

Referee report on

Endogenous Ranking in a Two-Sector Urn-Ball Matching Process

by Giuseppe Rose

In most search and matching models with heterogeneous agents, recruitment is random. On the other hand, some few papers use an extension of the urn-ball process to account for the fact that firms are likely to hire their best applicants. Selective recruitment sounds more realistic than random recruitment. However, the two assumptions are extreme. In some circumstances, for instance when workers' productivities are not very different, one can imagine that firms will prefer random recruitment because selective recruitment is costly. So the motivations of the paper by G. Rose are obvious : ranking should be endogenous.

The idea of the paper would be as follows. Workers are vertically differentiated and firms are divided into two sectors ("graduate"/"undergraduate"). To get a graduate job workers must pay an educational cost. Assume that the probability of filling a vacancy is high in the graduate sub-market relative to the average ability of applicants. In this case, firms would choose applicant ranking. The reason for this would be that with random recruitment they would attract lower-skilled workers by raising the probability for the marginal worker to get a good job. On the contrary, if market tightness is low, graduate firms would choose random recruitment. Otherwise, they would reduce the pool of their applicants.

This story sounds interesting. Unfortunately, the analysis is not correct. In addition, the manner in which ranking is made endogenous (firms are assumed to collude) is not convincing.

1 Analysis

This paper contains serious errors. I will focus on the urn-ball process with Applicant Ranking which plays a crucial role in this study.

1. The "probability" (it is a density) of a firm hiring a worker with ability θ (equation

(12), p. 11) is not given by

$$\exp(-(1 - \Gamma(\theta))\lambda) \gamma(\theta)$$

but by

$$\exp(-(1 - \Gamma(\theta))\lambda) \gamma(\theta)\lambda$$

The proof is as follows. As the number of workers and vacancies goes to infinity with market tightness ($1/\lambda$) given, the number of applications, K , received by a particular vacancy is Poisson with parameter λ :

$$\Pr[K = k] \rightarrow e^{-\lambda} \frac{\lambda^k}{k!}$$

Consider a firm that receives k applications and let T_1, \dots, T_k be the abilities of the k applicants. The order statistic, $\max[T_1, \dots, T_k]$, is a random variable whose density is

$$k\gamma(\theta)\Gamma(\theta)^{(k-1)}$$

So the non-conditional density $\alpha(\lambda, \theta)$ is

$$\sum_{k=1}^{\infty} k\gamma(\theta)\Gamma(\theta)^{(k-1)} \frac{e^{-\lambda}\lambda^k}{k!} = \exp(-(1 - \Gamma(\theta))\lambda) \gamma(\theta)\lambda$$

2. The unconditional probability of being hired in a g position , $\mathbf{a}_g(\lambda_g)$ (equation (10), p.10) is not

$$\int_{\theta^*}^{\bar{\theta}} a_g(\lambda_g, \theta) d\theta$$

but

$$\int_{\theta^*}^{\bar{\theta}} a_g(\lambda_g, \theta) \gamma_g(\theta) d\theta$$

with $\gamma_g(\theta)$ being the density of θ among graduate unemployed workers.

3. In a dynamic setting with AR, the distribution of ability θ among unemployed workers no longer coincides with its distribution among global labor force. For obvious reasons, the average ability of unemployed workers will be lower than that of employed workers. In other words, the c.d.f. $\Gamma(\theta)$ depends on market tightness λ . This makes the analysis very different.

4. The urn-ball cannot be extended to continuous time without any change. For example, during the time interval $[t, t + dt]$, the probability of a firm hiring a worker should tend to zero when dt tends to zero. One needs to use the "trick" which E. Moen introduced in his Journal of Labor Economics' paper (1999).

5. The Bellman equations for the value of a vacancy (equ. (20) and (22)) are not correct. Equation (22) is not

$$rV_g^V = -Q + \alpha_g(\lambda_g, \theta)(V_g^F - V_g^V)$$

but

$$rV_g^V = -Q + \int_{\theta^*}^{\bar{\theta}} \alpha_g(\lambda_g, \theta)(V_g^F(\theta) - V_g^V)d\theta$$

Consequently the same holds for the wage expressions (equ. (24) and (25)).

I did not understand the proof Proposition 1. In particular, relation (27) remains a deep enigma for me. Who is this individual who sets $e = g$ with probability γ (it is a density!)? Is there a relation with $\gamma(\theta)$? What is the meaning of $E[V_g^V/\theta]$? The value of a vacancy cannot depend on θ . Maybe this relation should be written as

$$\delta \leq V_g^V - V_{ug}^V$$

with V_g^V being defined as above.

2 Potential

The manner in which AR is made endogenous does not convince me. The substance of the author's argument can be summarized in the following sentence (p. 20) :

”Ranking may be applied even if firms operate in a sector characterized by homogenous workers simply because this hiring regime maximizes the availability of workers [...]”

As ranking is costly (the author does not take this into account) , a firm would deviate from such a situation. The decision (ranking/no ranking) of a particular firm cannot affect the availability of workers. Consequently, the author needs to assume tacit collusion concerning recruitment strategies. In my opinion, this assumption makes the potential of the paper quite questionable. In addition, assuming that tacit collusion is plausible (and possible with a continuum of firms), I see two objections :

- Why should firms’ collusion be restricted to recruitment strategies? Firms could also cooperate when deciding on the creation of new vacancies.

- Why should firms necessarily use their recruitment strategies as a means of increasing the availability of workers? They could increase the wages or pay a bonus to graduate workers. This might be better for welfare as the costs of ranking are a dead weight loss when workers are homogenous.

In fact the usual assumptions of the search and matching model do not make sense when firms can cooperate. What about free-entry?

On the other hand, I like an intuition behind these ”results” : by switching to ranking, the low-skill sector will attract workers from the high-skill sector because these (high-skill) workers will find a (lower-paid) job more easily (for $\theta = \theta^*$, the probability of finding a job in the LS sector becomes equal to one). I come back to this in my conclusion.

3 Other comments

-I am not sure that the equilibrium can be called bayesian.

-Neither Moen (JOLE, 99) nor Gavrel (LABECO, 09) divide the labor market into a high-skill sector and a low-skill sector (p.6). In these two papers firms are identical and workers’ search is undirected. From this perspective, the submitted manuscript is closer to Charlot and Decreuse (LABECO, 05). In Blanchard and Diamond (RES,

94), applicants are ranked according to their unemployment spells, not by ability. When reading the paper, one could understand that Butters (RES, 77) deals with the labor market.

-Unnecessarily, the notation is not usual. This makes the paper fastidious to read.

As mentioned above, endogenous ranking is a very interesting issue. I warmly encourage the author to pursue his work along this innovative line of research. In a first step, he would better use a static model. I think that his argument could be used in an analysis of the social efficiency of private recruitment strategies. Assume that the output of low-skill jobs depends on workers' ability (not so much as the output of high-skill jobs). If the costs are low, firms will choose to rank their applicants. According to the author's idea, low-skill firms will attract high-skill workers. This "downgrading" may be inefficient. In other words, a social planner would prefer random recruitment.