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PATTERNS OF UNEMPLOYMENT: AN INSIDER–OUTSIDER ANALYSIS

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1. Introduction

Theories of unemployment should be able to explain a broad spectrum of empirical regularities, such as the following prevalent features of the labor markets in the US and many European countries:

(1) Unemployment rates display a high degree of serial correlation, or "persistence". This phenomenon is more pronounced in most European countries than in the US.

(2) The average rate of unemployment has been higher in the US than in Europe over the 1950s and 60s, but the opposite has been the case in the 80s.

(3) The long-run unemployment rate appears to be independent of the level of productivity and the magnitude of the labor force. While the US and many European countries have witnessed massive growth of productivity and labor force over the long run, the unemployment rate has always tended to return to a narrow range (approximately 2 - 6%) over the long run. Over the short run, however, the unemployment rate often varies inversely with the productivity level.

Recent contributions to the unemployment literature have sought to explain one or the other of these stylized facts, but not how all of these regularities can arise in conjunction. For example, the explanations of US-European differences in unemployment persistence are generally distinct from those concerning differences in the average rates of unemployment. For if labor turnover costs,[1] membership effects,[2] and discouraged worker effects[3] are used not only

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[1]For example, Bertola (1990) and Lindbeck and Snower (1988).

[2]These are mechanisms whereby hired workers gain insider status and fired workers lose it. See, for example, Blanchard and Summers (1986), Gottfries and and Horn (1987), Lindbeck and Snower (1987). Lindbeck and Snower (1988, 1989) examine how persistence depends on the interaction between turnover costs and membership rules. Here turnover costs not only generate employment persistence directly, but are also responsible for the insiders' market power, which determines the influence of membership rules on wage formation.

[3]For example, Bean and Layard (1990)

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to explain the former differences, but also to provide a rationale for why the European unemployment rate exceeded the US rate in the 1980s, then it is not immediately clear why the reverse was true in the 50s and 60s. Moreover, stylized fact (3) casts doubt on the hysteresis hypothesis, for in the presence of a unit root it is extremely unlikely that the unemployment rate would remain within a narrow range despite random labor market shocks.

It has become increasingly common to analyze stylized facts (1) and (2) through a simple model of a non-clearing labor market in which employment and the real wage are given by the intersection of a downward-sloping labor demand curve and an upward-sloping wage setting curve, with the labor supply curve lying to the right of this intersection,[4] as shown in Figures 1. Here the equilibrium level of unemployment may be depicted as the difference between labor supply and demand at the equilibrium real wage (W*). Within this analytical setup, unemployment persistence (stylized fact (1)) may be illustrated by making the positions of the labor demand, wage setting, and labor supply curves depend on past levels of labor market activity. A change in the average rate of unemployment in the US relative to Europe (in stylized fact (2)) can easily be pictured in terms of changes in the relative positions of the above curves.

This setup, however, makes it difficult to account for stylized fact (3). Consider, for instance, the effects of an increase in labor productivity, manifested in an upward shift of the labor demand curve,[5] while the labor supply curve remains unchanged. The only way

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[4]The labor supply curve depicts the amount of labor services offered at any given real wage; the labor demand curve depicts the real marginal value product of labor set equal to the real wage; while the wage setting curve has different interpretations in different theoretical contexts. For example, in union theories it may be a bargaining locus (e.g. Johnson and Layard (1987)), in the efficiency wage theory (e.g. Shapiro and Stiglitz (1984)) it may be a no-shirking or no-quitting locus, and in the insider-outsider theory (e.g. Lindbeck and Snower (1990) it may represent insiders' wage claims.

[5]Of course, if the productivity change takes the form of an increase in the *average* product of labor, while the *marginal* product remains unchanged, the labor demand curve will remain unchanged as well, so

for this productivity increase to leave the long-run unemployment rate unchanged is for the wage setting curve to shift upwards by the same amount as the labor demand curve, as shown in Figure 1a. Yet the conventional theories of wage determination do not ensure that this will happen.[6] [7] Furthermore, these theories do not guarantee that when the labor force increases, so that the labor supply curve shifts to the right, the wage setting curve will shift rightwards sufficiently to keep the long-run unemployment rate unaffected, as shown in Figure 1b.[8]

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that unemployment will be unaffected by the productivity change. However, the empirical evidence on aggregate and sectoral production functions does not lend support to the hypothesis that productivity increases predominantly take this form.

[6]For example, in the bargaining models of wage determination (e.g. McDonald and Solow (1981)), a productivity increase may raise firms' bargaining surplus and improve workers' fall-back position and thereby raise the negotiated wage at any given level of employment, but as long as firms have some market power this upward shift of the wage setting function will generally be less than the upward shift of the labor demand curve. In the shirking and turnover variants of the efficiency wage theory (e.g. Shaprio and Stiglitz (1984) and Stiglitz (1985), respectively), the real wage that leaves workers indifferent between shirking and not shirking, or quitting and staying (at any given level of employment), does not depend on the level of productivity and thus the wage setting function does not shift at all in response to the productivity increase.

[7]Clearly, if the labor supply curve shifts inwards in response to an income effect from the productivity increase, this deficiency of the conventional theories becomes even more pronounced.

[8]In the productivity-differential variant of the efficiency wage theory (e.g. Weiss (1980), a rise in the labor force that leaves the distribution of abilities unchanged has no effect on the profit-maximizing wage. In the shirking and turnover variants, the impact effect of a rise in the labor force is to reduce workers' expected return from shirking or quitting and thus the wage necessary to discourage shirking or quitting falls; but the wage will not fall sufficiently to drive the unemployment rate down to its initial level. The reason is that, given that the initial wage is set at the minimum level that discourages workers from shirking or quitting, then a drop in the wage that is sufficient to restore the initial unemployment rate would clearly fail to have this discouragement effect. In the bargaining models, a rise in the labor force worsens workers' fall-back position and increases firms' probability of filling their vacancies, but the wage setting function will not fall sufficiently to restore the initial unemployment rate. The reason is that if the wage

The aim of this paper is to present a simple insider-outsider model that can account simultaneously for all of the stylized facts above, as well as generate a number of further empirically testable hypotheses concerning the determinants and evolution of unemployment. The model rests on two general observations: (i) labor markets are characterized by significant labor turnover, so that the gross flows of workers into and out of firms often far exceed the net changes in employment at these firms, and (ii) labor turnover costs play an important role in firm's employment decisions and in enabling insiders to gain market power in the wage setting process. Some comentators have suggested that the insider-outsider theory, with its heavy emphasis on labor turnover costs, may be irreconcilable with the observed magnitude of gross flows of workers into and out of firms. Our analysis, on the contrary, shows that if wage setters have imperfect information about productivity, significant labor turnover costs may not prevent large numbers of workers from moving into and out of jobs, but these costs can have an important influence on firms' hiring and retention rates, thereby affecting both the level and persistence of unemployment.

Our analysis has the following "insider-outsider" features: (i) It views labor turnover costs as "hurdles" which impede both the entry of outsiders to employment and the exit of insiders from employment. For example, when productivity is stochastic, hiring costs of outsiders are hurdles that outsiders' marginal revenue products must exceed in order to gain employment, and firing costs are hurdles that insiders' marginal revenue products must fall beneath in order to lose employment. (ii) These hurdles not only affect firms hiring and retention decisions, but - in doing so - also give insiders market power. This power arises because insiders face more favorable employment opportunities than the outsiders, in the sense that the outsiders' chances of gaining employment are less than the insiders'

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were to fall sufficiently, then an increase in the labor force would reduce the expected returns of workers relative to that of firms; but such an outcome is impossible if the relative bargaining strength of workers and firms (given, say, by the exponents of the Nash product) remains unchanged.

chances of retaining employment, at any given wage. (iii) The insiders are assumed to use their power to pursue their own interests in the wage negotiation process, from which the outsiders are "disenfranchized".

For simplicity, we will assume constant returns to labor, so that the insiders' wage demands do not depend on the magnitude of the firm's insider workforce. We do not regard "insider membership effects" in the wage setting function as a crucial element of the insider-outsider analysis, in contrast to a number of empirical studies (e.g. Nickell and Wadhwani (1990)) that measure the significance of insiders' activities in the labor market exclusively via such effects.

In this context, our model provides a straightforward microfoundation of unemployment persistence, which is shown to depend negatively on firms' hiring rates and positively on their retention rates. Thereby the model suggests several explanations for why unemployment persistence tends to be greater in European countries than in the US. It also indicates that the degree of unemployment persistence may vary cyclically, and suggests that the relative importance of firing costs versus "discouraged worker" effects in influencing unemployment persistence may vary over the business cycle. Beyond that, the model shows why the relative magnitudes of the unemployment rates in Europe and the US may depend on whether there is a world-wide recession or boom. Finally, it explains how long-run adjustments in the number of firms, labor turnover costs, and unemployment benefits can make the long-run unemployment rate independent of the levels of productivity and the labor force.

The paper is organized as follows. Section 2 deals with employment determination and Section 3 with wage formation. Section 4 combines the employment and wage models to derive the labor market equilibrium. Section 5 examines the implications of the model regarding the stylized facts above. Section 6 concludes.

2. Employment and Unemployment

We consider a labor market in which wage and employment decisions

are made in two successive stages: first wages are set through bargaining between firms and their employees (taking the employment repercussions into account), and then firms make the employment decisions (taking wages as given). The present section is concerned with the second stage of this decision making process, while Section 3 deals with the first stage. For simplicity, we assume that the firms are price takers in the product market, and thus setting the nominal wage automatically determines the real wage.[9]

2a. The Retention and Hiring Rates

To capture the main observed flows of workers into and out of firms, we extend the insider-outsider analysis to cover four types of workers:[10] (i) "incumbent insiders" (incumbent employees who continue to work for the same firm as in the previous period), (ii) "entering insiders" (incumbent employees who have switched to a new firm in the current period), (iii) "entering outsiders" (who have been hired from the unemployment pool in the current period), and (iv) "unemployed outsiders" (who remain in the unemployment pool in the current period). When an unemployed outsider is hired by a firm, he becomes an entering outsider; after remaining with that firm for one period, he becomes an incumbent insider; and when an incumbent insider switches firms, he becomes an entering insider.

Employees differ in terms of both the revenues they generate and the costs they incur to the firm. We assume that the marginal revenue product of an incumbent insider is greater than that of an entering insider, since the latter lacks firm-specific training; and the marginal revenue product of an entering insider is greater than that of an entering outsider, since the latter is assumed to lack both general and firm-specific training.

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[9]Our qualitative conclusions, however, continue to hold under monopolistic competition as well as the standard formulations of cartel, Cournot, and Bertrand oligopoly behavior.

[10]Existing insider-outsider models do not consider the possibility of "entering insiders".

In particular, let the marginal revenue product of an incumbent insider be $\gamma \cdot \Lambda$, where γ is a shift parameter used to proxy cyclical variations as well as productivity shocks, and Λ is a random variable with a twice-differentiable density $j(\Lambda)$. Each firm is assumed to face the same density $j(\Lambda)$ and parameter γ. Λ is iid across firms, and firms are assumed to differ only insofar as they draw different realized values of Λ. These realized values are assumed to become known after the wage decision but before employment decision; thus wage setters face an uncertain employment response.

The marginal revenue product of an entering insider is $\tau_I \cdot \Gamma \cdot \Lambda$, and that of an entering outsider is $\tau_O \cdot \Gamma \cdot \Lambda$, where τ_I and τ_O are constants, $0 < \tau_O < \tau_I < 1$.

As for the costs of these employees, we assume for expositional simplicity that all workers receive the same wage (W),[11] which is the outcome of a bargaining process between the incumbent insiders and their firms. Furthermore, although labor turnover costs can come in many different guises, we will assume here that they simply take the form of hiring and firing costs: the incumbent insider is associated with a firing cost F (where $F > 0$ and constant per worker); the entering outsider requires a hiring cost H_O, while the entering insider requires a hiring cost H_I (where $0 < H_I < H_O$, both constant per worker).

Letting firms be single-period profit-maximizers, it follows that an incumbent insider is retained when the profit from doing so ($\gamma \cdot \Lambda$ - W) plus the firing cost (F) is non-negative, so that $\Lambda \geq (W - F)/\gamma$.

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[11] It is worth noting that in a world where incumbent insiders have more market power than entering insiders and entering outsiders have even less, and where the wage can be precommitted when employment decisions are made, incumbent insiders, entering insiders, and entering outsiders may well wind up with different wages. However, the assumption that *all* workers - insiders and entrants alike - receive the same wage is a harmless simplification for our purposes, since it can be shown that our qualitative results can be derived from the weaker assumption that the wage (W_{EI}) of entering insiders and the wage (W_{EO}) of entering outsiders each depends positively on the wage (W) of incumbent insiders. This latter assumption is rationalized in the appendix.

Consequently the retention rate (i.e. the fraction of incumbent insiders that are retained by the firm) is

$$(1)\quad r = \int_{(W-F)/\gamma}^{\infty} j(\Lambda)\, d\Lambda \;=\; 1 - J\left[\frac{W-F}{\gamma}\right], \quad J' > 0,$$

where $J(\Lambda)$ is the cumulative density of Λ.

An entering insider is hired when the revenue from doing so $(\tau_I \cdot \gamma \cdot \Lambda)$ exceeds the cost $(W+H_I)$, so that $\Lambda \geq (W + H_I)/(\tau_I \cdot \gamma)$. Consequently the insider hiring rate (i.e. the fraction of insider applicants from other firms that are hired by the firm in question) is

$$(2a)\quad h_I = \int_{(W+H_I)/(\tau_I \cdot \gamma)}^{\infty} j(\Lambda)\, d\Lambda \;=\; 1 - J\left[\frac{W+H_I}{\tau_I \cdot \gamma}\right].$$

Similarly, an entering outsider is hired iff $\Lambda \geq (W + H_O)/(\tau_O \cdot \gamma)$, so that the outsider hiring rate (i.e. the fraction of outsiders applying to the firm that are hired) is

$$(2b)\quad h_O = \int_{(W+H_O)/(\tau_O \cdot \gamma)}^{\infty} j(\Lambda)\, d\Lambda \;=\; 1 - J\left[\frac{W+H_O}{\tau_O \cdot \gamma}\right].$$

We assume that the firm's workforce and the unemployment pool are "large", so that these retention and hiring rate may be approximated by constants (for given W, F, H, and γ) rather treated as random variables.

2b. Unemployment

Given the retention and hiring rates specified above, we now proceed to derive the unemployment rate. In the process, we aim to capture two independent sources of unemployment persistence: (i) the "insider advantage effect", whereby labor turnover costs give insiders more favorable employment conditions than outsiders and (ii) the "outsider disadvantage effect", whereby the ability of outsiders to find jobs falls with their unemployment duration.

We focus on the insider advantage effect arising from the direct influence of labor turnover costs on employment decisions. Specifically, these turnover costs give firms an incentive to retain incumbent insiders and to make the insider hiring rate exceed the

outsider hiring rate, thereby generating serial correlation in aggregate employment. The outsider disadvantage effect that we consider is commonly known as the "discouraged worker effect", whereby the search activity of the short-term unemployed workers tends to exceed that of the long-term unemployed, consequently generating serial correlation in unemployment. Needless to say, there are other insider advantage[12] and outsider disadvantage effects,[13] but it is unnecessary to include them in our analysis since they may be expected to have analogous implications for unemployment persistence.

In the context of our model, we define the "long-term unemployed" as those workers who have been unemployed for a period or more, whereas the "short-term unemployed" are those who have become unemployed in the current period. For simplicity, we assume that job search is a discrete activity, so that a worker either searches (and thereby has a positive probability of getting a job) or does not search (and thus has no chance of a job). In this framework, we capture the outsider disadvantage effect by assuming that *all* the short-term unemployed workers are engaged in job search, while only a fraction θ ($0 < \theta < 1$) of the long-term unemployed workers search.

The short-term unemployed workers come from two sources: (a) new entrants to the labor force and (b) insiders who leave their jobs at the beginning of the current period. Let λ and λ_{-1} be the current and last period's labor force, respectively. Then the number of new entrants to the labor force who remain unemployed is $(1 - h_o)\cdot(\lambda -$

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[12]We will not consider how unemployment persistence can arise from the indirect influence of labor turnover costs on employment, operating through the wage setting process (as in Blanchard and Summers (1986) and Lindbeck and Snower (1987)). Here, the current wage depends inversely on the size of the current insider workforce which, in turn, depends positively on past employment. Thus, the larger is past employment, the lower will be the current wage and consequently the larger will be current employment. As noted, we do not consider this effect critical to the insider-outsider analysis of unemployment, and we have excluded this possibility by assuming constant returns to labor.

[13]The ability of the long-term unemployed workers to find jobs may also be impaired on account of the deterioration and obsolescence of their human capital or firms' use of unemployment duration as a screening device for productivity.

λ_{-1}), since $\lambda - \lambda_{-1}$ is the number of new entrants and $h_O \cdot (\lambda - \lambda_{-1})$ of them are hired as entering outsiders.[14] Let N_{-1} be aggregate employment in the previous period, and σ be the exogenously given quit rate. Then the aggregate number of insiders who become unemployed in the current period is $(1 - h_I) \cdot [1 - r \cdot (1-\sigma)] \cdot N_{-1}$, since there are $r \cdot (1-\sigma) \cdot N_{-1}$ incumbent insiders, of whom $[1 - r \cdot (1-\sigma)] \cdot N_{-1}$ leave their jobs at the beginning of the current period and $h_I \cdot [1 - r \cdot (1-\sigma)] \cdot N_{-1}$ are hired as entering insiders. The level of short-term unemployment is the sum of the aggregate number of entrants and insiders who become unemployed in the current period: $(1 - h_O) \cdot (\lambda - \lambda_{-1}) + (1 - h_I) \cdot [1 - r \cdot (1-\sigma)] \cdot N_{-1}$.

The long-term unemployed are drawn exclusively from last period's unemployed outsiders, U_{-1}. Of these, $\theta \cdot U_{-1}$ engage in job search, $h_O \cdot \theta \cdot U_{-1}$ are hired. Thus, the level of long-term unemployment is $(1 - h_O) \cdot \theta \cdot U_{-1}$.

Total unemployment is the sum of short-term and long-term unemployment:

$$(3a) \quad U = (1 - h_O) \cdot (\lambda - \lambda_{-1}) + (1 - h_I) \cdot [1 - r \cdot (1-\sigma)] \cdot N_{-1} + (1 - h_O) \cdot \theta \cdot U_{-1}.$$

Defining the unemployment rate as $u \equiv (\lambda - N)/\lambda$ and the exogenously given growth rate of the labor force as $g_\lambda = (\lambda - \lambda_{-1})/\lambda_{-1}$, and observing that $\lambda = N + U$, we obtain the following equation for the unemployment rate (u):

$$(3b) \quad u = \left[\frac{1}{1+g_\lambda} \right] \cdot [h_I - h_O \cdot \theta + r \cdot (1-\sigma) \cdot (1-h_I)] \cdot u_{-1} + \left[\frac{1}{1+g_\lambda} \right] \cdot [g_\lambda \cdot (1-h_O) + (1-h_I) \cdot \{1 - r \cdot (1-\sigma)\}].$$

Here the "unemployment persistence coefficient", measuring the degree

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[14] We are implicitly assuming that the firm has sufficient job slots to employ all profitable applicants. In the short run, however, it is possible that the firm's labor and capital may be imperfectly substitutable and consequently the number of available job slots may fall short of the number of otherwise profitable applicants. Section 6 shows how our analysis must be amended in that event.

of persistence in the unemployment rate, is

$$(4) \quad \kappa = \circ[h_I - h_O \cdot \theta + r \cdot (1-\sigma) \cdot (1-h_I)] \cdot (1+g_\lambda)^{-1}.$$

For example, if 80% of all insider applicants and 10% of all outsider applicants are hired, 95% of all incumbent insiders are retained, 20% of the incumbent insiders quit, 50% of the long-term unemployed search, and the labor force is constant, then the unemployment persistence coefficient is just over 0.9.

The roles of the insider advantage effect and the outsider disadvantage effect in generating unemployment persistence are easy to identify. Regarding the former effect, it is apparent that insiders have two advantages over outsiders in our model: (i) the insider hiring rate exceeds the outsider hiring rate ($h_I > h_O$) and (ii) a fraction r of the insiders are retained from the previous period. Reducing each of these advantages (viz, reducing the insider hiring rate while raising the outsider hiring rate or reducing the retention rate) clearly reduces the unemployment persistence coefficient. As for the outsider disadvantage effect, a reduction in the differential between the search activity of the short-term and long-term unemployed workers (viz, a rise in the fraction θ) also reduces the unemployment persistence coefficient. Finally, it is easy to verify that in the absence of both the insider advantage and outside disadvantage effects ($h_I = h_E$, $r = 0$, $\theta = 1$), the unemployment persistence coefficient is zero ($\kappa = 0$).

In this way our model provides a simple, appealing microeconomic rationale for unemployment persistence. Equation (4) shows how the degree of unemployment persistence depends positively on the insider hiring rate and the retention rate and negatively on the outsider hiring rate. Furthermore, equations (1), (2a) and (2b) show how these hiring and retention rates depend on the wage and the labor turnover costs.

3. Wage Determination

Let the wage be the outcome of a Nash bargain between the firm

and its incumbent insiders. Since all insiders are assumed to be alike and to face constant returns to labor (so that the employment of one insider does not affect the marginal revenue product of another insider), the structure of the bargaining problem is the same regardless of whether the firm bargains individually with each of its incumbent insiders, or with a union of these insiders maximizing the utility of its representative member. In what follows we will assume that the bargaining objective of the insider is to maximize his expected income (in excess of his expected fall-back income), while the firm's objective is to maximize its expected profit (in excess of its expected fall-back profit).

In case of bargaining agreement between the firm and its insiders, the incumbent insider's payoff is $r \cdot W + (1-r) \cdot [h_I \cdot \hat{W} + (1-h_I) \cdot B]$, where $\hat{W}$ is the "outside wage" (the wage offered by other firms) and B is unemployment benefit, both taken to be exogenously given in the context of the bargaining problem. In words, if the the incumbent insider is retained (with probability r), he receives the wage W; and if he is fired (with probability (1-r)), then with probability h_I he is hired by another firm at wage $\hat{W}$ and with probability $(1-h_I)$ he remains unemployed an receives the unemployment benefit B. .

In case of bargaining disagreement, the incumbent insider engages in industrial action (whose effects on the firm will be described below) as well as seek another job. If he finds another job (with probability h_I), he receives the wage $\hat{W}$; while if he fails to find another job (with probability $(1-h_I)$), he receives the exogenously given fall-back income $\hat{B}$, which could be interpretted as support from family and friends during the industrial action or the proceeds from temporary self-employment. Thus the insider's fall-back position is $[h_I \cdot \hat{W} + (1-h_I) \cdot \hat{B}]$.

Consequently, the incumbent insider's bargaining objective is

$$\Omega_I = r \cdot W + (1-r) \cdot [h_I \cdot \hat{W} + (1-h_I) \cdot B] - [h_I \cdot \hat{W} + (1-h_I) \cdot \hat{B}].$$

Assuming for simplicity that $B = \hat{B}$ (i.e. the unemployment benefit is equal to the fall-back income under disagreement), this reduces to

$$(5a) \qquad \Omega_{I_0} = r\cdot[W - h_I\cdot\hat{W} - (1-h_I)\cdot B].$$

The firm under bargaining agreement has an expected profit of $\gamma\cdot\Lambda_{II}$ - W, where $\gamma\cdot\Lambda_{II}$ is the incumbent insider's marginal revenue product conditional on his having been retained[15], where

$$\Lambda_{II} = \left[\int_{(W-F)/\gamma}^{\infty} \Lambda\cdot j(\Lambda)\, d\Lambda\right] \Big/ \left[\int_{(W-F)/\gamma}^{\infty} j(\Lambda)\, d\Lambda\right]$$

$$= \Lambda_{II}[(W-F)/\gamma], \qquad \Lambda'_{II} \geq 0.$$

Under disagreement, as noted, the insiders engage in industrial actions, and we assume that the greater is the level of these actions - such as working to rule, striking, absenteeism, or sabotage - the lower will be the firm's fall-back profit, and thereby the greater the negotiated wage emerging from the Nash bargain. Yet even assuming that the industrial actions are costless to the incumbent insiders,[16] they have no incentive to inflict so much damage on the firm that its fall-back profit becomes less than its profit from replacing these insiders by entering insiders.[17] It follows that the incumbent insiders' industrial actions will be just sufficiently high so as to set the firm's fall-back profit (ξ) exactly equal to the profit per

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[15]Observe that if r=1, then $\Lambda_{II} = E(\Lambda)$, the mathematical expectation of Λ.

[16]This is not an assumption of substance in our analysis. In practice, the costs of industrial actions tend to fall more heavily on the firms than on the workers.

[17]The obvious reason is that if the insider is permanently replaced under bargaining disagreement, the present value of his income stream will generally be lower than if he is recalled after agreement has been reached. This rationale lies outside our one-period model, but can easily be incorporated in the intertemporal extension of our model given in Lindbeck and Snower (1991). We consider the possibility of replacing the incumbent insiders by entering insiders rather than be entering outsiders, since the entering insiders are assumed to be more profitable than the entering outsiders (recall that $\tau_I > \tau_O$ and $H_I < H_O$).

incumbent insider from replacing that insider by an entering insider. Let R be the entering insider's wage under bargaining disagreement; this wage is clearly distinct from the negotiated wage under agreement and is exogenously given in the context of the bargain. Let $\tau_I \cdot \gamma \cdot \Lambda_{EI}$ be the entering insider's expected marginal revenue product, where

$$\Lambda_{EI} = \left[\int_{(R+H_I)/(\tau_I \cdot \gamma)}^{\infty} \Lambda \cdot j(\Lambda)\, d\Lambda \right] \Big/ \left[\int_{(R+H_I)/(\tau_I \cdot \gamma)}^{\infty} j(\Lambda)\, d\Lambda \right]$$

$$= \lambda_{EI}[(R+H_I)/(\tau_I \cdot \gamma)], \qquad \lambda'_{EI} \geq 0.$$

Then the firm's fall-back profit is

$$(5b) \quad \xi \equiv \tau_I \cdot \gamma \cdot \Lambda_{EI} - R - H_I - F,$$

which may be taken as exogenously given to the wage bargainers.

Thus the firm's bargaining objective may be expressed as

$$(5c) \quad \Omega_F = \gamma \cdot \Lambda_{II} - W - \xi.$$

The Nash bargaining problem is

$$(6) \quad \Omega = (\Omega_I)^{\mu} \cdot (\Omega_F)^{1-\mu},$$

where μ (a constant) represents the bargaining strength of the incumbent insider (or union of incumbent insiders) relative to that of the firm. Maximizing Ω with respect to W yields the negotiated wage:[18]

$$(7) \quad W^* = \mu \cdot (1-\eta) \cdot [\gamma \cdot \Lambda_{II} - \xi] + (1-\mu) \cdot [h_I \cdot \hat{W} + (1-h_I) \cdot B],$$

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[18]To derive this result, note that the insider hiring rate ($h_I = 1 - J[(\hat{W}+H_I)/(\tau_I \cdot \gamma)]$) depends on $\hat{W}$, the wage that is relevant to the other firms and determined through negotiations between those firms and their insiders. Since W is exogenous to the bargaining problem under consideration, so will h_I be. Furthermore, we ignore the effect of W on the expected marginal revenue product of the insider, $\gamma \cdot \Lambda_{II}$. This effect is zero when r=1 (since then $\Lambda_{II} = E(\Lambda)$), and in practice it is quite unlikely to play a dominant role in wage determination when r<1.

where $\eta = -(\partial r/\partial W)\cdot[(W - h_I\cdot\hat{W} - (1-h_I)\cdot B)/r]$ is the elasticity of the retention ratio with respect to the wage, evaluated in terms of the excess of the wage over the insider's fall-back position. For simplicity, we assume that η is a constant.[19] Then the negotiated wage may be viewed as a linear weighted average of four components: (i) the insider's marginal revenue product, $\gamma\cdot\lambda_{II}$; (ii) the firm's fall-back profit, ξ; (iii) the "outside wage", $\hat{W}$; and (iv) the unemployment benefit (B). The short-run wage setting function (7) is illustrated by the WS^{SR} curve in Figure 2a.

4. Labor Market Activity

We now combine our models of unemployment and wage determination to describe the labor market equilibrium over the short and long run. In the short run, the four components of the negotiated wage ($\gamma\cdot\lambda_{II}$, ξ, $\hat{W}$, and B) are exogenously given, along with the insider hiring rate[20] (h_I) and last period's unemployment rate (u_{-1}). Thus the short run equilibrium wage (W^{SR}) and insider hiring rate (h_I^{SR}) may be described by the intersection of the hiring function (2a) and the wage setting function (7), denoted by IH and WS^{SR} (respectively) in Figure 2a. The IH curve shows that a rise in the negotiated wage reduces firms' hiring of insiders, and the WS_{SR} curve indicates that a rise in the insider hiring rate raises the negotiated wage, since it increases the insider's chance of receiving the alternative wage $\hat{W}$ rather than the unemployment benefit B.[21]

To derive the corresponding short-run equilibrium unemployment rate, we specify this rate in terms of the insiders' hiring rate. Substituting W out of (1) and (2a), we find that variations in the

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[19]This assumption restricts the functional form of the density of λ. In particular, it can be shown that the assumption implies that $(\partial j/\partial W)/(W/j) = \eta\cdot\gamma - 1$ is a constant.

[20]The rate at which other firms hire insiders depends on the wage ($\hat{W}$) and the insider hiring cost (H_I) at those firms, both of which are exogenously given in the context of the bargain under consideration.

[21]The slope of the WS_{SR} curve is $((\partial W^*/\partial h) = (1-\mu)\cdot(\hat{W}-B)) > 0$.

wage move the retention rate (r) and the insiders' hiring rate (h_I) in the same direction (given the relevant labor turnover costs, H_I and F, and productivity parameters, τ_I and γ):

$$(8a) \quad r = 1 - J[\tau_I \cdot J^{-1}(1-h_I) - \{(H_I+F)/\gamma\}].$$

Similarly, by (2a) and (2b), wage variations also move the outsiders' hiring rate (h_O) in the same direction as the insiders' hiring rate (h_I):

$$(8b) \quad h_O = 1 - J[(\tau_I/\tau_O) \cdot J^{-1}(1-h_I) + \{(H_O-H_I)/\gamma\}].$$

Substituting (8a) and (8b) into the unemployment function (3b), we find that the unemployment rate is inversely related to the insider's hiring rate, for given labor turnover costs (H and F) and productivity parameters (τ_I, τ_O, and γ). Intuitively, a fall in the wage raises the insider's hiring rate, along with the retention rate and the outsiders' hiring rate, and thereby reduces the unemployment rate. In terms of Figures 2, observe that given the short-run equilibrium insiders' hiring rate h_I^{SR} - as determined in Figure 2a - the short-run equilibrium unemployment rate is u^{SR} in Figure 2b.

In the long run, the four components of the negotiated wage ($\gamma \cdot \lambda_{II}$, ξ, $\hat{W}$, and B) as well as the past unemployment rate (u_{-1}) are endogenously determined. First of all, we assume that the wage (W), the insiders' hiring rate (h_I), and the unemployment rate (u) adjust so that

$$(9a) \quad u = u_{-1}$$

and

$$(9b) \quad W^* = \hat{W},$$

i.e. the unemployment rate is stationary and the negotiated wage is equal to the outside wage (since all firms face the same bargaining conditions). Beyond these straightforward assumptions, our aim is to specify long-run conditions under which the unemployment rate becomes independent of the level of productivity and the labor force. Accordingly, we assume that four further adjustments occur over the

long run:[22]

(i) The unemployment benefit B is proportional to the wage:

(10a) $B = \beta \cdot \hat{W}$,

where the replacement ratio β is a constant.

(ii) The labor turnover costs per worker are proportional to the wage:

(10b) $H_I = v_I \cdot \hat{W}$, $H_O = v_O \cdot \hat{W}$, $F = v_F \cdot \hat{W}$,

where v_I, v_O, and v_F are positive constants.

(iii) The entering insider's wage under disagreement is proportional to the wage:

(10c) $R = x_R \cdot \hat{W}$,

where x_R is a positive constant.

(iv) Entry of firms proceeds until the marginal entering firm makes zero profit on its most profitable employees. Since we have assumed that entering insiders are more productive than entering outsiders ($\tau_I > \tau_O$) and have lower hiring costs ($H_I < H_O$), the most profitable employees to a new firm are its entering insiders. Moreover, we assume that there are barriers to firm entry, manifesting themselves through a reduced ability of entering firms to generate revenue. Specifically, let the profit of an entering insider in a potentially entering firm be $(1/\alpha) \cdot (\tau_{EI} \cdot \gamma \cdot \lambda_{EI}) - W - H_I$, where the size of the entry barrier is given by the parameter α (where $\alpha > 1$). Let ϕ be the number of firms and assume that $\alpha = \alpha(\phi)$, $\alpha' > 0$, i.e. the greater the number of firms, the lower the revenue generated by a worker. Then in the long run the number of firms ($\phi = \phi^*$) is given by the following zero profit condition:

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[22]Johnson and Layard (1987) show that when the wage is set unilaterally by a union, then the assumption that the workers' fall-back income is proportional to the wage is sufficient to ensure that the long-run unemployment rate becomes independent of the productivity level. However, when the wage is the outcome of bargaining, as in our model, this assumption is no longer sufficient, as shown by equation (7). Nor does this assumption ensure that the long-run unemployment rate is independent of the magnitude of the labor force. In our model, this independence arises from our specification of the labor demand function in terms of the employment probability, rather than the employment level.

(10d) $\alpha^* \cdot W^* + H_I = \tau_{EI} \cdot \gamma \cdot \lambda_{EI}$,

where $\alpha^* = \mathring{\alpha}(\phi^*)$.

Conditions (10b) and (10d) imply that the entering insider's marginal revenue product is proportional to the equilibrium wage in the long run:

(11) $\tau_{EI} \cdot \gamma \cdot \lambda_{EI} = (\alpha^* + v_I) \cdot \hat{W}$.

Furthermore, conditions (10b), (10c), and (11) imply that the firm's fall-back profit (5b) is proportional to the equilibrium wage in the long run:

(12) $\xi = x \cdot \hat{W}$,

where $x = \alpha^* - x_R - v_F$.

Substituting conditions (9b), (10a), (11) and (12) into the short-run wage setting function (7), we obtain

$$W^* = \mu \cdot (1-\eta) \cdot [(\alpha^* + v_I) \cdot W^* - x \cdot W^*] + (1-\mu) \cdot [h_I^{LR} \cdot W^* - (1-h_I^{LR}) \cdot \beta \cdot W^*],$$

where h_I^{LR} is the long-run equilibrium employment probability. Cancelling W^* from both sides of this equation, we find that the negotiated wage must be set so that the long-run insider hiring rate (h_I^{LR}) is a constant:

$$(13) \quad h_I^{LR} = \frac{1 - \mu \cdot (1-\eta) \cdot (\alpha^* + v_I - x) - (1-\mu) \cdot \beta}{(1-\mu) \cdot (1-\beta)} .$$

This condition is illustrated by the vertical long-run wage setting curve (WS^{LR}) in Figure 3a.

Substituting condition (13) into the short-run unemployment function (4b), we obtain the following long-run unemployment function:

$$(14) \quad u^{LR} = \frac{g_\lambda \cdot (1-h_O) + (1-h_I) \cdot [1 - r \cdot (1-\sigma)]}{g_\lambda + h_O \cdot \theta + (1-h_I) \cdot [1 - r \cdot (1-\sigma)]} .$$

Finally, substituting (8a) and (8b) into (14), we find that the long-run unemployment rate (u^{LR}) is inversely related to the insider hiring rate (h_I), after the associated variations in the retention

rate (r) and the outsider hiring rate (h_O) are taken into account. This relation is described by the UF^{LR} curve in Figure 3b (where "UF" stands for "unemployment function).[23]

The intersection of the hiring function (2), pictured by the HF curve in Figure 3a, and the long-run wage setting function (13), illustrated by the WS^{LR} curve in Figure 3a, yield the long-run equilibrium wage rate (W^{LR}) and the long-run insider hiring rate (h^{LR}). Given this hiring rate, the UF^{LR} curve yields the long-run equilibrium unemployment rate (u^{LR}) in Figure 3b.

We now turn to the salient implications of our model.

5. Implications

5a. Positive Unemployment Persistence but No Hysteresis

Equation (4) implies that the degree of unemploment persistence, through positive, generally falls short of hysteresis. Given that the outsider hiring rate never exceeds the insider hiring rate[24] ($h_I \geq h_O$), the absence of persistence ($\kappa=0$) would require that the insider and outsider hiring rates are equal ($h_I = h_O$) as well as one of the following: (i) no retention of insiders ($r = 0$), (ii) all workers quitting at the end of each period ($\sigma = 1$), and (iii) hiring of all job applicants ($h_I = h_O = 1$). It is most unlikely that these conditions should be fullfilled in practice. Moreover, hysteresis ($\kappa = 1$) can occur in our model only in the extremely unlikely event that *all* of the following conditions hold simultaneously: (i) all insiders are retained ($r = 1$), (ii) there is no hiring ($h_I = h_O = 0$), (iii)

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[23]By (8a) and (8b), h_I, h_O, and r move in the same direction, for given labor turnover costs (H_I, H_O, and F) and productivity parameters (τ_I, τ_O, and γ). By (14), $(\partial u^{LR}/\partial h_I) < 0$, $(\partial u^{LR}/\partial h_O) < 0$, and $(\partial u^{LR}/\partial r) < 0$. Thus, u^{LR} is inversely related to h_I, taking the comovements of h_O and r into account.

[24]In other words, the fraction of outsider applicants hired never exceeds the corresponding fraction of insider applicants.

there are no quits ($\sigma=0$), and (iv) labor force growth is zero ($g_\lambda=0$).

The prediction of positive persistence but no hysteresis is compatible with the evidence on the serial correlation in unemployment rates together with the tendency of unemployment rates to return to a narrow range.

5b. Unemployment Persistence in Europe and the US

Our model suggests a simple set of explanations for why the degree of unemployment persistence tends to be higher in many European countries than in the US:

(i) Most European countries tend to have more widespread and comprehensive job security legislation than the US; firing costs in particular are generally higher in Europe than in the US. The higher union density in Europe than in the US may also be important in this regard, since union activity often amplifies firms' firing costs. In the context of our model it is easy to see that, for plausible parameter values, the greater is the firing cost (F), *ceteris paribus*, the greater will be the degree of unemployment persistence.[25]

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[25] By equation (4),

$$\frac{\partial \kappa}{\partial F} = \left(\frac{1}{1+g_\lambda}\right) \cdot \left[\frac{\partial h_I}{\partial W} \cdot \frac{\partial W}{\partial F} \cdot [1 - r\cdot(1-\sigma)] - \theta \cdot \frac{\partial h_O}{\partial W} \cdot \frac{\partial W}{\partial F} \right.$$

$$\left. + (1-\sigma) \cdot (1 - h_I) \cdot \left\{ \frac{\partial r}{\partial F} + \frac{\partial r}{\partial W} \cdot \frac{\partial W}{\partial F} \right\} \right].$$

The first right-hand term stands for the effect of F on the wage and thereby on the insider and outsider hiring rates; the second term represents the direct effect of F on the retention rate as well as the indirect effect via the wage. The effect of the firing cost on the wage is positive: a rise in F reduces the firm's fall-back profit (ξ) in equation (7), and thus the wage setting curve (WS_{SR}) shifts upwards in Figure 2a, while the insider hiring curve (IH) remains unchanged. Thus $(\partial W^*_{SR}/\partial F) > 0$. Using equations (1), (2a), and (2b), we find

Intuitively, a rise in the firing cost raises the equilibrium retention rate, which increases unemployment persistence. A secondary effect is that the rise in the firing cost increases the equilibrium wage and thereby reduces the retention rate, the outsider hiring rate (which raises unemployment persistence) and the insider hiring rate (which lowers unemployment persistence). The primary effect on unemployment persistence will generally dominate the secondary effects.

(ii) Over much of the postwar period, the US labor market has been characterized by a more heterogenous labor force, containing a comparatively large proportion of workers with inadequate skills or unstable work records (e.g. women, immigrants). By equation (4c), the greater is the quit rate σ, the lower will be the unemployment persistence coefficient, *ceteris paribus*. Intuitively, since incumbent insiders at a firm have a greater chance of retaining their jobs than other workers have of gaining employment at that firm, the current level of employment depends on the size of the incumbent insider workforce which, in turn, depends on the level of past employment. However, the greater is the quit rate, the smaller will be the number of incumbent workers relative to new entrants (*ceteris paribus*) and thus the less well current employment depend on past employment. Thus, for an exogenously given labor force, the greater is the quit rate,

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$$\frac{\partial \kappa}{\partial F} = \left(\frac{1}{1+g_\lambda}\right) \cdot \left(\frac{\partial W^*_{SR}}{\partial F}\right) \cdot \left(\frac{J'}{\gamma}\right) \cdot \left[\frac{\theta}{\tau_O} - \frac{1 - r\cdot(1-\sigma)}{\tau_I}\right]$$

$$+ \left(\frac{1}{1+g_\lambda}\right) \cdot \left(\frac{J'}{\gamma}\right) \cdot (1 - \sigma) \cdot (1 - h_I) \cdot \left[1 - \frac{\partial W^*_{SR}}{\partial F}\right].$$

The second right-hand term (representing the direct and indirect effects of F on r) is positive. The reason is that, by equation (7), $(\partial W^*/\partial F) = (\partial W^*/\partial \xi)\cdot(\partial \xi/\partial F) = \mu\cdot(1-\eta) < 1$ and that the insider hiring curve is not vertical in Figure 2a, so that $(\partial W^*_{SR}/\partial F) < (\partial W^*/\partial F)$. The first term (representing the effects of F on the hiring rates) are non-negative when $(\tau_O/\tau_I) \leq \theta/[1 - r\cdot(1-\sigma)]$, which holds for plausible parameter values. This condition is clearly sufficient for $(\partial \kappa/\partial F)$ to be positive.

the lower will be the degree of unemployment persistence.

(iii) The average growth rate of the labor force over the post-war period has been higher in the US than in Europe. By equation (4c), the greater is the labor force growth rate g_λ, the lower will be the unemployment persistence coefficient. Intuitively, the greater is g_λ (*ceteris paribus*), the greater will be the number of entering outsiders relative to the number of incumbent insiders. Thus the lower will be the degree of unemployment persistence.

In sum, our model suggests that the lower degree of unemployment persistence in Europe than in the US is due to a combination of differences in labor turnover costs, quit rates, and labor force growth rates.

5d. The Discouraged Worker Effect and Unemployment Persistence

Equation (4) permits a straightforward assessment of how the discouraged worker effect influences the degree of unemployment persistence. The smaller is the fraction θ of the long-term unemployed workers who engage in search, the greater is the discouraged worker effect. By implication, the smaller will be the proportion of the long-term unemployed workers who are hired in the current period, and the greater will be the degree of unemployment persistence.

Observe that the magnitude of this influence depends on the size of the outsider hiring rate (h_o). By equation (4), $(\partial\kappa/\partial\theta) = - h_o$. Since the outsider hiring rate varies pro-cyclically, the degree to which the discouraged worker effect influences unemployment persistence will vary pro-cyclically as well. In a recession (when γ is low), this hiring rate is low and only a small fraction of the long-term unemployed workers will be hired in any case, regardless of how many of them search. Then the discouraged worker effect will clearly have little role to play in determining the degree of unemployment persistence. It is only in a boom (when γ is high) that the discouraged worker effect may be an important determinant of unemployment persistence.

This conclusion sheds some light on the ongoing controversy concerning the relative importance of the discouraged worker effect and labor turnover costs in determining the degree of unemployment persistence. Bean and Layard (1990), for example, have argued that the discouraged worker effect invariably plays the dominant role. Our analysis, by contrast, suggests that the relative strength of these effects depends on the level of economic activity. It can be shown that the strength of the influence of firing costs on the degree of unemployment persistence tends to vary counter-cyclically.[26] Thus, the greater is the unemployment rate, the more important will firing costs be relative to the discouraged worker effect in determining unemployment persistence.

5e. Cyclical Variations in Unemployment Persistence

It is interesting to observe that the degree of unemployment persistence in our model is generally not constant over the business cycle. By equations (1), (2a), (2b), and (4), we find

$$(15a)\quad \frac{\partial \kappa}{\partial \gamma} = \left(\frac{1}{1+g_\lambda}\right)\cdot\left[\,[1 - r\cdot(1-\sigma)]\cdot\left[\frac{J'}{\tau_I\cdot\gamma}\right]\cdot\left[\frac{W+H_I}{\gamma} - \frac{\partial W}{\partial \gamma}\right]\right]$$

$$- \theta\cdot\left[\frac{J'}{\tau_O\cdot\gamma}\right]\cdot\left[\frac{W+H_O}{\gamma} - \frac{\partial W}{\partial \gamma}\right]$$

$$+ (1-\sigma)\cdot(1-h_I)\cdot\left[\frac{J'}{\gamma}\right]\cdot\left[\frac{W-F}{\gamma} - \frac{\partial W}{\partial \gamma}\right].$$

Deriving the short-run equilibrium wage from the intersection of the insider hiring function (2a) and the short-run wage setting function (7), we obtain

$$(15b)\quad \frac{\partial W}{\partial \gamma} = \frac{W + H_I}{\gamma + \dfrac{\tau_I\cdot\gamma^2}{(1-\mu)\cdot(W-B)\cdot J'}}.$$

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[26] By equation (1), $(\partial^2 r/\partial F\partial\gamma) = -(J'/\gamma^2) + (J''/\gamma)\cdot[(W-F)/\gamma^2]$, which is negative as long as J'' exceeds a negative lower bound.

From (15a) and (15b), it is evident that the degree of unemployment persistence will vary counter-cyclically ($(\partial\kappa/\partial\gamma) < 0$) if the firing cost (F), the outsider hiring cost (H_O), the incumbent/entering insider productivity differential (τ_I), and the degree of insider bargaining strength (μ) are sufficiently large.

The cyclical variability of unemployment persistence is an important policy issue. Specifically, when the unemployment persistence coefficient moves counter-cyclically, unemployment is more persistent in recessions that in booms. This implies that the labor market is less responsive to favorable shocks in a recession than to unfavorable shocks in a boom. Under these circumstances - generated by large labor turnover costs and insider bargaining power - there is a strong case to be made for stabilization policy.

5f. The Average Rate of Unemployment

Our model suggests a reason for stylized fact (2), namely, that the average unemployment rate was greater in the US than in Europe over the 1950s and 60s, but the other way around over the 1980s. As noted in Section 5c, our model leads us to expect that the European unemployment persistence coefficient will exceed the US one, so that the unemployment function in Figure 4 has a steeper slope ($\kappa = (\partial u/\partial u_{-1})$ in Europe than in the US. This is borne out by a large body of empirical evidence (e.g. Blanchard and Summers (1986)). If in addition the intercept of the unemployment function in Figure 4 is greater for the US than for Europe - which is also supported by the evidence - then clearly the size of the average unemployment rate in the US relative to Europe will depend critically on whether these areas have experienced a recession.

To make a simple thought experiment, suppose that in a world-wide recession $u_{EU} = u_{US} > \hat{u}$ in Figure 4, where $\hat{u} = 1 - (h_{US} - h_{EU})/(\kappa_{EU} - \kappa_{US})$ is the unemployment rate at which the two short-run unemployment functions cross. Then the unemployment rate in the following year will be higher in Europe than in the US; and since the degree of unemployment persistence in Europe exceeds that in the US, the European unemployment rate will remain relatively high after that. On

the other hand, suppose that in the presence of a world-wide boom $u_{EU} - u_{US} < \hat{u}$. Then the next year's unemployment rate will be lower in Europe than in the US; and, once again, since unemployment is more persistent in Europe, the European unemployment rate will remain relatively low for a long time.

Thus, in the aftermath of the world-wide recessions of the 1970s and 80s, when past unemployment rates were high in both regions, the average rate of unemployment in Europe could well exceed that of the US; whereas in the relatively prosperous times of the 1950s and 60s, when unemployment rates in both regions were low, the balance could be tipped the other way.

5g. The Long-Run Unemployment Rate

As shown in Section 4, our model provides an explanation for the stability of the long-run unemployment rate despite the massive secular increases in productivity and the labor force (stylized fact 3). Intuitively, the reason why the unemployment rate is independent of the size of the labor force (λ) is that the insider hiring function (2a) and the wage setting function (13) are both specified in terms of the insider hiring rate, rather than the employment level (which is common in many current models of non-clearing labor markets). The intersection of these two curves determines a unique insider hiring rate (h_I^{LR}) and - by equations (8a) and (8b) - a unique retention rate (r^{LR}) and outsider hiring rate (h_O^{LR}). Given these hiring and retention rates, an increase in the size of the labor force (λ) leads to an increase in employment which is just sufficient to keep the unemployment rate unchanged.

The intuitive reason why the long-run unemployment rate is independent of the level of productivity (proxied by γ) is that the wage setting curve is vertical in the long run. Thus an increase in productivity, which shifts the insider hiring curve upwards in Figure 3, leads to an increase in the real wage but leaves the insider hiring rate unchanged. By equations (8a) and (8b), the retention rate and the outsider hiring rate stay unchanged as well. Thus the long-run unemployment rate is unaffected.

Substituting equations (8a), (8b) and (13) into (14), we find that although the long-run unemployment rate does not depend on the size of the labor force or the level of productivity, it does depend positively on

- the growth rate of the labor force (g_λ),
- the quit rate (σ),
- the magnitude of barriers to the entry of firms (α^*),
- the magnitude of labor turnover costs (H and F).[27]

The policy implications of these results are self-evident. Supply-side policies that reduce entry barriers and structural policies that labor turnover costs (e.g. laws reducing severance pay or simplifying firing procedures) may help lower the long-run unemployment rate.

6. Conclusions

The aim of this paper has been to show how a simple insider-outsider model is able to account for various stylized facts concerning the US and European unemployment experience. The model also generates generates other empirically testable hypotheses concerning, for example, cyclical variations in unemployment persistence, the relative importance of firing costs and the "discouraged worker" effects in determining the degree of unemployment persistence, and the effect of barriers to the entry of firms on the long-run unemployment rate.

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[27] We assume that the greater the firing cost (f) and the insider hiring cost (H_I), the greater will be the long-run ratios v_F and v_I in equations (10b).

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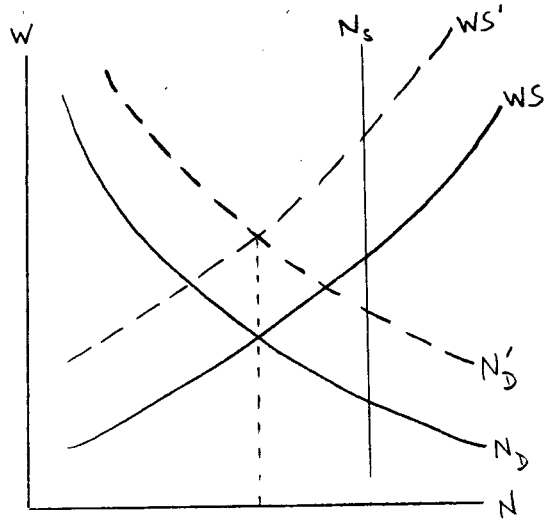
APPENDIX

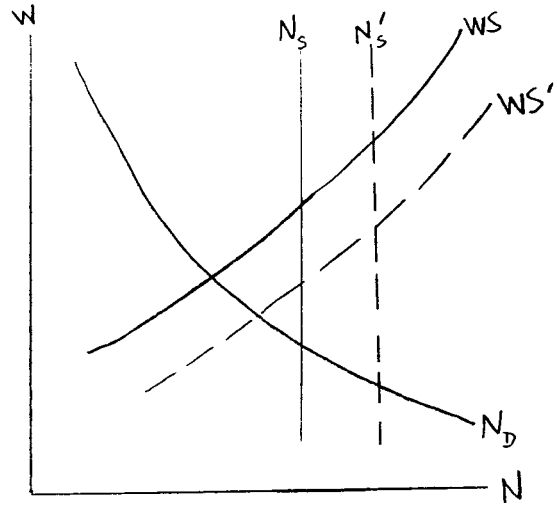
The assumption that the wage of entering insiders and entering outsiders depends positively on the wage of incumbent insiders may be rationalized in various ways. For example, if the incumbent insiders bargain collectively, they may use their market power to influence not only their wages, but those of the entering insiders and outsiders as well. In the context of our model, the incumbent insiders have an obvious incentive to keep the wages of entering insiders and outsiders sufficiently high so that the firm will not find it worthwhile to replace the insiders by these other workers, given the negotiated wage of the incumbent insiders. The replacement of incumbent insiders by entering outsiders will not occur as long as $\tau_O \cdot \gamma \cdot \lambda_{EO} - W_{EO} - H_{EO} \leq \gamma \cdot \lambda_{II} - W + F$, where $\gamma \cdot \lambda_{II}$ and $\gamma \cdot \lambda_{EO}$ are the expected marginal revenue products of incumbent and entering insiders, respectively, conditional on their being retained (defined along the lines of equation (5b)). If entering outsiders have no market power, their wage will be set at the minimum level compatible with this constraint, i.e. $W_{EO} = \gamma \cdot (\tau_O \cdot \lambda_{EO} - \lambda_{II}) + F - H_{EO} + W$. An analogous wage profile may be derived between entering insiders and incumbent insiders. Such profiles may also arise when insiders bargain individualistically with their firms and labor turnover costs are manipulable by the insiders, as in the case of cooperation and harassment activities (see Lindbeck and Snower (1988)).

An alternative rationale is based on a moral hazard argument. In setting the wage of entering outsiders, a myopic firm may have the incentive to promise these workers that they will turn into incumbent insiders in the next period (with a probability given by the retention rate), but then to dismiss all of them before that happens. The promise may serve to reduce the wage of the entering outsiders, since the greater is the insider wage that these entrants expect to receive in the future, the lower will be their current reservation wage; whereas the dismissal of entrants means that the firms would not have to pay the promised insider wage. Clearly this is not an equilibrium strategy. Once entrants realize that the firms operate a "revolving door", they will raise their reservation wage. In order for the firms

to signal that they are not pursuing this strategy, they need to set the wage of the entering outsiders sufficiently high so that the marginal profitability of these workers does not exceed that of the incumbent insiders: $\tau_O \cdot \gamma \cdot \lambda_{EO} - W_{EO} - H_{EO} \leq \gamma \cdot \lambda_{II} - W$. If the entering outsiders have no market power, their wage may be set at the minimum level compatible with this constraint, i.e. $W_{EO} = \gamma \cdot (\tau_O \cdot \lambda_{EO} - \lambda_{II}) - H_O + W$. An analogous wage profile can be derived between entering and incumbent insiders.

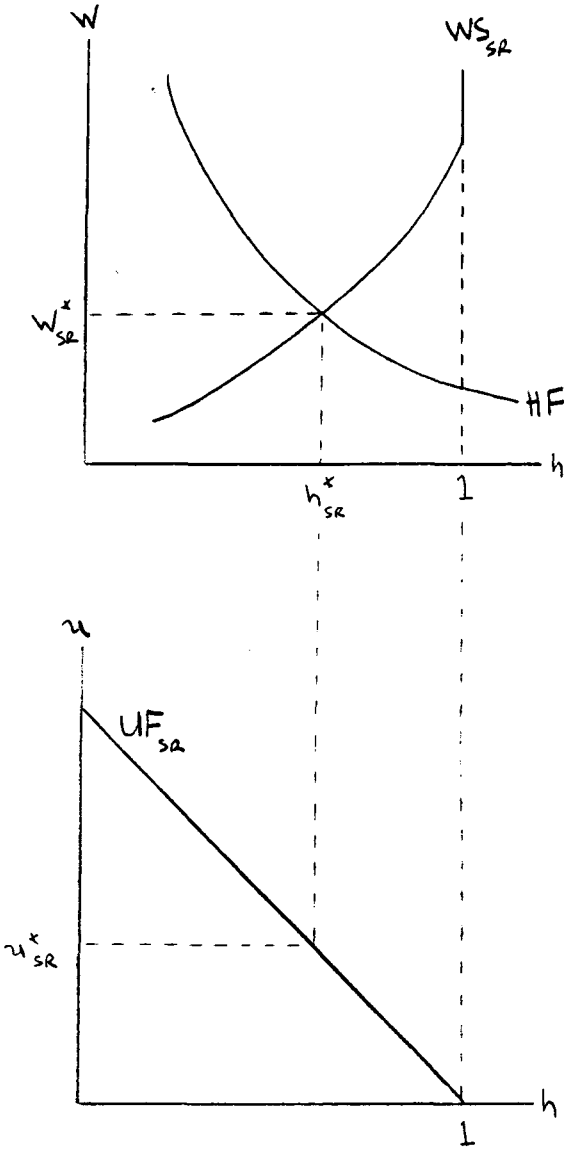


(a) A Productivity Increase

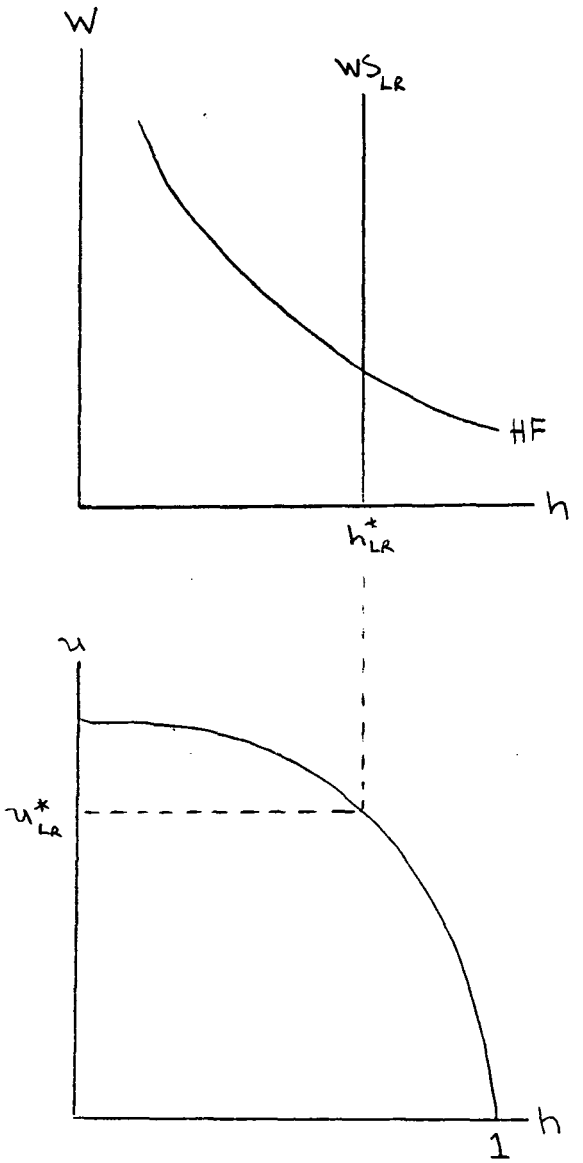


(b) A Labor Force Increase

FIGURES 1: The Effect of a Productivity Increase and a Labor Force Increase on Unemployment



FIGURES 2 : The Short-Run Equilibrium



FIGURES 3: The Long-Run Equilibrium

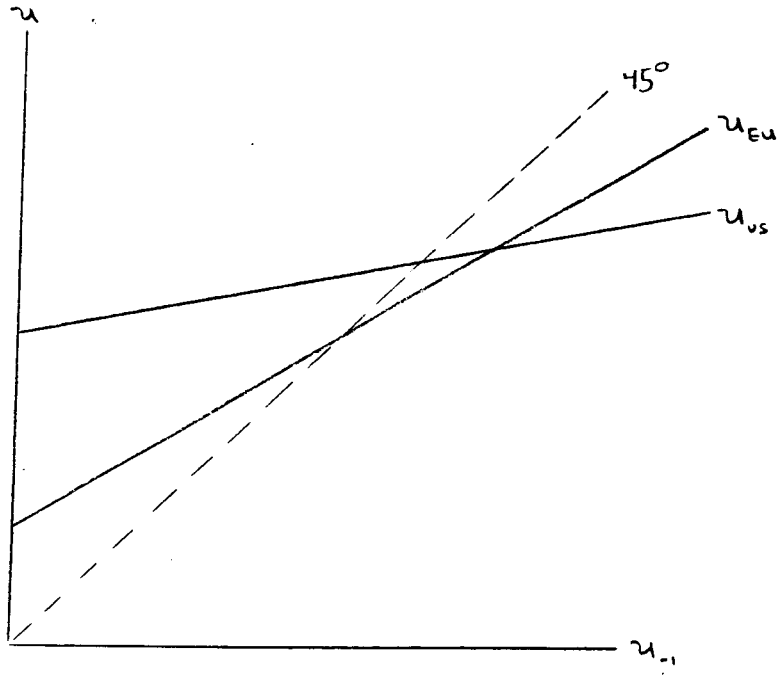


FIGURE 4: Average Rates of Unemployment