Redistributing opportunities in a job search model: the role of self-confidence and social norms

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Abstract

In this paper we explore the effects of redistributive policies in a job search model where different degrees of self-confidence generate different arrival rates of new jobs. We find that the job search model is an useful framework to address behavioral concerns about personal motivation. We find that self-confidence and effort are complements in the performance of search activity. Moreover rewards, i.e. moving to better jobs, are negative reinforces for self-confidence if the distribution of wages is stationary. We analyze the effect of redistributing policies of opportunities that aim to compress the distribution of the job arrival rates. Finally the presence of social norms may generate multiple equilibria.

KEYWORDS: Behavioral traits, job search, redistribution, social norms.

1 Introduction

Search theories in the labor market have been recently used to analyze empirical regularities as workers flows and wage dispersion. In particular one of the most important result derived

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from this strand of literature has been to show how pure wage dispersion among identical workers arises as an equilibrium outcome in a general equilibrium model characterized by search frictions (Burdett and Mortesen, 1998). In this respect the standard job search model offers an explanation of why identical workers that search for better jobs receive offers that differ with respect to wage rates. From the theoretical point of view whether a worker earns more than another one depends on factors that are purely stochastic as search is random and the cumulative distribution function of wages in equilibrium is shown to be continuous. Thus the literature originated by Burdett and Mortensen (1998) explains pure wage dispersion not explained by the standard neoclassical wage equation.

Another compelling explanation of why identical workers are paid differently concerns the theory of the behavioral determinants of earnings. Robust empirical evidence show that behavioral traits, as some some aspects of personality, may be considered to some extent as determinants of earnings (see e.g. Bowles, Gintis and Osborne, 2001 and Cawley, Heckman and Vytlacil, 2001). Social networks, patience, perseverance and self-confidence among others may explain part of the inequality that is not explained by the (neoclassical) standard wage equation. All these traits explain part of earnings differences, as well as different (upward) mobility rates, despite the fact they are not productive skills, i.e. they do not provide any contribution to the production as they do not enter the production function.

A first concern of this paper is to bring together the behavioral determinants of individual success in the labor market, for instance individual wage growth and amount of time experienced to find better jobs, and search theories. In the standard job search model the natural object to address behavioral concerns is the search activity; in this paper we focus our attention on the search intensity supplied by employed workers that determines the job arrival rate. We model the individual choice in a way that the size of the arrival rates of better jobs is partially determined by a particular behavioral trait.

Searching for a (better) job is a task that beyond effort requires self-confidence and perseverance. In this paper we bring in a very simple way the behavioral concerns about self-confidence and personal motivation in the job search model.[1] We find that the job search theory is a good

[1]There are few papers that analyzes behavioral concerns in search and matching models, more in general papers on behavioral labor economics. See DellaVigna and Paserman (2005) and Drago (2004) among others.

framework to address several behavioral aspects of personal motivation. In particular we find that some premises of motivation theory (Benabou and Tirole, 2002) are incorporated in the job search model when it accounts for motivational concerns. In particular the premise according to which effort and ability are complements, that is, in terms of our model, the more one person is self-confident the more he will exert search effort on the job. Moreover we find that rewards (to have found a new job) are negative reinforces (i.e. finding a better job decreases the level of self-confidence of a worker) if the the distribution of wages is stationary. In the paper we derive these results and we give for each of them the economic intuition related to the preceding findings of the so called behavioral economics approach.

In the model we introduce heterogeneity with respect to an innate (behavioral) attribute of individuals, i.e. the level of self-esteem adjusted for the relative importance that workers labor force attributes to luck for individual labor success. This attribute, depending on workers' wages, affects the decision to manipulate information about the marginal increase in the likelihood of obtaining a job in response to an increase in the search intensity. This in turn affects the search effort supplied: those who are endowed with a greater level of this attribute supply more effort in equilibrium and thereby experience greater job arrival rates. On the empirical side the importance of on-the-job search is widely recognized as one of the main factors determining the individual wage growth. Theoretically in the standard job search model each (acceptable) job offer is associated to a wage increase.[2]

Therefore in our model behavioral traits generate different opportunities for individual wage growth. The difference of arrival rates between those who do not exploit self-confidence in the matching process is even increasing in the presence of an increases of all the outside wage offers.[3] Finally we show a simple redistributive policy that attenuates job arrival rate differentials. To the extent that this job arrival rates differentials are driven by different degree of self-esteem, that in a certain sense are beyond the individual control, voters may be

[2] In a variant of the standard model, it is possible to allow for employers to match outside job offers (Postel-Vinay and Robin, 2002 and 2004) so that at each outside job offer is associated to a wage increase even in the same job. In this case then on-the-job search is even more important for individual wage growth.

[3] Note that such a shift may be interpreted as the effect of a pervasive technological shock in the economy. To this extent behavioral traits are more important for individual wage growth in period of technological change (Rubinstein and Tsiddon, 2004).

concerned to redistribute the opportunity to move to better jobs.[4] We impose a linear tax rate on search activity on the workers who search too much and a linear search subsidy on those who search less. We term such a policy as redistributing opportunities in that identical productively individuals may experience more similar arrival rates of better jobs.

We study such a policy in the presence of social norms. In particular we assume that there exists social stigma for those who receive the search subsidy. There exists evidence on this fact, see e.g. Moffitt (1983); for example living off subsidies generates disutility so that not all the eligible individuals for welfare programs participate in the programs (Lindbeck, Nyberg and Weibull, 1999). This exercise is more interesting if we posit that the disutility from being a recipient is decreasing in the share of recipients in the labor market. In this way the strength of disutility is endogenous to the model and we may obtain multiple equilibria (Lindbeck, Nyberg and Weibull, 2002 and 1999). Finally we report the view of the more recent studies on welfare state and social norms on how multiple equilibria should be interpreted.

The spirit and the contents of this study are very close to a companion paper, Drago (2004). The methodology is to use the insights of both the strands of empirical and theoretical behavioral economics, as well as game theory, to analyze more in depth inequality in the labor market and the interactions among actors therein. The underlying idea of this choice is that the pure neoclassical approach, or the standard view of labor markets, cannot, by default, explain several phenomena.

The plan of the paper is as follows. In the second section we introduce the basic model. In the third section we provide the simple model of job search accounting for self-motivation. Then we analyze the redistributive policy. Finally we draw the conclusion.

2 Preliminaries of the model

In this section we present the basic model we will manipulate for the analysis of self-confidence, redistributive policies and social norms. Consider a continuous and infinite time horizon model. There are two type of economic agents, workers and firms. Both employers and workers are

[4]Interesting studies document that demand for redistribution is higher in societies where rewards are believed to depend on factors that people cannot control, e.g. luck (see Fong, 2002)

respectively identical and the measure of workers is normalized to one. The matching process takes the form described by the standard search model: firms set the terms of employment (the wage) while workers choose among available offers. In this setting there are frictions because the rate at which workers find a job offer is positive but not equal to infinite and because employees have incomplete information in that they cannot direct their search toward the best wage offers. It is assumed that workers sample wage offers from a known distribution function. Workers are assumed to search for a job both when employed and unemployed, they choose a search effort that increase the rate at which job offers are sampled given the search cost they incur. On the employers side the monopsonistic power deriving from the fact that workers cannot observed the wage offers in the search process is constrained by competition. Firms who post high (low) wages on one hand decrease (increase) their expected profits ($E[\pi]$) and on the other increase (decrease) $E[\pi]$ by increasing (decreasing) the probability to find a worker and by decreasing (increasing) the probability the worker quits to better jobs. It is shown in literature (Burdett and Mortensen, 1998) that a non-degenerate distribution of wage offers characterizes the solution of the non cooperative wage posting game.

More precisely the structure of the model is as follows. All the agents discount future at the rate r. Workers search by drawing a sequential random wage sample from a cumulative distribution function $F(w)$. Assume $F(w)$ to be continuous on $\langle -\infty, +\infty \rangle$. Assume an interval $\langle b, \overline{w} \rangle$ such that $F(b) = 0$ and $lim_{w \rightarrow \overline{w}} F(\overline{w}) = 1$, and $F(w)$ is twice differentiable on the interval $\langle b, \overline{w} \rangle$, with first derivative strictly positive on $\langle b, \hat{w} \rangle$ and second derivative continuous on $\langle b, \overline{w} \rangle$.[5] Note that $[1 - F(w')]$ is the probability that a wage offer is at least as great as w', as well as $[F(w')]$ is the probability that a wage offer is less than w'. Every time an offer arrives, the decision of the worker is to accept or not the job offer. There is no recall. For employed and unemployed workers job offers arrive at the rate λs where λ is the so called search efficiency parameter and s the endogenous search effort. Workers incur the search cost $c(s)$, with $c'(s) > 0$, $c''(s) > 0$ and $c(0) = c'(0) = 0$ and receive the unemployment benefit b when

[5] Rather than an assumption, $F(b) = 1$ is derived in equilibrium, where b is the unemployment benefit, that as it will be clear, is equal to the reservation wage. Note that we take as given the properties of the c.d.f $F(w)$ that are derived in the analysis of the equilibrium of the standard job search model. For a simple derivation of the market equilibrium see e.g. Mortensen (2003).

they are unemployed. Moreover job are destroyed at the exogenous Poisson rate δ. The value of being employed at a wage w_i and of unemployment, denoted by V and $W(w_i)$, respectively, solve the following Bellman equations:

$$rV = b - c(s) + \lambda s \int max[W(w) - V, 0]dF(w) \tag{1}$$

$$rW(w_i) = w_i - c(s) + \lambda s \int_{w_i}^{\overline{w}} [W(w) - W(w_i)]dF(w) + \delta[V - W(w_i)], \tag{2}$$

Expression (1) states that at each instant the value of unemployment yields a net return equal to the unemployment benefit minus the search cost plus the expected gain deriving from receiving an acceptable job offer. Expression (2) states that the value of being employed yields at each instant a net return equal to the wage rate, minus the cost of search, minus the expected loss of being unemployed, plus the expected return of finding a better job. Workers accept employment if the wage offer is greater than the reservation wage defined as the wage R such that $W(R) = V$. Moreover as the derivative of the value of employment is

$$W'(w_i) = \frac{1}{r + \delta + \lambda s[1 - F(w_i)]} > 0 \tag{3}$$

by the envelope theorem and the Leibinitz rule, an employed worker quits to another job if and only if it pays a higher wage (cf. Mortensen, 2003). The search effort s in program in equation (2) maximizes the difference between the revenue to search and the search cost and it depends on the current wage:

$$s^* = argmax_{s \geq 0} \left\{ c(s) - \lambda s \int_{w_i}^{\overline{w}} [W(w) - W(w_i)]dF(w) \right\}. \tag{4}$$

Optimality requires the marginal cost of search to be equal to the marginal revenue of search activity:

$$c'(s) = \lambda \int_{w_i}^{\overline{w}} [W(w) - W(w_i)]dF(w). \tag{5}$$

Equation (5) defines an implicit function $g(s, x) = c'(s) - \lambda \int_{w_i}^{\overline{w}} [W(w) - W(w_i)]dF(w)$, where x can be either w_i or λ. The theorem of implicit function assures that the optimal level of effort is monotone decreasing in w and monotone increasing in λ. For a worker employed at wage w the instantaneous rate at which he finds a job with a wage rate greater than w is:

$$H(w) = \lambda s^*[1 - F(w)], \tag{6}$$

where s^* is implicitly defined by (5), and $1/H(w)$ is the expected waiting time to find a better job. Equation (1), (2) and the fact that the reservation wage R solves $W(R) = U$, together imply that the search intensity of an unemployed worker is the same as that of a worker employed at the reservation wage. From this fact we obtain the result that $R = b$ (see Mortensen, 2003 and Mortensen and Pissarides, 1999).

In the standard job search model it is important to distinguish between the distribution of wages offered to job seekers, denoted by $F(w)$, and the distribution of wages received by workers who are currently employed, i.e. the earnings distribution that we denote by $G(w)$, that in general may differ from $F(w)$. Denote by u the fraction of workers currently employed, in equilibrium the flow into unemployment must be equal to the flow into employment[6]:

$$\delta u = \lambda s(R)(1 - u) \tag{7}$$

Moreover in equilibrium the flow of workers into jobs that pay w or less must be equal to the outflow of workers from this job. The outflow is the sum of workers who become unemployed because of destruction plus the flow of workers that find a better job offer. The flow into this jobs is equal to the unemployed workers who find a job paying w or less:

$$(1 - u)\left\{\delta G(w) + [1 - F(w)] \int_R^w s(w_i) dG(w_i)\right\} = u\lambda s(R)F(w). \tag{8}$$

In general the efficiency parameter λ depends on the recruiting effort of employers and it is derived from the matching function that governs contacts between workers and firms. In what follows we take into account the framework above and we consider the steady state of the economy under which λ is constant.

[6]As it is usual we assume in what follows that the resulting share of population equals the expected one. Since the population is a continuum, this implies that e.g. the resulting share of population employed at wage less or equal than w that enters the unemployment pool is $\delta(1 - u)G(w)$

3 The Model

3.1 Psychological foundation of the model

Economists learned from psychologists that individuals have in many situations an incentive to manipulate information about the probabilities of success of the projects they are involved. In most of the projects that require time and effort, many individuals tend to overrate their ability and efficacy in pursuing such projects (Camerer, 1997). As it has recently emphasized by Benabou and Tirole (2002), confidence in one's ability is a valuable asset and as a consequence there exists a demand for self-serving beliefs which enhance motivation to act. Of course this approach requires that individuals have imperfect information about the eventual costs and payoffs of their actions, or alternatively imperfect information about their ability[7] (Benabou and Tirole, 2002).

In our simple setting we posit that each worker may decide to have access to programs that induce to manipulate information about search efficiency parameter, λ, that crucially affects the expected payoffs from search. The first crucial assumption for the results we derive is that workers may have imperfect information about the source of λ. As we pointed out before, in terms of the model, this parameter depends on the aggregate recruiting effort supplied by vacant firms; moreover search is random also on the employer side. In the spirit of the motivation theory we assume that some workers may believe to be, respect to some other workers, either i) more attractive in the search process to the "eyes" of the (vacant) firms or ii) more efficient in the search process. In the former case workers have imperfect information about the randomness of search process: they believe that firms direct their search toward the best workers. In the latter case workers have imperfect information about the functioning of the search process: they have a cognitive bias about the fact that λ is a parameter given by the labor market condition that is faced in the same way by the entire labor force. In both cases however workers' beliefs are mirrored by the belief to face a search efficiency parameter greater than the true one; moreover manipulation of information lies on personal self-confidence

[7] Other interesting papers on cognitive biases are Carrillo and Mariotti (2000) on strategic ignorance as self-discipline device in agents' actions affecting future welfare and Benabou and Tirole (2004) on willpower generated by intrapersonal game.

(self-esteem). Intuitively the more the worker is embedded with this behavioral attribute the more he will be willing to manipulation of information about λ, making him optimistic about his probability of success in the labor market.

3.2 Costs and benefits of self-confidence and job arrival rates differential

As Benabou and Tirole (2002) suggest, the manipulator can be another person, e.g. a friend, a manager. In this respect we can posit that self-confidence in the search process arises from workers' participation in social networks that help individuals to enhance the degree of own's efficacy with respect to the share of population who do not participate in these programs. We posit that participation to these programs (manipulation processes) is costly, in particular that each individual has to pay a fraction η of her wage rate.[8] The existence of such a cost is the other crucial assumption of the model.[9]

Why should individuals pay such a fraction that enhances their degree of self-confidence in the search process by mean of believing in a higher (own) λ? Several reasons can be addressed. First if we allow that workers can observe their colleagues' performances, as it will be clear, they will realize that the workers who are involved in these programs (paying fraction η of the wage rate) find job offers at faster rates than workers who do not participate. This reason may be termed as a motivational one. Second, as many papers on behavioral economics pointed out, self-confidence may be interpreted as a consumption value, being an argument of the utility function. This reason may be termed as the hedonic one (cf. Benabue and Tirole, 2002).

To be consistent with the arguments above, we assume that the decision to manipulate information about λ and the extent of manipulation are driven by a specific (behavioral) attribute of the worker. Unlike Benabou and Tirole (2002) we set up a simple model where

[8]This is a standard assumption in that acquiring additional information is costly, although in this case "good news" do not inform workers about the real parameters of the job market. Moreover we shall assume η sufficiently low so that the modified equation (3) is positive for any wage rate.

[9]Other many behavioral issues can be addressed to justify the existence of this cost. For example, when one feels to be self-confident in own's ability, he is involved in a intrapersonal game where at least one self recognizes the risks and the costs of self-confidence (overconfidence). Indeed the failure of the project is even more costly and painful if the agent's beliefs over the efficacy in pursuing that project were quite high, e.g. to fail an exam for a student who believed to be among the best.

self-confidence is an innate attribute partially defined by the comparative evaluation that the single worker makes about himself with respect to other workers. We assume that each worker is characterized by the following parameter:

$$\sigma = \frac{self - esteem}{luck} = \frac{x}{y} \tag{9}$$

where $0 < x \leq 1$ is a measure of how much the worker believes to be more efficient in the search process than the other workers, e.g. $x = 1$ means that the worker believes that there are no other workers better than him in the search activity.[10] The denominator $0 < y < 1$ is an attribute that denotes the relative importance that worker gives to luck for heterogeneity in individual labor success, e.g. $y \cong 1$ means that according to the worker, e.g. heterogeneity in the amount of time experienced to find a new job for workers who supplied the same search effort is almost completely determined by factors that are beyond the individual control, i.e. luck. The parameter σ is distributed in the population according to the c.d.f. $\Theta(\sigma)$, continuous and differentiable, with $\Theta'(\sigma) > 0$ and support defined on the interval $[\underline{\sigma}, \overline{\sigma}]$.

Upon paying the fraction η of the wage rate, the increase in the rate of efficiency parameter is proportional to the individual attribute σ, precisely the (perceived) efficiency parameter λ rises up to $\lambda + \epsilon\sigma$ where ϵ is a constant less than one. In this way workers believe to face $\lambda + \epsilon\sigma$ instead of the true parameter λ. Accordingly the lifetime utility to be employed at a wage rate w for a worker participating to the program now solves:

$$rW(w_i) = w_i(1 - \eta) - c(s) + (\lambda + \epsilon\sigma)s \int_{w_i}^{\overline{w}} [W(w) - W(w_i)]dF(w) + \delta[V - W(w_i)]. \tag{10}$$

The cost of participating to the network is equal for all the workers and it is proportional to the wage rate, whereas the benefits deriving from participation are positive but they vary from individual to individual according to the parameter σ defined above. Equation (10) is easily interpretable: workers who believe to possess better abilities than other colleagues employed at the same wage rate, believe as well to possess more efficacy in the search process. Yet, this trait that in expression (9) is denoted by x, is weighted by the belief y. Workers who believe

[10]Alternatively x can be a measure of how much the worker feels to be more attractive with respect to other workers. However we prefer the other interpretation.

that luck matters a lot attach less importance to self-esteem. So far we dealt with the extent of manipulation, however as we pointed out before the specific attribute σ determines also the decision to manipulate. Not all the workers will find it convenient to pay ηw.

Proposition 1 *For each wage rate w there exists a critical level $\sigma^*(w)$ such that for any worker with $\sigma(w) \geq \sigma^*(w)$ it is optimal to pay ηw. The critical level σ^* is an increasing function of the wage rate.*

At any wage rate, we term the worker with $\sigma(w) = \sigma^*(w)$ as the marginal participant.[11] Proposition 1 states that there exists a critical level of σ that defines the participation constraint to the program and that this critical level depends positively on the wage rate currently earned. Intuitively while the benefit from self-confidence, i.e. $\epsilon\sigma s \int_{w_i}^{\overline{w}}[W(w) - W(w_i)]dF(w)$, is decreasing with respect to the wage rate currently earned, the cost of manipulation process is constant with respect to the wage rate, that's why the higher is the wage the higher is σ^*.

For the share of workers with $\sigma(w_i) \geq \sigma^*(w_i)$ the lifetime utility to be employed at the wage rate w_i solves equation (10), for the share with $\sigma(w_i) < \sigma^*(w_i)$ the lifetime utility solves equation (2). This formalization is interesting for two reasons. First it makes the efficacy of the parameter σ distributed in the labor force to be state dependent. Whether σ is active depends also on the situations that the workers face and the efficacy of self-esteem is endogenous to the model.[12] This formulation implies that it is more likely that workers tend to overrate their ability if they believe to be "better" than others and if they believe that luck it is not so important for success. Second, this formulation divides the employed workers in two shares: one composed of workers who are, to different degrees, optimistic (self-confident) in their own efficacy respect to the others, believing to face an efficiency parameter equal to $\lambda + \epsilon\sigma$ (for those with $\sigma(w) \geq \sigma^*(w)$); the other composed of workers who are realistic in that they (correctly)

[11] For notational concerns, $\sigma(w)$ denotes the specific attribute of a worker employed at the wage rate w.

[12] In particular given the stationarity of the wage distribution, the demand for self-serving beliefs (self-confidence) of those workers who earn quite high wage, on the top of the wage distribution, is relatively less than what they would demand if they were on the bottom of the wage distribution. Intuitively workers who are already on the top of the distribution have little to gain from search and as consequence they do not find convenient (or too costly) to be self-confident, i.e. to pay ηw. This is also a complementary intuition for Proposition 1.

believe to face a parameter equal to λ.

However despite the fact workers with $\sigma(w) \geq \sigma^*(w)$ possess a wrong belief over the search efficiency parameter, they experience high job arrival rates.

Proposition 2 *For any wage rate, the job offer arrival rate for workers with $\sigma(w) \geq \sigma^*(w)$ is relatively higher than that one of workers with $\sigma(w) < \sigma^*(w)$.*

The job arrival rate is equal to the (true) search efficiency parameter λ times the search effort supplied and by equation (5) we know that the optimal level of search effort is increasing with respect to the level of the efficiency parameter. Workers with $\sigma \geq \sigma^*$ believe to face $\lambda + \epsilon\sigma$ and this fact induces them to supply more effort and finally to experience a greater job arrival rate than that one of those who (correctly) believe to face the true parameter λ.[13] In this respect beliefs on one's ability and effort are complements as in Benabou and Tirole (2002). This in turn can justify why some workers are willing to pay the fraction η of the wage rate.

3.3 Reinforces of self-confidence

When we deal with motivation, a natural question is whether rewards are positive or negative reinforces for self-confidence in the search process. Taking into account a worker with $\sigma(w) \geq \sigma^*(w)$, the question concerns whether the level of self-confidence of this worker, once has found a new job, is reinforced by the reward (to have found a job) or not. We did not specify learning dynamics about the beliefs in one's ability (x and y are fixed innate components); however note that in this context the results we would expect from learning are consistent with those we in effect obtain here. Indeed while the expected waiting time to find a better a job for a worker with $\sigma(w) > \sigma^*(w)$ is $1/(\lambda+\epsilon\sigma(w))s^{**}[1-F(w)]$, in average he will experience $1/\lambda s^{**}[1-F(w)]$, where s^{**} is the solution in program of the Bellman equation (10). If we allowed for learning about x, this fact would induce workers to decrease their degree of self-confidence. On the other hand workers with $\sigma(w) \geq \sigma^*(w)$ may observe that the amount of time to find a better job for

[13] Formally the search intensity of self-confident workers is $s^{**} = argmax_{s\geq 0} c(s) - (\lambda + \epsilon\sigma)s \int_{w_i}^{\overline{w}} [W(w) - W(w_i)]dF(w)$, whereas the search intensity s^* of non self-confident workers is given by (4). Given that the cost function is convex and the optimal condition, $s^{**} > s^*$ and obviously the job arrival rate of better job for self-confident workers is higher than that one of non self-confident, i.e. $\lambda s^{**}[1 - F(w_i)] > \lambda s^*[1 - F(w_i)]$

the workers with $\sigma(w) < \sigma^*(w)$, $1/\lambda s^*[1 - F(w)]$, where $s^* < s^*$, is the solution in program of (2) (defined by (4) and (5)), is discretely higher than their waiting time (by Proposition 2). In the same way, If we allowed for learning about x, this fact would induce them to increase their degree of self-esteem, in particular x in equation (9). In our model, under the stationarity assumption of the wage distribution, rewards are most likely to be negative reinforces, that is as if the former effect prevailed.

Proposition 3 *For the marginal participant the probability that rewards are negative reinforces is equal to one. For any worker with $\sigma(w) > \sigma^*(w)$, this probability is less than one, monotone increasing with respect to the new (acceptable) wage offer w, and decreasing with respect to σ.*

The last proposition is coherent with the interpretation of σ given by (9): in order to the second effect prevail on the first one, a high degree of self-esteem is needed according to (9).

3.4 Non Stationarity

One of the limitation of the standard job search model concerns the assumption of stationarity of the wage distribution $F(w)$. This assumption does not allow us to analyzes which role plays self-confidence in the search process when the economy is hit by positive technological shocks that brings about a shift of the wage distribution to the right. Suppose that all the (outside) wage offers are increased by an equal and positive constant so that the expected lifetime utility to find a new job increases. This in turn increases the expected benefit to find a new job so that all the workers increase their level of search effort. Interestingly the level of σ^* that defines the participation constraint increases.

Proposition 4 *A shift of the wage distribution F(w) increases σ^* for all the wage rates. The job arrival rates differentials among those with $\sigma(w) < \sigma^*(w)$ and those with $\sigma(w) \geq \sigma^*(w)$ increases.*

Therefore an increase in all the wages offers decreases the share of population that exploits the parameter σ to elicit self-motivation. That is to say that for example the marginal participants give up paying ηw.[14] Moreover the increase in the job arrival rate brought about by the

[14] A sufficient condition for this result is that the marginal cost elasticity is increasing with respect to s (see the Appendix).

technological change is even greater for the share of population with $\sigma(w) > \sigma^*(w)$.[15] The latter result is in line with the arguments according to which behavioral traits are part of the performances of workers in periods of technological change (see Bowles, Gintis and Osborne, 2001).

To summarize the main results of section 3 we can say that basically heterogeneity in the offer arrival rates depends on behavioral concerns (self-esteem and beliefs about the importance of luck for individual labor market success, expression (9)) that finally lead workers to supply different levels of on-the-job search effort. In more general terms heterogeneity in job arrival rates can be interpreted as heterogeneity in opportunities for upward mobility, i.e. unequal opportunities for social mobility. Moreover the innate attribute σ is state dependent in the sense that whether worker demands for self-serving beliefs (to be self-confident in the search process, or to put it in another way to manipulate information about λ) depends on the wage at which he is employed.

4 Redistributive policy

According to the result derived from the basic model above, for those who pay the fraction η of their wage rate, (those with $\sigma(w) \geq \sigma^*(w)$), the offer arrival rate is discretely higher than one of those embedded with $\sigma(w) < \sigma^*(w)$. In this framework we analyze the implementation and the effects of a redistributive policy of opportunities. We use this term to mean a policy that aims to compress the distribution of the job arrival rates for the population at any wage rate. For the sake of clarity let take into account two individuals 1 and 2 employed at the same wage rate w_i, with $\sigma_1(w_i) < \sigma^* < \sigma_2(w_i)$, the redistributing policy aims to reduce the differences in the job arrival rate among worker 1 and worker 2. The policy we implement imposes a linear tax rate on search effort to the (over)confident workers, i.e. to worker 2, and delivers a linear subsidy on search effort to the remaining share, e.g. to worker 1. While search subsidies are quite common in literature, a linear tax on search activity may appears somewhat

[15] The proof on this point is very simple: the increases in the expected gain from moving to new job is amplified by the term $\epsilon\sigma$, this induces more search intensity that in turn leads to a greater job arrival rate.

unrealistic at a first glance.[16] However in this context it will be clear that such a linear tax is formally equivalent to a tax on job mobility. Suppose fiscal authority can discriminate workers with $\sigma(w) > \sigma^*(w)$, or alternatively among those who exhibited high turnover rates. Then the linear tax rate on search effort has the same effect of a linear tax on the net gain associated to moving to a new job, i.e. $[W(w) - W(w_i)]$, where $W(w)$ is the lifetime utility associated to the new job. In other words our linear tax on search effort affects search activity as a linear tax on $[W(w) - W(w_i]$. The effect consists in a reduction of the return to search activity.[17]

4.1 Reasons for redistribution

Another question is why such a policy that aims to reduce job arrival rates differentials for each wage rate might be supported as a political equilibrium. Firstly it is important to stress the importance of the job arrival rates for individual wage growth. For the model above it is immediate to see that mobility is associated to individual wage growth, and to this extent a greater arrival rate of job offers is associated to wage increases. The standard model of section 2 can be also extended by allowing the employers to match the outside job offers of the poaching employers. In this case on-th-job search is more important for individual wage growth as in some cases an outside wage offer may result in an increase in the wage rate although the outside job is less productive that the current one (see Postel-Vinay and Robin, 2002). Other more difficult modification allow workers to be selective in the wage offers. In this case the strength of on-the-job search affects also the earnings profile of workers over the their labor market history.

Beyond an acceptable level of individual luck in the search process, voters may be concerned about the redistribution of opportunities for individual wage growth that are different because of heterogeneity in behavioral traits. More in general voters may be concerned about more equal opportunities for social mobility. As it is shown by several empirical studies, demand for redistribution and for egalitarian policies are driven by beliefs on the causes of individual

[16] We will give more reasonable motives in the next subsection. However a similar scheme is implemented by Shimer and Smith (2001) in a different framework.

[17] Note also that a general equilibrium effect of a reduction in search activity for the workers with $\sigma(w) > \sigma^*(w)$ is to reduce congestion suffered by the fraction of workers with $\sigma(w) < \sigma^*(w)$.

success in the labor market. Societies are more willing to support redistributive policies if the majority of people believe that the causes of poverty and of richness depend on factors that are beyond the individual control (see e.g. Fong, 2002 and the reference therein). Conversely there is less demand for redistribution in societies where rewards in the labor market are believed to depend exclusively on individual effort. Finally here voters may be concerned about redistribution because the job offer arrival rate differentials are driven by behavioral attributes that can be innate and beyond the individual control. [18]

4.2 The redistribution scheme in presence of social norms and the balanced policy

Assume a linear tax on search effort on those who pay the fraction η of their wage rate. We denote such a linear tax as ρ. The total revenue is distributed in form of a (linear) search subsidy to those with $\sigma(w) > \sigma^*(w)$. We denote such a linear subsidy as γ. To this framework we add the presence of a social norm with the regard to the social stigma suffered by those who receive benefits from the welfare state. It is widely documented that there exists a social disutility for being recipients in a welfare program.[19] The most striking evidence is in US where only the 40-70 percent of the eligible individuals for welfare programs (e.g. subsidies, transfers) finally takes part to the programs (cf. Lindbeck, Nyberg and Weibull, 1999). We denote such a disutility as μ that enters the lifetime utility of the recipients with minus sign. In this situation lifetime utilities to be employed at the wage rate w_i solve:

$$rW(w_i) = w_i(1-\eta) - c(s) + s\left\{(\lambda + \epsilon\sigma)\int_{w_i}^{\overline{w}} [W(w) - W(w_i)]dF(w) - \rho\right\} + \\ +\delta[V - W(w_i)], if \sigma \geq \sigma^*. \qquad (11)$$

[18] Even if we do not derive the political equilibrium, it is clear that the extent of such a redistributive policy is most likely to be large in countries where the majority of the workers is embedded with a denominator in expression (9) quite high. This observation would also imply that these countries would experience less job mobility, this is a hypothesis that needs to be investigated

[19] In the formalization of the interaction between economic incentives and social norms we use the simple and tractable procedure of Lindbeck, Nyberg and Weibull (1999) and (2002). They analyze the binary choice of work or living off transfers in the presence of social norms.

$$rW(w_i) = w_i - c(s) + s\left\{\lambda \int_{w_i}^{\overline{w}} [W(w) - W(w_i)]dF(w) + \gamma\right\} +$$
$$+\delta[V - W(w_i)] - \mu, if \sigma < \sigma^* \quad (12)$$

Taxes and subsidies make participation to the program that lead workers to manipulate information about λ more costly, in other words σ^* increases for all the wage rates. However this effect is attenuated by the social stigma μ and we assume that ρ and γ are fixed in a way that the effect of μ on the critical level of σ (to lower it) does not dominate on the effect of ρ and γ.[20] The critical level of $\sigma^*(w)$ that defines the participation constraint must be written as $\sigma^*(w, \rho, \gamma, \mu)$, increasing in the first, the second and the third argument and decreasing in the last one (see the Appendix). On the aggregate point of view it is clear why such a policy reduces job arrival rates differentials: with this scheme we have that a share of workers will search more (those who were before with $\sigma(w) < \sigma^*(w)$), and a fraction of workers will search less.

For any level of ρ, γ and μ, denote with $z = \Theta[\sigma^*(w, \rho, \gamma, \mu)]$ the share of recipients, that is obviously decreasing in μ and increasing in ρ and γ.[21] Following Lindbeck, Nyberg and Weibull (1999) and (2002) and most of the papers on social norms we assume that μ is a decreasing function of z.[22] More precisely we define $\mu = g(z)$, where $g : [0, 1] \to R_+$, continuously differentiable with $g' < 0$.

This simple modification brings about a set of new results. In this way the critical level $\sigma^*(w)$ now depends also on the share of recipients z (substitutes $\mu = g(z)$ in the expression of

[20] Note that we implicitly assume that workers must be either taxed or subsidized. For those who do not pay ηw, it is possible to model the choice of refusing the search subsidy (so that they do not experience social stigma), or of accepting the search subsidy. This would happen if the lifetime utility from being subsidized is less than the lifetime utility of not being recipient, given that $\sigma(w) < \sigma^*(w)$. This would be the case for the workers employed at sufficiently high wage rates. However the results we can derive from this observation do not change very much the analysis in which we are interested here.

[21] It is possible to derive the explicit value of this z. However we avoid the calculus for the sake of simplicity; what we need to know is how z varies with respect to the parameters. Moreover recall that the population is a continuum, $z \in [0, 1]$ and that at any instant we approximate the values of the measures of workers with the expected ones.

[22] Here the intuition is that the more are the recipients and the less is the disutility from being recipient, it is something that is clearly true in many contexts.

z), i.e. both σ^* and the intensity of μ are endogenous to the model. In this context individuals face a strategic environment as the payoffs of worker's behavior depend on the behaviors of the other workers. As it is standard a profile of individual choice, given ρ and γ, and for each level of the wage rate, is a Nash equilibrium if and only if z satisfies the following fixed point equation:

$$z = Q(z) \tag{13}$$

where Q is a function that maps the unit interval into itself: $Q : [0, 1] \to [0, 1]$ and z is defined above to be equal to $\Theta[\sigma^*((w), \hat{\rho}, \hat{\gamma}, g(z))]$, where the hat on ρ and γ means that they are taken as given. In equation (13), $Q(z)$ is an increasing function of the endogenous variable z[23] The function $Q(z)$ is continuous in the unit interval, thus, given ρ and γ, there exists at least one fixed point, denoting the Nash equilibrium. Note that if the disutility μ were a constant, then there would have existed exactly one fixed point. However as μ is a decreasing function of the share of the recipients, depending on the functional form of $g(z)$, we can obtain more than one fixed points, i.e. multiple equilibria. This is a result common in the literature on social norms, as well as when they are brought in the welfare state (Lindbeck, Nyberg and Weibull, 1999, 2002). It is possible to show with the usual arguments that if we augment the model with a certain degree of learning in a stochastic environment with imperfect information of the workers, then in the in case of three equilibria, given the feedback effect above, the stable equilibria are the extreme ones.[24]

In what follows we restrict our analysis to balanced policies, that is policies that satisfy the budget constraint according to which the total revenue from taxes has to be equal to the total amount of subsidies delivered. Denote with R and S the total revenue and the total amount of subsidies, respectively:

[23]Note that $g' < 0$, then σ^* is increasing with respect to z and as consequence of the fact that $\Theta'[\sigma] > 0$, $Q(z)$ is increasing in z.

[24]For our model however the presence of social norms can make more difficult the implementation of the redistribution of opportunities. Indeed now depending on the functional form of g, it is possible to obtain that the effect of disutility of tax and subsidy on the critical level of σ may be dominated by the strength of social stigma. See sub-section 4.3.

$$R = (1-u)(1-\Theta[\sigma^*(w,\rho,\gamma,\mu)) \int_R^{\overline{w}} \rho s(w) dG(w) \tag{14}$$

$$S = (1-u)\Theta[\sigma^*(w),\rho,\gamma,\mu)) \int_R^{\overline{w}} \gamma s(w) dG(w) \tag{15}$$

We call a balanced equilibrium the equilibrium such that equation (13) and $R = S$ are simultaneously satisfied. We end up with the following proposition that closes the model.

Proposition 5 *For each share of recipients z exists exactly one balanced policy such that $R = S$ and for any balanced policy there exists at most on share of recipient z that satisfied fixed point equation (13).*

Of course the strength of the disutility may depend also on the denominator of equation (9) as well as the extent of redistribution.[25]

4.3 Discussion on multiple equilibria

In our simple model we pointed out how, depending on the functional form of g, we may obtain multiple equilibria. In case of multiple equilibria the usual critique is that one reported by Lindbeck, Nyberg and Weibull (1999) that "anything can happen" and therefore the indeterminacy of equilibrium reveals the uselessness of the theory. But as Lindbeck et al. (1999) point out this is not the case, and even if it was this would not justify the "exclusion of social norms from our models". Provided that the strength of social stigma is very high, or, to put it in another way, provided that $g(z)$ is very sensitive to changes in z, to relate the result of the last section to those obtained of Lindbeck et al. (1999), we may basically have two results.[26] Suppose to fix the linear tax rate (e.g. very low), in the first case (that we term A) we have a majority of tax payers mirrored by a high share of self-confident in the search process.[27] For

[25] Proposition 5 is again very similar to Lindbeck, Nyberg and Weibull (1999).

[26] In case of multiple equilibria in our case indeed the interior equilibrium is unstable.

[27] In this case the effect of taxes and subsidy do not discourage workers from being self-confident as saying that $g(z)$ is very sensitive to changes in z may imply that the effect of the disutility on σ^* dominate the effect of taxes and subsidies.

the same tax rate, in the second one (that we term with B) we have majority of subsidized mirrored by a low share of self-confident in the search process. Indeed in A the disutility from being a recipients is very high implying a low value of σ^* for all the wage rates, while in B such a disutility is very low implying a much more higher vale of σ^* for all the wage rates.[28] With regard to the redistribution, the effect of the policy brings more equal opportunities in either cases A and B respect to the situation on section 3. However the policy is more effective in case B, in that being σ^* very high, the job arrival rate differential is low than that one in case A, σ^* is lower for all the wage rates.

The last implication of the model is that in case A we observe a labor market characterized by higher turnover and mobility rates than those we observe of case B. In more general term in case the extent of frictions is lower than that one we observe in case B. Empirical investigation are needed with regard to the last point. Indeed if it is true that some economies are characterized by high turnover and mobility rates (e.g. US and UK), and other economies by lower rates (e.g. France and Germany), the challenge is to relate these patterns to the framework we presented in the last section.

5 Conclusion

In this paper we introduced in a very simple way the behavioral trait of self-confidence in the standard job search model. We explored the effects of self-confidence and we found some interesting results in line with the theory according to which behavioral traits can be important for individual labor market success. In our case self-confidence affects the rate at which wage offers are sampled as well as the expected time to find a better job. Self-esteem and effort are complements, and rewards are most likely to be negative reinforces. Moreover self-confidence is more effective when the the distribution of the wage shifts to the right, e.g. because of the arrival of a technological shock. In such a model we explored the effects of a simple redistributing policy that attenuates job arrival rates differential. We introduced in the analysis the presence

[28] Recall that the critical value of σ is decreasing with respect to $g(z) = \mu$. Note that that in the former case the high value of disutility should be balanced in part by the fact that a majority of tax-payers imply a high per capita subsidy rate and this lower σ^*. The same arguments in opposite directions holds for the second case.

of social norms, namely social stigma and guilt deriving from being subsidized. The presence of the social norm is relevant when we assume that the extent to which it affects individual decision is endogenous to the model. In this case we found equilibrium conditions and optimal strategies and we show how we can obtain multiple equilibria and the implications of the model. Future research concerns deeper analysis of the interaction of social norms and of the behavioral trait presented in section 3 (expression 9), the introduction of evolutionary game theory for analyzing conventions in such a framework as well as the analysis of the political equilibrium studying voting processes that may interact in the model with the behavioral traits we introduced.

Appendix

Define marginal cost elasticity $\beta(s) = sc''(s)/c'(s)$ and assume it's increasing with respect to s although it is not a necessary condition for the results showed below.

Proof of Proposition 1. We gave the intuition in the text. Denote $[\int_{w_i}^{\overline{w}}[W(w) - W(w_i)]dF(w)$ with E. For the worker it is optimal to pay ηw if and only if the resulting lifetime utility is greater than that one resulting from not paying ηw, that is:

$$c(s^*) - \lambda s^* E - c(s^{**}) + \lambda s^{**} E > \eta w - \epsilon\sigma s^{**} E \tag{16}$$

where s^* is given by equation (4) and s^{**} is the argmax of $[c(s) - (\lambda + \sigma\epsilon)s \int_{w_i}^{\overline{w}}[W(w) - W(w_i)]dF(w)]$. Note that the LHS of equation (16) is strictly negative. Indeed s^* is the arg max of $-c(s) + \lambda s E$, whereas $s^{**} > s^*$ is not. Then a necessary condition for (16) to hold is $\epsilon\sigma s^{**}E - \eta w > 0$. Inequality (16) is satisfied as an equality for a unique σ denoted in the text as σ^*. Deriving σ^* from (16) as an equality and differentiating σ^* with with respect to w, we find the derivative to be positive using the envelope theorem. Prop. 2 derives from equation (5) (see also note 12) and Prop. 3 from the proof of Prop. 1.

Proof of Proposition 4. Denote with E' the gain $[\int_{w_i}^{\overline{w}}[W(w) - W(w_i)]dF(w)]$ after the the shift on the right of the wage distribution distribution occurred. Denote σ^{oo} the critical level required to participate in the program after the shift occurred. We have the critical equal to $\sigma^{oo} = [c(s^{oo}) - c(s^o)]/\lambda\epsilon\sigma E' s^{oo} + (s^{oo} - s^o)/\epsilon\sigma s^{oo} + \eta w/\lambda\epsilon\sigma s^{oo}E'$, where s^{oo} is the argmax of $[c(s) - (\lambda + \sigma\epsilon)sE']$ and s^o is the argmax of $[c(s) - \lambda s E']$. If we compute $\sigma^{**} - \sigma^{oo}$, where σ^{**} is defined above in (16) as an equality, we find that it to be negative, meaning that the critical level of σ increased.

Derivation of $\sigma^*(w)$ in presence of tax rate and subsidy rate and social stigma. In this case condition (16) now is:

$$c(s^*) - \lambda s^* E - c(s^{**}) + \lambda s^{**} E > \eta w - \lambda\epsilon\sigma s^{**} E + \rho s^{**} + \gamma s^* - \mu, \tag{17}$$

from which it is immediate to see that σ^* is increasing in ρ and γ and decreasing in μ.

Proof of proposition 5. To show the first part take as given the share of recipients z; from $R = S$ let consider γ as the independent variable, then ρ is an increasing function of γ. On the other hand recall that the share of recipients is increasing with respect to γ and to ρ. Therefore from the expression of z we can derive that ρ is a decreasing function of γ: for a higher γ is needed a lower ρ for z to be constant, and viceversa. For the second part suppose a share of recipients $\overline{z}$ satisfies $R = S$, and take as given the tax and subsidy rates. Then it is immediate to see that any $z \neq \overline{z}$ results in a deficit or in a surplus of the budget constraint.

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