Preferences for Rigid Wages and Job Protection in Equilibrium Unemployment

Tito Boeri and Michael C. Burda*

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Abstract

The Mortensen-Pissarides (MP) model of equilibrium unemployment is modified to study worker and firm preferences for rigid wages and job protection across exogenous skill classes. The benefits of rigid wages derive from economizing on wage renegotiation costs, while preferences for job protection potentially derive from inefficient severance. For some calibrations, the model can explain the political acceptance by workers and firms of labor market rigidities for lower skill segments, and offers an economic account of excess coverage and free-riding.

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*Boeri: Bocconi University IGIER, CEPR and IZA, (tito.boeri@uni-bocconi.it); Burda: Humboldt-Universität zu Berlin, CEPR and IZA (burda@wiwi.hu-berlin.de). We are grateful for the many useful comments of seminar participants in Berlin, Milan, IZA Bonn, Mainz, Tilburg and Uppsala. This work is supported by the EU Commission's SER Project "Dynamic Aspects of the European Unemployment Problem" and the SFB 373 (German Science Foundation). We are grateful to Ronald Bachmann, Michael Kvasnicka, Long Kang and Mauro Maggioni for useful research assistance.

1 Introduction

This paper explores the costs and benefits of wage rigidity, and more generally, the value of rigid wage regimes to workers and employers in a model of equilibrium unemployment. In practice, we seek to explain or at least better understand i) the increasing heterogeneity across countries in the presence of unions and ii) the phenomenon of excess coverage observed especially in European labor markets. Excess coverage generally refers to the extension of collective agreements to wages paid to nonunion members, but can also include other aspects of union influence on the nature of the employment relationship. This phenomenon has been documented recently by the OECD (1996) and Boeri, Calmfors and Brugiavini (2001).

We adapt the equilibrium search/matching framework (Mortensen Pissarides 1994, 2000, henceforth MP) to labor market rigidities captures the distinction between jobs whose match-surplus is shared between employers and workers in a decentralised fashion (the flexible-wage, individual-bargaining regime), and those in which wages are determined outside the parameters of the employment relationship (the rigid-wage, collective bargaining regime). In doing so, we extend the MP framework to account for two frictions. In what we label competitive search labor markets, wages are freely determined in Nash bargaining, but worker-firm matches are subject to renegotiation costs whenever productivity changes exogenously. These renegotiation costs are seen as an inherent aspect of decentralized labor markets. Flexible wage setting in a competitive search market is compared with a rigid-wage labor market, in which pay is determined without reference to individual productivity. The second distortion in the model, which has yet to be considered in the context of the MP framework, is wage rigidity. By assumption, the rigid wage economy avoids recurrent renegotiation costs, but at the cost of inefficient separations. The existence of a severance tax completes our characterization of a rigid labor market. The introduction of labor market rigidity in the MP model changes sharply worker valuation of jobs by skill class. Some workers will prefer flexible labor markets, other prefer rigid labor markets.

We then show that workers of different skill level have different preferences over rigid versus flexible labor markets, and show this using a calibrated version of the model. Changes in exogenous parameters yield different skills levels of indifference and hence affect the skill profile of the two distributions of workers, which prefer the flexible regime versus the rigid-wage regime. In addition, our modification of the MP model allows us to study deadweight

severance (job destruction) costs imposed on firms in order to reduce job destruction and increase the attractiveness of membership. Such costs are frequently, but by no means always, imposed in the context of collective bargaining. While the severance tax unambiguously reduces welfare in the economy, we are able to show that worker preferences for a rigid-wage regime increase in the presence of job protection.

The rest of the paper is organized as follows. Section 2 modifies the now-standard MP model of equilibrium search unemployment by adding renegotiation costs. This opens up a justification for introducing rigidities, which we study in the context of equilibrium search in Section 3. Section 4 studies preferences of workers for the two regimes in the context of a calibrated version of the model and considers how they vary in response to changes in underlying institutions and the level of the rigid-wage. Section 5. concludes.

2 The Competitive Search Labor Market with Renegotiation Costs[1]

We assume a continuum of labor markets indexed by $s \in (0, 1]$ where s can be thought of as a nonrandom, observable component of productivity, called skill. Workers cannot change their skill level. Firms can work with all types of workers but only one at any given point in time. When matched, a firm and a worker generate a flow productivity sx, where $x \in (0, 1]$ is a match-specific component referred to as a "shock." For production to occur, a worker must be matched with a job. All new matches (i.e. filled jobs) begin at the highest possible value of x ($x = 1$). Immediately thereafter, match productivity changes at Poisson frequency λ and is a random draw with a fixed, known cumulative distribution $F(x)$. Workers supply their labor inelastically and are either unemployed or employed. Firms either produce with one worker, or search with an open vacancy. They can enter freely into all labor markets at zero cost, but must pay a search cost of k per unit period.

One central innovation in this paper is to introduce a friction arising in the renegotiation of wages whenever a productivity shock occurs, modeled as a one-off cost ρ. The worker pays this cost formally, but since wages are

[1] This section briefly reviews the MP model, which serves as the cornerstone of our analysis. Mortensen and Pissarides (1999b) show that such segmentation can arise as a self-selected equilibrium when workers and firms possess and post skill requirements and search costs are positive in skill.

bargained over continuously, both parties will ultimately share the costs of renegotiation in equilibrium. For simplicity, we assume that the renegotiation cost is unavoidable and represents frictions inherent to the continuation of a flexible wage contract. One interpretation of ρ is an unavoidable investment necessary to maintain the existing employment relationship, given that the shock has occurred.

2.1 Steady-State Equilibrium State Valuations in a Labor Market of Skill s

We first define and solve for steady-state valuations of states of unemployment and employment in a labor market of arbitrary skill s, when wages are perfectly flexible. Where it is understood to hold for all skill groups, the subscript for s will be suppressed for notational convenience. In the light of our assumptions, the equilibrium, steady-state valuation of unemployment (U) is determined by

$$rU = b + \theta\, q\,(\theta)\,[W(1) - U] \tag{1}$$

where r is the (instantaneous) interest rate, b represents unemployment income, θ is a measure of market tightness expressed by the ratio of vacancies to unemployment (v/u), and q is a matching probability for vacancies arising from a constant-returns-to-scale matching function $m = m(u, v)$, with $q = \frac{m(u,v)}{v} = m(\theta, 1)$, so $q'(\theta) < 0$. The function $W(x)$ returns the value of employment in a job-worker match with current productivity x. Given an assumed common startup productivity level for all worker-job matches ($x = 1$), it follows that all vacancies in a given labor market are identical *ex-ante*. Thus the value of a vacancy V obeys a similar arbitrage relation:

$$rV = -sk + q\,(\theta)\,[J(1) - V] \tag{2}$$

where J is the value of a filled vacancy and sk is the flow cost of keeping a vacancy posted, which is assumed proportional to skill.

Workers of skill level s with a job of given productivity level x can be thought of as owning an asset with value determined by the probability of an improvement as well as a deterioration of productivity. This depends in turn on the equilibrium valuations of those states. Let $W(x)$ denote the continuation value of working in a competitive labor market in a job with

productivity x defined by the functional equation

$$rW(x) = w(x) + \lambda \int_R^1 (W(z) - W(x) - \rho) dF(z) + \lambda F(R)(U - W(x)). \quad (3)$$

Given x, the implicit rate of return on the asset W is equal to the current wage plus the implied capital gain or loss on the employment relationship. A nontransferable "cost of renegotiation" ρ must be paid each time a shock occurs *for the match to continue*, since a change to x implies an adjustment of the wage. The lower bound of the definite integral R is the endogenous cutoff or threshold value of productivity x, below which the match is no longer profitable and the job/worker pair is destroyed. Because match dissolution allows the worker-firm pair to avoid paying ρ, the equilibrium value of R will reflect the savings on the renegotiation cost which are possible when the match is destroyed.

A similar arbitrage argument determines the valuation to a firm of a filled job, given the current realization of x and for a worker of skill level s :

$$rJ(x) = sx - w(x) + \lambda \int_R^1 ((J(z) - J(x)) dF(z) + \lambda F(R)(V - J(x)). \quad (4)$$

Initially, we set deadweight costs of job loss in the competitive sector to zero.[2]. Since there are no further restrictions on the entry of firms, the equilibrium value of vacant jobs must satisfy the free entry condition $V = 0$, and (2) becomes

$$sk = q(\theta) J(1), \quad (5)$$

which, for given state of the labor market, also pins down the equilibrium value of a filled job at initial productivity $x = 1$.

2.2 Wage Determination

Wages paid in a match in the non-unionised segment are determined by a Nash sharing rule.[3] For an existing match in the competitive labor market,

[2]In other words, compensation for job loss in the competitive search market is fully negotiable, and hence transferred, between the worker and the firm, and is therefore ignored.

[3]Here we follow standard MP (1994) and Pissarides (2000).

the Nash-bargained wage solves

$$w(x) = \arg\max [W(x) - U]^{\beta} [J(x) - V]^{(1-\beta)}$$

yielding the first order condition

$$W(x) - U = \beta \left[J(x) + W(x) - V - U \right]. \tag{6}$$

Combining (5) and $V = 0$ with (3) and (6) evaluated at $x = 1$ yields

$$rU = b + \frac{\beta s k \theta}{1 - \beta}. \tag{7}$$

The equilibrium value of unemployment is linear in θ, which in this model is a sufficient statistic for tightness in labor markets. We use (7) to obtain the equilibrium wage rule:

$$w(x) = (1 - \beta) \left[b + \lambda (1 - F(R)) \rho \right] + \beta s \left(k\theta + x \right). \tag{8}$$

Notice that the equilibrium wage depends not only on familiar parameters such as b (the monetary value of unemployment or leisure), θ (labor market tightness) and x (match productivity), but also on λ, the shock probability, and the renegotiation cost ρ. These factors are more important, the more likely a job is to *survive* $(1 - F(R))$. Idiosyncratic productivity shocks which do not lead to match dissolution make the worker partially liable for paying renegotiation costs. Only by dissolving the match and passing into unemployment, is it possible to avoid paying renegotiation costs; consequently, a greater wage is needed to indemnify for this contingency. Effectively, the fallback of the worker is increased by the *savings* on future renegotiation costs that is implied by a breakdown of negotiations and spell of unemployment[4]. The more power the employer has, the more likely will the wage reflect this "compensating differential" as opposed to rents accruing to the match.

2.3 Job Destruction

As in the MP model, jobs are destroyed when productivity falls below its corresponding reservation or threshold level. In the competitive search market, R is defined for each skill s implicitly by the condition

[4]Notice that the hold-up problem (Malcomson, 1997) does not arise in this context because the incidence of ρ is, by assumption, not subject to negotiation.

$$J(R) = 0. \tag{9}$$

At the same time, Nash bargaining (see below) also implies that R satisfies the zero match-surplus condition:

$$J(R) - V + W(R) - U = 0 \tag{10}$$

and, given the free entry condition $V = 0$, it follows that

$$W(R) = U$$

that is, in the non-unionised sector separations are privately, but not necessarily socially efficient in the sense of Pissarides (2000).

The reservation productivity level for the competitive search market, R, is determined implicitly by the *job destruction* condition[5]

$$sR + \frac{s\lambda}{r+\lambda}\int_R^1 (z-R)dF(z) = \lambda\left[1 - F(R)\right]s\rho + rU \tag{11}$$

After substituting for rU from (7), this condition in the competitive search model with renegotiation costs can be written as

$$sR + \frac{s\lambda}{r+\lambda}\int_R^1 (z-R)dF(z) = b + \frac{\beta sk\theta}{1-\beta} + \lambda\left[1 - F(R)\right]s\rho \tag{12}$$

The left-hand side is the flow benefit of a continuing match with productivity R; this is the current value plus the option value deriving from possible future improvements over the next time interval. The right-hand side represents the (opportunity) costs of maintaining the match at the threshold value of idiosyncratic productivity, *plus the expected value of renegotiation costs.* This *job destruction* (JD) *condition* defines an upward-sloping curve in (θ, R) space, which we show in Figure 1.[6]

[5] The derivation of this condition is standard and can be found in the Appendix.

[6] Differentiate (12) totally and solve for $dR/d\theta$ to obtain

$\frac{dR}{d\theta} = \frac{\frac{\beta k}{1-\beta}}{s\left[1 - \frac{\lambda}{r+\lambda}(1-F)\right] + \lambda f\rho} > 0.$

2.4 Job Creation

The *job creation condition* in a competitive labor market follows Pissarides (2000). Combine the equilibrium wage equation (8) with the valuation equation (4), evaluated for a filled job at $x = R$, plus the fact that at the destruction margin, $J(R) = 0$, we obtain:

$$0 = (1-\beta)\left[sR - b - \lambda(1-F(R))\rho\right] - \beta sk\theta + \lambda \int_R^1 J(z)dF(z). \tag{13}$$

Solving for $\lambda \int_R^1 J(z)dF(z)$ and inserting this result into (4), eliminating the wage wie (8) and imposing $V = 0$ yields

$$(r+\lambda)\, J(x) = (1-\beta)s\,(x-R) \tag{14}$$

Finally use this expression and the zero profit condition (5), set $x = 1$ and divide by s to obtain:

$$\frac{(1-\beta)(1-R)}{(r+\lambda)} = \frac{k}{q\,(\theta)} \tag{15}$$

This condition on R and θ is represented in Figure 1 by the downward-sloping *JC-curve* (for *job creation).*[7] Notice that neither s or ρ affect the position of the JC curve. The intuition for this result is that renegotiation costs do not affect the incentive to create a job at any given skill level, but rather influence the viability of the job via the surplus available to the match. Insofar as hiring-recruitment costs are proportional to skills, there is no bias on the job creation margin in favour of a particular skill level.[8]

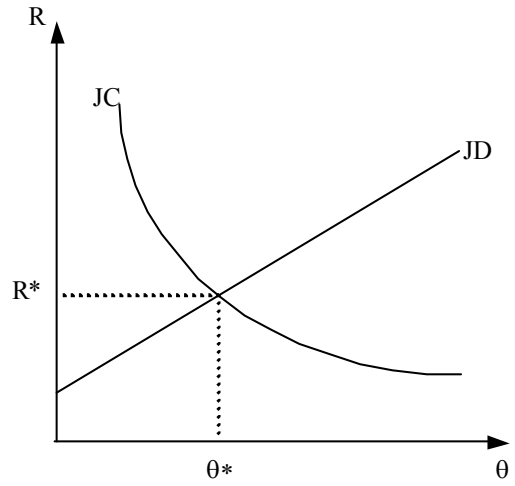
2.5 Equilibrium

The intersection of (12) with the job creation condition (15) defines a labor market equilibrium for submarket with skill s. For each skill level there ex-

[7] Implicit differentiation of (15) gives $\frac{dR}{d\theta} = \frac{(r+\lambda)kq'}{(1-\beta)sq^2}$, where f is the density associated with F. Since $q'(\theta) < 0$, $\frac{dR}{d\theta} < 0$ unambiguously.

[8] Job *destruction* margins are, however, affected by skills: the reservation productivity level is indeed decreasing in s. See Mortensen and Pissarides (2000). When hiring costs are not proportional to the skill level, but are fixed, then the job creation condition will no longer be independent of s. Insofar as market tightness increases with s, the worker fallback option will improve with skill and this in turn may render R non-monotonic in s.

Figure 1: Equilibrium in a Competitive Search Labor Market



ists a unique equilibrium reservation productivity and labor tightness pair (R^*, θ^*) given by the implicit functions of deterministic productivity s, the Poisson arrival rate λ, renegotiation costs ρ and income in unemployment b:

$$R^* = R^*(s, \lambda, \rho, b)$$
$$\theta^* = \theta^*(s, \lambda, \rho, b).$$

The result is depicted in Figure 1.

Given the equilibrium R^* and θ^*, the unemployment rate in the labor submarket for skill level s follows from the familiar flow condition for constant unemployment:

$$u^* \equiv u^*(s, \lambda, \rho, b) = \frac{\lambda F(R^*)}{\lambda F(R^*) + \theta^* q(\theta^*)}. \tag{16}$$

The partial derivatives of the three implicit functions can be summarized in the following table:

TABLE 1

..... *Effect of* $\Longrightarrow$	ρ	λ	s	b	β	
..on $\Downarrow$						
R^*	$+$	$+$	$-$	$+$	$+$	
θ^*	$-$	$+$	$+$	$-$	$-$	
u^*	$+$	$+$	$-$	$+$	$+$	

2.6 Closed Labor Markets

Due to the presence of renegotiation costs and income in unemployment which are independent of s, a market for labor will not exist for all skill levels in the competitive search regime. It is useful to define $\underline{s}^*$, the minimal skill class for which the labor market is open ($\theta > 0$); that is to say, in which positive vacancies are observed. If no vacancies are posted, the unemployment rate is 100% and the labor market is said to be *closed*.[9] $\underline{s}$ is implicitly defined by the condition $\theta^* = 0$ or $R^* = 1$, such that all labor markets for skills levels lower than $\underline{s}^*$ are closed. By inspection of Figure 1, no intersection in the allowable range for R ($0 < R \leq 1$) with $\theta = 0$ is possible, so the binding constraint is $R \leq 1$. Taking the limit of the JD condition (12) as R approaches 1 implies

$$s = b + \frac{\beta s k \theta}{1 - \beta}$$

or, for admissible (positive) values of θ,

$$\theta = \frac{(s - b)(1 - \beta)}{\beta s k}.$$

It follows that as long as $s > b$, $\theta > 0$ and the labor market is open.[10] Match productivity at the outset must strictly exceed the flow benefit from leisure. This condition is rather mild compared with the rigid labor market, as will be shown below.

[9] Evidently there is no gain from employing workers with a productivity which does not cover the opportunities costs of both parties, so that no worker would ever be observed working at a wage lower than b.

[10] The renegotiation cost does not appear because in the limit as $R \to 1$, the probablility of match dissolution approaches unity, rendering the renegotiation cost irrelevant. Similarly, the cost of posting a vacancy merely affects the level of unemployment but not the viability of the market.

2.7 Valuation of Employment and Filled Jobs in the Competitive Segment

We now derive expressions, while will be useful later, for the value to a worker in employment at full initial productivity ($W(1)$), and the value of a filled job $J(1)$,. Their sum is the total available gross surplus available to the match, $S(1)$.

Rearrange the first order condition or sharing rule (6) using (15), and (7) we can write

$$W(1) = \frac{b}{r} + \frac{\beta s\left(1 - R^*\right)}{(r+\lambda)} + \frac{\beta s k \theta^*}{r\left(1-\beta\right)} \tag{17}$$

and evidently,

$$\frac{\partial W(1)}{\partial s} = \frac{\beta(1-R^*)}{(r+\lambda)} + \frac{\beta k\theta^*}{r\left(1-\beta\right)} - \frac{\beta s}{(r+\lambda)}\frac{\partial R^*}{\partial s} + \frac{\beta s k}{r\left(1-\beta\right)}\frac{\partial \theta^*}{\partial s}$$

$$= \frac{\beta}{(r+\lambda)r}\left[r\left(1-R^*\right) + \frac{(r+\lambda)\beta k\theta^*}{(1-\beta)} - rs\frac{\partial R^*}{\partial s} + \frac{k\left(r+\lambda\right)}{(1-\beta)}\frac{\partial \theta^*}{\partial s}\right] > 0. \tag{18}$$

so in (s, W) space, the valuation of the competitive employment state is unambiguously increasing in skill s. Intuitively, s has three effects on the valuation of a job. First it increases the flow payoff in all cases that the job survives. Second it lowers the threshold value of productivity, holding all else constant, and thereby increases the expected duration of the job. Finally, it raises equilibrium job tightness in the local labor market, raising the probability of finding a job in that labor market, given that one is unemployed.[11]

For the valuation of firms, we have

$$J(1) = \frac{ks}{q(\theta)}$$

and differentiate, obtaining:

[11] The sign of the second derivative involves the curvature of response of R^* and θ respectively to s :

$$\frac{\partial W^2(1)}{\partial s^2} = -\frac{\beta}{(r+\lambda)}\left[\frac{\partial R^*}{\partial s} + s\frac{\partial^2 R^*}{\partial s^2}\right] + \frac{\beta k}{r\left(1-\beta\right)}\left[\frac{\partial \theta^*}{\partial s} + s\frac{\partial^2 \theta^*}{\partial s^2}\right] \tag{19}$$

and is ambiguous. One sufficient condition for convexity of the value of competitive segment employment is that R^* and θ are not too responsive to s: $\frac{s\frac{\partial^2 R^*}{\partial s^2}}{\frac{\partial R^*}{\partial s}} < 1$ and $\frac{s\frac{\partial^2 \theta^*}{\partial s^2}}{\frac{\partial \theta^*}{\partial s}} > -1$.

$$\frac{\partial J(1)}{\partial s} = \frac{k}{q(\theta)} - \frac{skq'}{q^2}\frac{\partial \theta}{\partial s} > 0 \tag{20}$$

so that an increase in skills unambiguously increases the value of the firm (filled job). For the same reasons as above, the sign of the second derivative of $J(1)$ with respect to s cannot be signed unambiguously.

The signs of derivatives of state evaluations of employment and filled jobs can be derived in a straightforward way and are summarized in the Table 2:

TABLE 2

Effect of ...	b	ρ	λ	β	k
...on					
$W(1)$	?	$-$	$-$	$+$	$-$
$J(1)$	$-$	$-$	$-$	$-$	?

3 The Search Labor Market with Rigidities

3.1 A Characterization of Rigidities

We now present a further modification of the MP model to study the labor market rigidities in the search/matching context. In a second step, we proceed to value employment in this regime from the perspective of labor market participants. A rigid labor market is characterized by two features. First, the wage is rigid in the sense that labor compensation is independent of local or idiosyncratic influences; i.e. match productivity or market tightness in the particular skill category. It may, however, depend on skill. We will denote this rigid wage as w^r and assume it can be parametrized as $w^r = \overline{w} + \phi s$ with $0 < \phi < 1$. $\overline{w}$, with $\overline{w} \geq b$, can be thought of as a minimum wage, while ϕ reflects skill-dependence of compensation independent of match productivity. Low values suggest "egalitarian" wage structures, with increasing values corresponding to pay according to ability.

A second rigidity considered in this paper is employment protection, modeled as an exogenous firing tax sT assessed on all termination of matches, with $T < \frac{1}{r+\lambda}$. It is paid to a third party (i.e. is dissipated) and can be thought of as pure deadweight loss. The implications of this tax have been discussed in Mortensen and Pissarides (1999) and Pissarides (2000). One might include legal fees which must be paid when severance is contested, or as legal

expenses paid to lawyers; they might also be related to strikes, sabotage, *Dienst nach Vorschrift* (dilatory performance of work) or court-initiated delays in termination of labor contracts. This cost is to be distinguished from severance compensation (a lump-sum transfer from employer to employee upon severance), which in principle can be offset by a compensating wage adjustment. Another innovation of our paper is to show that while the severance tax would be shared in a competitive market, this is not the case for the rigid wage regime.[12]

What is the effect of introducing employment protection? By construction, these costs cannot be internalized in a labor contract. As in Pissarides (2000), we assume that the tax is proportional to skill. It is now well-known that firing taxes have an ambigous effect on the unemployment rate in models of equilibrium with risk-neutral agents, even while they reduce overall output in the economy (Hopenhayn/Rogerson (1998), Ljungqvist (2002). This will also be the case for our model. In what follows we solve for the search equilibrium under these conditions.

Separations in the rigid-wage segment are inefficient in the sense that for some range of productivities workers will be fired, but at the given wage, they would prefer to continue working. This stands in contrast to the Mortensen-Pissarides formulation in which quits and layoffs are indistinguishable. Given that job security is tenuous for low skill workers, it may be rational for workers, more generally, unions and legislators, to make firing more difficult; at the same time, higher skilled workers are unlikely to be interested in job security, given their high reemployment probabilities.[13] As we will see below, however, severance regulation may have the effect of closing down markets for some skill levels entirely, even if the effect on unemployment in remaining open markets is ambiguous.[14]

[12] One fascinating issue involving holdup problem and the wage bargain with severance taxes does not arise in our model, since the wage is independent of the idiosyncratic productivity of the match. See Pissarides (2000) and Mortensen and Pissarides (1999).

[13] A similar argument was developed by Bertola and Rogerson (1997) who pointed to the fact that constraints to wage adjustment need to be compensated by barriers to employment adjusted in order not to paradoxically generate higher turnover rates in rigid countries. Our model explores the opposite causal link, going from the presence of employment protection to the acceptance of rigid wages.

[14] It should be stressed that neither of the rigidities considered involves the government, which frees the analysis from the additional burden of modeling public finance restrictions and the resulting intratemporal and intertemporal issues which may arise.

3.2 Valuation of Labor Market States for Workers and Firms

By assumption, w^r is independent of idiosyncratic productivity x. Let R^r be the reservation productivity, from the employer's perspective, which will apply to a match in the rigid-wage regime, that is, the job is destroyed for realizations of x lower than R^r. Notice that R^r will take different values for different skill levels. At the same time, the valuation of employment in a rigid labor market, W^r, will not depend directly on labor market tightness in the local labor market. It will depend crucially on R^r,which in turn will depend on $\overline{w}$, ϕ, T and other parameters. It is given by

$$rW^r = \overline{w} + \phi s + \lambda F(R^r)(U^r - W^r) \tag{21}$$

At this point, it is natural to impose a participation constraint on employment $W^r \geq U^r$, where U^r denotes the value of unemployment for a worker in the rigid wage segment. As in the competitive search market, the valuation of unemployment U^r is determined by an arbitrage relation similar to (1), except that W^R replaces W, θ^R replaces θ, etc.

From the employer's perspective, the asset value of a job in a rigid-wage labor market of skill level s is determined by

$$rJ^r(x) = sx - (\overline{w} + \phi s) + \lambda \int_{R^r}^{1} ((J^r(z) - J^r(x))dF(z) + \lambda F(R^r)(V - J^r(x) - sT). \tag{22}$$

Vacancies are valued in a fashion analogous to (2), and we assume that the costs of posting vacancies in the rigid regime are identical to those in the competitive market. As in the competitive search labor market, the "free entry" condition results from $V^r = 0$. Equation (5) and has its analogue in the rigid-wage labor market

$$J^r(1) = \frac{sk}{q(\theta^r)}. \tag{23}$$

3.3 Job Destruction

The hallmark of the rigid wage regime is that the value of a job to the employee is independent of match productivity. Hence, the set of idiosyncratic

productivities for which the job is destroyed will not necessarily coincide with those for which the job has zero value to the worker at the assumed rigid wage. Rather, the participation constraint implies that for a given skill level, $W^r(R^r) = W^r > U^r$. In rigid wage labor markets, the "consensual" dissolution of an employment relationship is no longer the rule; from the workers' standpoint, there are always too many separations. *Except on a set of measure zero, there are only involuntary layoffs in rigid wage regime.* In contrast, quits and layoffs are indistinguishable in competitive search labor markets.[15]

Because the rigid wage is not the outcome of individual level bargaining, surplus division obeys a rule of the residual claimant type. Let $S^r(x)$ be the total surplus resulting from a match for any s, so for any $x \in [R^r, 1]$

$$J^r(x) = \max(-sT, S^r(x) - (W^r - U^r)). \tag{24}$$

The firm obtains all surplus greater than $(W^r - U^r)$. The maximum operator applies since the firm can always close operation, here at cost sT. Unlike the competitive search labor market, the decision to destroy a job is taken by employers unilaterally and given by $J^r < -sT$ for any s; yet in general at this point $W^r > U^r$. The reservation productivity R^r for a union match of skill level s, the reservation value for jobs in the rigid wage regime is given by (see Appendix):

$$sR^r + \frac{\lambda s}{r+\lambda}\int_{R^r}^{1}(x - R^r)dF(x) = \overline{w} + \phi s - rsT \tag{25}$$

This condition is similar to the job destruction condition for the flexible (Nash-bargained) wage case derived by Mortensen and Pissarides (1999). Unlike the competitive case, the component related to renegotiation costs is absent. The threshold value for job destruction will be lower for any θ, reflecting the effect of employment protection. This expression represents the job destruction condition in the rigid search market, the JD-curve, which is plotted in (θ^r, R^r) space in Figure 2. By inspection it is easy to see that the JD curve is horizontal, reflecting the independence of R^r of local labor market conditions. The unambiguous effect of increasing the firing tax T is evident from the figure: it reduces the job destruction threshold and raises the average duration of a job.[16]

[15] Quits by workers cannot result in material gains, by assumption. Amending this assumption is subject for future research.

[16] While the effect of T on labor market tightness $\theta = v/u$ is ambiguous in general, in

3.4 Job Creation

As in the competitive search labor market, jobs creation is determined by a free entry condition on vacancy posting as long as the present discounted value of this activity is positive. In the presence of a firing tax sT, the relevant shut-down condition is given by $J(R) = -sT$, since $J(x) = \max(-sT, S^r(x) - (W^r - U^r))$. The job creation condition for a job in the rigid wage labor market is shown in the Appendix to be given by

$$\frac{1 - R^r}{r + \lambda} - T = \frac{k}{q\left(\theta^r\right)}. \tag{26}$$

The JC curve in the rigid labor market is plotted in Figure 2. It remains strictly downward sloping in (θ^r, R^r)-space, since $q' < 0$. When $T = 0$, it lies everywhere above that of the competitive labor market.

As already stressed above, in contrast to the competitive search market (12), neither labor market tightness (θ^r) nor individual worker bargaining strength (β) appear in the job creation condition. Moreover, job creation margins are unaffected by skill levels, as in the competitive segment. The union wage matters only via R^r, which is endogenously determined as the intersection of the JC and JD curves for every s. As in the competitive search labor market, an increase in λ *ceteris paribus* shifts back the job creation curve towards the origin.

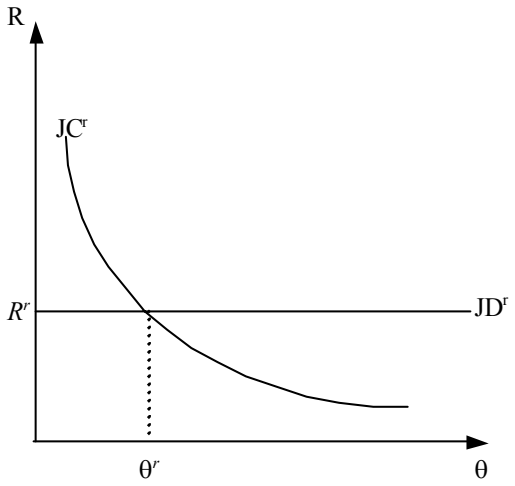
One important observation is that job protection is only sensible in this model when the labor market is rigid - otherwise overall welfare could be increased by eliminating it. By introducing job protection, the hurdle for job destruction is increased. Clearly, this will affect different labor markets for skill differently.

3.5 Equilibrium

The intersection of the JD and the JC curves depicted in Figure 2 gives unique equilibrium values of the reservation productivity and market tightness for the rigid search labor market, which we call $R^r = R^r(s, b, \overline{w}, \phi, T)$ and $\theta^r = \theta^r(s, b, \overline{w}, \phi, T)$ respectively. An increase in s is shifts the JD curve downwards, and shifts the JC curve outwards from the origin, so an increase in skill unambiguously tightens the rigid-wage labor market (θ^r rises) and

the present model the effect is unambiguously negative.

Figure 2: Equilibrium in a Rigid Search Market



lowers the firing threshold R^r.[17] As noted above, increases in wage parameters have unambiguous effects on job duration (negative), job tightness (negative) and unemployment (positive). In, contrast to findings in most of the current literature, an increase in the firing tax unambiguously raises unemployment. Analogous to (16), the equilibrium unemployment rate u^{r*}

[17] Formally,

$$\frac{\partial \theta}{\partial s} = \frac{\left[s\left[1-\frac{\lambda}{r+\lambda}\left(1-R^*\right)\right]+\lambda\rho f\right]\left(-\frac{kq'}{q^2}\right)+\left[R^*+\frac{\lambda}{r+\lambda}\int_{R^*}^{1}(z-R^*)dF(z)\right]\frac{(1-\beta)s}{r+\lambda}}{A} \tag{27}$$

where $A = s\left[1-\frac{\lambda}{r+\lambda}\left(1-R^*\right)\right]+\lambda\rho f(-\frac{kq'}{q^2})+\frac{(1-\beta)s}{r+\lambda}\frac{\beta k}{1-\beta} > 0$,and all functions are evaluated at (R^*, θ^*). In the rigid labor market segment we have

$$\frac{\partial \theta^r}{\partial s} = \frac{\frac{s\lambda}{(r+\lambda)^2}\int_{R^r}^{1}\left(z-R^r\right)dF(z)+\frac{1}{r+\lambda}-\frac{\lambda s}{r+\lambda}f\frac{1-R^r}{r+\lambda}}{B} \tag{28}$$

where $B = (s-\frac{\lambda s}{r+\lambda}f)(-\frac{kq'}{q^2}) > 0$, with all functions evaluated at (R^r, θ^r).

in a rigid-wage labor market with skill level s is given by .

$$u^r = \frac{\lambda F(R^r)}{\lambda F(R^r) + \theta^r q(\theta^r)} \equiv u^r(s, b, \overline{w}, \phi). \tag{29}$$

The dependence of the endogenous variables on the model parameters is described in Table 2.

TABLE 3

...Effect of $\Longrightarrow$	s	$\overline{w}$	ϕ	T
....on$\Downarrow$				
R^r	$-$	$+$	$+$	$-$
θ^r	$+$	$-$	$-$	$-$
u^r	$-$	$+$	$+$	$+$

Note that in the rigid search market regime, neither the job creation nor job destruction conditions depend on unemployment income b, as long as it is independent of the wage setting (and $\overline{w} > b$).

3.6 Closed Labor Markets

As in the case of competitive search labor markets, it is useful to define the critical minimal skill $\underline{s}^r$, defined implicitly defined by the condition $\theta^r(\underline{s}^r) = 0$ or $R^r(\underline{s}^r) = 1$, below which workers are unemployable and the labor market is closed. In rigid search markets, one might expect that the minimum wage $\overline{w}$, the productivity-based pay scale ϕ as well as a firing tax T might close markets which might otherwise survive under normal Nash bargaining conditions. Yet this effect is usually ignored in the discussion in the literature on the net effect of firing costs on employment.

Consider first the condition $\theta^r(\underline{s}^r) > 0$, that is, that the supply of vacancies is strictly positive. By inspection of (26), this requires $R^r \leq 1-(r+\lambda)\,T$. Thus no labor markets will be open for skills with $R^r \in [1-(r+\lambda)\,T, 1]$. An alternative condition derives from the limit of (25) as $R^r \to 1$, or $s \geq \frac{\overline{w}}{1-\phi+rT}$. It follows that $\underline{s}^r$ will be the larger of $\frac{\overline{w}}{1-\phi+rT}$ and $s : R^r = 1-(r+\lambda)\,T$. Given the participation constraint, $\underline{s}^r > b = \underline{s}^*$.

3.7 Equilibrium Valuation of Employment in the Rigid Wage Segment by skill s

Consider the relationship between skills and the value of employment in the rigid-wage segment. The valuation of a rigid wage job obeys:

$$W^r = \frac{\overline{w} + \phi s + \lambda F(R^r) U^r}{r + \lambda F(R^r)}, \tag{30}$$

while the value of unemployment (U^r) for a worker employed by market with skill level s[18]

$$rU^r = b + \theta^r q\left(\theta^r\right)\left[W^r - U^r\right] \tag{31}$$

Combining and solving we obtain:

$$W^r = \frac{b}{r} + \frac{1}{1 + \frac{\lambda F(R^r)}{r + \theta^r q(\theta^r)}}\left[\frac{(\overline{w} + \phi s) - b}{r}\right]$$

Note that if $\overline{w} = b$,

$$W^r = \frac{1}{r}\left[b + \frac{1}{1 + \frac{\lambda F(R^r)}{r + \theta^r q(\theta^r)}}\phi s\right].$$

As in the competitive search market case, it is possible to show that W^r is unambiguously increasing in skill s. Intuitively, raising s raises the value of employment because it increases pay directly, as well as equilibrium job tightness in the local labor market, raising the probability of finding a job. It also increases the duration of a job. As long as ϕ is strictly positive, higher skills will be associated with a higher flow payoff in the continuation region. As in the competitive case, the sign of the second derivative of W^r is ambiguous.

For the valuation of firms, start with

$$J^r(1) = \frac{sk}{q\left(\theta^r\right)}. \tag{33}$$

Differentiation yields

[18] As always, the subscript for s is suppressed where it is understood that this equation holds for every skill group.

$$\frac{\partial J^r(1)}{\partial s} = \frac{k}{q\left(\theta^r\right)} - \frac{skq'}{q^2}\frac{\partial \theta^r}{\partial s} > 0 \tag{34}$$

and as in the competitive case the second derivative of $J^r(1)$ is ambiguous.

The following table summarizes the effects of other changes on $W^r(1)$ and $J^r(1)$ conditional the magch surviving:

TABLE 4

Effect of ...	$\overline{w}$	ϕ	λ	T
...on				
$W^r(1)$	$+$	$+$	$-$	$-$
$J^r(1)$	$-$	$-$	$-$	$+$

In particular, it is true that $\frac{\partial J^r(1)}{\partial T} = -\frac{skq'}{q^2}\frac{\partial \theta^r}{\partial T} \lesseqgtr 0$ as $\frac{\partial \theta^r}{\partial T} \lesseqgtr 0$: while the effect of the firing tax on the value of the firm is ambiguous, it will only be positive if it raises labor market tightness, which is not the case in the current setup. This is thus inconsistent with a Marxian "surplus value" interpretation of firing taxes: A firing tax raises the wealth of capitalists only if it reduces the unemployment rate!

4 Worker and Firm Preferences for Labor Market Regimes: A Calibration

The objective of this section is to consider one tractable example using particular functional forms and consider the model's implications. We thus follow a tradition begun by Mortensen/Millard (1997) and Mortensen/Pissarides (1999) for analyzing the effects of labor market institutions, and propose a standard calibration and then proceed to study its behavior.

4.1 Calibration

4.1.1 Setup

We now present a parametrization of our model which will be used in the analysis below. We consider an economy with matching success probabilities given by a Cobb-Douglas form $q(\theta) = A\theta^{-\alpha}$ with $A > 0$, $1 > \alpha > 0$. The idiosyncratic shock is distributed uniformly over the interval (0,1]. Under these

conditions, the job creation condition for market of skill s in the competitive search labor market is given by

$$\theta^* = \left[(1-\beta)\frac{A(1-R^*)}{k(r+\lambda)}\right]^{1/\alpha} \tag{35}$$

and in the rigid search market by the condition

$$\theta^r = \left[\frac{A}{k}\left(\frac{1-R^r}{r+\lambda} - T\right)\right]^{1/\alpha}. \tag{36}$$

The job destruction conditions are respectively

$$sR^* + \frac{s\lambda(1-R^*)^2}{2\,(r+\lambda)} = b + \frac{\beta sk\theta^*}{1-\beta} + \lambda\,(1-R^*)\,\rho \tag{37}$$

and

$$sR^r + \frac{s\lambda(1-R^r)^2}{2\,(r+\lambda)} = \overline{w} + \phi s - rsT. \tag{38}$$

Note that under these conditions it is is not possible to solve explicitly for R^*, while threshold productivity in the rigid wage segment is given by

$$R^r = -\frac{r}{\lambda} + \sqrt{\left(\frac{r}{\lambda}\right)^2 + \frac{2(r+\lambda)\,(\overline{w} + \phi s - rsT)}{s\lambda} - 1}. \tag{39}$$

4.1.2 Numerical values

Figure 3 displays the results for the two value functions under the functional restrictions discussed above and for the two regimes, for a numerical calibration of the model with parameter values given in Table 6. Values chosen for λ and k are in line with those employed by Yashiv (2000) in the calibration of the MP model to data from Israel, and by Mortensen and Pissarides (1999). The fixed rigid wage component is arbitrarily set just above unemployment income, which is itself established at a level leaving about one-sixth of the skill distribution out of employment under competitive conditions. We impose the Hosios condition (Hosios 1990), so the decentralized equilibrium can actually achieve the social optimum.[19] The value for the renegotiation

[19] This rules out the most obvious justification of the role of unions. See Boone and Bovenberg (2000) for an analysis of optimal taxation in the MP model.

costs is admittedly arbitrary. In the baseline simulation it is set equal to two quarters of output.[20]

Table 6. Base Calibration Values
Parameter Values for Calibration,
Quarterly Model

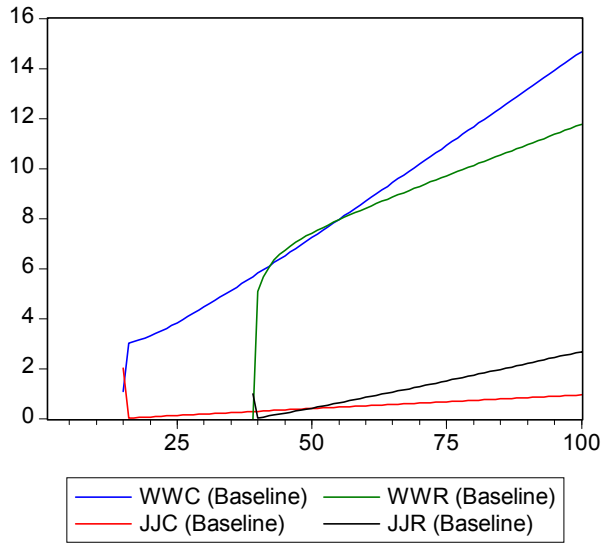
A (total productivity of matching)	0.30
α, β (elasticity of $q(\theta)$, labor bargaining power)	0.50
b (income in unemployment)	0.15
λ (frequency of the match-specific shock)	0.10
r (real interest rate)	0.05
ρ (renegotiation costs)	2.00
k (recruitment costs, proportional to prod.)	0.15
$\overline{w}$ (base wage)	0.20
ϕ (productivity pay scale parameter)	0.45
T (firing tax, proportional to prod.)	1.00

4.2 Evaluating Preferences

In Figure 3, the valuation of employment and a filled job under both regimes is plotted by skill s for the baseline calibration. As can be seen, the labor market is shut down for the lowest skill levels in both segments. As intuition predicts, higher-skill workers prefer to have their wages set under competitive conditions, while low-skill workers prefer the rigid regime - if their labor market it open. Moving upwards on the skill ladder, the labor market starts operating in the rigid-wage segment. When low skill types can actually choose among the two segments, they would opt for the rigid wage regime. For higher skill levels, however, the workers' most preferred regime is individual bargaining. At the same time, more skill classes are shut out of labor market activity under the rigid regime. Local sensitivity analysis of the calibration around the baseline reveals that the fraction of those working in rigid labor markets which prefer them to competitive markets is positively related to the interest rate, the Poisson incidence parameter λ, to the pro-

[20]Recall that the renegotiation cost represents the monetary valuation of all (including intangible) costs of rewriting the contract upon the realization of the idiosyncratic productivity shock.

Figure 3: Equilibrium Valuation of Employment and Filled Jobs (x=1) by Skill, Baseline Calibration



ductivity pay parameter ϕ, the base wage $\overline{w}$, the cost of renegotiation ρ and the firing tax T.

In Figure 3 the preferences of the employed for the regime clearly depend on skill, so the distribution of skill in the economy will play a central role in determining aggregate preferences. In the base calibration, those workers with skill levels $s = [0.43, 0.54]$ will prefer the rigid wage regime, while workers with skill in the intervals $[0.40, 0.42]$ and $[0.55, 1.00]$ prefer the competitive regime. If the density of workers in the economy were uniform over skill, and the two alternatives were subjected to a vote among those in work in both regimes, the rigid regime would clearly lose to the more flexible economy in a one-on-one election among those with jobs. Only if there were significant mass in the middle of the the skill distribution, would the the rigid wage regime have any chance of a majority. At the same time, it is noteworthy that firms operating with 60% of all potential skill levels (all firms operating with workers of productivity greater than 0.40) and 91% of all firms in operation in the rigid wage regime will favor the status quo. To the extent the "capitalists" have any political clout in this model, they are likely to repre-

sent a conservative force in favor of rigid wage regimes, unless they represent pressure from outside lobbying for regime change.

4.3 The importance of renegotiation costs and firing costs reconsidered

At the same time, the level of renegotiation costs ρ necessary to induce significant support for a rigid wage regime appear too large to be realistic. Figures 4 and 5 display alternative calibrations for ρ=1.0, and 4.0. The results are highly suggestive of - at least for models obeying the Hosios condition - a type of optimality of the Nash bargaining wage rule in the MP-model; in the absence of significant frictions this sharing rule delivers outcomes that are unlikely to be improved upon.

This conclusion also applies to the firing tax, which is obviously a deadweight loss to the economy. The firing tax reduces firings and overall turnover, and, in our model, has an unambiguous effect on unemployment; it also unambiguously shuts down low-skilled labor markets. Figure 6 show the baseline calibration for a range of values of T ranging from 0 to 5 quarters of output. Not only does increasing severance tax close labor markets, but it also reduces the value of employment for those in work. For example the median productivity worker is made worse off monotonically with increasing T.

In light of these results, it is natural to ask why there is any political support at all for severance taxes of the type discussed in this paper. It is however, possible that introducing severance taxes for all employment in the economy - both competitive as well as rigid skill segments - can increase the *relative* attractiveness of the rigid labor market regime. Introducing a severance tax in the flexible regime lead to job creation and destruction conditions for our calibration:

$$\theta^* = \left(\frac{A}{k}\right)^{1/\alpha} \left[\frac{(1-\beta)(1-R^*)}{(r+\lambda)} - T\right]^{1/\alpha} \tag{40}$$

$$sR^* + \frac{s\lambda(1-R^*)^2}{2\,(r+\lambda)} = b + \frac{\beta sk\theta^*}{1-\beta} + \lambda\,(1-R^*)\,\rho - rsT \tag{41}$$

respectively. Can the rigid economy be more attractive than the competitive search economy? Figure 8 shows the results for $T = 1$ in both regimes. Here the overwhelming majority of skill classes will opt for rigid labor markets. In

Figure 4: Baseline calibration with ρ=1.0

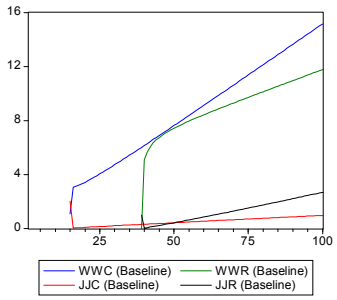


Figure 5: Baseline calibration with ρ=4.0

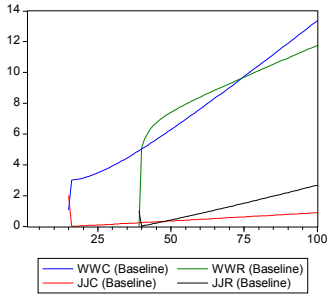
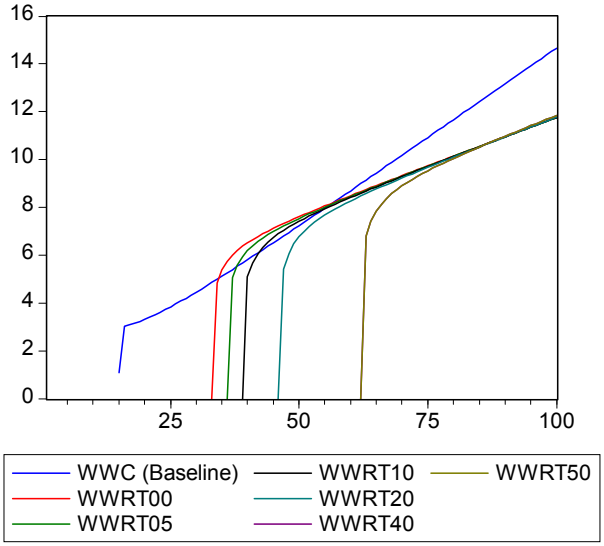


Figure 6: Valuation of Employment for Different Values of T, by Skill, Baseline Calibration



the second panel, the level of the renegotiation cost is cut to only 0.2 quarters of output (versus 2.0 quarters in the baseline) With a severance tax applying to both regimes, the rigid wage regime is still preferred even for very modest renegotiation costs.

This finding suggests that the relative attractiveness of rigid wage regime can be enhanced by the imposition of firing taxes on both regimes. To the extent that labor unions are advocates of rigid labor markets, the model's prediction is consistent with the well-established correlation of employment protection legislation with union organization as well as the support offered by unions for employment protection legislation. Severance regulation appears to be a complement for wage rigidities, for example, rather than a substitute.

4.4 Interpretation: Labor Unions, Collective Bargaining and Endogenous Membership

Explaining wage policies which are actually chosen in labor markets is not a trivial task. One approach is to assume that some decision-maker (union, government) can choose a wage policy unilaterally to maximize some utility or objective function given the constraints implied by the labor market and the overall economy (see Farber 1986, Booth 1995). An alternative, which looks beyond unions as the sole means of collective wage determination, asks whether a single rigid wage can find majority support in the population. In this section, we sketch the model's potential for explaining the endogeneity of union membership as well as "excess coverage" (OECD 1996) and free-riding by non-members, in this latter sense.

Suppose that at each skill level s, workers take a one-time decision on the labor market regime which maximizes the value of employment. They do this before a match is created and have to be in that regime until the match is dissolved. This is consistent with evidence on the dynamics of union membership, suggesting that de-unionisation occurs mainly because new firms and new jobs are not unionised, and not through resignation of incumbent workers (Machin, 2000). There is no incentive for workers to abandon the rigid-wage regime after the match is created as productivity can only decline from the initial match level. We do however explicitly rule out the possibility that workers who initially shun union membership later endorse the rigid-wage regime. The decision is a simple comparison of the

Figure 7: Valuations of Employment and Filled Jobs when Severance Tax Applies in both Regimes, $\rho = 2.0$

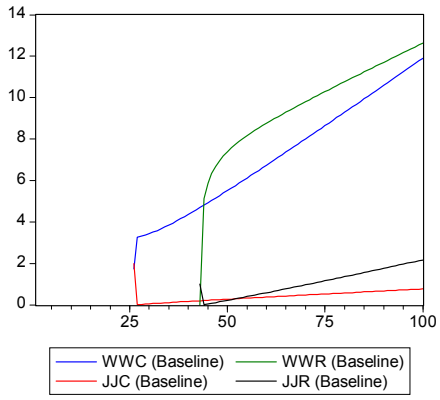


Figure 8:

Figure 9: Valuations of Employment and Filled Jobs when Severance Tax Applies in both Regimes, $\rho = 0.2$

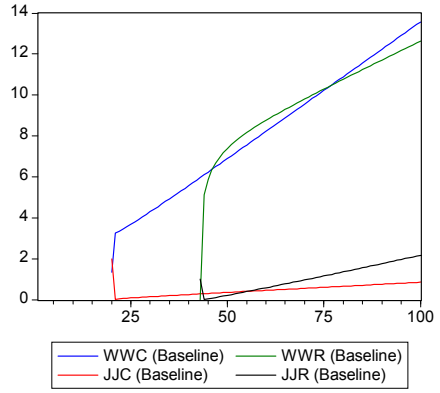


Figure 10:

valuation of employment in the two states, $W^*(1)$ and W^r. The fraction of (open) skill markets for which $W^*(1) > W^r$ can be thought of as a measure of political support for labor rigidities. At the same time, union membership is costly - say, a fraction d of the wage each period, implying that a necessary condition for membership is

$$d < r\left(W^*(1) - W^r\right)/w^r. \tag{42}$$

Yet this is not a sufficient condition, as the implementation of the rigid wage regime is a public good and rational workers would refuse to pay dues if they could enjoy the benefits without doing so. Members could profit directly from additional "employment protection" as in the case of Italy - there, unions protect their members in the first instance from dismissals. Yet we have determined above that severance taxation in this calibration considered reduces the value of employment.

One possible way out is to assume that gains from union membership stem from being able to control the agenda, i.e. to determine the rigid-wage alternative to a competitive search environment. One could imagine endogenizing the wage decision by allowing members to vote on their most preferred extent of rigidities. Naturally, the order of the agenda is crucial and a more detailed and careful discussion of these issues must be left to further research. Here we will only scratch the surface of a number of interesting complications which arise via agenda-setting, and consider only the most-preferred productivity-wage scale. As can be seen in Figure drawn from the example above, the *most preferred* wage for a worker of skill s, $\phi^*(s)$, is monotone increasing in s. The decisionmaking procedure is modeled as follows. The outcome of the competitive search labor market with a severance tax applied to all labor markets is taken as given, as characterized in Figure 8. Workers evaluate their gains from rigid labor markets expressed as the class of wage policies discussed in this paper: $w^r = \overline{w} + \phi s$. To simplify the problem, we assume $\overline{w} = b = 0.15$, and that voting only occurs over ϕ. We set membership dues to be 3% of the wage ($d = .03$) and assume that workers join the union if (42) holds. Now hold an election among these workers, and take the wage policy most preferred by the median worker in this group. This will in turn induce a new membership, a new most preferred policy, etc. The question is: is there a fixed point in this process? The point is not trivial, since a union with dynamic membership linked to employment could,

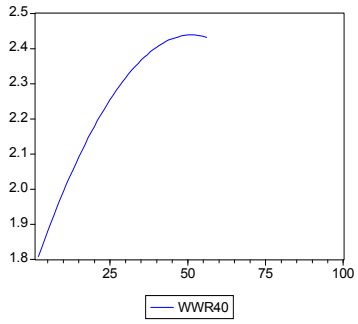


Figure 11:

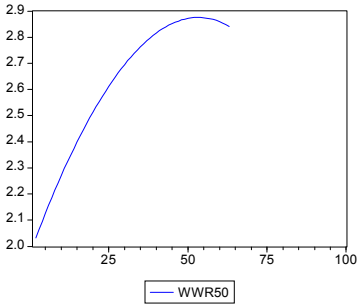


Figure 12:

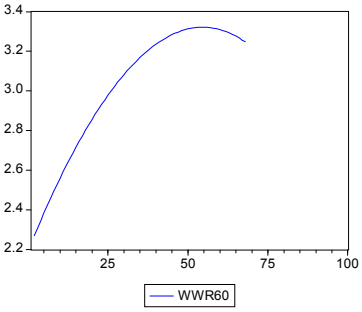


Figure 13:

by pursuing an overly aggressive wage policy, vote itself out of existence.[21]

For the baseline calibration chosen here (but here with $T = 1$ in both regimes and $\rho = 0.2$), there is a fixed point, it is unique and is given by $\phi = 0.49$, corresponding to the most preferred ϕ of the worker of productivity class $s = 0.49$.[22] Given the uniform distribution of skill assumed, this recursive process results in an outcome in which 65% of markets (or 65% of all skill classes) are open. Workers in 21% of all skill classes actually join the union, corresponding to a membership rate of about 32%. At the same time, workers in 30% of all skill levels prefer (and thus accept or adopt) the rigid labor market regime, implying a coverage rate of about 46%. "Excess coverage" is thus roughly 30%, in line with findings of the OECD for many European countries (OECD, 1996). Reducing union dues to $d = 0.01$ (equivalently, making union membership more attractive) results in a slightly more aggressive wage policy ($\phi = 0.50$), most-preferred by worker of productivity $s = 0.53$, but with a higher membership rate (29% of all skill levels and 45% of all open markets) and an excess coverage of only about 14%. The model thus offers some insights towards explaining stylized facts concerning patterns in union membership and the coverage of collective bargaining discussed by the OECD (1996) and Boeri et al. (2001)

5 Conclusion

In this paper we have used the equilibrium search/matching theory of unemployment along the lines of Mortensen and Pissarides (1994, 2000) to study the issue of preference of workers for which addresses directly issues involving both coverage and membership of labor unions. Our main results can be summarised as follows: First, the introduction of renogotiation costs in a competitive search market makes a rigid wage regime attractive to a nontrivial segment of the working population. Even the most "rigid" of rigid wage regimes can find broad support - in the sense that workers' utility is higher than in competitive search submarket. We have argued that this support may be expressed as membership in a labor union, but also as political endorsement of rigid wage policies (such as minimum wage policies and the

[21] See Blanchard and Summers (1986) and Burda (1990) for examples in which this occurs, even when expectations are rational and workers perfectly understand the process.

[22] Here we employed a grid of 100 skill classes and thus have rounded results to the nearest hundredth..

extension of contract wages to nonunionized workers). Interestingly, the lowest and the highest skilled will prefer the competitive search market: the former because they are frozen out of access to a job, the latter because they can do better in competitive search market.

Second, severance protection (a tax on separations that is a loss to the economy) can increase the relative popularity of rigid wage policies, because it further increases utility of rigid wage workers who keep their jobs, measured relative to the competitive search equilibrium. Although severance taxation is a deadweight loss in the competitive labor market, but it can increase the relative appeal of rigid wage policies for low-skill workers which are at greatest risk.

Third we sketch a way to disantangle membership of a union from general preferences for rigid wages. The extensive theoretical literature on labor unions summarized for example in Booth (1995) has tended to take membership as given. This makes it difficult to interpret the declines in union membership observed in most OECD countries and the role played by administrative extension of the coverage of collective agreements. Even less attention is devoted to the way in which labor market institutions and the legal framework for collective bargaining affect the decision to join a union. Hence, the existing body of theory offers little guidance in understanding two developments common to many European countries in the last two decades: the decline in membership and the increasing "excess coverage rates", namely the difference between the share of workers to which collective agreements apply (e.g., because of the administrative extension of collective agreements) and the share of workers belonging to the unions signing the agreements. In our framework, members are those who would accept a lower rigid wage and thus are willing to pay union dues out of what they receive belonging to the rigid wage regime. We have shown that when rigid wages are set to maximise the value of employment of the median worker (in terms of her skill level, the only dimension along which workers are allowed to vary in this model), the upskilling of the population induces an increase in the rigid wage. This, in turn, reduces membership more than the coverage of rigid wages.

Empirical evidence on employers' assessment of the relevance of renegotiation costs, on the relation between employment protection and collective bargaining coverage, on the skill profile of union members and on the relationship between excess coverage and changes in labor market institutions is broadly in line with the implications of our model.

The main purpose of this paper was to convince the reader that the MP

model of the equilibrim unemployment and the labor market can be a valuable tool for improving our understanding of collective bargaining arrangements. Clearly, much more can be done than has been attempted in this paper.

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6 Appendix (March 8 2003)

Appendix is under revision but can be supplied by request (burda@wiwi.hu-berlin.de)