Job Qualities, Search Unemployment, and Public Policy

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Brown Bag Presentation at the University of Victoria, September 2017

INTRODUCTION

Facing difficult times, in order to reduce high unemployment rates, several governments have chosen to adjust their economic policies by introducing:

- austerity programs (which cut social benefits, and UI),
- tax reforms (reducing tax rates or progressivity of the tax structure),
- job incentive programs (which subsidize job creation).

These adjustments are often justified by an appeal to common sense, but are also prescriptions that come out of the standard DMP model -- as exemplified in Pissarides (1985).

When considering job creation subsidy programs, many governments also focus on the creation of "high quality" jobs.

For eg., many US states have implemented "Quality Job Programs" (QJPs) which subsidize only high-skilled or high-paying jobs.

In this study, we question the faith in these policies, by considering the theoretical effects of these policies in a simple directed search model with different job qualities.

Related Literature

A) *Public Policy and Unemployment with Undirected Search*

Boone and Bovenberg (2002), Mortensen and Pissarides (2003), Hungerbühler *et al* (2006), Lehmann and Van der Linden (2007), Jiang (2014), Michau (2015)

B) *Public Policy and Unemployment with Directed Search*

Julien, Kennes, King, and Mangin (2009)

Golosov, Maziero, and Menzio (2013)

Geromichalos (2015)

A Preview of the Results

In a model with a progressive tax structure, subsidies to "good" and "bad" jobs, and unemployment benefits, we find the following results:

- Job creation and unemployment are independent of the tax structure.
- The unemployment rate is independent of subsidy rate for "good" jobs, only responds to the subsidy rate for the *lowest* quality jobs.
- Creation of any jobs better than the worst jobs is independent of the unemployment benefit rate.
- The creation of "good" jobs responds only to the *difference* in the subsidies for jobs one class better and one class worse.

Moreover:

- The equilibrium allocations in this model are *constrained efficient* in the absence of any policy parameters (as is standard in directed search models with large markets).
- However, the framework also admits a multitude of other policy configurations that are also constrained efficient.
- In particular, we identify a configuration that completely eliminates *ex post* income inequality without sacrificing efficiency -- and balances the government's budget.

THE MODEL

Large numbers $N >> 0$ of homogeneous workers and $M >> 0$ of identical firms exist.

$Q \in \{1, 2, 3, ...\}$ different types of jobs can be created, by any firm.

$$y_q \equiv \text{output of a type } q \text{ job, } q = 1, 2, ..., Q$$

We assume: $$0 < y_1 < y_2 < ... < y_Q$$

A job of type q costs k_q to create, where:

$$k_1 \in (0, y_1)$$

$$k_q \in (k_{q-1}, y_q) \quad \forall q = 2,3,...,Q$$

Let $M_q \equiv$ measure of vacancies of type q (determined endogenously).

$\theta_q \equiv M_q / N =$ Market tightness for type q vacancies

$$\Rightarrow \theta \equiv \sum_{q=1}^{Q} \theta_q = M / N = \text{aggregate labour market tightness}$$

POLICY PARAMETERS

The government levies taxes on wages according to a progressive tax scheme with tax rates:

$$0 \leq \tau_1 \leq \tau_2 \leq ... \leq \tau_Q \leq 1$$

and tax thresholds:

$$0 \leq \omega_1 \leq \omega_2 \leq ... \leq \omega_Q$$

It also provides subsidies (or taxes) for jobs created:

$$\sigma_q \ \forall q = 1, 2, ..., Q$$

And unemployment benefits:

$$b \geq 0.$$

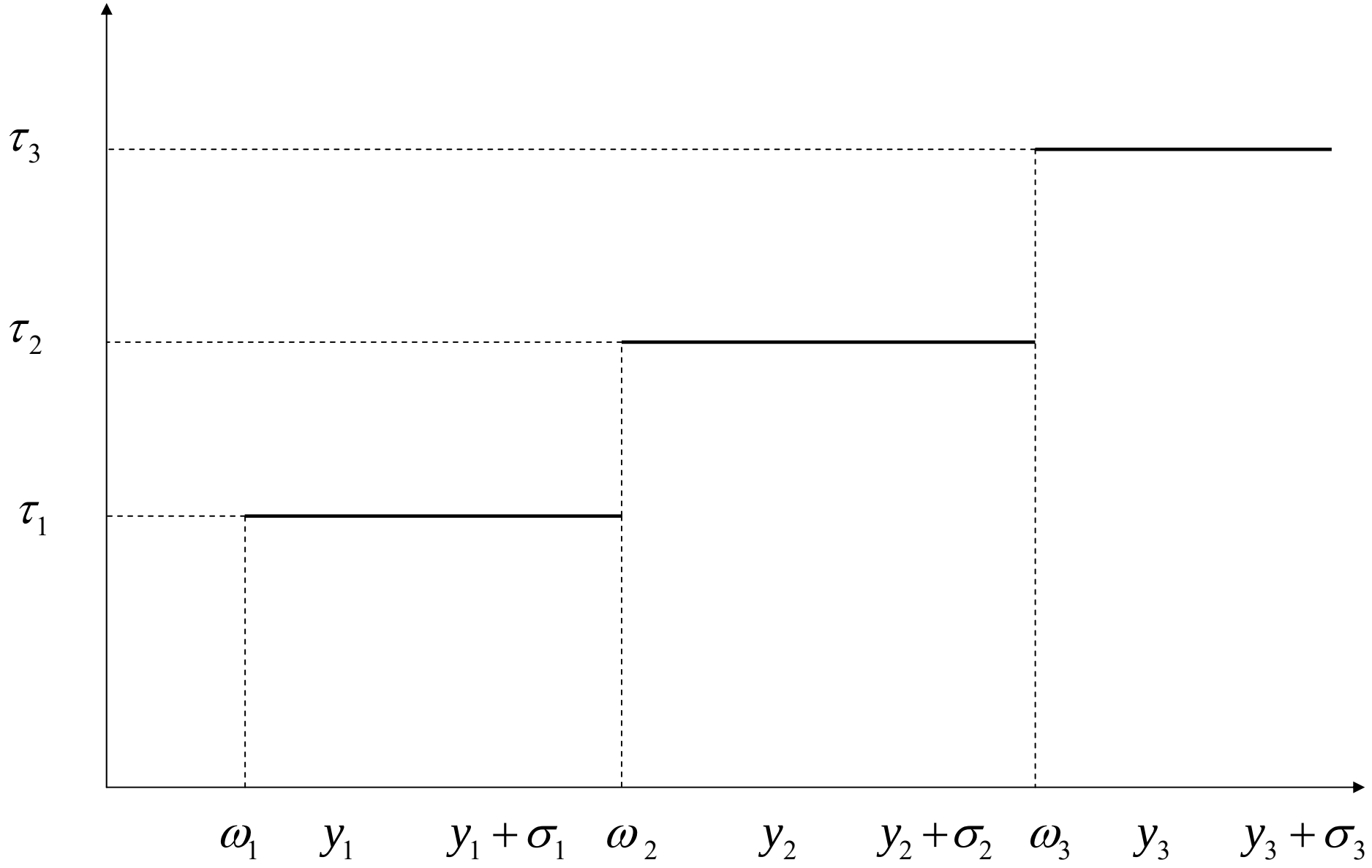
PARAMETER RESTRICTIONS

$$b < y_1 + \sigma_1$$

$$\omega_1 < y_1 \leq y_1 + \sigma_1 < \omega_2 < y_2 \leq y_2 + \sigma_2 < \ldots < y_Q \leq y_Q + \sigma_Q$$

Note that this allows for the possibility that benefits b are:

- untaxed (if $b < \omega_1$)
- taxed (if $b \in [\omega_1, y_1 + \sigma_1)$)


τ_3
τ_2
τ_1
ω_1
y_1
$y_1+\sigma_1$
ω_2
y_2
$y_2+\sigma_2$
ω_3
y_3
$y_3+\sigma_3$

MATCHING AND WAGE DETERMINATION

Workers announce reserve wages, and firms choose which worker to approach with a job offer (directed search).

- If no firm approaches a worker, then that worker is unemployed.
- If exactly one firm approaches, the worker is employed at reserve wage.
- If more than one firm approaches, the worker is employed at a firm with the highest output (plus any subsidy) among those who approach, at a wage equal to the output (plus any subsidy) of the firm with the second highest output (plus any subsidy).

If more than one firm offers the highest wage, the worker picks one randomly.

STAGES OF THE GAME

1. Government sets the values of the policy parameters.
2. Firms choose whether to enter, and what type of job to create.
3. Each worker chooses and announces a reserve wage w_r.
4. Each firm assigns a probability to choosing each worker.
5. Firms are assigned to workers, and wages are determined.

AFTER TAX WAGES

If a worker is approached by only one vacancy then he is paid his reserve wage. The after-tax wage in this case is given by:

$$w_a = \begin{cases} w_r & if \quad w_r < \omega_1 \\ \omega_1 + (1-\tau_1)(w_r - \omega_1) & if \quad \omega_1 \le w_r < \omega_2 \\ \omega_1 + (1-\tau_1)(\omega_2 - \omega_1) + (1-\tau_2)(w_r - \omega_2) & if \quad \omega_2 \le w_r < \omega_3 \\ \vdots & \vdots \\ \omega_1 + \sum_{q=1}^{Q-1}(1-\tau_q)(\omega_{q+1} - \omega_q) + (1-\tau_Q)(w_r - \omega_Q) & if \quad w_r > \omega_Q \end{cases}$$

Let $w_q^j \equiv$ wage paid by a type q vacancy when the 2nd-highest vacancy approaching the worker is type j. After-tax wages, in general, are:

$$
w_q^j = \begin{cases}
w_0^0 = \min\left\{(1-\tau_1)b + \tau_1\omega_1,\ b\right\} \\
w_q^0 = w_a \ \ \forall q = 1,2,...,Q \\
w_q^1 = \omega_1 + (1-\tau_1)(y_1 + \sigma_1 - \omega_1) \ \ \forall q = 1,2,...,Q \\
w_q^2 = \omega_1 + (1-\tau_1)(\omega_2 - \omega_1) + (1-\tau_2)(y_2 + \sigma_2 - \omega_2) \ \ \forall q = 2,3,...,Q \\
\vdots \\
w_Q^j = \omega_1 + \sum_{i=1}^{j-1}(1-\tau_i)(\omega_{i+1} - \omega_i) + (1-\tau_j)(y_j + \sigma_j - \omega_j) \ \ \forall j = 2,3,...,Q
\end{cases}
$$

FIRM PAYOFFS

$P_0 \equiv$ probability a firm is alone when in approaches a worker

$P_q \equiv$ prob that a firm competes with at least 1 type-q firm when approaching a worker and no other firms of higher types.

$\pi_q \equiv$ post-entry profits from creating a type-q vacancy

Thus:

$$\pi_1 = P_0(y_1 + \sigma_1 - w_r)$$

$$\pi_2 = P_0(y_2 + \sigma_2 - w_r) + P_1(y_2 + \sigma_2 - y_1 - \sigma_1)$$

$$\pi_3 = P_0(y_3 + \sigma_3 - w_r) + P_1(y_3 + \sigma_3 - y_1 - \sigma_1) + P_2(y_3 + \sigma_3 - y_2 - \sigma_2)$$

$$\vdots$$

$$\pi_Q = P_0(y_Q + \sigma_Q - w_r) + \sum_{q=1}^{Q-1} P_q(y_Q + \sigma_Q - y_q - \sigma_q)$$

THE EQUILIBRIUM

We consider the unique symmetric subgame perfect Nash equilibrium, where firms use mixed strategies when choosing which worker to approach.

PROPOSITION 1

There exists a unique equilibrium, with the following properties:

i) The reserve wage is given by: $w_r^* = b$

ii) Probabilities are given by:

$$P_0^* = \exp\left(-\sum_{q=1}^{Q} \theta_q^* \right)$$

$$P_q^* = \left(1 - e^{-\theta_q}\right) \exp\left(-\sum_{i=q+1}^{Q} \theta_i^* \right) \quad \forall q = 1, 2, ..., Q-1$$

iii) Market tightness for each type of job is given by:

$$\theta_1^* = \ln\left[\frac{\left(y_1+\sigma_1-b\right)\left(k_2-k_1\right)}{\left(y_2+\sigma_2-y_1-\sigma_1\right)k_1}\right]$$

$$\theta_q^* = \ln\left[\frac{\left(y_q+\sigma_q-y_{q-1}-\sigma_{q-1}\right)\left(k_{q+1}-k_q\right)}{\left(y_{q+1}+\sigma_{q+1}-y_q-\sigma_q\right)\left(k_q-k_{q-1}\right)}\right] \quad \forall q = 2,3,...,Q-1$$

$$\theta_Q^* = \ln\left(\frac{y_Q+\sigma_Q-y_{Q-1}-\sigma_{Q-1}}{k_Q-k_{Q-1}}\right)$$

iv) The equilibrium unemployment rate is:

$$U^* = \frac{k_1}{y_1+\sigma_1-b}$$

PROPERTIES OF THE EQUILIBRIUM

1. Easy to solve: vacancy entry conditions pin down $\left(\theta_2^*, \theta_3^*, ..., \theta_Q^*\right)$ then worker's problem provides $w_r^* = b$, which pins down θ_1^*.

2. Closed-form solutions are available for all of the endogenous variables, including the wage distribution -- which has two sources of dispersion (productivity and residual).

3. The equilibrium values of θ_q^* are functions of job qualities $q-1,\ q,$ and $q+1$, but of no other job qualities.

4. Job creation, unemployment, and the distribution of before-tax wages, are independent of the tax structure $(\tau_q, \omega_q)\ \forall q = 1, 2, ..., Q$.

5. The unemployment rate responds only to benefits (b) and subsidies to the worst jobs (σ_1).

6. Subsidies to other jobs σ_q, $\forall q = 2,3,...,Q-1$ increase the creation of type q jobs but decrease the creation of types $q-1$ and $q+1$ jobs, leaving total job creation (and unemployment) unchanged.

7. Subsidies to the very best jobs σ_Q increase the creation of type the best jobs, but decrease the creation of the second-best jobs. leaving total job creation (and unemployment) unchanged.

8. If subsidies are uniform ($\sigma_q = \sigma \ \forall q = 1,2,...,Q$) then increasing these subsidies will increase the creation of the worst jobs and reduce unemployment, but will not affect the creation of other jobs.

Alternative interpretation: a reduction in the corporate tax rate would increase the creation of the worst jobs, reduce unemployment, but not affect the creation of other, higher-quality jobs.

9. Changes to unemployment benefits b increase unemployment and reduce the number of the worst jobs created, but have no effect on the creation of any other type of job.

10. Increases in benefits and/or subsidies to low-quality jobs will increase expected wages and reduce wage inequality, whereas increases in subsidies to high-quality jobs will increase expected wages and increase wage inequality.

11. The laissez-faire equilibrium, where all policy variables are set to zero, is constrained-efficient.

12. However, many other policy configurations are also consistent with constrained efficiency. All that is required for constrained-efficiency is that

$$\sigma_q = \sigma = b \ \forall q = 1, 2, ..., Q$$

13. If, additionally, $\tau_q = 1 \ \forall q = 1, 2, ..., Q$, and $\omega_1 = b$ then policy can induce a constrained-efficient allocation which satisfies the government's budget constraint and where all post-tax wage inequality is eliminated.

CONCLUSIONS

In many ways, this is a very standard search model, in the spirit of DMP, as (for example) in Pissarides (1985):

- Each worker has one unit of labour to sell.
- Each firm has one vacancy to fill.
- Matching is probabilistic.
- Entry on the firm side is determined by a zero profit condition.

By introducing directed search and different job qualities, we significantly change the implications of the model.

Directed search changes the *normative* properties of the DMP model, by eliminating the efficiency problem inherent in that model. (This is well known.)

It also, however, affects the *positive* properties: the recursive nature of the equilibrium (for example) makes the entry of good jobs *independent* of unemployment benefits -- and subsidies to good jobs have no effect at all on unemployment.

In this framework, there is no trade-off between efficiency and equity: efficiency does not need to be sacrificed to enact a redistributive policy.

The simple policy recommendations from the standard DMP model (austerity, tax reduction, and subsidies) are not generally robust to alternative (especially, directed search) specifications.

More research is needed ...