Chapter 4: JOB SEARCH

J. Ignacio García Pérez

Universidad Pablo de Olavide - Department of Economics

BASIC REFERENCE: Cahuc & Zylberberg (2004), Chapter 3
The economic theory of labour supply pays no attention to the time and cost of looking for work.

There is no place for the unemployed person, even though her principal activity amounts to looking for work.

Such a description of the labour market implicitly assumes a structure of perfect information.

This is too simplistic: We must examine the consequences of imperfect information.

This is precisely the purpose of job search theory: to study the behaviour of an individual who has imperfect information about jobs and wages.
Imperfect information in the labour market occurs in the form of a number of different possible wages which can be offered.

Hence, job-seekers survey the labour market so as to find the highest wage being paid for their services.

This procedure is not different from that adopted by, for example, a person looking for an apartment (at the best possible rent).

The theory of job search is not in conflict with the theory of labour supply.

It sheds light on the decision to participate, which now lies in knowing whether it is worthwhile to look for work.
How job-seekers spend their time

Average minutes per day (US, 2003-2006).

<table>
<thead>
<tr>
<th></th>
<th>Employed</th>
<th>Unemployed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep</td>
<td>496</td>
<td>555</td>
</tr>
<tr>
<td>Personal care</td>
<td>110</td>
<td>97</td>
</tr>
<tr>
<td>Home production</td>
<td>158</td>
<td>254</td>
</tr>
<tr>
<td>Leisure</td>
<td>320</td>
<td>442</td>
</tr>
<tr>
<td>Work</td>
<td>325</td>
<td>10</td>
</tr>
<tr>
<td>Job search</td>
<td>1</td>
<td>32</td>
</tr>
</tbody>
</table>

There is a clear difference between unemployed and employed workers: due to observed or unobserved characteristics (different responses to incentives).
The labour supply model suggests that two effects may influence the amount of time spent searching for work.

1. Given that an hour of search returns less than an hour of work, the **substitution effect** ought to result in less time devoted to job search by an unemployed than what an employee devotes to work.

2. Since the income of an unemployed is less than that of a wage-earner, the **income effect** ought to result in more time spent on search.

However, the time devoted to job search by the unemployed is an average that comprises a high proportion of persons who did not look for a job.

- In fact, just 20% of unemployed persons engaged in job search activity the day before the survey.

- The average daily search duration of unemployed persons who do actually hunt for work the day before they were queried is 160 minutes.
Research on job search activity shows that unemployed persons react to economic incentives (Krueger and Mueller, 2010):

- Workers who expect to be recalled by their previous employer search substantially less than the average unemployed worker.
- Time spent looking for a job is inversely correlated to the level of unemployment benefits.
- Job seekers are likely to have less access to financial resources (e.g., because they do not have a working spouse) tend to respond more to UI benefits than do those with greater financial support.
How incentives affect job search

This figure shows that job search by unemployed workers benefiting from unemployment insurance intensifies as week twenty-sixth (the point at which benefits will come to an end) approaches.

It also reveals that the amount of time devoted to job search by workers not receiving unemployment benefits is inferior to that of the eligible unemployed.
Krueger and Mueller (2010) show that this gap persists even for workers with the same observable characteristics (age, gender, etc.).

It might, however, arise from non-observable characteristics like personal motivation or any other characteristic capable of influencing both eligibility for unemployment insurance and the intensity of job search.

Hence the observation that the duration of job search differs between the eligible and non-eligible unemployed does not warrant the conclusion that financial support during unemployment has a causal impact on the amount of time devoted to job search.
### Active Search Method

<table>
<thead>
<tr>
<th>Method</th>
<th>off line</th>
<th>on line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contacted employer directly</td>
<td>0.36</td>
<td>0.29</td>
</tr>
<tr>
<td>Contacted public employment agency</td>
<td>0.19</td>
<td>0.19</td>
</tr>
<tr>
<td>Contacted private employment agency</td>
<td>0.07</td>
<td>0.08</td>
</tr>
<tr>
<td>Contacted friends or relatives</td>
<td>0.44</td>
<td>0.11</td>
</tr>
<tr>
<td>Contacted school/university employment center</td>
<td>0.05</td>
<td>0.06</td>
</tr>
<tr>
<td>Sent out resumes or filled out applications</td>
<td>0.24</td>
<td>0.48</td>
</tr>
<tr>
<td>Checked unions or professional registers</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>Placed or answered ads</td>
<td>0.16</td>
<td>0.17</td>
</tr>
<tr>
<td>Other active methods</td>
<td>0.04</td>
<td>0.03</td>
</tr>
<tr>
<td>Total active search methods</td>
<td>1.58</td>
<td>1.44</td>
</tr>
</tbody>
</table>
Job search methods: an Internet revolution?

<table>
<thead>
<tr>
<th>Passive Search Method</th>
<th>off line</th>
<th>on line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Looked at ads</td>
<td>0.30</td>
<td>0.32</td>
</tr>
<tr>
<td>Attended job training programs or courses</td>
<td>0.06</td>
<td>0.03</td>
</tr>
<tr>
<td>Other passive methods</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Total passive search method</td>
<td>0.38</td>
<td>0.37</td>
</tr>
</tbody>
</table>

In these tables, we observe that, on average, an unemployed person makes use of 1.58 of the 9 methods of off line search.

The proportion is 1.44 out of 9 for on line job search.

It is interesting to note that job search on the Internet is much more "formal" than off line search. The “contacted friends or relatives” approach is adopted by only 11% of unemployed persons via the Internet, whereas it is adopted by 44% of off line job seekers.
Job search theory arises initially out of a basic model — today called the partial model — describing the behaviour of a person looking for work in a situation of imperfect information.

In this model we assume that:
- all the unemployed have access, in an exogeneous fashion, to unemployment insurance benefits,
- they are not allowed to select the intensity of their search,
- they cannot look for (another) job once they are employed.
The basic model

This model aims to describe the behaviour of an unemployed person who dedicates all of his efforts to look for a job,

We assume that the conditions in which this search takes place do not vary over time.

In this model, the optimal strategy of a person looking for work consists simply of choosing a reservation wage.

The amount chosen depends on all the parameters of the model.
The main hypothesis of the job search model is that the job-seeker does not know exactly what wage each job pays.

We postulate that the job-seeker knows only the cumulative distribution of the possible wages.

We further assume that this distribution is the same at each date, and that successive wage offers are independent draws from this distribution: \( H(\cdot) \).

A job offer comes down to the proposal of a constant real wage \( w \) which the worker will receive on each date as long as he remains with the firm.
Discounted expected utility of an employee

We will further assume that:

- the agent is risk-neutral
- we leave out of account the disutility of work. Thus, his *instantaneous* utility then simply equals $w$.
- over each short interval of time $dt$, any job whatsoever can disappear at the rate $q$
- the real instantaneous rate of interest $r$ is constant and exogeneous. Hence, the term $1/(1 + r)$ thus represents the discount factor over each short interval of time $dt$. 
In a stationary state, the discounted expected utility $V_e$ of an employed person receiving wage $w$ satisfies the following relation:

\[
V_e = \frac{1}{1 + r} \left[ w + (1 - q)V_e + qV_u \right]
\]

Rearranging the terms of this expression, we arrive at:

\[
rV_e = w + q(V_u - V_e)
\]
The optimal search strategy

In order to simplify, we will assume that a job-seeker can only meet a single employer on any date.

The employer offers the job-seeker the constant wage $w$ over the duration of her employment, which she is free to accept or refuse.

The optimal job-search strategy is then as follows:

1. If the job-seeker receives no offer on date $t$, she continues looking. This behaviour results from the stationarity of intertemporal utility $V_u$.

2. If the job-seeker receives a wage offer $w$, she accepts if $V_e(w) > V_u$. If not, she continues looking.
The optimal search strategy

Since a job-seeker’s expected utility $V_u$ does not depend on a particular wage offer $w$, we have that $V_e(w)$ is an increasing linear function of the wage offered.

This relation also shows that phase 2 of the search strategy amounts to the adoption of a “stopping rule” that dictates accepting wage $w$ if and only if it is superior to a threshold-value $x$ defined by:

$$x = rV_u$$

The acceptance of an offer exactly equal to $x$ procures for the job-seeker the same level of utility that she gets by remaining unemployed, in other words $V_e(x) = V_u$. 
As in the theory of labour supply, wage $x$ continues being called the **reservation wage**, but below we shall see that it means something tangibly different.

Thus the job search model shows that the optimal strategy consists of continuing hunting for a job as long as incoming job offers entail wages below the reservation wage.
We will designate by $\lambda$ the arrival rate of job offers. It reflects the general state of the labour market, but it also depends on the personal characteristics of the job-seeker and the effort he puts into the search.

The search for a job entails costs at every turn. Some are financial in nature but it is equally necessary to include the opportunity cost of the search.

All these costs will be summed up, at each date, by a single scalar $c > 0$.

There are also benefits associated with periods of looking for work. These comprise unemployment benefits, and also perhaps the consumption of domestic production, and leisure.
If, for each date, we express the sum of these gains by the scalar $b > 0$, the net instantaneous income from looking for work, denoted by $z$, is then equal to $(b - c)$.

The discounted utility $V_\lambda$ expected upon receiving an offer of employment is thus equal to

\[
V_\lambda = \int_0^x V_u dH(w) + \int_x^{+\infty} V_e(w) dH(w)
\]

Conversely, if the job-seeker receives no offers, he keeps searching, which procures for him a discounted expected utility equal to $V_u$. 
Now, during a short interval of time $dt$ in length, a job-seeker gains $zd$ and has a probability $\lambda dt$ of receiving a job offer so we will have:

\[
V_u = \frac{1}{1 + r} \left[ z + \lambda V_\lambda + (1 - \lambda) V_u \right]
\]

Examining the various ways the assets $V_u$ of an unemployed person may be invested.

- In the “financial” market these assets will bring in $rV_u$ at any moment,
- while if “invested” in the labour market they will procure income $z$ augmented by the value $\lambda(V_\lambda - V_u)$ of the average gain linked to the change of status of a person who is looking for work.
After some algebra, we easily arrive at the following equation, which implicitly characterizes the reservation wage as a function of the parameters of the model:

\[ x = z + \frac{\lambda}{r + q} \int_{x}^{+\infty} (w - x) dH(w) \]

This expression shows that the reservation wage is equal to the net income from the job search plus the discounted expected value of what the job search can yield above the reservation wage.
Hazard rate and Average Duration

The values of two other important variables flow from knowing the reservation wage. These are the **hazard rate**, or *the exit rate from unemployment*, and the **average duration** of unemployment.

Since a job-seeker becomes employed when
1. she receives a wage offer, which occurs at rate $\lambda$
2. the offer is at least equal to her reservation wage — which occurs with probability $[1 - H(x)]$ —

the exit rate from unemployment takes the value

$\lambda[1 - H(x)]$ (7)
The average duration of unemployment, denoted $T_u$, is then given by:

$$T_u = \frac{1}{\lambda [1 - H(x)]}$$  \hspace{1cm} (8)

The interpretation of this equation is very intuitive: it means that if a job-seeker has one chance in ten of becoming employed in any week, she will on average remain unemployed for ten weeks.

It also shows that the average duration of unemployment is an increasing function of the reservation wage.
The comparative statics properties of the job search model are very easily obtained if we write the relation \(6\) defining the reservation wage in the following form:

\[
\Phi(x, z, r, \lambda, q) = 0, \quad \Phi(x, z, r, \lambda, q) \equiv x - z - \frac{\lambda}{r + q} \int_x^{+\infty} (w - x) dH(w)
\]

(9)

We can easily verify that the partial derivatives of the function \(\Phi\) possess the following properties:

(10) \(\Phi_x > 0, \; \Phi_z < 0, \; \Phi_r > 0, \; \Phi_\lambda < 0, \; \Phi_q > 0\)
Comparative Statics of the Basic Model

As relation (9) implies $\frac{\partial x}{\partial i} = -\Phi_i / \Phi_x$, $i = z, r, \lambda, q$, we can obtain the direction of the variations in the reservation wage as a function of the parameters:

$$
\begin{align*}
\frac{\partial x}{\partial z} &> 0, \\
\frac{\partial x}{\partial \lambda} &> 0, \\
\frac{\partial x}{\partial r} &< 0, \\
\frac{\partial x}{\partial q} &< 0
\end{align*}
$$

(11)

With the help of relation (8), we deduce from this the main comparative statics properties of the average duration of unemployment. The result is:

$$
\begin{align*}
\frac{\partial T_u}{\partial z} &> 0, \\
\frac{\partial T_u}{\partial r} &< 0, \\
\frac{\partial T_u}{\partial q} &< 0
\end{align*}
$$

(12)
Comparative Statics of the Basic Model

An increase in unemployment benefits should have the effect of lengthening the duration of unemployment.

This result is highly intuitive: a job-seeker receiving higher compensation will be more demanding in terms of the wage he hopes to get.

When the job loss rate $q$ increases, the current demands of job-seekers diminish, since the gap between the expected utility of an employee and that of a job-seeker shrinks.

Another interpretation is that when jobs are of shorter duration, workers are less demanding because they know they will have other opportunities in the future.
An increase in $\lambda$, the arrival rate of wage offers, has an ambiguous effect on the amount of time devoted to looking for a job.

- In this case, job-seekers revise their reservation wage upward, which entails a lowering of the term $[1 - H(x)]$.

- The direction of consequent change in the rate of exit from unemployment $\lambda[(1 - H(x))]$ and the average duration of unemployment $T_u = 1/\lambda[(1 - H(x))]$ is then unknown.

- It should be noted, however, that if the frequency with which job offers arrive has little effect on the reservation wage, the average duration of unemployment decreases with this frequency.

Finally, a rise in $r$, because the worker places less value on the future, lower reservation wage and thus reduces unemployment duration.
Decisions to participate in the labor market are envisaged differently under the theory of labor supply and under the theory of job search.

It is possible, though, to contemplate a hybrid model that takes into account three possible states: non-participation, job-seeking, and employment.

In the theory of labor supply, participation in the labor market depends on a comparison between the current wage \( w \) and the reservation wage \( w_A \).

The theory of job search defines the reservation wage \( x \) as the wage at which the job-seeker is indifferent between accepting a job and continuing to look.
The choice between participation and non-participation is based on a comparison between the expected utility of a job-seeker $V_u$ and that of a non-participant $V_I$.

If the latter receives a constant income $R_I$ at each date, her expected utility is defined by the equality $rV_I = R_I$.

This can easily be compared to that of a job-seeker, which is such that $rV_u = x$.

An agent decides to participate in the labor market if and only if $V_I \leq V_u$, which translates into the inequality $x(\Omega) \geq R_I$. 
Hence, the decision of a participant will be to accept an offer whenever $w > x(\Omega)$,

and to continue unemployed and searching when $x(\Omega) \geq w > R_I$.

The theory of job search suggests that the rate of participation depends on the set, $\Omega$, of all the factors affecting the labor market.

For example, some studies reveal that a rise in unemployment benefits (an increase of $z$) is often accompanied by a rise in the participation rate, in the form of a rise in unemployment.

This relationship augments the procyclical character of the participation rates deduced in the previous chapter.
As a general rule, an individual who has a job is still able to carry out a search in order to find another one.

We will assume that the costs of job search are negligible for a worker who is employed.

Let us assume that an employed person receives job offers with a frequency of $\lambda_e$,

The discounted utility $V_e(w)$ expected by a wage-earner whose current wage is $w$ has three components:

1. The instantaneous income $w$ deriving from her waged labor,
2. the average discounted expected gain $q [V_u - V_e(w)]$ due to job loss,
3. and the discounted expected earnings $\lambda_e \int_w^{+\infty} [V_e(\xi) - V_e(w)]dH(\xi)$ consequent upon a change of employer (which occurs for every wage offer that exceeds the present wage $w$).

EXTENTION: On-the-job search
Finally $V_e(w)$ is defined by:

$$rV_e(w) = w + q [V_u - V_e(w)] + \lambda e \int_w^{+\infty} [V_e(\xi) - V_e(w)] dH(\xi)$$

(13)

Hence, the optimal search strategy for a job-seeker is characterized by a reservation wage $x$ such that $V_e(x) = V_u$.

If the arrival rate for a job-seeker is $\lambda_u$, her discounted expected utility $V_u$ continues to be:

$$rV_u = z + \lambda_u \int_x^{+\infty} [V_e(\xi) - V_u] dH(\xi)$$

(14)
Making \( w = x \) in (??) and comparing (14), we immediately get:

\[
x = z + \frac{\lambda_u - \lambda_e}{r + q} \int_x^{+\infty} [V_e(\xi) - V_u] \, dH(\xi)
\]

Compared to the basic model, this equation indicates that a job-seeker must henceforth weight the discounted expected utility of the job-search by the difference \( \lambda_e - \lambda_u \) of the rates with which job offers arrive.
Properties of the reservation wage

When \( \lambda_e = 0 \), we come back to the reservation wage of the basic model.

If \( \lambda_e > 0 \), the job-seeker takes account of the possibilities of future income associated with continuing to look for a job while employed. Adopting this stance has the effect of lowering the reservation wage.

If \( \lambda_e = \lambda_u \), the reservation wage is equal to the net income \( z \) of the job-seeker.

If \( \lambda_e > \lambda_u \), the reservation wage falls below \( z \). In this configuration of the parameters, an employee has more chances of obtaining an acceptable offer than a job-seeker.

The latter thus has an incentive to accept “bad” jobs which nevertheless afford him better prospects than his present situation of being unemployed.

The bulk of the estimations show however that the inequality \( \lambda_u \geq \lambda_e \) is the most probable.

This likely comes about because unemployed job-seekers devote more effort to looking for work than employed job-seekers do.