{\gamma}} \left\{ \int_{\bar{\gamma}}^{\gamma^{\max}} U[(W + a \cdot e_1 \cdot \gamma) \cdot (1 - \tau), e_2] \cdot G(\gamma) d\gamma \right\} \\
 & - \sigma_e \cdot \{ \rho \cdot U[R \cdot (1 - \tau), \eta_2] + (1 - \rho) \cdot U[B, 0] \} = 0
 \end{aligned}$$

Here the marginal disutility of effort (the first term) is set equal to the associated marginal utility of income via a rise in the effort premium (the second term), and an effort-induced rise in the retention probability implying an increased chance of receiving insider income (the third term) and a reduced chance of receiving outsider or entrant income (the fourth term).

In this context, the morale effect of labour turnover works through the cut-off productivity \bar{Q} . A rise in \bar{Q} raises the turnover rate and this affects the level of effort which the insider decides to devote to his job. Letting ϕ be the left-hand expression of (11),

$$(12) \quad \frac{\partial e_1}{\partial Q} = \frac{\partial \phi / \partial \bar{Q}}{\partial \phi / \partial e_1}$$

where $(\partial \phi / \partial e_1)$ is assumed negative so that the second-order condition for utility maximization holds. Moreover,

$$(13) \quad \begin{aligned} \frac{\partial \phi}{\partial Q} = & \frac{1}{e_1} \cdot \frac{\partial}{\partial \gamma} \left\{ \int_{\gamma}^{\gamma^{\max}} U_Y \cdot a \cdot \gamma \cdot (1 - \tau) \cdot G(\gamma) d\gamma \right\} & (\text{Term 1}) \\ & + [\bar{\gamma}_{eQ} \cdot \frac{\partial}{\partial \gamma} \left\{ \int_{\gamma}^{\gamma^{\max}} U[(W + a \cdot e_1 \cdot \gamma) \cdot (1 - \tau), e_2] \cdot G(\gamma) d\gamma \right\}] & (\text{Term 2a}) \\ & - \sigma_{eQ} \cdot \{ \rho \cdot U[R \cdot (1 - \tau), \eta_2] + (1 - \rho) \cdot U[B, 0] \} & (\text{Term 2b}) \\ & + \bar{\gamma}_e \cdot \bar{\gamma}_Q \cdot \frac{\partial^2}{\partial \gamma^2} \left\{ \int_{\gamma}^{\gamma^{\max}} U[(W + a \cdot e_1 \cdot \gamma) \cdot (1 - \tau), e_2] \cdot G(\gamma) d\gamma \right\} & (\text{Term 3}) \end{aligned}$$

The first two terms of this expression may be indentified as substitution effects of the effort reward on effort; the last term may be called an income effect:

Term 1: A rise in \bar{Q} (for a given level of effort, e) increases the critical value of the output-effort coefficient, $\bar{\gamma}$. Thus, the worker is less likely to receive the marginal effort premium, $a \cdot \gamma \cdot (1 - \tau)$ (yielding utility of $U_Y \cdot a \cdot \gamma \cdot (1 - \tau)$). In other words, there is a fall in the expected value of the effort reward; hence, Term 1 is negative.

Term 2a: A rise in \bar{Q} reduces $\bar{\gamma}_e$ (since $\bar{\gamma}_{eQ} = -(1/e^2) < 0$). In other words, a rise in \bar{Q} gives the worker greater leverage in raising his retention chances through effort

(i.e. reducing \bar{y} through e). In this respect, the effort reward increases; hence, Term 2a is positive.

Term 2b: A rise in \bar{Q} , as shown, raises the worker's leverage on his retention chances through effort and thereby reduces his chances of receiving the income of an entrant or an outsider. Hence, Term 2b is of opposite sign to Term 2a (and of smaller absolute value, since the income of an insider exceeds that of an entrant or outsider).

Term 3: As noted, a rise in \bar{Q} increases \bar{y} and thereby reduces the expected value of the effort reward. If $U_{yy}, G'' < 0$ over the relevant range, then the associated utility loss becomes progressively greater and - obversely - the utility loss to be avoided through a given rise in effort becomes progressively greater as well.

In sum, an employer who raises the cut-off productivity, \bar{Q} , initiates several countervailing effects on work effort. On the one hand, he discourages effort by reducing the expected marginal effort premium; on the other, he encourages effort by increasing the worker's effort leverage on retention and possibly also by raising the worker's expected marginal utility of income. These effects correspond to the commonplace idea that workers who face greater chances of dismissal may work less hard if they find that their effort is less likely to be rewarded, or they may work harder for fear of losing their current labour income.

As noted above, persistent involuntary unemployment can arise in our analysis when employers find the process of labour turnover

costly, on account of an associated adverse influence on worker morale. The cost of labour turnover arises only when the sum of all the effects above is negative, so that

$$(14) \quad e = e(\bar{Q})$$

$$(-)$$

In that event, employers may reject the underbidding of outsiders, since acceptance of the lower bids would mean reducing the effort of the insiders (and, as we shall see, that of the underbidders themselves). Yet if $(\partial e / \partial \bar{Q}) > 0$, then the exchange of insiders for outsiders would not only reduce the firm's labour costs, but would also raise the productivity of their employees. Consequently the exchange would continue until all involuntary unemployment is eliminated.

Now consider the behaviour of an entrant. Although his first-period income, $R^*(1 - \tau)$, is less than that of an insider, in all succeeding periods the expected income per unit of effort is the same for both. (The reason is, of course, that after the initial period the entrant turns into an insider). Since $U_{ye} = 0$ and since current effort receives a stochastic reward in the next period, it is clear that the effort function of the entrant is identical to that of the insider. This result is in line with our analytical strategy whereby involuntary unemployment is shown to exist even though insiders and entrants have the same job characteristics.

As for the outsider, he has no choice but to expend no effort and consume his income of $B^*(1 - \tau)$.

5. The Behaviour of Firms

Each firm is a maximiser of expected profit. Its decision making problem is similar to that in the skeleton model of Section 2. Yet now its control variables are not the numbers of insiders and entrants to be employed, but rather the cut-off productivity, \bar{Q} . Moreover, the expected productivity premium which the firm pays to its insiders is now $a \cdot e_{-1} \cdot \tilde{\gamma}$, where $\tilde{\gamma}$ is the average output-effort coefficient of an insider (i.e. the mean of Q/e_{-1} , conditional on $Q > \bar{Q}$). (In Figure 1a, $\tilde{\gamma}$ divides the shaded area into two equal parts). Since the density of γ is given, $\tilde{\gamma}$ is a monotonically increasing function of Q/e_{-1} , provided that $G(\gamma) > 0$ for $0 < \gamma < \gamma^{\max}$:

$$(15) \quad \tilde{\gamma} = \tilde{\gamma}(\bar{Q}/e_{-1})$$

(+)

Aside from these modifications, the firm's profit maximisation problem is the same as that of Section 2:

$$(16) \quad \text{Maximise } \pi = e \cdot (L_E + L_I) - (W + a \cdot e_{-1} \cdot \gamma) \cdot \sigma \cdot \bar{L} \\ - R \cdot (1 - \sigma) \cdot \bar{L}$$

$$\text{subject to } L_E + L_I = \bar{L}$$

$$e = e(\bar{Q}) \tag{14}$$

$$\sigma = \sigma(e_{-1}, \bar{Q}) = (L_I / \bar{L}) \tag{9}$$

$$\tilde{\gamma} = \tilde{\gamma}(\bar{Q}/e_{-1}) \tag{15}$$

and W , a , and R are exogenously given to the firm. The firm is assumed to have rational expectations in the sense that it correctly

perceives the four constraints above (although it does not know the realised value of γ) and realises that the insiders and entrants have the same effort function.

Under static conditions, a finite time horizon, and a zero rate of time discount, the first-order condition for optimality is

$$(17) \quad A \cdot (1 - a \cdot \sigma \cdot \tilde{\gamma}) - B \cdot a \cdot \sigma \cdot e = (W + a \cdot e \cdot \gamma) - R$$

where

$$A = \frac{e_{\bar{Q}}}{\sigma_e \cdot e_{\bar{Q}} + \sigma_{\bar{Q}}} = \frac{(\partial e / \partial \bar{Q})}{(\partial \sigma / \partial \bar{Q})}$$

$$B = \frac{\tilde{\gamma}_{\bar{Q}} + \tilde{\gamma}_e \cdot e_{\bar{Q}}}{\sigma_e \cdot e_{\bar{Q}} + \sigma_{\bar{Q}}} = \frac{(\partial \tilde{\gamma} / \partial \bar{Q})}{(\partial \sigma / \partial \bar{Q})}$$

This condition is the analogue of condition (5) of the skeleton model. In both conditions, the right-hand term is the insider-entrant income differential and the left-hand term is the morale effect of labour turnover.

By raising \bar{Q} , the firm reduces the retention probability of each of its workers and thereby reduces their effort. As result, the firm's revenue falls (by A) as well as its labour cost. The latter is due to a drop in the expected productivity premium which, in turn, is attributable partly to the fall in the retention probability (viz, $A \cdot a \cdot \sigma \cdot \tilde{\gamma}$) and partly to the fall in the premium per unit of effort (viz, $B \cdot a \cdot \sigma \cdot e$). This is how a rise in \bar{Q} affects the firm's marginal revenue (net of changes in the productivity premium). The marginal revenue is set equal to the firm's marginal cost saving from exchanging an insider for an outsider.

The mechanism at work here is that the firm uses Q (and thereby its rate of labour turnover) as a screening device for effort (e). It is well to ask how this operates. Why should the firm's dismissal of some insiders affect the effort of the remaining insiders? Could the firm not promise the remaining insiders and the entrants that they would not be dismissed and thereby achieve a permanent fall in labour cost without any compensating fall in productivity?

The answer is no, on two counts. First, as we have seen, the fall in labour cost is not permanent, since entrants turn into insiders after their initiation period. Second, once the firm has fired some of its insiders, it has no incentive to ensure that the remaining insiders and the entrants are not subject to the same fate. For if it is in the firm's interest to dismiss some of its insiders in one time period, it will still be in its interests to do so in the next time period, when the entrants have turned into insiders.

Nor does the firm find it worthwhile to protect the jobs of a strict subset of its employees. For increased job security for some workers would mean greater job insecurity for the rest. Given diminishing returns to labour retention ($e'' < 0$), then an unequal distribution of retention prospects would yield lower profit than an equal one. We assume (quite plausibly) that employees have no method of enforcing employment promises which are not in the firm's interests to keep. (Seniority systems lie beyond the scope of our analysis.)

Thus, when a firm finds it worthwhile to raise its rate of labour turnover, it cannot avoid implying that the job retention probability of all its current employees has fallen.

6. Equilibrium in the Labour Market

The behaviour patterns of Section 3-5 may now be combined to provide a picture of persistent involuntary unemployment. We let R , W and a be exogenously fixed outcomes of a bargaining process and that the government policy instruments are fixed as well. The latter include the unemployment benefits (B), the income tax rate (τ), and the number of people employed in the public sector (L^G).

The level of unemployment is simply the difference between the labour supply (i.e. one unit of labour by n workers) and the labour demand (by m identical firms and the government):

$$(18) \quad u = n - m \cdot \bar{L} - L^G.$$

As noted, each worker seeking a job faces the same employment probability, ρ . This is the ratio of vacancies ($[1 - \sigma] \cdot \bar{L}$) to job searchers ($[1 - \sigma] \cdot \bar{L} + u$):

$$(19) \quad \rho \equiv \frac{(1 - \sigma) \cdot \bar{L}}{(1 - \sigma) \cdot \bar{L} + u}$$

For the level of unemployment given by (18), the definition (19) traces out an inverse relation between ρ and σ , as illustrated by the ρ -curve in Figure 2.

Making no explicit mention of the fixed parameters of government policy and the bargaining process, the behaviour of the firms may be summarised as follows:

$$(20) \quad Q = Q(\rho)$$

(+)

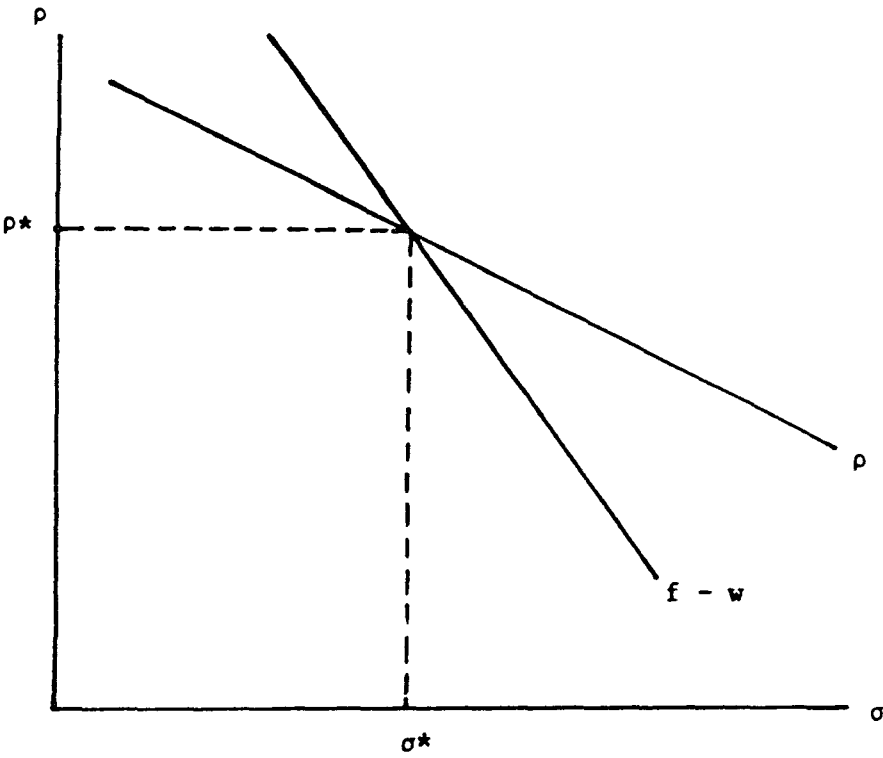


FIGURE 2: The Labour-Market Equilibrium

as illustrated by the f -curve¹¹ in Figure 3a (where " f " stands for "firms").

Continuing to ignore the fixed parameters above, let us express the effort of insiders and entrants in terms of the cut-off productivity and the employment probability:¹²

$$(14') \quad e = e(\bar{Q}, \rho) \\ (-) \quad (-)$$

Substituting (14') into the retention probability function (11') we obtain

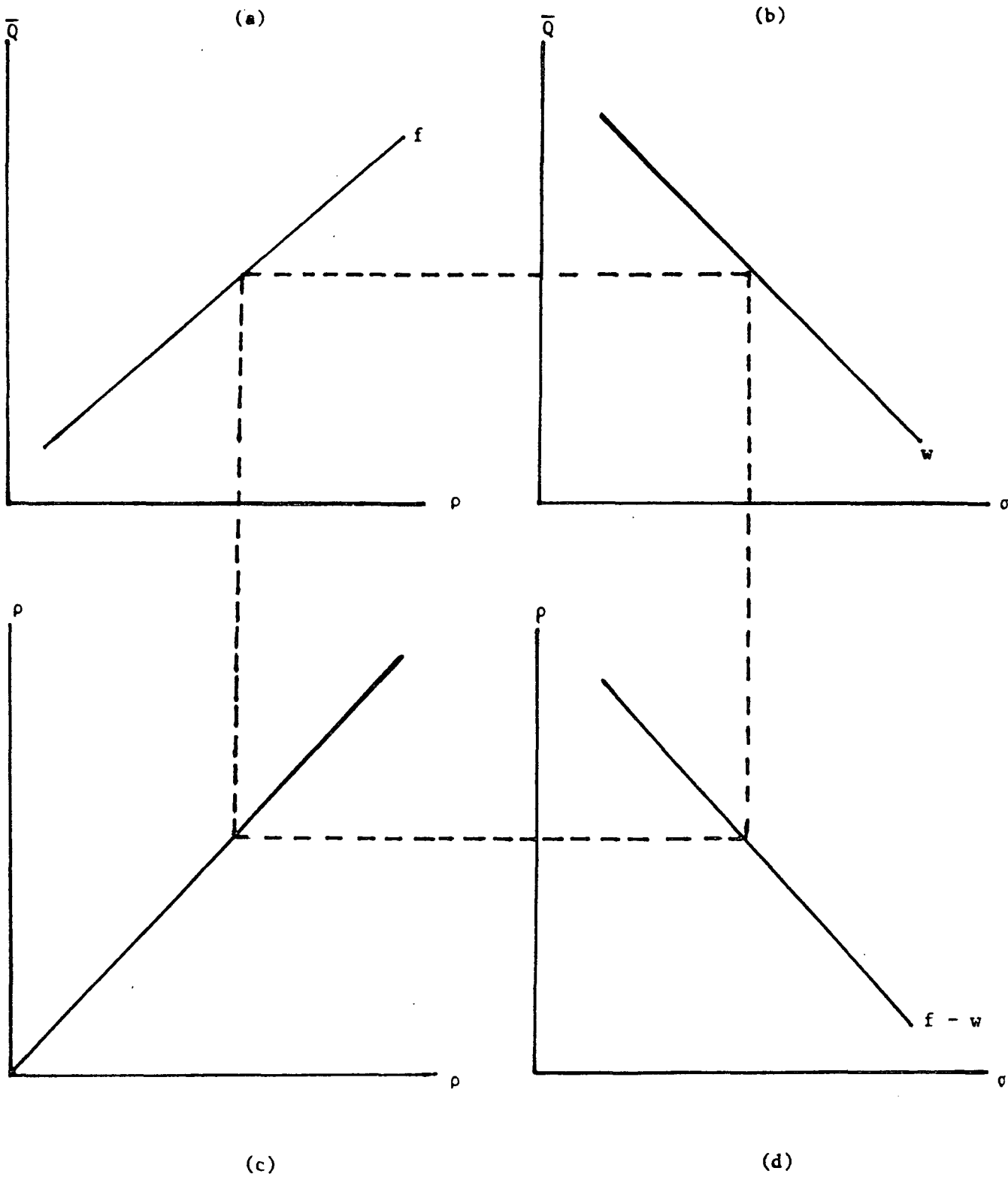
$$(21) \quad \sigma = H(\bar{Q}, \rho) \\ (-) \quad (-)$$

A movement upward along the f -curve of Figure 3a is associated with a fall in the retention ratio, σ (by (21)). Thereby we generate the w -curve of Figure 3b (where " w " stands for "workers").

The f -curve can now be combined with the w -curve to provide a summary of how the behaviour of the firms and households makes the retention ratio (σ) respond to the employment probability (ρ). This is the f - w curve of Figure 3d.

The intersection of the f - w curve and the ρ -curve¹³, in Figure 2, yields the equilibrium retention ratio (σ^*) and the equilibrium employment probability (ρ^*). From this, the equilibrium cut-off productivity (\bar{Q}), rate of labour turnover, and effort level (e) may be derived.

Observe the sense in which our explanation of involuntary unemployment depends on the morale effect of labour turnover. Clearly, if a rise in labour turnover (generated by a rise in the



FIGURES 3: The Behaviour of the Firms and Workers

cut-off productivity, \bar{Q}) would under no circumstances discourage effort, then unemployment could not appear in our analysis. However, our explanation does not require that the effect of turnover on effort be negative over the entire range of turnover rates. Rather, there is a stability argument to be made. As long as the effect above is positive, firms do not face a turnover cost and thus they replace the high-wage entrants with the low-wage insiders. This process continues until either the involuntary unemployment has disappeared or the effect of turnover on effort turns sufficiently negative so that the firms' turnover cost rises to the level of the insider-entrant wage differential. Hence, in the unemployment equilibrium, the adverse influence of turnover on effort is present.

What are the fundamental sources of involuntary unemployment in our analysis? To begin with, as noted, the wages of entrants and insiders must be sufficiently high relative to unemployment benefits, that workers prefer being employed to being unemployed. We have assumed the insider wage to exceed the entrant wage and the latter, in turn, to exceed the reservation wage. In this context, unemployment persists so long as (a) the entrant wage remains above the reservation wage and (b) the firm exchanges only a limited number of insiders with entrants.

The former source of unemployment - the inability of firms to extract all the rent from employment through an "entrance fee" - lies beyond the scope of this paper. (But it does not lie beyond the reach of our analysis: our argument that current effort is rewarded in the future could be used to generate a positive relation between effort and the entrant wage, thereby providing a new rationale for the efficiency wage hypothesis. In this case, firms would not charge a

full entrance fee, since the adverse effect on entrants' productivity would outweigh the associated reduction in labour cost).

The latter source of unemployment - the absence of underbidding - has been rationalised in terms of the morale effect of labour turnover. As we have seen, this effect arises only when there is a division of responsibility over effort and employers make the employment decisions. Furthermore, at least some of the rewards for current effort are gleaned in the future. Why should this be?

In practice, employees have no option but to make their effort decisions unilaterally, because effort usually cannot be measured accurately and objectively enough to be included in the terms of an employment contract. Time-rate employment contracts never contain a precise specification of the effort required to do a particular job and piece-rate contracts rarely, if ever, define the exact product quality to be attained.

It is not quite so clear why employers often have unilateral responsibility over employment decisions. There are, of course, many partial exceptions to this rule - e.g. seniority rules, manning agreements - but the fact remains that most employment contracts give the employers extensive discretion regarding whom to hire and fire. One particularly cogent reason for this arrangement is that bargaining over individual jobs would require not only the employers to monitor the performance of their various workers, but for the workers to monitor each other as well. The disutility associated with the latter form of monitoring are probably quite substantial in practice.

Characteristically, employees within a firm (and particularly those working at the same location) are often in a much better position to observe and assess each other's performance than their

employers are. Thus, the resource costs to the workers who monitor are comparatively low. Yet the utility costs to both the monitoring and the monitored workers are a quite different matter. Employees of equal rank within a firm generally appear unwilling to be watchdogs over another because they would find it disturbing to know that their colleagues are keeping records about their job achievements - in fact, records which have to be detailed, accurate and objective enough to precipitate their dismissal. In other words, monitoring by fellow workers raises the disutility of work. Whenever this influence is sufficiently strong, workers find it in their best interests to hand the responsibility for employment decisions to their employers.

Furthermore, the activity of inter-worker monitoring may significantly reduce the productivity of employees who work in teams. Such employees require each other's trust and cooperation in order to be fully effective and this may be undermined through mutual monitoring. In this case, the employers may have an incentive to offer their workers a bribe for relinquishing control over employment decisions.

For these reasons, the firms' control over firing and hiring - presupposed by our analysis above - may be Pareto efficient.

Yet the morale effect of labour turnover also requires that current effort be rewarded in the future. Can this practice be Pareto efficient as well? Recall that the effort reward in our analysis has two components - a "time-rate" wage (W) and an expected "piece-rate" premium ($a \cdot e_{-1} \cdot \gamma$) - each of which are awarded only after fulfillment of the cut-off productivity, \bar{Q} . Although we have been concerned with the joint influence of these components on work effort, either of them alone could be sufficient to generate the morale effect of labour

turnover.¹⁴ Given that employers observe effort imperfectly and with a lag, and given that they make the employment decisions unilaterally, do labour remuneration schemes exist which are Pareto-superior to that of our analysis?

The following are conceivable possibilities, but none of these obviates the morale effect of labour turnover (and thus they have been passed over in our analysis). The piece-rate (a) could be expressed as a nonlinear function of output (rather than set as a constant); or the piece-rate premium ($a \cdot e_{-1} \cdot \gamma$) could be paid regardless of whether a worker is retained or fired. In these cases at least part of the reward for current effort is still awarded only in the future and only in the event of retention (even in the latter case, since there the worker receives W only if retained), and thus effort still depends on the rate of labour turnover. Replacing the \bar{Q} rule with an effort reward (penalty) system which does not contain the firing decision in another possibility. Here the firm could replace insiders with entrants by inducing the former to quit in response to a penalty for low productivity. This procedure is uncommon in practice, but, in any event, effort would remain dependent on labour turnover.

Finally, workers cannot be expected to insure themselves fully against dismissal for the standard moral-hazard reasons.

In sum, our morale effect of labour turnover requires that employees control work effort, employers control employment, and effort rewards are lagged and contingent on retention. These prerequisites can be fulfilled in a world where employers have imperfect information on effort, there is a lag between effort and output, and employees are unwilling to monitor themselves.

7. Job Security and Worker Productivity

Our analysis of the morale effect of labour turnover not only has implications for the existence of involuntary unemployment, but also sheds light on the controversy concerning the relation between job security and worker productivity.

7a. The Controversy.

This controversy - among economists, journalists and politicians - is of long standing. The debate has become particularly heated in the past decade, stimulated partly by the recent productivity slowdown and partly by the rise in average unemployment levels in mature capitalist economies.

Some people of "conservative" persuasion argue that in the post-war market economies, many collective bargaining agreements and governments' economic and legal measures to promote job security have robbed workers of their motivation and permitted their objectives to be at variance with those of their employers. Workers who are reasonably sure of remaining employed allegedly have no need to exert themselves on their current jobs. Low work effort and absenteeism - according to this line of argument - are the result. This is said to be a major deficiency of the Welfare state in modern market economies and is also reputed to extend to centrally planned economies, where guarantees to work frequently co-exist with low productivity.

For this reason, unemployment has been called a "worker disciplining device". Employees who fear that they may join the ranks of the unemployed may attempt to protect their jobs through special work achievement. Such a reaction is natural not only because it strengthens their position vis-a-vis their competitors within the

firm, but also because it reduces the chances that the firm will be forced to contract or close down its operations.

On the other side of the barricades are those who argue that job security enables workers to benefit from their work effort and thus provides a crucial effort incentive. This has been the thrust of our argument about the morale effect of labour turnover. If current effort tends to be rewarded in the future and if these rewards are contingent on job retention, then increased job security means a stronger association between the expenditure of effort and the associated compensation. In that case, job security may mean more, not less, worker productivity.

This argument, too, is supported by a rough-and-ready body of evidence. There are inter-country comparisons: e.g. Japan, which grants its workers a higher degree of job security than most other capitalist economies, is generally agreed to have comparatively high work morale. There are also inter-firm comparisons: viz, those with comparatively low turnover rates tend to be ones where employees work comparatively hard to establish reputations. Moreover, business circles often appear to take such an association for granted and the low-turnover policies of some companies, such as IBM, are based on this perception.

Beyond doubt, the controversy about job security and productivity is a highly significant one, with obvious policy implications for both government and business enterprise. Its significance, in fact, has risen throughout the twentieth century; for as legal specifications and restrictions of hours of work have become increasingly stringent in the modern industrial economies, work effort has become the major dimension in which workers can vary their labour inputs in response to

the economic incentives they face. Yet effort, in comparison to the other recognised attributes of work (such as hours of work, sick leave, vacation time, etc.) is particularly difficult to monitor. The looser the relation between effort and its immediate rewards, the more significant intertemporal associations may become, and the greater the influence of job security on effort.

It is tempting to believe, quite simply, that job security has both a positive and a negative influence on effort and that each side in the controversy are concentrating on only one of these influences. In that event, the relative merits of their arguments could be decided through empirical examination.

7b. Micro- and Macroeconomic Job Security

In our view, however, the above controversy blurs the distinction between two entirely separate aspects of job security, with separate implications for work effort. The first may be termed "microeconomic job security" and is characterised by the worker's perceived probability of retaining his current job. The second is "macroeconomic job security" and it may be measured by the worker's perceived probability of regaining employment once he has been fired.

There is no immutable relation between these probabilities. The former reflects the employment conditions in a particular firm; in particular, its labour turnover rate, its survival prospects, and the prospects of capital-labour substitution. The latter reflects the economy-wide employment conditions; in particular, the ratio of vacancies to job searchers, the availability of job information, and the accessibility of government employment creation schemes. Clearly, it is possible for a worker to perceive a high probability of

retaining his current job and a low probability of being re-employed, or vice versa. An individual firm, responsible for a negligible share of economy-wide transactions, can affect the first probability but not the second; a government engaged in large-scale employment schemes, has an immediate influence on the first, but only an indirect influence on the second.

Micro- and macroeconomic job security influence work effort through quite separate channels.

With regard to the former, we have seen that $(\partial e / \partial Q)$ may be positive or negative: however, with regard to the latter, $(\partial e / \partial \rho)$ (implied by Equations (11) and (12)) can be shown to be unambiguously negative. (A rise in ρ reduces the expected income differential between workers who are retained and those who are fired. In this manner, macroeconomic job security mitigates the gains from job effort. Consequently, the substitution effect is negative. Moreover, a rise in the re-employment probability raises each worker's total expected income and thereby induces him to consume more leisure on the job, i.e. provide less effort. Thus, the income effect is negative as well.)

7c. Upshot

The upshot of these considerations is that light can be shed on the controversy between productivity and job security by distinguishing between micro- and macroeconomic job security. The effects of these two kinds of job security can go in opposite directions and, in the context of this article, they actually do when there is involuntary unemployment. Hence, work effort in our model can be stimulated by increasing the microeconomic and reducing

the macroeconomic job security of workers. The contestants in the controversy may have been talking past one another by adopting different concepts of job security.

Naturally, this does not mean that the two concepts are not related. Consider a simple example in the context of the model of Section 6. A rise in government employment (L^G) reduces the level of unemployment (u) and thus shifts the ρ curve upwards, leaving the $f-w$ curve unchanged, as shown in Figure 4. As result, macroeconomic job security (represented by the employment probability, ρ) rises while microeconomic job security (represented by the retention ratio, σ) falls. In our example, both of these effects serve to reduce the productivity of labour.

Naturally, the above is only a partial equilibrium exercise and in a general equilibrium context there is no reason why the relation between ρ and σ be invariably an inverse one. Needless to say, the relation in practice may be expected to depend on how the government expenditures are financed, to what degree profits are distributed to the workers, and so on.

8. Recapitulation

Our paper examines various guises of the relation between worker productivity and job security, and explores the possibility of involuntary unemployment emerging as result.

We have shown that whereas macroeconomic job security reduces productivity, microeconomic job security has counter-veiling substitution and income effects on work effort. The nature of these effects is intuitively clear: a change in labour turnover affects workers' marginal effort reward and this, in turn, affects how hard

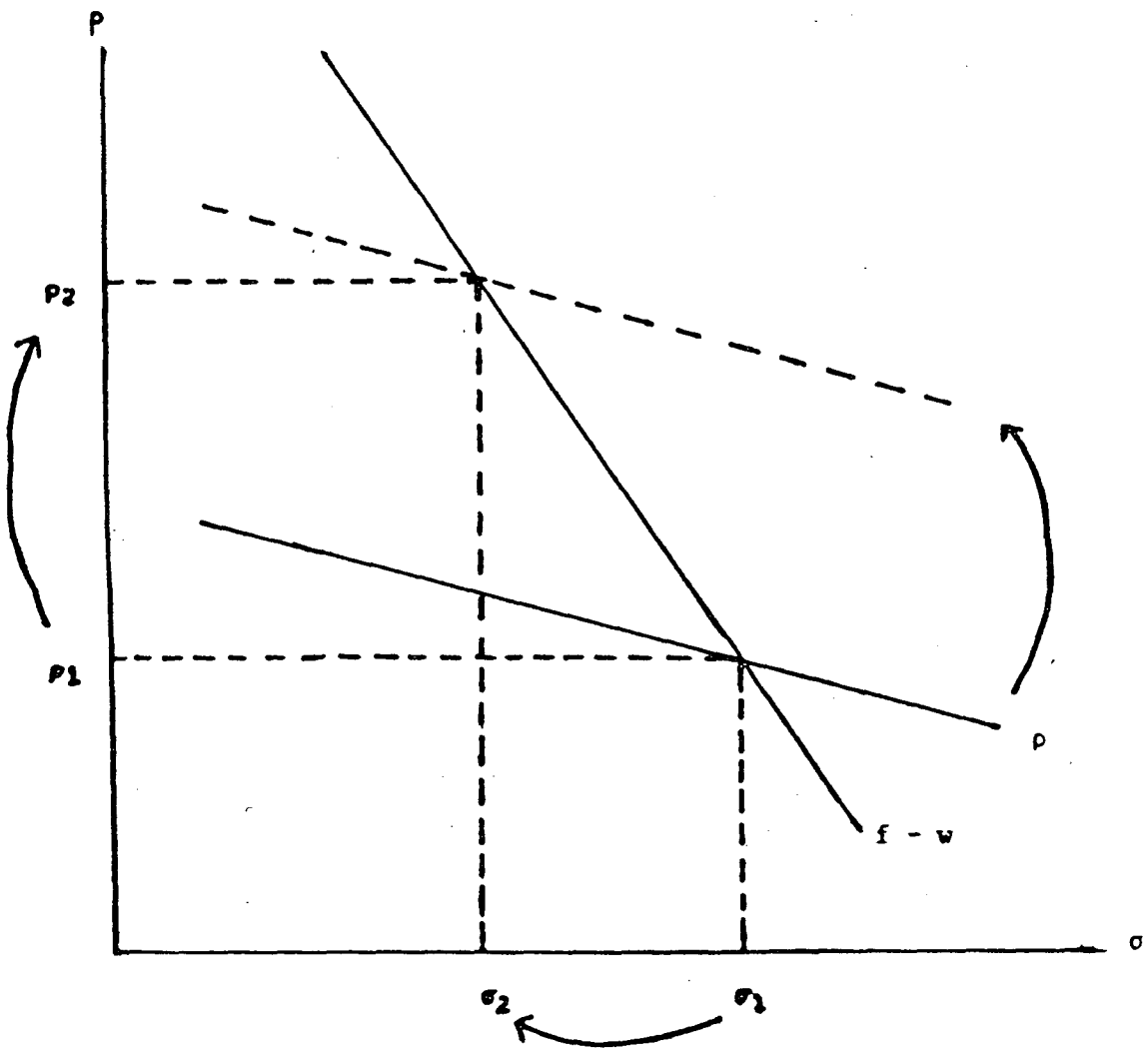


FIGURE 4: The Effects of a Rise in Government Employment

they work. On the one hand, a reduction in the marginal effort reward may diminish the incentive to provide effort; on the other, it makes workers less able to afford providing little effort. Thus, workers who perceive a higher chance of being dismissed may work less hard because their effort is less likely to be rewarded, or they may work harder in an attempt to retain their jobs.

This story rests on the condition that effort rewards are lagged and contingent on job retention. We have generated this condition by supposing that the provision of effort precedes output, that effort is imperfectly observed by employers, and that employers fire only those workers who produce less than a critical level of output. We have focused on effort rewards which take the form of time-rate and piece-rate wages.

However, the qualitative conclusions of our analysis could also have been reached if the effort rewards took the form of promotions. Promotions - like the rewards in our analysis - are usually awarded for past job achievements, and workers' endeavour to establish reputations are aimed at reaping future rewards for current effort.

Within this framework, we have seen that when wages are such that workers prefer employment to unemployment and insiders receive more remuneration than outsiders, outsiders may nevertheless be unable to underbid the insiders. This can happen when labour turnover has an adverse effect on work effort. In that event, involuntary unemployment persists.

Footnotes

We gratefully acknowledge the helpful comments offered by Ben Lockwood, Ron Smith, and particularly Andrew Oswald.

1. See, for example, Barro and Grossman (1976), Benassy (1975), Malinvaud (1977), and Muellbauer and Portes (1978).
2. See, for example, Gylfason and Lindbeck (1984) and Oswald (1982).
3. Corden (1981)
4. For example, Weiss (1980) deals with a problem of this sort.
5. This, for example, is the set-up of Malcomson (1981) and Snower (1983).
6. The second-order condition is satisfied since $e'' < 0$ and $(1 - a) > 0$.

$$7. \quad \frac{\partial L_1}{\partial W} = \frac{\bar{L}}{e''[1 - a\sigma] - 2 \cdot a \cdot e'}$$

$$\frac{\partial L_I}{\partial R} = - \frac{\bar{L}}{e''[1 - a\sigma] - 2 \cdot a \cdot e'}$$

$$\frac{\partial L_I}{\partial a} = \frac{(e' \cdot \sigma + e) \cdot \bar{L}}{e''[1 - a\sigma] - 2 \cdot a \cdot e'}$$

8. Note that the insider can be presumed to receive such a premium, for had he failed to meet the cut-off productivity (Q) in the previous period, he would not be an insider in the current period.
9. Workers who are due to retire in the next period play no essential role in our analysis, and thus we choose to ignore them. (Presumably they have no incentive to provide effort in the current period.)

10. We presuppose that the insider does not switch jobs unless fired.

This is indeed in the insider's best interests since $W > R$.

11. This relation is unambiguously positive only under some simplifying assumptions. Let

$$\psi = A \cdot (1 - a \cdot \sigma \cdot \tilde{\gamma}) - B \cdot a \cdot \sigma \cdot e - W - a \cdot e \cdot \tilde{\gamma} + R = 0$$

Then $\frac{\partial \bar{Q}}{\partial \rho} = - \frac{\partial \psi / \partial \rho}{\partial \psi / \partial \bar{Q}}$, where

$$\frac{\partial \psi}{\partial \bar{Q}} < 0 \text{ in order for the second-order conditions for profit maximization to hold.}$$

$$\begin{aligned} \frac{\partial \psi}{\partial \rho} = & -A \cdot a \cdot (\sigma_{\rho} \cdot \tilde{\gamma} + \sigma \cdot \tilde{\gamma}_{\rho}) - B \cdot a \cdot (\sigma_{\rho} \cdot e + \sigma \cdot e_{\rho}) \\ & - a \cdot (e_{\rho} \cdot \tilde{\gamma} + e \cdot \tilde{\gamma}_{\rho}) + (\partial R / \partial \rho), \end{aligned}$$

letting $A_{\rho} = B_{\rho} = 0$. This last expression is positive if $(\partial R / \partial \rho) > 0$ and $\tilde{\gamma}_{\rho}$ is sufficiently small.

12. Letting ϕ be the left-hand term of (11),

$$\frac{\partial e}{\partial \rho} = - \frac{\partial \phi / \partial \rho}{\partial \phi / \partial e} < 0,$$

since $(\partial \phi / \partial e) < 0$ by the second-order condition for utility maximisation and

$$\frac{\partial \phi}{\partial \rho} = - \sigma_e \cdot \{U[R \cdot (1 - \tau), \eta_2] - U[B, 0]\} < 0$$

13. Our model does not tell whether the ρ curve is steeper than the $f-w$ curve or vice versa, although the correspondence principle may be used to generate the configuration of Figure 2: assuming that ρ adjusts instantaneously to exogenous shocks (in accordance with equation (19)) where σ adjusts with a lag, the equilibrium (σ^*, ρ^*) is stable only if the $f-w$ curve is steeper than the ρ curve.

14. Clearly, our derivation of the morale effect of labour turnover is valid for the special case in which $W = 0$. For the other special case, where $a = 0$,

$$\frac{\partial \phi}{\partial Q} = \sigma_{e\bar{Q}} \{U[W^*(1 - \tau), e_2] - \rho U[R^*(1 - \tau), n_2] - (1 - \rho) \cdot U[B, 0]\}$$

where ϕ is the left-hand term of (11). The morale effect (viz, $(\partial e / \partial \bar{Q}) < 0$) arises when $\sigma_{e\bar{Q}} < 0$.

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