Equilibrium Unemployment with Wage Posting: Burdett-Mortensen Meet Pissarides

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Abstract

The wage posting approach to search equilibrium is incorporated into the equilibrium unemployment approach in the paper. The unique equilibrium to the wage posting game analyzed is a distribution of wage offers of the same functional form as that originally derived by Burdett and Mortensen (1998). The synthesis is extended by allowing for match specific investment by employers. The outcome is endogenous productivity differences across jobs that are induced by equilibrium wage offer differences. Contrary to the original Burdett-Mortensen solution, the equilibrium wage offers distribution can be unimodal with a long right tail when match-specific investment are included.

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The two principal branches of the literature on search approaches to equilibrium labor market analysis have led somewhat separate lives. The matching framework (See Pissarides (1990) and Mortensen and Pissarides (1994).) has found application as a tool for understanding labor market flows and unemployment. Models of wage posting (See Burdett and Judd (1983), Burdett and Mortensen (1989, 1998) and Mortensen (1990).) embody a particular theory of wage determination which has been applied in the empirical analysis of wage differentials.[1] A graft of these two strands promises a joint theory of wage and employment determination in which employers play active roles as both wage setters and job creators.

A synthesis of the two approaches and an extension of the model to include investment in match specific capital are sketched in this paper.[2] Even though workers and employers are all identical, a unique dispersed wage equilibrium exists which limits to that derived by Burdett and Mortensen (1989) as the rate of time discount vanishes in the simplest form of the synthesis. Although a no-trade equilibrium of the Diamond (1971) type also exists because market tightness is endogenous, it is unstable with respect to a simple entry process.

In the dispersed equilibrium, unemployment compensation or alternatively a binding minimum wage reduces the incentive to create jobs as in Pissarides (1990) but decreases the range of wages offered as in Burdett and Mortensen (1998). These properties suggest that income support programs may contribute to higher unemployment and less wage dispersion in the welfare states of Europe relative to the US and UK, economies in which unemployment insurance and minimum wage provisions are less generous. Despite the adverse effects of these policies on employment, the model also implies that an appropriately chosen level of either income support for the unemployed or a binding minimum wage can improve welfare because all wages are set too low as a consequence of employer monopsony power and because dispersed wages induces inefficient labor turnover in the economy modeled.

In its original simple form, the Burdett-Mortensen wage posting model has problems fitting empirical wage data. In particular, the model implies that the equilibrium offer and wage densities increase monotonically across their common support in apparent conflict with the long right tail typically observed. Although this property only need hold for given worker characteristics that covary with productivity, even a wage equation error term with an increasing density is difficult to square with the facts. It should be noted that Bontemps, Robin and van den Berg (1997) have improved fits by ex-

[1] These applications include Bontemps et al (1997), Bowlus et al (1995,1997), Kiefer and Neumann (1993), van den Berg and Ridder (1995), and van den Berg and Ridder (1997).

[2] The extension is along the lines developed by Quercioli (1998) for the Burdett-Mortensen model.

ploiting Mortensen's (1990) demonstration that more productive employers offer higher wages. In this case, a skewed distribution of employer productivity can induce appropriately shaped tails in the distribution of wage offers. Still, existing theory neither explains nor restricts the assumed exogenous distribution of employer productivity.

When endogenous match specific investment is allowed, the offer density in the Burdett-Mortensen model need not be increasing. Indeed, it has a single mode which typically lies in the interior of the support under mild restrictions on the form of the relationship between labor productivity and capital once investment in match specific capital is allowed. Numerical experiments with a calibrated version of the model are conducted to illustrate how the shape of the density is affected by critical parameters of the model. These experiments demonstrate that the wage offer density declines in the right tail for all parameter values considered.

1 Search and Matching

As in the Pissarides (1990) matching model, firms create identical "job sites" and each is either vacant or filled. The equilibrium measure of vacancies v is determined by a free entry condition. The total labor force, composed of identical workers, is fixed and represented as a unit mass. Each individual worker is either employed or not. As in the Burdett-Mortensen model, employers post wage offers but workers must search among them to determine who offers what both while employed and while unemployed. Consequently, both the numbers of unemployed workers u and the number of employed workers $1-u$ are inputs, along with the vacancy measure, in the labor market matching technology. Specifically, let $m(v, u, 1-u)$ represent the matching function equal in value to the total flow of offers received by workers. It is increasing and concave in the three arguments by assumption.

For simplicity, we assume that employed and unemployed workers are perfect substitutes in the matching process and all search at unit intensity, i.e., only the number of searching workers matters.[3] Because the total flow

[3] Implicitly, Burdett and Mortensen consider the more general case in which employed and unemployed workers are not perfect substitutes. It is clear from the results of their analysis that nothing conceptual is lost by restricting attention to the special case provided that *some* employed workers are willing to search when wage offers differ across employers. However, characterizing equilibrium in the general case, although it is of obvious empirical

of contacts must equal the sum made by both unemployed and employed workers, the offer arrival rate is independent of employment status and an increasing concave function of vacancies. Formally, as $\lambda_0 u + \lambda_1 (1-u) = m(v,u,1-u) = m(v,1)$ for all u and $m(v,1)$ concave imply

$$\lambda_0 = \lambda_1 = \lambda(v) = m(v,1) \tag{1}$$

where $\lambda(v)$ is an increasing concave function.

An unemployed worker accepts the first offer no less than the common reservation wage and an employed worker accepts any offer in excess of that currently earned. The assumption that employed and unemployed workers are perfect substitutes implies that the reservation wage is equal to the unemployment benefit, denoted as b. (See Mortensen and Neumann (1988).) Obviously, no employer can profit by offering less than the common reservation wage in equilibrium. As a consequence, the lowest wage offered is always b. For this reason, b can also be interpreted as the minimum wage if the latter exceed the unemployment benefit.

Employed workers flow into unemployment at the exogenous job destruction rate δ and the unemployed flows out at the job finding rate $\lambda(v)$ as in Pissarides (1990). The inflow, $\delta(1-u(v))$, and outflow, $\lambda(v)u(v)$, are equal at the steady state value of unemployment given by

$$\frac{u}{1-u} = \frac{\delta}{\lambda(v)}. \tag{2}$$

Given random matching and the fact that all wage offers are bounded below by b in equilibrium, the probability that any unemployed searching worker meets an employer offering a wage less than or equal to w is equal to the value of wage offer distribution function $F(w)$. Because employed workers only move to higher paying jobs, the flow into the set of worker who earn wage w or less is $\lambda(v)F(w)u$ but the flow out is $[\delta + \lambda(v)(1-F(w))]\,G(w)(1-u)$ where $G(w)$ denotes the fraction of those employed at wage w or less, the wage distribution function. These two facts imply that the steady state distribution of wages earned across employed worker can be written as

$$G(w) = \frac{\lambda(v)F(w)u}{[\delta + \lambda(v)(1-F(w))]\,(1-u)} = \frac{\delta F(w)}{\delta + \lambda(v)[1-F(w)]} \tag{3}$$

where the second equality follows by using equation (2) to eliminate u.

interest, is more complicated.

2 Wage Posting

In the matching framework, the relevant profit concept is the expected return attributable to the posting of a vacancy net of cost. Wages are set to maximize the return and entry drives its value to zero. Formally, the asset value of a vacant job solves the continuous time Bellman equation

$$rV = \max_{w \geq b} \{\eta(v)\,[u + (1-u)G(w)]\,(J(w) - V) - c\} \tag{4}$$

where $\eta(v) \equiv \lambda(v)/v$ is the average rate at which vacancies are filled and $c > 0$ is the flow cost of recruiting per vacancy. In other words, the expected net return to holding a job vacant, the left side of the equation, equals the product of the rate at which workers are contacted per vacancy, $\eta(v)$, the probability that the worker contacted will accept, unity if unemployed given $w \geq b$ and $G(w)$ if employed where G is the distribution of wage rates across employed workers, and the capital gain captured when a vacancy is filled, $J(w) - V$, less the recruiting cost flow per vacancy c.

As employed workers quit when they receive a higher alternative wage offer, the expected present value of the employer's future flow of quasi-rents once a worker is hired at wage w, $J(w)$, solves

$$rJ(w) = p - w - \lambda(v)[1 - F(w)](J(w) - V) - \delta J(w) \tag{5}$$

where p is the flow value of match product, δ is the exogenous job destruction rate and $\lambda(v)[1 - F(w)]$ is the expected rate at which an employed worker finds a job paying more than w, the employer's quit rate. The specification allows an employer to seek another worker in the event of a quit but presumes that the job is of no value in the case of destruction.

As free entry eliminates pure profit in vacancy creation, $V = 0$, the equations above imply

$$\frac{cv}{\lambda(v)} = \max_{w \geq b} \left\{ \left(\frac{\delta}{\delta + \lambda(v)[1 - F(w)]} \right) \left(\frac{p - w}{r + \delta + \lambda(v)[1 - F(w)]} \right) \right\}. \tag{6}$$

In other words, the expected cost of filling a vacancy, the left side of (6), equals the expected present value of the future profit attributable to filling one, the right side, for every wage offer that maximizes the value of hiring a worker.

Briefly stated then, a steady state *search-matching equilibrium* is a vacancy rate v and a wage offer distribution F such that the value of hiring a worker is maximum at every element in its support. As the lowest wage offer is accepted only by the unemployed, the optimal lower support choice must be either the reservation wage of the unemployed or a binding minimum wage. As a corollary, equation (6) implies that the equilibrium number of vacancies v solves

$$cv = \frac{(p-b)\lambda(v)}{(\delta+\lambda(v))\,(r+\delta+\lambda(v))}. \tag{7}$$

To exclude the trivial no-trade case, assume that market output per worker exceeds the opportunity cost of employment, i.e., $p > b$. Given $\lambda(v)$ increasing and concave and the Inada conditions $\lambda(0) = 0$ and $\lambda'(0) = \infty$, exactly two solutions exist to equation (7), the first at $v = 0$, and the second at some strictly positive number. Only the positive solution is stable in the sense that the return to vacancy creation exceeds (is less than) the cost for positive values to its left (right) of the equilibrium value. In short, a simple entry process starting with positive vacancies will find the positive equilibrium.

Employers have two reasons for offering a wage above the reservation wage of the unemployed, b. First, an employer's acceptance rate increases with the wage offer and second the employer's retention rate increases with the wage paid. These effects respectively explain why the first and the second terms on the right side of (6) increase with w. Finally, because every wage in the support of the equilibrium wage offer distribution must yield the same profit, $F(w)$ satisfies

$$\begin{aligned} & \frac{p-b}{(r+\delta+\lambda(v))\,(\delta+\lambda(v))} \\ = & \frac{p-w}{(r+\delta+\lambda(v)[1-F(w)])\,(\delta+\lambda(v)[1-F(w)])} \end{aligned} \tag{8}$$

for all $w \in [b, \overline{w}]$ where the upper support of the offer distribution is

$$\overline{w} = b + \left(1 - \frac{(r+\delta)\,\delta}{(r+\delta+\lambda(v))\,(\delta+\lambda(v))}\right)(p-b) \tag{9}$$

by virtue of $F(\overline{w}) = 1$.

Given that $v \to 0$ implies $\lambda(v) \to 0$, a unit mass at $w = b$ is the only offer distribution consistent with equation (8) in the limit when $v = 0$. In other words, the inefficient no-trade equilibrium solution $v_0^* = 0$ represents Diamond's (1971) equilibrium in which all employers post the monopsony wage and no workers are employed. At the positive equilibrium value v_1^*, $\lambda(v_1^*)$ is positive and finite. Hence, associated with this solution is a unique value of $F(w)$ for each choice of $w > b$ because the right side of (8) is increases in $F(w)$. Furthermore, $F(b) = 0$ and $F(w)$ is increasing as a consequence of the fact that the right side of (8) is decreasing in w. Hence, a unique equilibrium exists in which trade takes place and the associated wage offer distribution is everywhere dispersed.[4]

Note that the $F(w)$ is simply the positive root of a quadratic equation. Indeed, the wage offer distribution takes the closed form

$$F(w) = \frac{r + 2(\delta + \lambda(v))}{2\lambda(v)} \left[1 - \sqrt{\frac{r^2 + 4\left(\delta + \lambda(v)\right)\left(r + \delta + \lambda(v)\right)\left(\frac{p-w}{p-b}\right)}{\left((r + 2(\delta + \lambda(v))\right))^2}} \right] \tag{10}$$

This solution limits to the Burdett-Mortensen equilibrium distribution

$$\lim_{r \to 0} F(w) = \left(\frac{\delta + \lambda(v)}{\lambda(v)}\right) \left[1 - \sqrt{\left(\frac{p-w}{p-b}\right)} \right] \tag{11}$$

as the interest rate tends to zero which is the case they study. Hence, the matching framework when combined with the wage posting assumption represents an alternative interpretation of their model.

Demonstrating that the positive solution to equation (7) is decreasing in b is a trivial mathematical exercise. Because a higher unemployment benefit or binding minimum wage increases all wages paid, it is not surprising that vacancies fall with either. As a consequence, the steady state unemployment rate, that defined in equation (2), increases with b. Furthermore, an increase in b need not increase the average wage as in Burdett and Mortensen (1998). Although the direct effect of an increase in b on F is negative by virtue of (10), the associated decrease in the offer arrival rate $\lambda(v)$ may offset any stochastic improvement in wage offers. Still, wage dispersion as measured by the equilibrium offer range, $\overline{w} - b$, decrease with b by virtue of equation

[4]One can show that an equilibrium offer distribution has no mass point and must have a convex support when $\lambda(v)$ is positive and finite. (See Mortensen (1990) and Burdett and Mortensen (1989).) Consequently, the offer c.d.f. derived here is the unique equilibrium when $v = v_1^* > 0$.

(9) both because the direct effect is negative and because the offer arrival frequency $\lambda(v)$ decreases with b.

3 Match Specific Capital

In this extension, let k represent match specific investment per worker and let the value of worker productivity be an increasing concave function of this investment denoted as $pf(k)$. Because investments of this form are made after worker and employer meet, the cost of training the worker to perform the job is an example, and future returns are lost once worker and job separate, the value equations (4) and (5) can be rewritten as

$$rV = \max_{(w,k)\geq 0} \left\{ \eta(v) \left(\frac{\delta}{\delta + \lambda[1 - F(w)]} \right) (J(w,k) - k - V) - c \right\} \tag{12}$$

and

$$rJ(w,k) = pf(k) - w - \lambda(v)[1 - F(w)](J(w) - V) - \delta J(w) \tag{13}$$

to reflect this extension. In other words, each employer precommits to both the wage offered and the extent of its specific investment in the match. Hence, the free entry condition $V = 0$ and the requirement that every wage offer and investment combination must yield the same profit imply that

$$\frac{cv}{\lambda(v)} = \max_{w\geq 0} \frac{\delta \left[pf(k(w)) - w - k(w)\left(r + \delta + \lambda(v)[1 - F(w)]\right)\right]}{\left(r + \delta + \lambda(v)[1 - F(w)]\right)\left(\delta + \lambda(v)[1 - F(w)]\right)} \tag{14}$$

holds for every wage offer choice where

$$k(w) = \arg\max \left\{ pf(k) - w - k\left(r + \delta + \lambda(v)[1 - F(w)]\right) \right\} \tag{15}$$

is the optimal investment given that wage w is offered.

For the extended model, a *search equilibrium* is a vacancy level v, a wage offer distribution $F(w)$, and an investment policy function $k(w)$ that satisfy (14) and (15) for all w in the support of F. Equilibrium market tightness must satisfy

$$cv = \frac{\delta\lambda(v) \max_{k\geq 0} \left\{ pf(k) - b - k\left(r + \delta + \lambda(v)\right)\right\}}{\left(r + \delta + \lambda(v)\right)\left(\delta + \lambda(v)\right)} \tag{16}$$

as a consequence of the fact that $F(b) = 0$. Given $f'(0) > r + \delta$ and b small enough, there are again two solutions for v: one at the origin and a second which is strictly finite and positive. At the positive solution, the associated wage offer distribution solves

$$\frac{cv}{\delta\lambda(v)} = \frac{\max_{k\geq 0}\{pf(k) - w - k\,(r + \delta + \lambda(v)[1 - F(w)])\}}{(r + \delta + \lambda(v)[1 - F(w)])\,(\delta + \lambda(v)[1 - F(w)])} \tag{17}$$

Since the right side is strictly decreasing in w and strictly increasing in $F(w)$, a unique continuous offer distribution exists.

Finally, for any choice of wage offer w, the optimal training investment policy is fully characterized by the first order condition

$$pf'(k(w)) = r + \delta + \lambda(v)[1 - F(w)] \tag{18}$$

given the standard production function assumptions: $f(0) = 0$, $f'(0) = \infty$, $f'(k) > 0$, and $f''(k) < 0$. Namely, the marginal return on employer investment in match specific training must equal the relevant time rate of discount, the interest rate plus the match separation rate. As an implication, *employers who offer higher wages invest more in match specific capital*, i.e.

$$k'(w) = \frac{-\lambda(v)F'(w)}{pf''(k)} > 0, \tag{19}$$

because workers quit higher paying employers at a lower rate. Hence, workers employed at higher wages are more productive even though all worker and employers are identical ex ante.

4 Policy

Although unemployment compensation or a binding minimum wage generally reduce equilibrium employment, social welfare can be improved by introducing one or the other because employers, exploiting monopsony power in the modeled labor market, set wage rates too low. To see the validity of this claim in the brightest light, consider the social planner's problem in the limiting case of $r = 0$ in the simple case in which match specific investment is impossible. If there is no pure time discounting, a utilitarian planner would choose the job vacancy level to maximize the steady state aggregate output flow net of recruiting costs. Given that unemployed workers produce nothing (the social opportunity cost of employment is zero) for simplicity, the social planner's problem is

$$\max_v \left\{ p \left(\frac{\lambda(v)}{\delta + \lambda(v)} \right) - cv \right\}. \tag{20}$$

As $\lambda(v)$ is increasing and concave, there is the unique solution, denote it as v^0. The comparable positive search equilibrium level, v^*, is such that

$$\frac{p\delta\lambda'(v^0)}{(\delta + \lambda(v^0))^2} = c = \frac{p\delta\lambda(v^*)/v^*}{(\delta + \lambda(v^*))^2} < \frac{p\delta\lambda'(v^*)}{(\delta + \lambda(v^*))^2} \tag{21}$$

by virtue of equation (7) given $b = 0$ and the assumed concavity of $\lambda(v)$. Since the function on the left side of (21) is decreasing in v, the market equilibrium level of vacancies exceeds the social optimum, $v^* > v^0$, and consequently employment is too high.

Indeed, equations (7) and (21) together imply that either an unemployment benefit or a minimum wage of the magnitude which solve

$$\frac{b}{p} = 1 - \frac{v^0\lambda'(v^0)}{\lambda(v^0)} \tag{22}$$

will equate equilibrium market tightness v^* with the social optimum v^0. In other words, the optimal minimum wage or unemployment compensation expressed as a fraction of worker output should equal unity minus the elasticity of the matching function with respect to vacancies.[5] Available empirical estimates of the elasticity suggests a value for the ratio somewhere in the range between 40% and 60%.

In the model with match specific investment, the equilibrium vacancy level falls and unemployment increase with b by virtue of (16) and (2) as well. However, because the quit rate is also lowered, the first order condition (18) implies that match specific investment increases as either the unemployment benefit or a binding minimum wage increases for all wage offers except the highest one. Because across job movements have no social return in the environment modelled, equilibrium match specific investment is too low from a social point of view. Hence, it would appear that a positive unemployment

[5] The same condition for social optimality holds in the case of positive time discounting given that the social planner wishes chooses a market tightness policy that maximized the present value of future aggregate income.

benefit or minimum wage can improve welfare for two reasons, by offsetting the inefficiency induced by employer market power as in the previous model and by reducing the rate at which employed workers make job to job transitions. Actually, the issue is more complicated because under investment in match specific capital is responsible for reduced employer demand for new vacancies.

Because the hire flow is $\lambda(v)u$ and each new hire is endowed with the same investment in match specific capital k, the planner's problem, maximize steady state net output, is

$$\max_{v,k}\left\{pf(k)\left(\frac{\lambda(v)}{\delta+\lambda(v)}\right)-cv-k\lambda(v)\left(\frac{\delta}{\delta+\lambda(v)}\right)\right\} \tag{23}$$

in the special case of no time discounting. Hence, the first best vacancy-investment pair (v^0, k^0) is defined by the first order conditions

$$\frac{(pf(k^0)-\delta k^0)\delta\lambda'(v^0)}{(\delta+\lambda(v^0))^2}=c \tag{24}$$

and

$$pf'(k^0)=\delta. \tag{25}$$

The level of b that will insure that the equilibrium level of vacancies is first best, i.e., $v^* = v^0$ is

$$\frac{b}{pf(k^0)-\delta k^0}=\frac{\max_k\{pf(k)-(\delta+\lambda(v^0))k\}}{pf(k^0)-\delta k^0}-\frac{v^0\lambda'(v^0)}{\lambda(v^0)}$$

by virtue of (24) and (16) in the case of $r = 0$. Because the numerator of the first term on the right is less than the denominator as a consequence of under investment in match specific capital in search equilibrium, the required value of b need not be positive. Still, this value is a lower bound on the unemployment compensation which is the second best optimal choice because the second best optimal value of v is less than v^0 due to under investment in match specific capital when there is only one policy instrument available.

5 Wage Distribution

The general shape of the equilibrium wage offer density is characterized using equation (17). By differentiating all terms with respect to w, one obtains the following expression for the offer density

$$\lambda F'(w) = \frac{1}{k^0(w) + \frac{cv}{\delta\lambda(v)}\left[r + 2(\delta + \lambda(v)[1 - F(w)])\right]}.$$

Because specific capital investment is ignored ($k^0(w) \equiv 0$) in the original Burdett-Mortensen version of the model, its follows that the equilibrium wage offer density is strictly increasing on its support in this case. Because $k^0(w)$ is increasing in the generalization, a decreasing density is also a possibility. For example, the fact

$$\begin{aligned} \frac{F''(w)}{F'(w)} &= (\lambda F'(w))^2 \left[\frac{2cv}{\delta\lambda(v)} + \frac{1}{pf''(k^0(w))}\right] \\ &= (\lambda F'(w))^2 \left[\frac{2cv}{\delta\lambda(v)} - \frac{[k^0(w)]^{1-\alpha}}{\alpha(1-\alpha)p}\right] \end{aligned} \tag{26}$$

implies that the wage offer density increases then decreases with w if the production function is of the Cobb-Douglas form $\ln(f(k)) = \alpha \ln(k), \alpha \in (0, 1)$.

A better feel for the implications of endogenous match specific capital for the shape of the equilibrium wage offer distribution can be achieved by numerically solving a parameterized version of the model for reasonable parameter values. In the computations below the unit time period is one quarter of a year, the interest rate is set at $r = 0.01$, the job destruction rate is $\delta = 0.06$, and the other parameters are set to imply that the unemployment hazard is $\lambda(v) = 1$. These values are consistent with a real riskless rate of return of 4% per year, an unemployment duration hazard of one quarter, and an unemployment rate of 6.5%, all of which are consistent with US experience in the last twenty years. The Cobb-Douglas form

$$pf(\alpha) = pk^\alpha, \alpha \in (0, 1) \tag{27}$$

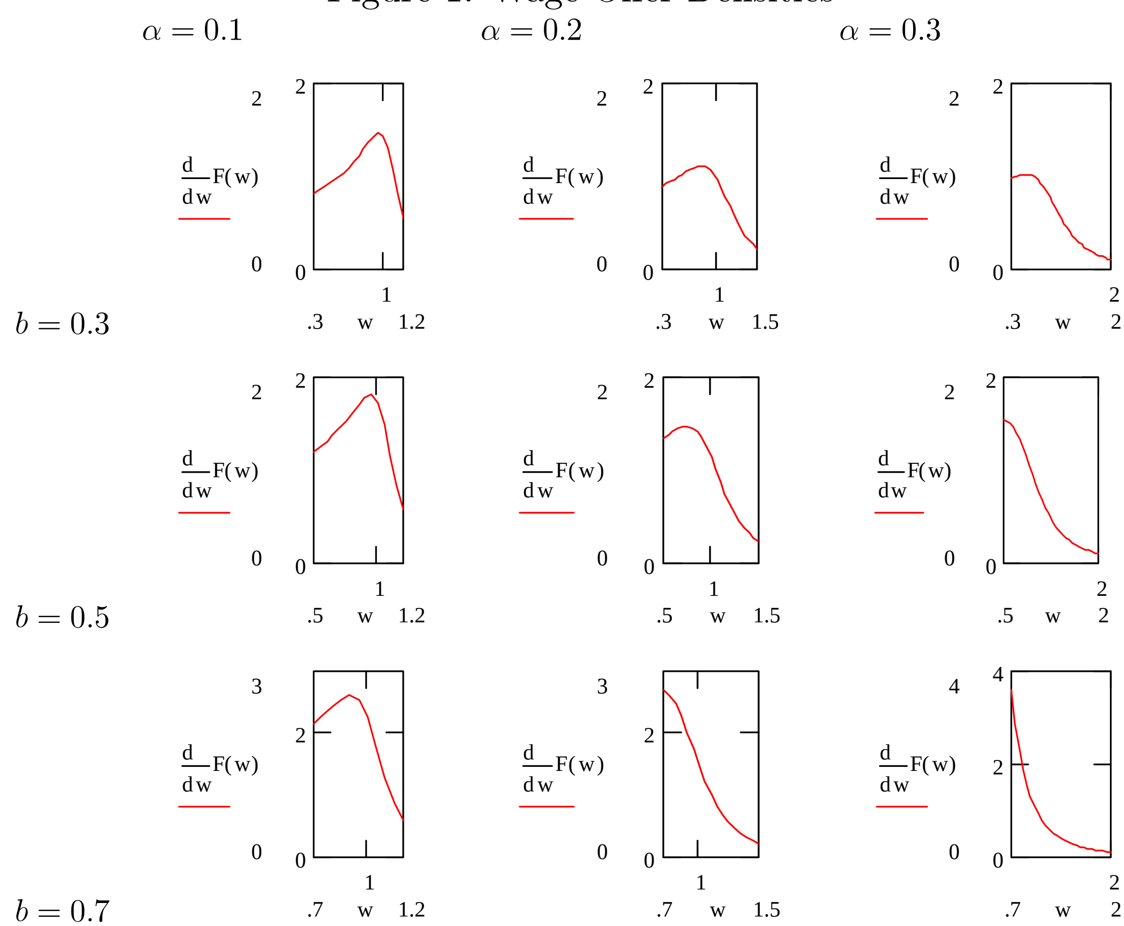
for the relation between worker productivity and capital is assumed. We normalize by setting p so that output per worker is the least productivity job is unity,

$$p(k^0(b))^\alpha = 1. \tag{28}$$

Given this choice of the numeraire, the cost parameters c and b are measured as fractions of output per worker per quarter in the least productive job.

After imposing the calibration assumptions and after setting p to satisfy the normalization above, we have two free parameters: the unemployed workers reservation wage b and the elasticity of the production function with respect to capital α. Given any pair of values for these parameters, the wage offer distribution function and density are computed as follows: First, equation (16) is used to solve for the cost of recruiting a worker $cv/\lambda(v)$ consistent with the requirement that the lower support of the offer distribution is equal to the reservation wage b. Having tied down this cost for the assumed values of (b, α), the equilibrium distribution function is generated numerically solving equation (17) for a range of wage rates above b. The results for various parameter combinations are Illustrated in Figure 1.

Figure 1: Wage Offer Densities



The values of the worker's reservation wage considered range from 30% to 70% of the output of the least productive employer. Although only values of the capital elasticity up to 30% are considered, it clear that a unimodal distribution with a right tail which can be quite long is the typical case for all parameter values. Note that the compression of the distribution induced by higher values of the reservation wage is visually quite evident. Furthermore, the right tail of the wage offer distribution clearly lengthens as α increase.

6 Conclusions

A synthesis of the job-worker matching and the wage-posting approaches to equilibrium in environments characterize by market friction is proposed and explored. The model is also extended to include a match specific capital choice. The combined approach provides a theory of employment and wage determination which high lights the role of employers as strategic wage setters and job creators.

New implications for social policy and the wage offer distribution are derived in the paper. Wages are disperse and set too low as a consequence of monopsony power from a social efficiency point of view in the environment modeled. Because vacancies fall and wage dispersion diminishes with the lowest wage offered, an appropriately chosen mandated minimum wage generally exists which is welfare improving. Although the simple version of the model implies an increasing offer density, the wage offer density can take on more realistic shapes when match specific investment is an endogenous employer decision in the model.

References

[1] Acemoglu, D. and R. Shimer (1997). "Efficient Wage Dispersion," working paper, Department of Economics, MIT.

[2] Bontemps, C, J-M. Robin, and G.J. van den Berg (1997). "Equilibrium Search with Productivity Dispersion: Theory and Estimation", presented at the 1997 meeting of the Society for Economic Dynamics, Oxford.

[3] Bowlus, A.J., N.M. Kiefer, and G.R. Neumann (1997). "Equilibrium Search Models and the Transition from School To Work," working paper, Department of Ecomics , University of Iowa.

[4] Bowlus, A.J., N.M. Kiefer, and G.R. Neumann (1995). "Estimation of Equilibrium Wage Distributions with Heterogeneity," *Journal of Applied Econometrics* 10, S119-S131.

[5] Burdett, K. (1990). "A New Framework for Labor Market Policy" in J. Hartog, G. Ridder, and J. Theeuwes (eds.), *Panel Data and Labor Market Studies*, Amsterdam: North Holland.

[6] Burdett, K. and K. Judd (1983). "Equilibrium Price Distributions", *Econometrica* 51, 955-970.

[7] Burdett, K. and D. T. Mortensen (1989). "Equilibrium Wage Differentials and Employer Size," Discussion Paper No. 860, Northwestern University.

[8] Burdett, K. and D. T. Mortensen (1998). "Wage Differentials, Employer Size, and Unemployment," *International Economic Review.*

[9] Card, D. and A. B. Kruger (1995). *Myth and Measurement: The New Economics of the Minimum Wage*, Princeton University Press, N.J.

[10] Coles, M.G. (1997). "Equilibrium Wage Dispersion, Firm Size and Growth," presented at the 1997 meeting of the Society for Economic Dynamic, Oxford.

[11] Diamond, P.A. (1971). "A Model of Price Adjustment," *Journal of Economic Theory* 3, 156-168.

[12] Kiefer, N.M. and G.R. Neumann (1993). "Wage Dispersion with Homogeneity: the Empirical Equilibrium Search Model" in H. Bunzel et al. (eds.), *Panel Data and Labor Market Analysis*, Amsterdam: North Holland.

[13] Mortensen, D.T. (1990). "Equilibrium Wage Distributions: A Synthesis" in J. Hartog, G. Ridder, and J. Theeuwes (eds.), *Panel Data and Labor Market Studies*, Amsterdam: North Holland.

[14] Mortensen, D.T., and C.A. Pissarides (1994). "Job Creation and Job Destruction in the Theory of Unemployment," *Review of Economic Studies* (1994) 61, 397-415.

[15] Mortensen, D.T. and G.R. Neumann (1988). "Estimating Structural Models of Unemployment and Job Duration" in W.A. Barnett, E.R. Bernt, and H. White (eds.), *Dynamic Econometric Modelling, Proceedings of the Third International Symposium in Economic theory and Econometrica,* Cambridge: Cambridge University Press.

[16] Pissarides, C.A. (1990). *Equilibrium Unemployment Theory.* Oxford: Basil Blackwell.

[17] Quercioli, E. (1998), *Firm Specific Training in a Search Equilibrium: Theory and Evidence*, University of Essex Phd thesis.

[18] Ridder, G. and G.J. van den Berg (1995). "Empirical Equilibrium Search Models," wording paper, Department of Econometrics, Free University, Amsterdam and forthcoming in *Econometrica.*

[19] Van den Berg, G.J. and G. Ridder (1993). "On the Estimation of Equilibrium Search Models with Panel Data" in J.C. van Ours et al. (eds.), *Labor Market Demand and Equilibrium Wage Formation*, Amsterdam: North Holland.