GATE
Groupe d'Analyse et de Théorie Économique
UMR 5824 du CNRS

DOCUMENTS DE TRAVAIL - WORKING PAPERS

W.P. 02-02

Do spatial constraints affect the job search efficiency ?

Sandra CAVACO
Jean-Yves LESUEUR
Mareva SABATIER

Février 2002

GATE Groupe d'Analyse et de Théorie Économique
UMR 5824 du CNRS
93 chemin des Mouilles – 69130 Écully – France
B.P. 167 – 69131 Écully Cedex
Tél. +33 (0)4 72 86 60 60 – Fax +33 (0)4 72 86 60 90
Messagerie électronique gate@gate.cnrs.fr
Serveur Web : www.gate.cnrs.fr

CONTRAINTES SPATIALES ET EFFICACITE DE LA RECHERCHE SUR LE MARCHE DU TRAVAIL

Sandra Cavaco*, Jean-Yves Lesueur* and Mareva Sabatier**

(February 2002)

*GATE (Groupe d'Analyse et de Théorie Economique),
UMR-CNRS n°5824, Université Lumière Lyon 2.
**IRES (Institut de Recherches Economiques et Sociales)
Université Catholique de Louvain
E-mail : cavaco@gate.cnrs.fr, lesueur@gate.cnrs.fr, sabatier@ires.ucl.ac.be

Abstract :

Theoretical and empirical works on job search often neglect the role of unemployed environment like spatial constraints meets while searching for a job. This paper proposes a job search model where both the spatial search area and the reservation wage are assumed to be endogenous. We exploit data from a French survey conducted by Research Direction of Employment Ministry (DARES) to estimate the structural parameters of the model. First we estimate the choice of the search area, *i.e.* the choice between passive (receiving job offers through the local public employment agencies) and active strategies (extending the job search area using others search channels). Using a bivariate probit model, we highlight that this choice depends significantly on individual attributes and spatial constraints and that it affects job quality. Besides, the independence of irrelevant alternatives is not rejected. Secondly, using Gamma duration model we treat both individual and unobservable heterogeneity and the multiple destinations after unemployment (long-term jobs, short-term jobs and subsidised jobs). Moreover, estimations are made on sub-samples in which individuals are homogenous according to their level of diploma and their situation towards the unemployment insurance. Controlling for unobservable heterogeneity and selection bias, the econometric results show that the passive strategy is more efficient for low-graduated people accessing a subsidised job. However, the active strategy is more efficient for high-graduated individuals accessing a full-term or a short-term job.

JEL Classification : J61, J64, C3
Key Words : Job Search – Spatial Constraints – Unemployment Duration – Search Strategies

Résumé :

Parmi les multiples facteurs explicatifs de l'hétérogénéité des transitions individuelles vers l'emploi, les études économétriques ont porté peu d'attention aux effets des effets liés à l'environnement de la recherche, comme notamment les contraintes spatiales supportées par les chercheurs d'emploi (éloignement des zones de concentration des emplois comme des agences publiques de placement notamment).

Tel est l'enjeu de cet article où l'on étudie l'influence du choix de l'horizon spatial de la recherche et des contraintes spatiales rencontrées au cours de la recherche sur la durée de l'épisode de chômage. On estime pour cela la vraisemblance associée à un modèle structurel de recherche dans lequel le salaire de réserve comme la décision d'augmentation de la distance de prospection sont endogènes. A partir des données individuelles de l'enquête « Trajectoire des Demandeurs d'emploi » de la DARES, un traitement économétrique préalable de l'endogénéité et de la non indépendance des choix alternatifs non pertinents permet de contrôler ces sources de biais lors de l'estimation de la fonction de vraisemblance associée à l'expression du taux de hasard. La procédure d'estimation retenue à ce niveau permet de contrôler l'hétérogénéité des issues selon la nature du contrat d'embauche (CDI, CDD, contrats aidés), le niveau de formation et l'indemnisation chômage. Correction faite des sources d'hétérogénéité inobservable, les résultats font apparaître d'une part que l'arbitrage opéré par le chercheur d'emploi entre stratégie active de recherche (élargir son horizon spatial de recherche) et stratégie passive (recevoir des offres d'emploi de l'ANPE) exerce un effet particulièrement discriminant quant à la qualité de l'emploi retrouvé (CDI, CDD, Contrat Aidé).

Mots clés : Théorie de la recherche d'emploi, Transitions vers l'emploi, économétrie des modèles de durée, contraintes spatiales
Classification JEL : J61, J64

1. Introduction

Finding an explanation for the success or the failure of individual job search has been one of the main research programmes of labour economists during the last three decades. This study aims at contributing to this literature by questioning the potential impact of individual spatial constraints on the job search efficiency.

Theoretical and empirical works on job search focus commonly on the effects of individual factors, public employment policies or unemployment insurance. They often neglect the role of the search environment, in particular the role of spatial characteristics. Some recent studies yet try to link job search theory and spatial economics. One issue that has attracted some attention is the effect of the *spatial mismatch* (Kain, 1992), in particular in the United States. Holzer, Ihandfled, Sjoquist (1994) model the impact of search distance in a static job search model and estimating a reduced-form duration model. They conclude that the localisation of the black unemployed people in town centre whereas jobs are concentrated in suburbs explain that these people face higher search costs and stay longer in unemployment. Rogers (1997) assumes that the distances to jobs can affect both the offer rate, the commuting costs and the search costs. But, as the distance to jobs can have multiple and opposite impacts on unemployment duration, the estimation of reduced-form duration models does not allow the author to conclude about these impacts.

Therefore, a more complete study to evaluate the impact of spatial mismatch seems to be the one of Van den Berg and Gorter (1997). Their main contribution is to estimate a structural job search model characterised by a non-stationary environment, in which workers trade off between wages and commuting time. It is also one of the rare contributions focused on Europe. They indeed exploit a Dutch data set which contains very rich information, in particular on individual reservation wages. Their results highlight that the individual trade-off is influenced by three types of covariates : individuals attributes, family characteristics and environmental factors. For female, the number of children dwindles the search area and the probability of accepting high commuting time. An additional child raises the marginal wage claim up to $80 for a commuting time equal to two hours per day. Besides, the town size is positively related with the commuting time, probably because of more developed transport modes.

Finally, in the line of Nickell (1998), Gardner, Pierre and Oswald (2001) and Oswald (1997), as they affect the moving cost from job to job, spatial factors like the distribution of

home-ownership can be viewed as one of "the missing pieces" to explain the rise of unemployment in Europe.

All these studies then campaign for the introduction of spatial constraints in the analysis of job search efficiency. Here, we contribute to this literature by modelling and estimating the impact of the choice of the spatial search area on unemployment duration in France. The case of France is particularly interesting since the unemployed people face two major search strategies. The first one, qualified as a passive search strategy, consists in searching through the local public employment agencies, called ALE (A*gences Locales pour l'Emploi*). ALE provide free job offers but only localised in a determined area: the one that is administratively controlled by the ALE. The second strategy, called active strategy, consists in extending the search area beyond the ALE area, using alternative search methods (market methods, private employment agencies or networks). In such an institutional context, spatial constraints can explain the choice of search strategies and search efficiency.

Section 2 presents a job search model that allows for spatial choices. In this model, the job offer rate depends positively on the two search strategies. Both reservation wage and the search area are assumed to be endogenous. As the equilibrium properties lead us to an ambiguous effect of the spatial search area on the exit rate from unemployment, the structural parameters of the model are estimated.

Section 3 describes the data. We exploit data from a French survey called *Trajectoires des Demandeurs d'Emploi* (TDE), conducted by the Research Direction of Employment Ministry (DARES). It concerns people who became unemployed in 1995 and interviewed each year until 1998. This survey provides large information both on individual characteristic, spatial factors, search strategies and unemployment duration. Our analysis focuses on the first search period observed in the data set. In section 3 we also estimate the choice of the search area, i.e. the choice between passive and active strategies. Using a bivariate probit model, we highlight that this choice depends significantly on individual attributes and spatial constraints. Besides, the independence of irrelevant alternatives is not rejected. In the light of these results and to avoid selectivity bias, estimated probabilities of using each strategies are computed and introduced as components of the offer rate.

Section 4 details the estimation method used to evaluate the structural parameters of the model and comments the main results. Our specification assumptions allow us to treat both individual and unobservable heterogeneity and the multiple destinations after unemployment. Three independent destinations are analysed : long-term jobs, short-term jobs and subsidised jobs. Estimations are also made on sub-samples in which individuals are homogenous

according to their level of diploma and their situation towards the unemployment insurance. This specification allows us to make a significant contribution to the empirical literature on the link between spatial economics and job search theory. Indeed, the choice of the spatial search area, taking into account its selectivity, affects significantly not only the individual unemployment duration but also the job quality. Nevertheless, the impact of the two search strategies is found to be strongly heterogeneous. The passive strategy, limiting the search area to the ALE zone, is more efficient for low-graduated people accessing a public measure. Yet it can increase the unemployment duration for high-graduated people. In the opposite, the active strategy accelerates the exit from unemployment for all the unemployed people. In addition, this strategy seems to be more efficient to access a long-term job.
The final section concludes.

2. The model

2.1. Notations and assumptions

Our model is inspired from the job search models with endogenous search effort (Mortensen, 1986; Fougère, Pradel, Roger, 1996) but we assume here that both reservation wage and search distance are endogenous. Two states are considered : unemployment and employment. There is no on-the-job search. The search environment is assumed to be stationary. Let *r* be the interest rate. Any offered wage, *w*, is viewed as a random sample from a cumulative distribution $F(w)$. Individuals are risk neutral and homogenous except concerning the search behaviour.

Indeed, two search strategies can be adopted (and potentially combined) : a passive one and an active one. By using the passive strategy, unemployed people can receive offers from the local public employment agency (ALE) with an intensity λ_0. This intensity is assumed to be higher when people live near the ALE or the jobs localisation. If *x* denotes the distance between home and ALE and y those to the nearest job area, we then have : $\frac{\partial \lambda_0}{\partial x} < 0$ and $\frac{\partial \lambda_o}{\partial y} < 0$. Using the passive strategy, unemployed people limit their search distance to the area administratively controlled by the local unemployment service. The active strategy allows them to search beyond this restrictive zone, mobilising other search channels like market methods or networks. Let d be the endogenous search distance associated to the active

strategy. In the line of Holzer, Ihlanfeldt and Sjoquist (1994), this search distance (d) is supposed to be higher than the commuting distance in the previous job (noted d_{-1}) or strictly positive in case of the first enter in the labour market. So we have : $0 < d_{-1} < d$.

As the passive strategy provides free job offers to unemployed people, search costs depend only on the search distance *d*. The cost function is defined as follows :

$$C_R(d) = Ad^{1+\alpha}, \text{ where } 0 < \alpha < 1 \text{ and } A > 0$$

This function have the following properties : $C_R(0) = 0$; $C_R'(d) > 0$ and $C_R''(d) > 0$.

Note $\bar{d}$ the commuting distance associated to the accepted job. The cost function is written : $\bar{C} = C_R(\bar{d})$. We then suppose that the search costs and the effective commuting costs are defined by the same functional form. Finally, if $d*$ is the optimal search distance, we have : $\bar{C} < C_R(d*) \quad \forall \bar{d}, \quad 0 < \bar{d} < d*$.

As two ways to obtain job offers are defined, the offer rate depends positively on the two strategies and is defined as follows :

$$\lambda = \gamma(a_0\lambda_0 + b_0 d)$$

where γ is the individual search efficiency and a_0 and b_0 are two constants reflecting the impacts on the two search strategies on the offer rate.

During the search, individuals can receive unemployment benefits, noted *b*. At each search sequence *dt*, the probability of receiving an offer is λdt. Individuals can accept the offer and stop searching or refuse the offer and continue the search.

2.2. Equilibrium properties

To determine both reservation wage, *w**, and the optimal search distance, *d**, we can solve the optimisation problem using the Bellman principle. Individuals are then assumed to maximise their future net income given the optimality of their decisions at each sequence. Let $W(w - \bar{C}, \bar{d})$ be the present expected value of stopping, accepting the offer *w* given commuting costs $\bar{C}$, for a distance $\bar{d}$, and working forever after at that wage. Let *V* the

present expected value of searching during the next pe**riod. Workers then stop the search if and only if $V = W\left(w^* - \overline{C}, \overline{d}\right)$.

When accepting an offer, individuals receive:

$$W(w-\overline{C},\overline{d})=\frac{w-\overline{C}}{r} \tag{1}$$

If individuals continue the search, they receive :

$$V = \frac{(b - C_R(d))dt}{1 + rdt} + \frac{\lambda dt}{1 + rdt}.\mathrm{E}_w\left\{Max\left[W(w - \overline{C}, \overline{d}); V\right]\right\} + \frac{1 - \lambda dt}{1 + rdt}.V \tag{2}$$

Multiplying by $1+rdt$, we find :

$$rV=b-C_R(d)+\frac{\lambda}{r}H(w) \tag{3}$$

where $H(w) = \int_{w^*}^{+\infty} 1 - F(w)dw$

As $\lambda = \gamma(a_0\lambda_0 + b_0 d)$ and combining (1) and (3), we can obtain :

$$C_R(d)=b+\overline{C}-w^*+\frac{\gamma(a_0\lambda_0+b_0 d)}{r}H(w) \tag{4}$$

By differentiating (4) and rearranging terms, we can define the following system :

$$(S) \quad \begin{cases} C_R'(d) = \dfrac{\gamma b_0}{r} H(w) \\ C_R(d) - \dfrac{1}{b_0}(a_0\lambda_0 + b_0 d)C_R'(d) = b + \overline{C} - w^* \end{cases}$$

The *S* system admits a unique solution, giving the reservation wage, *w** and the optimal search distance *d**, defined as follows (see appendix 1) :

$$d^* = \left[\frac{\gamma b_0}{rA(1+\alpha)}H(w)\right]^{\frac{1}{\alpha}} \tag{5}$$

and

$$w^* = b + \overline{C} - Ad^{\alpha}\left[d - \frac{1}{b_0}\left(a_0\lambda_0 + b_0 d\right)(1+\alpha)\right] \tag{6}$$

We now turn to some comparative static properties of the exit rate from unemployment, given the system (*S*). This exit rate, noted θ, is defined as the product of the

probability of receiving an offer (λ) and the probability that the offered wage is greater than the reservation wage. It can then be written as :

$$\theta = \gamma(a_0\lambda_0 + b_0 d)[1 - F(w)] \qquad (7)$$

From the total differentiation of (7), the respective effects of λ_0 and d on the offer rate can be found. We then have :

$$\frac{d\theta}{d\lambda_0} = \gamma a_0 (1 - F(w)) + \gamma b_0 (1 - F(w))\frac{dd}{d\lambda_0} - \gamma(a_0\lambda_0 + b_0 d) f(w)\frac{dw^*}{d\lambda_0} \qquad (8)$$

and $$\frac{d\theta}{dd} = \gamma b_0 (1 - F(w)) - \gamma(a_0\lambda_0 + b_0 d) f(w)\frac{dw^*}{dd} \qquad (9)$$

Relating the comparative static properties of (S) system (see appendix 2) to (8) and (9), we then conclude that the two search strategies have ambiguous effects on the exit rate. The equilibrium properties lead also to an indeterminacy in the impacts of exogenous variables, such as the spatial distances, *x* and *y* and the individual search efficiency, γ, on θ (see table 1 in appendix 2).

3 – Data description and the choice of the spatial search area

In order to estimate the structural parameters of the model, we exploit data from the TDE French survey (*Trajectoires des Demandeurs d'Emploi*) conducted by the Research Direction of the Employment Ministry (DARES). It concerns individuals who became unemployed in 1995 and interviewed each year until. Among these people, 60% are less than 35 years old and 75% have a level of education below or equal to the secondary education level. The survey contains information about individual and household characteristics as well as spatial variables. 62% of the people live further than 8 miles from a job area, whereas 70% live near an ALE. Furthermore, 67% own vehicles. Over the survey period, 74% of the job seekers find a job. The median unemployment duration is about 10 months. During this search period, 63% of the inquired individuals have mobilised the ALE (passive search strategy). 80% have adopted an active strategy by extending their job search area beyond the ALE area (*i.e* by moving or by increasing their residence-workplace distance) and then by searching through their network, market methods and private employment agencies.

The existence of a selection bias in the choice of these two job search strategies can be suspected for two reasons. First, it may depend on individual attributes and spatial constraints. Second, the choice of each strategy can be conditioned by the access or not to an alternative one. So, before estimating the structural parameters of the model presented section 1, the choice process of the search strategies is analysed. The use of a bivariate probit model (with heteroscedasticity correction of White, 1982) allows us to test both the selectivity rule and the independence of irrelevant alternatives. We have :

$$\begin{cases} ANPE_i = \beta_{1i} X_{1i} + \varepsilon_{1i} \\ PROSP_i = \beta_{2i} X_{2i} + \varepsilon_{2i} \end{cases}$$

where

- X_1 et X_2 are vectors of explanatory variables, which may influence the decision of searching through the ALE ($ANPE_i$) or the choice of extending the spatial job search area ($PROSP_i$)

- β_1 et β_2 provide the respective effects on X_1 et X_2

- ε_1 et ε_2 are residuals terms with $(\varepsilon_1, \varepsilon_2) \rightarrow N(0,0,1,1,\rho)$

The explanatory variables of the choice of using the passive job search strategy are the following : individual characteristics (gender, nationality, level of education), the quit cause of the previous job, unemployment benefits, the fact of having used the ALE to find the previous job, spatial criteria such as proximity to job area or to an ALE.

In order to explain the active strategy use, we test the effect of individuals characteristics, family composition, active job search methods (network, market methods, and private employment agencies), the cause of job quit, income (getting housing benefits), commuting (to have a car or not) and localisation constraints.

Fur purpose of presentation, the estimation results are provided in Appendix 3 (see table 2).
These results first highlight that the independence of irrelevant alternatives is not rejected. The correlation coefficient between ε_1 and ε_2 is not significantly different from zero. We then conclude that people choose their job search strategy without taking into account the existence of alternative strategies.
We now turn to the interpretation of the impacts of explanatory variables on choices. By reference to university level, having a primary or secondary level of education (DIPLO1 and

DIPLO2) has a positive effect on the recourse to the ALE during the job search. Thus, this result confirms that the less-graduated people are more likely to search through the ALE, especially in France (Adnett, 1987; Lizé, 1997). Besides, the fact of having used the passive strategy to find the previous job (INTPUB) is positively linked with the probability of using this strategy in the present search period. This stresses a relative and individual specialisation in search strategies among search period.

Alternative search methods to the ALE use influence the choice of the active search strategy. Using market methods or private employment agencies (reference : networks) increases the probability to extend the search area. People who search through the first two channels accept implicitly a higher mobility degree.

Finally, we see that spatial constraints affect significantly the search strategies choice. Living near an ALE (variable *x*) increases the probability to have limited the search area to the ALE zone (passive strategy) and reduces the probability of widening the job search area (active strategy). In this case, job seekers have lower transport costs over their job search period. Although the distance to the job area (variable *y*) has no effect on the passive search strategy, it is determinant on the decision to extent the job search area. Moreover our results strengthen some empirical conclusions regarding the *spatial mismatch.* As Van den Berg and Gorter (1997), the higher is the number of children, the lower is the probability to adopt the active search strategy. In fact, it is all the more difficult to accept either longer commuting times as the family is large or as individuals have no car. Furthermore receiving housing benefits has a negative impact on the active search strategy choice.

In sum, unemployed people do not choose randomly their search strategy. Many observable individual characteristics and especially spatial variables explain this choice. Besides, the independence of irrelevant alternatives is not rejected. In order to avoid selectivity bias, estimated probabilities (ANPEp and PROSPp) of using each strategy are computed and introduced as components of the offer rate in the estimation of the structural parameters of the model (Heckman et Robb, 1985).

4. Results and comments

4.1. The method

Because the active and passive search strategies have a theoretical ambiguous effect on exit rate, we estimate the structural parameters of the model defined in section 2. For that purpose, the likelihood function associated to the model must be determined, according to the assumptions made in section 2.1.

As the search environment is stationary, an exponential distribution for individual unemployment duration, t_i, is specified. The right-censored observations are controlled by a dummy variable noted c_i. When people leave unemployment, they can access a long-term job (issue 1), a short-term job (issue 2) or a subsidised job (issue 3). In order to take into account the issues' heterogeneity, we then defined a specific hazard rate for each destination, *m*, ($m = 1,2,3$) and a binary variable, noted d_{mi} and equal to 1 if individuals access the destination *m*. But, the estimation of a competing risks duration model can cause identification problems if too few explanatory factors are continuous (Han, Hausman,1990). In our study, we only have one continuous variable explaining duration : the wages. For purpose of identification and in the line of Lancaster (1990, pp.99-107), we assume that the issues are independent. With this assumption and insofar as exponential hazards are proportional, a likelihood function can be maximised for each destination, considering the other observations as censored.

The theoretical model, as all the job search models, supposes that the offer rate depends only on the search behaviour. To overcome this restrictive hypothesis, we focus the empirical analysis on six different sub-samples defined according to three levels of diploma (DIPL1, DIPL2, DIPL3) and the fact of receiving or not unemployment benefits (INDEM=1 or 0). Many works indeed underline the strong effect of these two factors on unemployment durations (see Meyer (1995) and Devine and Kiefer (1991) for a survey). Beyond observable characteristics, the presence of unobservable heterogeneity terms, v_i, is tested. Adopting a Gamma distribution[1] for the v_i effects, the hazard rate, θ, the density function $f(t)$ and the survivor function $S(t)$ are defined as follows (Greene, 1997, pp.995-996) :

[1] *v* terms are distributed as a Gamma function with mean 1 and variance $\frac{1}{k}$, then $g(v) = \frac{k^k}{\Gamma(k)} e^{-kv} v^{k-1}$

$$\begin{cases} \theta_i = \theta_i \\ f(t_i) = \theta_i \left[1 + \frac{1}{k}\theta_i t_i\right]^{-1} \\ S(t_i) = \left[1 + \frac{1}{k}\theta_i t_i\right]^{-k} \end{cases} \quad (10)$$

where $\frac{1}{k}$ is the Gamma variance

Finally, we suppose that wages are distributed according to a log-logistic function with parameters ξ_1 and ξ_2 . This assumption allows us to test the existence of a threshold in the wages distribution. We then have:

$$F(w_i) = \frac{1}{1 + (\xi_1 w_1)^{1/\xi_2}}$$

If $\xi_2 > 1$, a threshold exists and is equal to:

$$S = \left(\frac{\xi_2 - 1}{\xi_1}\right)^{1/\xi_2}$$

Integrating all these hypothesis, the log-likelihood function related to the *m* issue ($m = 1,2,3$) is then given by:

$$\begin{aligned} \ln L = & \sum_{i=1}^{n} c_i d_{mi} \ln \gamma + c_i d_{mi} \ln \left[a_0 ANPp_i + b_0 PROSPp_i\right] \\ & + \frac{c_i d_{mi}}{\xi_2}\left[\ln(\xi_1 w_i) + \ln(1 + \xi_1 w_i)\right] - (c_i d_{mi} + k + c_i k) \\ & \ln\left[1 + \frac{1}{k}\left[\gamma(a_0 ANPp_i + b_0 PROSPp_i)\left(\frac{(\xi_1 w_i)^{1/\xi_2}}{(1 + \xi_1 w_i)^{1/\xi_2}}\right)\right]\right] \end{aligned} \quad (11)$$

Maximising this function for each issue and each sub-sample ensures to estimate the following coefficients :

- γ the effect of individual search efficiency
- a_0 the impact of the passive search strategy (through public employment service)
- b_0 the effect of the active strategy

- ξ_1 and ξ_2, the parameters of the wages distribution

- $1/k$, the Gamma variance

4.2. Empirical results

The estimation results for the model specified in (11) are reported in table 3. Note first that the Gamma variance is significantly different from zero for only two issues : the long-term jobs access and the subsidies jobs access. It then seems that individual unobservable terms influence the individual duration only for the "extreme" destinations, in terms of job stability.

As expected, the unemployment duration decreases significantly with the individual search efficiency ($\gamma > 0$). But this impact is stronger for high levels of diploma, for stable issues and for people who do not receive unemployment compensations.

Table 3 : Empirical results from Gamma Duration Model

		DIPL1				DIPL2				DIPL3			
		INDEM=1		INDEM=0		INDEM=1		INDEM=0		INDEM=1		INDEM=0	
		Coefficient	T Student	Coefficient	T Student	Coefficient	T Student	Coefficient	T Student	Coefficient	T Student	Coefficient	TStudent
LONG TERM JOBS	a_0	-0.003	-1.99**	-0.006	-2.05**	-0.018	-1.49^{ns}	-0.002	1.52^{ns}	0.012	3.91***	0.021	3.87***
	b_0	-2.087	-2.65***	-2.079	-3.01***	-2.283	-2.73***	-2.301	-2.94***	-2.508	-4.84***	-2.504	-4.81***
	γ	-0.601	-1.97**	-0.662	-2.06**	-0.708	-2.16**	-0.720	-2.12**	-0.852	-2.12**	-0.891	-2.09**
	ξ_1	0.60 E-5	1.89*	0.61 E-5	1.90*	0.56 E-5	2.03**	0.55 E-5	1.98**	0.50 E-5	1.89*	0.49 E-5	1.85*
	ξ_2	1.102	1.94*	1.102	1.93*	1.101	2.02**	1.101	1.99**	1.103	1.91*	1.102	1.90*
	1/k	0.094	2.01**	0.101	1.90*	0.109	1.87*	0.099	1.80*	0.099	1.98**	0.100	2.01**
	S	6900.54		6797.81		7340.03		7461.14		8147.62		8449.34	
	LnL	-662.09		-798.53		-1901.65		-2092.76		-951.32		-1001.67	
	N	482		783		1152		1795		764		802	
SHORT TERM JOBS	a_0	-0.091	-2.21**	-0.089	-2.29**	-0.043	-2.44**	-0.040	-2.37**	-0.015	-2.42**	-0.016	-2.40**
	b_0	-1.504	-2.16**	-1.418	-2.21**	-1.629	-2.10**	-1.638	-2.12**	-1.723	-2.13**	-1.752	-2.18**
	γ	-0.406	-2.81***	-0.421	-2.83***	-0.513	-2.18**	-0.545	-2.14**	-0.576	-1.99**	-0.591	-2.01**
	ξ_1	0.63 E-5	1.90*	0.64 E-5	1.91*	0.60 E-5	1.77*	0.60 E-5	1.84*	0.58 E-5	1.82*	0.59 E-5	1.85*
	ξ_2	1.104	1.92*	1.105	1.93*	1.103	1.91*	1.104	1.91*	1.104	1.95**	1.103	1.94*
	1/k	0.003	1.15^{ns}	0.002	1.19^{ns}	0.027	1.10^{ns}	0.022	1.07^{ns}	0.002	1.12^{ns}	0.005	1.08^{ns}
	S	6612.62		6523.61		6906.27		6911.42		7126.94		7012.32	
	LnL	-671.89		-792.35		-1899.97		-2091.04		-940.96		-939.18	
	N	482		783		1152		1795		764		802	
SUBSIDISED JOBS	a_0	-3.997	-4.98***	-4.009	-4.91***	-1.012	-2.62***	-1.005	-2.59***	-0.201	-2.51***	-0.195	-2.57***
	b_0	-0.006	-2.01**	-0.004	-2.00**	-0.367	-1.97**	-0.370	-1.96**	-0.621	-2.04**	-0.618	-2.08**
	γ	-0.056	-2.09**	-0.081	-2.11**	-0.099	-2.03**	-0.157	-2.01**	-0.186	-1.97**	-0.201	-2.13**
	ξ_1	0.91 E-5	1.91*	0.92 E-5	1.90*	0.77 E-5	1.89*	0.76 E-5	1.90*	0.71 E-5	1.88*	0.70 E-5	1.91*
	ξ_2	1.110	1.93*	1.109	1.92*	1.108	1.90*	1.109	1.92*	1.107	1.85*	1.106	1.94*
	1/k	0.211	2.68***	0.231	2.59***	0.194	2.75***	0.190	2.69***	0.105	2.45**	0.112	2.51***
	S	4762.05		4712.53		5529.93		5598.52		5946.72		6019.68	
	LnL	-672.99		-801.18		-1902.06		-2100.09		-902.83		-912.01	
	N	482		783		1152		1795		764		802	

with : *** : significant at 1%; ** : significant at 5%; * : significant at 10%; ns : non significant

NB1 : 0.60 E-5 = 0.0000060 NB2 : *S* = threshold in wages distribution

We also see that $\xi_2 > 1$ for all issues and sub-samples. This indicates that the offered wages distribution is not monotonically increasing. In the opposite, this distribution is increasing only until a threshold, *S*, and then it is decreasing. The threshold values can be computed for each sub-sample. This emphases that a relative hierarchy in wage thresholds exist according to issues after unemployment. Indeed, thresholds are positively related with the stability of the job found. For example, for low graduated people (DIPL1) who do not receive unemployment insurance, the estimated threshold is 31% higher when these people access to a full-term job than to a public measure. This result confirms that large wage disparities exist according to the type of labour contract found.

The main contribution of the microeconometric results concerns the estimation of the two search strategies impacts, taking into account their selectivity rule. Indeed, estimations allows us to overcome the theoretical ambiguity concerning coefficients a_0 and b_0. Note first that the unemployment benefits have no impact on the relative efficiency of the two strategies.

We see that the individual choice between active and passive search strategies, this choice being correlated with individual attributes but not with context (see section 3), has a strong effect on the individual duration and also on the job quality. Indeed, searching through the public service (passive strategy) and thus limiting the search area to the ALE zone is more efficient for low graduated people accessing a subsidised job. But, for the highest level of diploma and the access to long-term job, this strategy has a positive impact on duration. This result can be related to the specialisation of the French public employment agencies in two fields : the public measure access and the assistance for low-graduated people.

At the same time, the alternative search strategy which consists in extending the search area using others search methods than the ALE decreases the unemployment duration, whatever the job found or the sub-sample studied. For all the unemployed people the search beyond the public employment agency area always beneficial. Despite higher search costs, this strategy then increases the offer rate and accelerate the exit from unemployment. This strategy seems even to be more efficient for high-graduated people accessing a full-term or a short-term job.

5 – Conclusion

This paper proposes a job search model where both spatial search area and reservation wage are assumed to be endogenous. As the equilibrium properties lead to an ambiguous

effect of the spatial search area on the exit rate from unemployment, the structural parameters of the model are estimated. We exploit data from a French survey called *Trajectoires des Demandeurs d'Emploi* (TDE) conducted by Research Direction of Employment Ministry (DARES). The estimation of the search area choice by a bivariate probit model allow us to test the selectivity rule and the independence of irrelevant alternatives hypothesis.

Moreover, our specification assumptions allow us to treat both individual and unobservable heterogeneity and the multiple destinations after unemployment. Three independent issues are analysed : long-term jobs, short-term jobs and subsidised jobs. Besides, estimations are carried out on sub-samples in which individuals are homogenous according to their level of diploma and their situation towards the unemployment insurance.

First, the econometric results show that the job seeker's trade off between the two strategies is independent of the context but strongly determined by individual attributes and spatial constraints. Second, their choice has a strong impact on the job quality. Thus, the passive strategy (ALE) is more efficient for low-graduated people accessing a subsidised job. However, the active strategy (extending the job search area using others search methods than the ALE) is more efficient for high-graduated individuals accessing a full-term or a short-term job. We then conclude that the spatial constraints play an important role in the exit form unemployment.

Appendix 1 : Equilibrium solutions (*w, *d**) from system S**

From (S) we can write that :

$$d^*=\left[\frac{\gamma b_0}{rA(1+\alpha)}H(w)\right]^{\frac{1}{\alpha}} \qquad (5)$$

and

$$w^* = b + \overline{C} - Ad^{\alpha}\left[d - \frac{1}{b_0}\left(a_0\lambda_0 + b_0 d\right)(1+\alpha)\right] \qquad (6)$$

According to first and second order conditions from (6) we have :

$$\frac{\partial w^*}{\partial d}=A\alpha(1+\alpha)d^{\alpha-1}\left[\frac{a_0}{b_0}\lambda_0+d\right]>0$$

$$\frac{\partial^2 w^*}{\partial d^2}=A\alpha(1+\alpha)d^{\alpha-2}\left[\alpha d-(1-\alpha)\frac{a_0}{b_0}\lambda_0\right]$$

$$\frac{\partial^2 w^*}{\partial d^2}=0\Leftrightarrow d=\hat{d}=\frac{a_0\lambda_0(1-\alpha)}{b_0\alpha}$$

$$\frac{\partial^2 w^*}{\partial d^2}>0\Leftrightarrow d>\hat{d} \qquad \text{and} \qquad \frac{\partial^2 w^*}{\partial d^2}<0\Leftrightarrow d<\hat{d}$$

Where $\hat{d}$ is a threshold value of the spatial search distance corresponding to the inflexion point of the reservation wage function. So from (5) we obtain:

$$\frac{\partial d^*}{\partial w}=-\frac{Z}{\alpha}[H(w)]^{\frac{1-\alpha}{\alpha}}[1-F(w)]<0$$

$$\begin{cases}\lim d^*=0\\ w\to\infty\end{cases}$$

So : $$\frac{\partial^2 d^*}{\partial w^2}=\frac{Z}{\alpha}[H(w)]^{\frac{1-2\alpha}{\alpha}}\left\{H(w)f(w)-[1-F(w)]\frac{(1-\alpha)}{\alpha}\right\}>0$$

with : $$Z=\left[\frac{\gamma b_0}{rA(1+\alpha)}\right]^{\frac{1}{\alpha}}$$

Under these conditions, the S system admits a unique solution (*w**, *d**).

Appendix 2 : Comparative static results

$$\frac{dw}{d\gamma}=\frac{r.C'_R(d).\left[\frac{a_0}{b_0}\lambda_0+d\right]}{\gamma\left[\gamma a_0[1-F(w)]\left[\frac{a_0}{b_0}\lambda_0+d\right]+r\right]}>0 \quad ; \quad \frac{dd}{d\gamma}=\frac{r.C'_R(d)}{\gamma.C''_R(d).\left[\gamma b_0[1-F(w)]\left[\frac{a_0}{b_0}\lambda_0+d\right]+r\right]}>0$$

$$\frac{dw}{d\lambda_0}=\frac{r\frac{a_0}{b_0}.C'_R(d)}{\left[\gamma b_0[1-F(w)]\left[\frac{a_0}{b_0}\lambda_0+d\right]+r\right]}>0 \quad ; \quad \frac{dd}{d\lambda_0}=\frac{-\gamma[1-F(w)]a_0C'_R(d)}{C''_R(d).\left[\gamma b_0[1-F(w)]\left[\frac{a_0}{b_0}\lambda_0+d\right]+r\right]}<0$$

$\frac{d\theta}{dx}=\frac{d\theta}{d\lambda_0}.\frac{d\lambda_0}{dx}$ and $\frac{d\theta}{dy}=\frac{d\theta}{d\lambda_0}.\frac{d\lambda_0}{dy}$ with $\frac{d\lambda_0}{dx}<0$ and $\frac{d\lambda_0}{dy}<0$

Parameters

	γ	X	Y
Exit rate (θ)	+ -	+ -	+ -

Table 1 : Equilibrium comparative static properties of the model

Appendix 3 : The bivariate probit estimation results

Table 2 : Choice Determinants of the search area

	Coefficients	T-ratio
Passive Strategy : ANPE		
Constant	0.047	0.31ns
FEMALE : female	0.111	1.91*
FRANC : French nationality	-0.246	-2.4**
DIPLO1 : primary education level	0.145	1.72*
DIPLO2 : secondary education level	0.210	3.03***
DIPLO3 : university education level	réf.	
DEMIS : quit last job	0.055	0.60ns
LICEN: layoff	réf.	
INDEMCHO : receiving unemployment benefits	0.023	0.35ns
CENTRE1 : living less than 8 miles from a job area	réf.	
CENTRE2 : living between 8 and 25 miles from a job area	0.034	0.33ns
CENTRE3 : living further than 25 miles from a job area	0.110	1.04ns
INTPUB : former job found through the ALE	0.608	6.12***
ANP1 : living less than 2 miles from an ALE	0.199	3.10***
ANP2 : living further than 2 miles from a ALE	réf.	
Job Area :	-0.086	-0.77ns
POISSY	-0.036	-0.34ns
CERGY	ref.	
MANTES	-0.113	-0.93ns
AIX	0.096	0.62ns
MARSEILLE	ref.	
ETANG	0.283	2.80***
LENS	ref.	
ROUBAIX		
Active strategy : PROSP		
Constant	0.704	3.54***
FEMALE : female	-0.097	-1.46 ns
FRANC : French nationality	-0.118	-1.01 ns
ENFANT : having children	-0.131	-1.68*
PROMAR : market methods	0.208	2.25**
ECOCON : entrance examination	0.102	0.46 ns
INTERI : private employment agencies	0.229	2.85***
RESEAU : social and professional network	réf.	
ALLOCLOG : receiving housing benefits	-0.203	-2.97***
CENTRE1 : living less than 8 miles from a job area	réf.	
CENTRE2 : living between 8 and 25 miles from a job area	0.246	2.16**
CENTRE3 : living further than 25 miles from a job area	0.342	2.92***
ANP1 : living less than 2 miles from an ALE	-0.274	-3.54***
ANP2 : living further than 2 miles from an ALE	réf.	
AUTO : having a car	0.164	2.23**
Job area :	0.238	1.80*
POISSY	0.425	3.22***
CERGY	ref.	
MANTES	-0.283	-2.16**
AIX	0.048	0.27 ns
MARSEILLE	ref.	
ETANG	0.290	2.73***
LENS	ref.	
ROUBAIX		
ρ	-0.0091	-0.22 ns
Log-likelihood	-2278.75	
Number of observations	2022	

with : *** : significant at 1%; ** : significant at 5%; * : significant at 10%; ns : non significant

References

Adnett N. J., (1987), "State Employment Agencies and Labour Market Efficiency", *Journal of Developpement Economics*, Vol.12, pp.327-340.

Burdett K. and D.T. Mortensen, (1978), "Labor Supply under Uncertainty", *Research in Labor Economics*, 2, pp.109-158.

Devine T. and Kiefer N. (1991), Empirical Labor Economics : the Search Approach, Oxford University Press, New-York, pp.343.

Dormont B., Fougère D., A. Prieto, (2001), "L'effet de l'allocation unique dégressive sur la reprise d'emploi ", *Economie et Statistique* N° 343, vol. 3 pp. 3-28.

Fougère D., Pradel J. and Roger M., (1996), "Intensité de recherche d'emploi et taux de sortie du chômage : une analyse économétrique sur données individuelles", *13èmes Journées de Micro-économie Appliquée*.

Gardner J., Pierre G. and A. Oswald (2001), Moving for Job Reasons, W.P. University of Warwick, september

Greene W., (1997), *Econometric Analysis*, 3rd Edition, Prentice Hall.

Han A., J.A. Hausman, (1990), "Flexible Parametric Estimation of Duration and Competing Risk Models", *Journal of Applied Econometrics*, Vol.5, pp.1-28.

Heckman J.J., R.J. Robb, 1985, "Alternative Methods for Evaluating the Impact of Interventions : An Overview, *Journal of Econometrics*, Vol.30, n°1-2, pp.239-267.

Holzer H.J., Ihlandfeld K.R. and Sjoquist D.L., (1994), Work, Search and Travel among White and Black Youth, *Journal of Urban Economics*, 35, pp. 320-345.

Kain J., (1992), The spatial mismatch hypothesis three decades later, *Housing Policy Debate*, 3, pp. 371-462.

Lancaster T., (1990), The Econometric Analysis of Transition Data, Econometric Society Monographs, New York, Cambridge University Press.

Lizé L., (1997), "L'ANPE comme Intermédiaire sur le Marché du Travail", *Les Intermédiaires de l'Insertion*, Cahiers du CEE, n°36, pp.183-233.

Meyer B.D., (1995), "Lessons from the US Unemployment Insurance Experiments", *Journal of Economic Literature*, Vol.XXXIII, pp.91-131.

Mortensen D.T., (1986), Job search and labor market analysis, in Ashenfelter O. and Layard R. (ed.), *Handbook of Labor Economics*, Chap. 15, vol.2.

Nickell S. (1998),Unemployment : Questions and Some Answers, *The Economic Journal*, vol. 108, Mai, pp. 802-816

Oswald A. (1997a), The Missing Piece of the Unemployment Puzzle, W.P. University of Warwick, novembre.

Oswald A. (1997b), Theory of Homes and Jobs, W.P. University of Warwick

Rogers C.L., (1997), Job search and unemployment duration: Implications for the spatial mismatch hypothesis, *Journal of Urban Economics*, 42, pp. 109-132.

Van Den Berg G.J. and Gorter C., (1997), Job Search and Commuting Time, *Journal of Business and Economics Statistics*, 15 (2), pp. 269-281.

White H., (1982), "Maximum Likelihood Estimation of Misspecified Models", *Econometrica*, n°53, pp.1-6.