Skills of the unemployed and multiple equilibria in the labour market

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Abstract

This draft describes how heterogenous workers may matter for matching functions and job-finding rates in recessions. I make two departures from the Mortensen-Pissarides workhorse model: A fixed hiring cost and differences in skill. The effects are to increase the volatility of the aggregate job-finding rate over the business cycle and to change the matching function in a way that is consistent with a first exploration of the data.

1 Introduction

Some casual observations from the recent recession are the following. First, job adds have become painstakingly detailed in their specification of required skills. To be hired, workers must be experts and posses exactly the described skill mix. Second, managers deem it not worthwhile to hire new people because of training costs. And third, newspapers claim that "firms cannot find the right workers".

At a first glance, this sounds like increasingly severe mismatch or a story about a rising educational gap where firms all of a sudden are looking for skills that were

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not in demand before. Underlying this story is a perception that some structural transformation has accelerated during the recession, and as a result, the economy now suffers from a deteriorated matching technology.

An alternative view that will be emphasised here is that the poor labour market performance does not stem from a structural transformation but simply is caused by a cost-benefit analysis in which expected future profits are compared to the costs of establishing a match. If e.g. "aggregate demand" is low, then matches will be less productive and only profits from matches with the best workers will suffice to recover the initial outlays.

In the standard Mortensen-Pissarides model, any meeting between worker and firm results in a match, regardless of idiosyncracies in the match quality. The reason is that at the job interview, the search costs have already been incurred and as long as the worker produces something, however little, it's worthwhile to hire the worker.

This prediction of the standard model does not conform well with the story told and can be remedied by introducing a fixed hiring cost and worker heterogeneities. As will be shown below, in such a setting aggregate productivity basically selects how bad new hires can be if they in their relationship with the firm are to create enough profits to cover the hiring cost.

The observation that firms have become more picky recently in their choice of workers does not mean that they no longer post vacancies. Instead, in the model the firms advertise for workers but reject the bad ones once they meet. It is this extra barrier to hiring that causes the poor matching performance. An econometrician estimating a matching function from data on vacancies, unemployment, and hires will not pick up such distinction between meeting and matching. Indeed, it seems to be the conclusion from a first data exploration with these variables that the residuals from an estimated matching function are positively correlated with GDP growth. This conforms well with the story told here if GDP is a proxy for match profitability.

The last prediction of the model is perhaps yet another half answer to Shimer's "volatility puzzle" (Shimer (2005)). Indeed, when recessions kick in, because of the fixed hiring cost and differences in worker skill firms no longer hire bad workers, in effect introducing a second channel of discontinuous adjustment of the job-finding rate, one channel more than in the standard model.

On the negative side, I am concerned that the model presented here will not match the facts documented in Andreas Müller's job market paper (2010). Using CPS data, he shows how the ability of the unemployed workers on average rises during recessions, and decreases over the course of expansions. In other words, the average ability is often high at the end of recessions and somewhat low just prior to recessions. Further, Muller reveal that such skill composition changes are caused more by changing separation rate patterns than by hiring patterns. In the model presented here, the changing skill composition is driven mostly by hiring, not firing, and a fishing-out effect of good workers pollutes the unemployment pool in recessions.

2 Model

There are two kinds of workers in the model, good and bad. They differ with respect to their match productivities; Good workers produce pG and bad workers produce pB, where aggregate productivity $p \in \{p_l, p_h\}$, $p_l < p_h$. Firms only observe the skills of applicants when they are interviewed; in other words, firms cannot direct their search. Workers meet firms at rate $\lambda(\theta)$, and firms meet workers at rate $\eta(\theta)$. A fraction μ_G of applicants will be good workers, and a fraction $\mu_B = 1 - \mu_G$ will be bad. These are defined as $\mu_G = u_G/(u_G + u_B)$ where u_j is the unemployment level of workers with skill j.

If a firm desires to hire a worker it must pay a fixed hiring cost K. The wage setting mechanism is standard Nash bargaining every time idiosyncratic match-specific shocks hit, and at these times the outside option of the firm is 0. However, when the firm hires the worker, its outside option is K and thus some of the fixed cost will be financed by a reduction in the wage until the first productivity shock arrives.

Otherwise the model is standard Mortensen-Pissarides. As a first attempt, I write down a model where agents cannot foresee changes in productivity so that jumps in p are always of surprise to the agents.

The Hamilton-Jacobi-Bellman equations are:

$$\begin{aligned}
rU_G &= b + \lambda(\theta)(W_G(1) - U_G) \\
rW_G(\epsilon) &= w_G(\epsilon) + \alpha \int \max\{W_G(\epsilon'), U_G\} - W_G(\epsilon) dF(\epsilon') \\
rJ_G(\epsilon) &= pG\epsilon - w_G(\epsilon) + \alpha \int \max\{J_G(\epsilon'), 0\} - J_G(\epsilon) dF(\epsilon') \\
rU_B &= b + \lambda(\theta) 1_{[J_B(1) > K]}(W_B(1) - U_B) \\
rW_B(\epsilon) &= w_B(\epsilon) + \alpha \int \max\{W_B(\epsilon'), U_B\} - W_B(\epsilon) dF(\epsilon') \\
rJ_B(\epsilon) &= pB\epsilon - w_B(\epsilon) + \alpha \int \max\{J_B(\epsilon'), 0\} - J_B(\epsilon) dF(\epsilon') \\
rV &= -c + \eta(\theta)(\mu_G(J_G(1) - K) + \mu_B \max\{J_B(1) - K, 0\} - V).
\end{aligned}$$

There is free entry into posting vacancies so the remaining three equations are

$$\begin{aligned}
V &= 0 \\
(1-\beta)(W_j(\epsilon) - U_j(\epsilon)) &= \beta J_j(\epsilon), \text{ for } \epsilon \in [0,1] \text{ and an old match,} \\
(1-\beta)(W_j(1) - U_j(\epsilon)) &= \beta(J_j() - K) \text{ for initial matches.}
\end{aligned}$$

I assumed that good workers are productive enough to be hired even in bad times. In fact, this will follow from an assumption that hypothetical average workers will be hired, but more about that later. Now I consider for what values of the parameters bad workers will not be hired in recessions but will be hired in expansions.

The Job Creation condition and Job Destruction conditions are the equilibrium conditions derived from the Hamilton-Jacobi-Bellman equations above:

$$JC: \quad \frac{c}{\eta(\theta)} = \mu_G(J_G(1) - K) + \mu_B \max\{J_B(1) - K, 0\} \tag{1}$$

$$JD_G : b + \frac{\beta}{1-\beta}\lambda(\theta)(J_G(1) - K) = pG(R_G + \frac{\alpha}{r+\alpha}\int_{R_G}^{1} \epsilon - R_G dF(\epsilon)) \tag{2}$$

$$JD_B : \quad b + \frac{\beta}{1-\beta}\lambda(\theta)\max\{J_B(1) - K, 0\} = pB(R_B + \frac{\alpha}{r+\alpha}\int_{R_B}^{1} \epsilon - R_B dF(\epsilon)) \tag{3}$$

$$J_B(1) = \frac{pB(1-R_B)(1-\beta)}{r+\alpha} + \beta K, \quad J_G(1) = \frac{pG(1-R_G)(1-\beta)}{r+\alpha} + \beta K, \tag{4}$$

$$\text{If } J_B(1) - K > 0 : \mu_G = \frac{\phi_G \alpha F(R_G) F(R_B) + \lambda(\theta)\phi_G F(R_G)}{\alpha F(R_G) F(R_B) + \lambda(\theta)(\phi_G F(R_G) + \phi_B F(R_B))}, \tag{5}$$

$$\text{If } J_B(1) - K \leq 0 : \mu_G = \frac{\phi_G \alpha F(R_G)}{\alpha F(R_G) + \phi_B \lambda(\theta)}. \tag{6}$$

The equations for μ_G were derived from standard flow equations for unemployment levels.

To analyse the equation system, I make the following definitions of $\tilde{R}_B(b)$ and $\hat{R}_B(b)$

$$b = p_l B(\tilde{R}_B(b) + \alpha/(r+\alpha) \int_{\tilde{R}_B(b)}^{1} \epsilon - \tilde{R}_B(b) dF(\epsilon)), \tag{7}$$

$$b = p_h B(\hat{R}_B(b) + \alpha/(r+\alpha) \int_{\hat{R}_B(b)}^{1} \epsilon - \hat{R}_B(b) dF(\epsilon)), \tag{8}$$

as well as of $\tilde{\tilde{R}}_B(b)$

$$\frac{c}{\eta(\tilde{\tilde{\theta}})} = \tilde{\mu}_G(\tilde{\tilde{J}}_G(1) - K) + \tilde{\mu}_B(\tilde{\tilde{J}}_B(1) - K) \tag{9}$$

$$b + \frac{\beta}{1-\beta}\lambda(\tilde{\tilde{\theta}})(\tilde{\tilde{J}}_G(1) - K) = p_l G(\tilde{\tilde{R}}_G + \frac{\alpha}{r+\alpha}\int_{\tilde{\tilde{R}}_G}^{1} \epsilon - \tilde{\tilde{R}}_G dF(\epsilon)) \tag{10}$$

$$b + \frac{\beta}{1-\beta}\lambda(\tilde{\tilde{\theta}})(\tilde{\tilde{J}}_B(1) - K) = p_l B(\tilde{\tilde{R}}_B + \frac{\alpha}{r+\alpha}\int_{\tilde{\tilde{R}}_B}^{1} \epsilon - \tilde{\tilde{R}}_B dF(\epsilon)) \tag{11}$$

$$\tilde{\tilde{J}}_B(1) = \frac{p_l B(1-\tilde{\tilde{R}}_B)(1-\beta)}{r+\alpha} + \beta K, \quad \tilde{\tilde{J}}_G(1) = \frac{p_l G(1-\tilde{\tilde{R}}_G)(1-\beta)}{r+\alpha} + \beta K, \tag{12}$$

$$\tilde{\mu}_G = \frac{\phi_G \alpha F(\tilde{\tilde{R}}_G)F(\tilde{\tilde{R}}_B) + \lambda(\tilde{\tilde{\theta}})\phi_G F(\tilde{\tilde{R}}_G)}{\alpha F(\tilde{\tilde{R}}_G)F(\tilde{\tilde{R}}_B) + \lambda(\tilde{\tilde{\theta}})(\phi_G F(\tilde{\tilde{R}}_G) + \phi_B F(\tilde{\tilde{R}}_B))} \tag{13}$$

and of $\hat{\hat{R}}_B(b)$:

$$\frac{c}{\eta(\hat{\hat{\theta}})} = \hat{\mu}_G(\hat{\hat{J}}_G(1) - K) + \hat{\mu}_B(\hat{\hat{J}}_B(1) - K) \tag{14}$$

$$b + \frac{\beta}{1-\beta}\lambda(\hat{\hat{\theta}})(\hat{\hat{J}}_G(1) - K) = p_l G(\hat{\hat{R}}_G + \frac{\alpha}{r+\alpha}\int_{\hat{\hat{R}}_G}^{1} \epsilon - \hat{\hat{R}}_G dF(\epsilon)) \tag{15}$$

$$b + \frac{\beta}{1-\beta}\lambda(\hat{\hat{\theta}})(\hat{\hat{J}}_B(1) - K) = p_l B(\hat{\hat{R}}_B + \frac{\alpha}{r+\alpha}\int_{\hat{\hat{R}}_B}^{1} \epsilon - \hat{\hat{R}}_B dF(\epsilon)) \tag{16}$$

$$\hat{\hat{J}}_B(1) = \frac{p_l B(1-\hat{\hat{R}}_B)(1-\beta)}{r+\alpha} + \beta K, \quad \hat{\hat{J}}_G(1) = \frac{p_l G(1-\hat{\hat{R}}_G)(1-\beta)}{r+\alpha} + \beta K, \tag{17}$$

$$\hat{\mu}_G = \frac{\phi_G \alpha F(\hat{\hat{R}}_G)F(\hat{\hat{R}}_B) + \lambda(\hat{\hat{\theta}})\phi_G F(\hat{\hat{R}}_G)}{\alpha F(\hat{\hat{R}}_G)F(\hat{\hat{R}}_B) + \lambda(\hat{\hat{\theta}})(\phi_G F(\hat{\hat{R}}_G) + \phi_B F(\hat{\hat{R}}_B))}. \tag{18}$$

(The difference between the tilde and the hat is the value of p.) These equations mimick the original system of equations but are manageable without the max operator.

Define also

$$b^* = p_l B(1 + \frac{\alpha}{r+\alpha} \int_{1-\frac{K(r+\alpha)}{p_l B}}^{1} 1 - F(\epsilon) d\epsilon) - K(r+\alpha),$$

$$b^{**} = p_h B(1 + \frac{\alpha}{r+\alpha} \int_{1-\frac{K(r+\alpha)}{p_h B}}^{1} 1 - F(\epsilon) d\epsilon) - K(r+\alpha).$$

One can show that $b^* < b^{**}$, and with assumption $A1)$ below, $b^* > 0$, and by (8) $b^{**} < p_h B$.

Proposition:

Suppose that the parameters are such that the following assumptions are satisfied:

A1) $\quad 0 < K < \min\{\frac{p_h B(1 - \hat{R}_B(0))}{r+\alpha}, \frac{p_l B(1 - \tilde{R}_B(0))}{r+\alpha}\},$

A2) $\quad$ (9) – (13) and (14) – (18) have a solution,

A3) $\quad$ the equation system

$$\frac{c}{\eta(\theta)} = \frac{p_l(\phi_G G + \phi_B B)(1-R)(1-\beta)}{r+\alpha} - (1-\beta)K > 0,$$

$$b^{**} + \frac{\beta}{1-\beta} c\theta = p_l(\phi_G G + \phi_B B)(R + \frac{\alpha}{r+\alpha} \int_R^1 \epsilon - R dF(\epsilon))$$

has a solution.

Here, "a solution" means no complex numbers, a market tightness exceeding zero, and reservation productivities inside $[0, 1]$.

Then:

1) for $0 \leq b < b^*$ unemployed bad workers are hired in both expansions and recessions, for $b^* \leq b < b^{**}$ bad workers are hired in expansions but not in recessions, and for $b \geq b^{**}$ bad workers are never hired;

2) Good workers are always hired;

3) hypothetical workers of average skill $\phi_G G + \phi_B B$ would be hired in good and bad times, as long as $b \leq b^{**}$.

It is the range $b^* \leq b < b^{**}$ that is of interest to here; I checked in MATLAB that parameters satisfying the assumptions exist.

Proof:

I consider expansions and recessions separately and prove that there exists one threshold for each regime such that for b smaller than this threshold, a bad worker will be hired in this regime, and for b greater or equal to the threshold, bad workers will not be hired. I only write down the proof for recessions; The case of expansions is almost analogous if one replaces $p = p_l$ with $p = p_h$ everywhere (the difference is technical and concerns how to prove multiple equilibria, but more about that later). In terms of notation, the threshold for recessions will be b^* from above, and the threshold for expansions will be b^{**}. The good workers in point 2) of the proposition will be considered in the end of the proof, and the bad workers considered in point 1) now.

First, note from (3) that no hiring of bad workers takes place when $b = p_l B$. Second, note that $\tilde{R}'(b) > 0$ for all b. Now, for b such that $J_B(1) - K \leq 0$, $R_B(b) = \tilde{R}_B(b)$, and $p_l B(1 - \tilde{R}_B(b))/(r + \alpha) \leq K$. In other words,

$$p_l B(1 - \tilde{R}_B(b))/(r + \alpha) > K \;\Rightarrow\; \text{bad workers are hired.} \tag{19}$$

By assumption A1), (19) is true for $b = 0$. Then define b^* as

$$\frac{p_h B(1 - \tilde{R}_B(b^*))}{r + \alpha} = K$$

which can be shown to equal the definition of b^* above. By monotonicity, $b^* > 0$, and $b^* < p_l B$ because $p_l B(1 - \tilde{R}_B(p_l B))/(r + \alpha) = 0 < K$. This shows that for $b < b^*$, workers are hired. The next step is to show that for $b \geq b^*$, workers are not hired.

The region where bad workers are hired is non-empty (it includes $b = 0$), and for b in this region, $R(b) = \tilde{\tilde{R}}_B(b)$ and $p_l B(1 - \tilde{\tilde{R}}_B(b))/(r + \alpha) > K$. In other words,

$$\frac{p_l B(1 - \tilde{\tilde{R}}_B(b))}{r + \alpha} \leq K \;\Rightarrow\; \text{bad workers are not hired.}$$

The next step is to show that $\tilde{\tilde{R}}_B(b^*) = \tilde{R}_B(b^*)$. This is done by verification, i.e. by plugging the suggested solution $\tilde{R}(b^*)$ for $\tilde{\tilde{R}}_B$ into the HJB-equations (9)-(13) and using assumptions on existence. What remains is only to postulate (to be justified in the next subsection) that $\tilde{\tilde{R}}'_B(b) > 0$, so that for all $b \geq b^*$, bad workers are not hired in recessions. As already mentioned, the case for expansions is (almost) analogous, and yields a threshold $b^{**} > b^{*}$.

Now turn to the good workers. I want to prove that they are always hired. First, consider a separate economy that has all the features of the one above, except that only workers of average skill $\phi_G G + \phi_B B$ exist. I assume that these workers are always hired, that is,

$$\frac{c}{\eta(\theta_A)} = \frac{p(\phi_G G + \phi_B B)(1 - R_A)(1 - \beta)}{r + \alpha} - (1 - \beta)K > 0 \qquad (20)$$

$$b + \frac{\beta}{1 - \beta} c\theta_A = p(\phi_G G + \phi_B B)(R_A + \frac{\alpha}{r + \alpha} \int_{R_A}^{1} \epsilon - R_A dF(\epsilon)). \qquad (21)$$

Suppose that average skill in this economy goes up, and suppose that θ_A goes down. Then by (21), R_A goes down. But then (20) gives a contradiction, implying that θ_A goes up, and thus the workers are still hired when they all become more skilled. However, this conclusion was obtained under the assumption that the presence of bad guys in the economy does not influence the decision to hire the good ones. In fact I only considered the good guys in an economy with exclusively good guys. I now extend the argument to a mixed economy with good and bad workers, as follows.

What determines whether the good guys are hired or not is R_G. There are two ways in which the presence of bad workers can influence R_G—look at (1) and (2). First, when bad workers are present, it's no longer the case that $J_G(1) - K = c/\eta(\theta)$, and second, market tightness is different. I now split into two cases, namely whether the bad workers are hired or not.

Suppose that they are not hired. Then θ doesn't enter equation (3), and R_B doesn't enter (1) because $J_B(1) \leq K$ and μ_G only depends on R_G and θ. In other words, the remaining variables θ, R_G are determined exactly as in the economy only populated by good guys, with one difference—that $\mu_G \in (0, 1)$ serves as an increase in costs. One can show unambiguously that an increase in search costs lead to a lower reservation productivity. In other words, when bad guys enter the economy but are not hired, $J_G(1)$ is larger than in the economy without bad guys.

Suppose then that bad workers are hired, and the good guys are not, i.e. that $J_G(1) - K \leq 0$ and $J_B(1) - K > 0$. This implies that $R_G > R_B$ so that the right hand side of (2)>the right hand side of (3), in turn implying that $0 > J_B(1) - K > 0$, a contradiction. In sum, when hypothetical average guys are always hired in a separate economy, so are the good workers in the mixed economy (always).

The only remaining part is to write down a condition that for parameter values of interest guarantees that average workers always are hired. To do that, I use the following observations. If workers are hired for one value of p, then they are hired for larger values of p (easy to prove). And if workers are hired for one value of b, then they are hired for lower values also. The condition sought is then assumption A3). End of proof.

The proposition has the implications outlined in the introduction: To cover the fixed hiring costs, only good workers are hired in recessions. The implications are that the job finding rates becomes more volatile over the business cycle (recalling that market tightness is higher in good times, compare $\lambda(\theta(p_h))$ with $\lambda(\theta(p_l))\mu_G$), and that the matching function shifts over the business cycle because of changing pickyness of the firms.

2.1 Multiple equilibria

Contrary to the standard Mortensen-Pissarides search model, this model features two equilibria instead of one. One is stable and the other is unstable as demonstrated below. The feed-back mechanisms causing the multiplicity are the same in recessions and expansions, but technically the case of expansions is more complicated. I will now show how these two equilibria come about for the expansion case.

To see that multiple equilibria is a possibility, note how the expected value of meeting a worker changes:

$$d\frac{c}{\eta(\theta)} = (J_G(1) - J_B(1))d\mu_G - \frac{p_h(1-\beta)}{r+\alpha}(\mu_G G dR_G + (1-\mu_G)BdR_B).$$

In other words, if the expected profits of meeting a good worker are much higher than of the bad workers, then an increase in the fraction of good workers among the unemployed will matter a lot for the expected value. But at the same time, increases in reservation productivities shorten the duration of matches and decrease the expected value. Such decreases matter more if there are many good workers because a shortening of the duration matters more for good matches. Multiple equilibria arise if the first effect trumps the second at some ranges of the reservation productivities and the second trumps the first at other ranges of the reservation productivities. To see exactly how, it is necessary to take a closer look at the job-destruction conditions.

First, from (2) and (3) it follows that $R_B > R_G$ except $R_G = 1 \Leftrightarrow R_B = 1$. From the same equations it follows that

$$B\left(R_B + \frac{\alpha}{r+\alpha}\int_{R_B}^{1} \epsilon - R_B dF(\epsilon)\right) < G\left(R_G + \frac{\alpha}{r+\alpha}\int_{R_G}^{1} \epsilon - R_G dF(\epsilon)\right).$$

Now consider R_B as a function of R_G. Combine (**??**) and (2) into

$$(J_B(1)-K)[p_h G(R_G+\frac{\alpha}{r+\alpha}\int_{R_G}^{1}\epsilon - R_G dF(\epsilon))-b] \tag{22}$$

$$=(J_G(1)-K)[p_h B(R_B+\frac{\alpha}{r+\alpha}\int_{R_B}^{1}\epsilon - R_B dF(\epsilon))-b], \tag{23}$$

from which it follows that sign $R'_G(b) =$ sign $R'_B(b)$ and

$$R'_B(R_G) = \frac{B(1-R_B)p_h G(1-\frac{\alpha}{r+\alpha}(1-F(R_G)))+G[p_h B(R_B+\frac{\alpha}{r+\alpha}\int_{R_B}^{1}\epsilon-R_B dF(\epsilon))-b]}{G(1-R_G)p_h B(1-\frac{\alpha}{r+\alpha}(1-F(R_B)))+B[p_h G(R_G+\frac{\alpha}{r+\alpha}\int_{R_G}^{1}\epsilon-R_G dF(\epsilon))-b]} < 1.$$

One also sees from this equation that $R'_B(R_G)$ is increasing. $R'_B(1) = 1$.

The implications are the following. For low R_G, $R_B - R_G$ is high and so is $J_G(1) - J_B(1)$. But as R_G increases, this difference decreases to zero. In words, if R_G is already high, the duration if matched with a bad worker is not much different from the duration of a match with a good worker. As a result, improvements in the fraction of good workers in the unemployment pool have smaller and smaller positive effects. The negative effects increase, however, as $R'_B(R_G)$ increases. Add to this that μ_G is increasing in R_G, so that for higher values of R_G the negative effects are bigger because there are more good workers and good workers are affected more ($G > B$). The result is an expected value of meeting a worker that is concave in R_G.

A full proof would require a close investigation of $\mu_G(R_G)$ to prove that it is increasing and concave. I'm still missing some technical details here but the intuition is simply that as firms lay off more good workers, the fraction of good workers in the unemployment pool increases but to a lesser extent if firms are already firing many good workers.

Now, why do the two equilibria arise? Starting from the low equilibrium, if some firms start firing good workers at higher thresholds, then the fraction of good workers in the unemployment pool increases and since the difference between hiring and bad worker is big, the expected value from posted vacancies increases, and market tightness increases. The rest of the firms then want to fire good workers at higher thresholds also, for the simple reason that workers' outside option improved. As long as market tightness responds favourably by increasing as the unemployment pool gets better, a self-reinforcing effect is created that only stops once the difference in payoff to hiring good and bad workers has declined sufficiently. At this point, a new equilibrium emerges.

That the two equilibria are located on parts of the job-creation curve with opposite slope signs has implications for the stability properties of the equilibria. In reality, the skill composition of the pool of unemployed workers doesn't change instantaneously but evolves according to the inflows and outflows. This means that one can draw standard, negatively sloped temporary job-creation curves through each of the two intersections between the steady state job-creation curve and job-destruction curve. Changing parameters shift the steady state and temporary job-creation curves as well as the job-destruction curve. Intersections between the temporary job-creation curve and job-destruction curve are the short run equilibria. Following this analysis, one sees that the equilibrium on the upward-sloping part of the steady state job-creation curve is unstable. A slight change in a parameter value and the economy bounces off to either the other equilibrium or to $R_G = 0$. Perhaps this is best explained graphically. As an example, consider changes in b. It is seen that once the dynamic effects are taken into account, $R'_G(b)$ and hence $R'_B(b) > 0$, as required in the proof of the proposition.

Examples of parameter values show that in recessions there are huge differences in the possible values of market tightness and total unemployment (one example gave 10% and 20%). So far, I only experimented with a uniform distribution F and I think this distribution causes there to only be two equilibria, not more.

3 Conclusion

This draft describes how a modified search and matching model may explain some casual and empirical observations. The model is a Mortensen-Pissarides model with a fixed hiring cost and worker heterogeneities in skill.

Another direction to pursue is if the fixed cost is needed, after all. Alternative assumptions that are worth exploring are e.g. that firms can post only one vacancy. This creates an option value in vacancy posting and so it might be worth it to reject to bad worker even if there is a positive surplus from matching with a bad worker.

References

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