Endogenous Location and Commuting Choice in a Labour-Market Search Model

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March 2006

Abstract
The purpose of this paper is to investigate how the geographical mobility on the labour market could be improved for workers. The problem is twofold, since mobility gains can be obtained through both commuting and migration. A partial two-region labour-market search model is established in which unemployed workers maximise their optimal search strategy which includes the decision of where to search for a job and importantly commuting and migration decisions. The workers are heterogeneous with respect to preference for leisure and place utility. In a setting with identical regions three main findings are found: A) Economic recession leads to higher mobility. More workers are willing to commute to other regions, but the effect on migration is ambiguous. B) Interregional transport-cost and interregional commuting-time reductions improve the overall mobility, but reduce the migration between regions. C) Increasing wage/unemployment benefit ratio increases mobility via two effects. Firstly, workers tend to accept interregional commuting costs and migration, because work yields higher payoff. Secondly, in contrast to finding A) and B), some workers who did not search for a job at all now enter an active search strategy. When leaving the identical region setup and acknowledging the spatial dimension of mobility, more effects enter and results are not so clear. Economic recession in one region still tends to impose mobility for workers in this region, but it will reduce mobility in the other region. Mobility gains are still obtained if the interregional transport cost is reduced, and it still results in increasing interregional commuting and less migration. Higher wages in only one region yield ambiguous mobility in this region, but tend to increase mobility from other regions – leaving the overall mobility ambiguous.

JEL classification: J6, R13

Key words: Labour mobility, commuting behaviour, work-related migration, job search.

1 Introduction

In this paper geographical mobility is defined by the workers' willingness to search for a job in other regions. Geographical mobility can be improved via migration and commuting. Improvements in geographical mobility are desirable because economic growth can be increased and unemployment can be reduced. Commuting has increased overall in the last decades (Andersen (1999) finds a 25% increase in the commuting distances in Denmark), but it may slow down a bit in the future because of increasing congestion problems. Migration has not experienced the same increase as commuting, and work-related migration is not the main source of the total migration. 10-20% of the total migration is work-related migration. In the United States, Schachter (2001) finds that 16.2% of the total migration in the years 1999-2000 was primarily work-related, and other surveys find figures from 9.8% in Denmark (Christensen et al. (1987)) and 18.2% in the Scandinavian countries (Nordisk Ministerråd (2002)), where the multiple reasons for migration were allowed in the latter survey. This paper only deals with work-related migration.

Eliasson et al. (2003) examine empirically the relationship between commuting and migration. They find that unemployment increases the likelihood of mobility as well as migration. This paper provides a theoretical foundation in which unemployed workers choose commuting or migration. The theoretical results in this paper are in line with Eliasson et al. (2003) who also find that better accessibility (lower transport cost) to surrounding regions significantly increases the likelihood of choosing commuting as the mobility mode.

This paper focuses on the choices of the unemployed workers and their choices of labour-market searches and choices of where to live. When employed, the worker is assumed to keep his/her job and not move residence. Missing on-the-job search has led to criticism of search theory, see for instance Tobin (1972), because most job acceptances are by workers who are employed. Theoretical models of on-the-job search are later analysed by for example Burdett (1978), Mortensen (1994) and Pissarides (2000). No on-the-job search is just one simplification of the workers described in this paper. Two-earner households, level of education, level of skills, retirement and new entry of workers, and car ownership may also be possible extensions. A more disaggregated description of workers would improve the evaluation of the distributional consequences of the model. However, the overall geographical mobility results of this paper do not rely on the chosen level of aggregation.

The starting point of the labour-market search model is developed by Pilegaard (2003), who builds upon the work of Pissarides (2000). This paper adds the dimension of migration and looks closer at mobility questions in connection with the model. Unemployed workers maximise expected lifetime utility which includes both expected job and unemployment spell. It is possible to search for a job in zero, one or two regions and expected unemployment falls with the search intensity, since it is more likely to get a job if the unemployed workers search in more regions. Mobility is improved if workers choose to search for a job in more regions, and does therefore also include unemployed workers, who shift their search strategy from zero regions (non-active) to an active search strategy. The workers are heterogeneous with respect to preference for leisure and the utility they obtain of living in a specific region (place utility). Because of the heterogeneity the optimal search strategies differ for the workers. Unemployed workers who choose maximal job search intensity (search in both regions) also decide whether or not commuting or migration is preferable.

It is assumed that workers like leisure, and unemployed workers enjoy more leisure which may lead to that the unemployed workers with higher preference for leisure will not search at all. McFadyen and Thomas (1997) point out insights and theory from social psychology which incorporates non-monetary duration dependency on search behaviour. These themes are very relevant when long-time unemployment is analysed and may lead to that the value of leisure is lower for the unemployed than for the employed. This should be kept in mind, when results are evaluated.

Van Ommeren et al. (2004) develop a multiregional equilibrium search model and investigate the effects of infrastructure improvement. They find that intraregional infrastructure improvement will decrease local and national unemployment, but adverse effects may be experienced in adjacent regions. This is comparable with a wage increase in a region since both higher regional wage and lower intraregional transport make it more favourable to search in the region which experiences the improved conditions. However, the results in this paper cannot support the clear result in van Ommeren et al. (2004). The reason is that improved conditions in a specific region also lower the search intensity of workers who beforehand were willing to search in more regions. But an additional effect in this paper is in line with the results of van Ommeren et al. (2004). In this paper workers can choose not to search actively for a job, and when regional wage or intraregional transport cost decreases some workers will begin the job search in the region and hereby lower the unemployment.

Larsen et al. (2006) also examine the relationship of transport cost in a multiregional setting. They find together with van Ommeren et al. (2004) that lower interregional transport cost tends to decrease unemployment. The model developed in this paper supports this finding, but the result relies on two aspects. Firstly, the cost of lowering interregional transport cost is not defined and will of course depend on the specific projects considered. Secondly, the distinction between intra- and interregional transport cost is seldom fully independent. If a road is built between two regions it could result in both lower intra- and interregional transport cost since the road also improves the intraregional transport cost. However, pure examples of interregional infrastructure improvement exist, if for instance a bridge or road is built between two regions, which cannot be used intraregionally.

Van Ommeren et al. (1997) find that workers who receive more job offers commute less. Their result is obtained in the theoretical search model with non-specific regions and in an empirical analysis. Their result is supported in this paper with identical regions. However, with more job offers in one region only the theoretical result is ambiguous because workers from other regions will tend to commute more.

Compared to the above-mentioned papers this paper only considers the labour market. Furthermore, the job openings, wages, unemployment benefits, transport costs, and commuting time costs are exogenously determined. This assumption leaves out many feedback mechanisms which could be essential in applied work, but the purpose of this paper is to consider mobility from a theoretical point of view.

Migration can only take place if the unemployed finds a job in the other region or if the unemployed worker voluntarily wants to stay unemployed and is better off as unemployed in the other region. These simplifications are made to prevent unrealistic speculation in regional housing, and the simplifications can be justified by moving costs and the fact that empirical data tell that people more often change job than residence. Moving costs are not explicitly included in the paper. This also

covers the case where a layoff comes unexpected and there is no time to change residence in the same period.

The outline of this paper is as follow: Section 2 describes the two-region labour-market search model, and the search strategies are defined. In section 3 identical regions are considered, and effects on mobility are examined. Section 4 examines regional effects, and section 5 concludes this paper.

2 The regional labour market

In the regional labour-market search model the unemployed workers choose in which regions they want to search for a job. The possibility to achieve a job in a given region depends on the supply of vacancies and the total demand from job seekers in the region. In this paper the focus is on the demand side of the job market and the supply side is exogenously given.

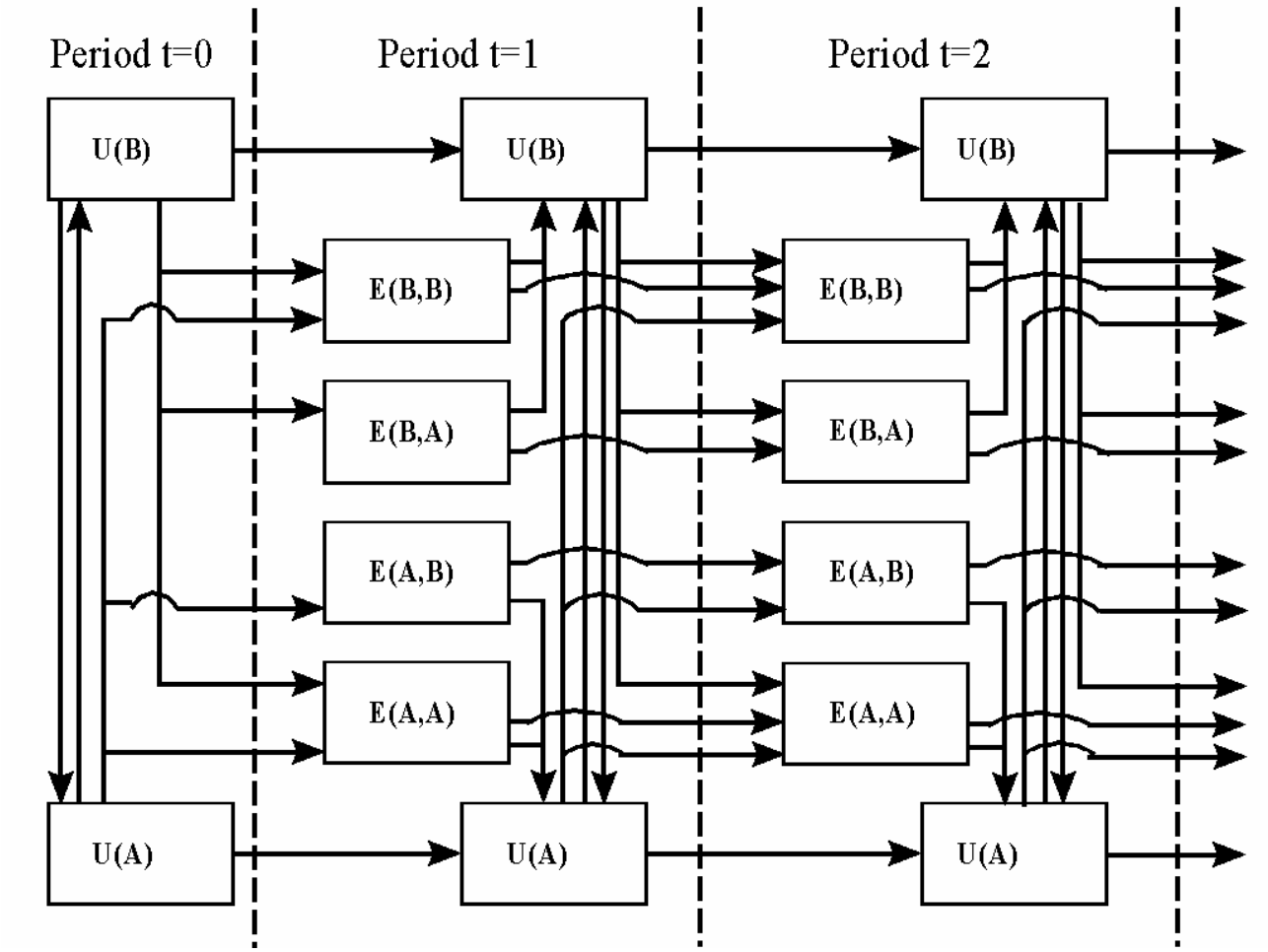

Figure 2.1. The labour market flows

Figure 2.1 illustrates the dynamics of the regional labour market. There are two regions *A* and *B*. $r \in \{A,B\}$ denotes place of residence whereas $s \in \{A,B\}$ denotes place of work. The labour force consists of unemployed workers *U(r)* and employed workers *E(r,s)*. In period *t=0* an unemployed

worker in region *A*, *U(A)*, has to make a decision about, where to search for a job and where to live. There are five possible results of the labour-market search of the unemployed worker: 1) *E(A,A)*: He gets a job in region *A*. 2) *E(B,B)*: He gets a job in region *B* and moves to region *B*. 3) *E(A,B)*: He gets a job in region *B* and becomes a commuter with residence in *A*. 4) *U(A)*: He gets no job and stays in region A. 5) *U(B)*: He gets no job and moves to region B.

As discussed in the introduction, employed workers do not look for another job or another region. Every period a share of the workers is separated from their job, and this share (separation rate) is exogenously given.

In the underlying search model formulated by Pissarides (2000) the search activity is costly for both firms and workers. Resources are used before job creation and production can take place. Vacant jobs and unemployed workers are matched according to the matching technology in the region. For simplification, the underlying endogenous matching process described in Pissarides is ignored. Exogenous probabilities to be matched are introduced and defined as ω_r. This implies that there are no feedback effects of changes in the number of job candidates. This feedback effect results in that an increase in the number of job candidates would lower the probabilities to be matched. Ignoring this feedback effect does not affect the overall results in this paper, but it would be important to measure if welfare analyses were to be carried out.

The size of the labour force is fixed. Workers are homogeneous from the firm's point of view, but workers differ with respect to preferences for leisure and residential location.

In this paper there are two definitions of utilities. *Flow utility* which is obtained in each period and *lifetime utility* which is the sum of all the discounted flow utilities for a worker. The regional flow utility in region *r* at time *t* is defined as:

$$U_{r,t} = f\left(C_{r,t}\right) + \nu F_r^L + \mu R_r \tag{1.1}$$

where $f\left(C_{r,t}\right)$ is the consumption function. All income is spent on consumption in the period it is collected. This is only a minor assumption, but it could be relevant if a mobility gain implies economic growth which would change savings considerably. ν is the parameter of leisure, and μ is the parameter of living in a region. Every worker is assigned a ν and a μ which are both uniformly distributed between zero and one. It is assumed that ν and μ are independent. The net utility of living in a region is R_r. It is a net utility where the utility of living in the least preferred region is defined as zero. The exogenous amount of leisure F_r^L is defined:

$$F_r^L = \begin{cases} F_{r,s}^E & \text{if an employed worker} \\ F^U & \text{if an unemployed worker} \end{cases} \tag{1.2}$$

where $F^U > F_{r,r}^E > F_{r,s\neq r}^E$ which means that the unemployed worker has more leisure than the employed worker who works and lives in the same region, and the employed worker who commutes between the two regions has least leisure.

It is assumed that workers spend all income in a given time period on consumption. The income depends on the labour-market status of the worker; $I^U_{r,t}$ for the unemployed worker and $I^E_{r,s,t}$ for the employed worker, where $I^U_{r,t} < I^E_{r,s,t}$.

Lifetime utility incorporates the sum of the expected flow utilities in different regions over time. The lifetime utility at period *t* can be defined as the flow utility which is obtained at the end of the period plus the expected utilities that are obtained in future periods. The following notation is used. *V* is the lifetime utility and superscript indicates an unemployed worker (*U*) or an employed worker (*E*) and subscripts indicate place of residence (*r*), place of work (*s*) (if not an unemployed worker), the search strategy (*l*) and period *t*. The search strategy is a combination of where to search for a job and where to locate.

The unemployed workers choose the search strategy which maximizes lifetime utility. The unemployed workers can choose not to search for a job, if the gain of working is not high enough. The strategy not to search for a job is named unemployment search strategy (US_r) and it also includes a decision on where to live, which the subscript *r* indicates. Using the residential search strategy (RS_r) the unemployed worker only searches in the region in which he lives. If the regions are not identical, it could be the outcome to choose a non-residential search strategy (NS_r), where the unemployed worker lives in region *r*, but only searches for a job in region *s*. If the unemployed worker searches in both regions, he could either choose commuting search strategy (CS_r) or moving search strategy (MS_r). This is five search strategies in each region analysed in this paper. By restricting the possibility of migration to be only in connection with a new job or the search strategy US_r, then other search strategies are ruled out, such as always living in region *r* when unemployed, but in region *s* when employed. This latter example may be relevant if there was utility of living next to workers of the same kind (employed/unemployed). Other externalities among households could also make seemingly unrealistic search behaviour to be very relevant. Kanemoto (1987) emphasises that especially in the United States racial problems are analysed in context of spatial externalities.

An unemployed worker who does not want to change his place of residence because of high preferences for the location and who is only searching for a job in the region in which he lives because of high preferences for leisure, has the following lifetime utility ($V^U_{r,l=RS,t}$):

$$(1+\delta)V^U_{r,l=RS,t} = U^U_{r,t} + \omega_r\left(V^E_{r,r,l=RS,t+1}\right) + (1-\omega_r)V^U_{r,l=RS,t+1} \tag{1.3}$$

where $\delta \geq 0$ is the discount factor, $U^U_{r,t}$ is the flow utility of an unemployed worker, and $V^E_{r,r,l=RS,t+1}$ is the lifetime utility of an employed worker in period *t+1* who lives in region *r*, works in region *r*, and chooses the search strategy $l = RS$, when he becomes unemployed.

An employed worker with the same strategy has the following lifetime utility:

$$(1+\delta)V^E_{r,r,l=RS,t} = U^E_{r,r,t} + \lambda_r\left(V^U_{r,l=RS,t+1}\right) + (1-\lambda_r)V^E_{r,r,l=RS,t+1} \tag{1.4}$$

The employed worker obtains flow utility at the end of the period. The separation rate, λ, determines the probability of staying employed in the next period.

Substituting equation (1.4) into (1.3) and using the fact that in steady state *t=t+1=t+2=...* yields:

$$V_{r,l=RS}^{U} = \frac{1}{\delta(1+\beta_r)}\left(U_r^U + \beta_r U_{r,r}^E\right) \tag{1.5}$$

where $\beta_r = \frac{\omega_r}{\delta + \lambda_r}$. β_r expresses the relationship between getting a job and being laid off. If the possibility of getting a job is increasing then it becomes relatively more important what the utility of being employed is. If the separation rate is increasing then it becomes relatively more important what the utility of being an unemployed worker is.

An unemployed worker with sufficiently low preferences for leisure and sufficiently high preferences for place of residence will search for a job in both regions, but he will not change his place of residence. In steady state, an unemployed worker who searches in both regions, but always stays in the home region, has the following lifetime utility:

$$V_{r,l=CS}^{U} = \frac{1}{\delta(1+\beta_r+\beta_s)}\left(U_r^U + \beta_r U_{r,r}^E + \beta_s U_{r,s}^E\right) \tag{1.6}$$

The equation is similar to equation (1.5), but the flow utility obtained when working in the other region is also present. The β's indicate the chance of being in the three labour-market states: Unemployment, employed worker in place of residence, or employed worker commuting to the other region.

If the unemployed worker searches in both regions and moves to the region where he gets a job, then he has the following lifetime utility in steady state:

$$V_{r,l=MS}^{U} = \frac{1}{\delta(1+\beta_r+\beta_s)}\left(\left(1-\hat{\gamma}_r\right)U_r^U + \hat{\gamma}_r U_s^U + \beta_r U_{r,r}^E + \beta_s U_{s,s}^E\right) \tag{1.7}$$

where $\hat{\gamma}_r = \frac{\lambda_s \beta_s}{\delta + \omega_r + \omega_s}$. There are four flow utilities weighted by the possibilities of being in one of the four labour-market states. If the probability of getting a job in the place of residence is increasing then the flow utility of being an employed worker in the place of residence becomes relatively more important. Regarding the flow utility of being an unemployed worker, there are two effects if the probability of getting a job increases in the home region. First, the flow utility of being an unemployed worker becomes relatively less important because the worker is more likely to be employed. Second, the flow utility of being an unemployed worker in region *r* becomes relatively more important compared to the flow utility of being unemployed in region *s* because the worker is more likely to be employed in region *r*.

If the unemployed worker has high preference for place of residence, but the other region offers sufficiently better workplace conditions then the unemployed worker chooses the search strategy NS_r and the worker will then have the following lifetime utility:

$$V_{r,l=NS}^{U} = \frac{1}{\delta(1+\beta_s)}\left(U_r^U + \beta_s U_{r,s}^E\right) \tag{1.8}$$

If the regions and labour market are identical this strategy is not optimal compared to the search strategy RS_r, because of commuting and leisure costs.

Finally, some unemployed workers may choose not to search at all, when the increased income as employed does not cover the leisure lost. The lifetime utility will then be:

$$V_{r,l=US}^{U} = \frac{1}{\delta} U_r^U \tag{1.9}$$

The workers are heterogeneous and therefore different search strategies can be optimal. Workers differ with respect to preference and leisure, represented by the values of the two parameters *v* and μ. When comparing the strategies it is possible to find the marginal values of *v* and μ which characterise the marginal worker who is indifferent among some strategies. The strategies are compared two at a time and marginal conditions are obtained.

If the preference for living in a region is sufficiently high the worker would always locate in that region. When an unemployed worker does not want to choose US_r, the choice for the unemployed worker is whether or not to search for a job in the other region. The marginal condition is independent of the value of μ. The problem is solved as follows:

$$V_{r,l=RS}^{U} = V_{r,l=CS}^{U}$$

$$\Leftrightarrow$$

$$\nu_r^{*1} = \frac{(1+\beta_r) I_{r,s}^E - I_r^U - \beta_r I_{r,r}^E}{-(1+\beta_r) F_{r,s}^E + F^U + \beta_r F_{r,r}^E} \tag{1.10}$$

where ν_r^{*1} is the marginal value of *v* where a worker is indifferent between searching in the other region or not. If ν_r^{*1} is increasing then more workers will also search for a job in the other region. ν_r^{*1} depends positively on income from the other region and depends negatively on residential income as unemployed or employed. The negative dependence on income as unemployed occurs since the worker spends more time as unemployed when search strategy RS_r is chosen. Furthermore, the amount of leisure also matters. For instance, if a new road is built between the two regions it could result in more leisure for the commuting workers between the two regions. Other things being equal ν_r^{*1} will increase in this case.

The strategies, search in both regions and move to the region where the worker gets a job, and search in the home region, are also compared to find the marginal values of ν and μ:

$$V_{r,l=RS}^{U} = V_{r,l=MS}^{U}$$

$$\Leftrightarrow$$

$$\mu_r^{*2} = \frac{1+\beta_r}{R_r\left(\beta_s + \hat{\gamma}_r\right)} \left(\begin{array}{c} \left(I_{s,s}^E - I_r^U\right)\beta_s + \left(I_{s,s}^E - I_{r,r}^E\right)\beta_r\beta_s + \left(I_s^U - I_r^U\right)\hat{\gamma}_r\left(1+\beta_r\right) \\ + \left(\left(F_{s,s}^E - F^U\right)\beta_s + \left(F_{s,s}^E - F_{r,r}^E\right)\beta_r\beta_s\right)\nu_r^{*2} \end{array} \right) \tag{1.11}$$

where μ_r^{*2} and ν_r^{*2} are the two marginal values where a marginal worker is indifferent between the strategies RS_r and MS_r. If the amount of leisure is equal for an employed worker in the two regions ($F_{r,r}^E = F_{s,s}^E$), then μ_r^{*2} depends negatively on ν_r^{*2} because $F^U > F_{s,s}^E$. Since $I_{s,s}^E > I_r^U$ the

marginal value tends to be above zero given sufficiently small regional differences in I^E and I^U which illustrates that workers with no or little preferences for leisure would like to search in two regions because it tends to yield more income. One disadvantage of MS_r is the lower place of residence utility R_r, which affects workers towards the search strategy RS_r.

When unemployed workers are sufficiently better off as employed, the search strategy choice is between MS_r and CS_r, which is the choice of less leisure as interregional commuter versus less place of residence utility as mover. The marginal workers can be calculated as:

$$V^U_{r,l=CS} = V^U_{r,l=MS}$$
$$\Leftrightarrow$$
$$\mu_r^{*3} = \frac{1}{R_r\left(\beta_s + \hat{\gamma}_r\right)}\left(\left(I^E_{s,s} - I^E_{r,s}\right)\beta_s + \left(I^U_s - I^U_r\right)\hat{\gamma}_r + \left(F^E_{s,s} - F^E_{r,s}\right)\beta_s \nu_r^{*3}\right) \tag{1.12}$$

where μ_r^{*3} and ν_r^{*3} are the two values where the marginal worker is indifferent. μ_r^{*3} depends positively on ν_r^{*3} because $F^E_{s,s} > F^E_{r,s}$. With sufficiently similar regions and low preference of leisure μ_r^{*3} tends to be positive because $I^E_{r,s}$ typically includes interregional commuting costs.

The choice between the two search strategies US_r and RS_r illustrates the payoff of being employed. The two search strategies ensure place of residence in region *r* and therefore the preference for place of residence will not enter the marginal condition of the two strategies ν_r^{*4}, as shown:

$$V^U_{r,l=US} = V^U_{r,l=RS}$$
$$\Leftrightarrow$$
$$\nu_r^{*4} = \frac{I^E_{r,r} - I^U_r}{F^U - F^E_{r,r}} \tag{1.13}$$

ν_r^{*4} is positive and if $I^E_{r,r} - I^U_r > F^U - F^E_{r,r}$ then $\nu_r^{*4} > 1$ which implies that no unemployed worker chooses US_r since ν is normalised to be between zero and one. The interpretation is straightforward that the income must cover the loss of leisure if RS_r is preferred to US_r.

Several search strategy states exist in equilibrium. First, the basic characteristics of steady state equilibrium are described in section 3, whereas spatial effects will be described in section 4.

3. Basic effects with identical regions

To describe basic effects identical regions are assumed. In this case the search strategy NS_r is not optimal. Furthermore, only workers with preference of living in region *r* are considered, since the regional effects with identical regions are the same. It is assumed that there are some workers choosing the rest of the four search strategies.

The marginal conditions of the strategies are illustrated in figure 3.1. *1, *2, *3 and *4 are the four marginal conditions and they refer to the four lines described in section 2. Furthermore, it is assumed that $I^E_{r,r} - I^U_r < F^U - F^E_{r,r}$, which implies that *US* is an optimal strategy for workers with sufficiently high preference for leisure. It is also assumed that *4 is greater than *1 which implies that there are workers who choose *RS* . Then for workers for whom it is not optimal to choose *US* , combinations of ν and μ exist which are sufficiently high, such that *RS* is the optimal strategy. If ν is sufficiently low and μ sufficiently high then *CS* is the optimal strategy. Finally, when μ and ν are sufficiently low then the optimal strategy is *MS* .

As noted above *1 and *4 are independent of μ and therefore *1 and *4 are vertical in figure 3.1. *3 has a positive slope, and with identical regions *2 has a negative slope. The interpretation of a negative slope of *2 is that given μ leisure becomes more and more important as ν increases and when the worker searches for job in one region, only he is more frequently unemployed with more leisure. *3 has a positive slope because it is time-consuming to commute to the other region. The intersection between *3 and ν = 0 is positive because $I^E_{s,s} - I^E_{r,s} > 0$.

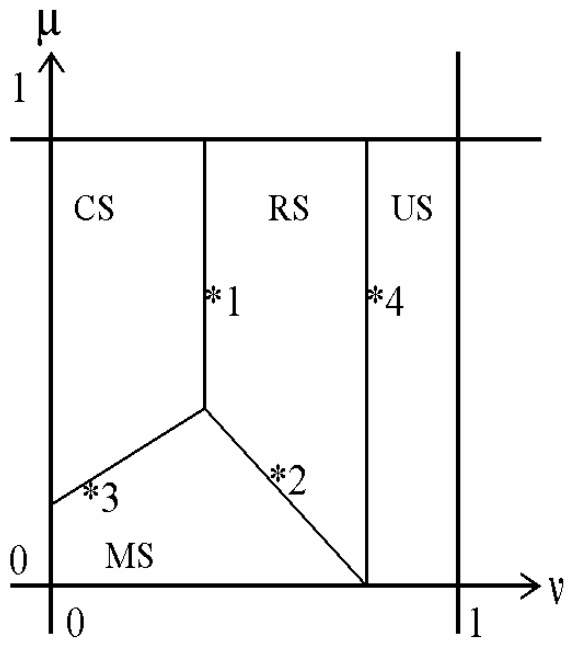

Figure 3.1. The search behaviours of the workers

When the marginal conditions are determined it is possible to calculate the number of workers using each of the four strategies. The sizes of the search strategy areas in figure 3.1 illustrate the share of the working force who choose a given strategy since it is assumed that ν and μ are uniformly distributed between zero and one.

Let us now assume that an economic expansion results in an increasing number of job openings and/or longer employment spells in the steady state equilibrium. This exogenous change is illustrated in figure 3.2.

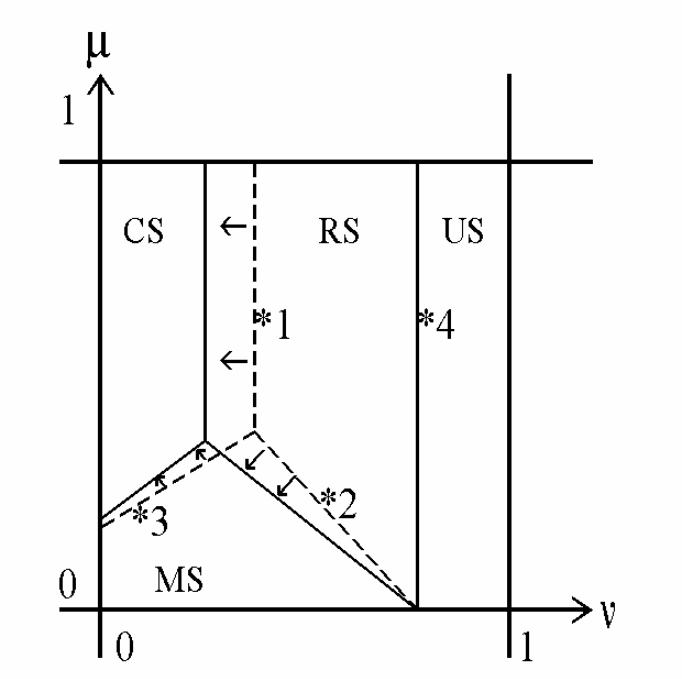

Figure 3.2. Economic expansion

The economic expansion has no effect for *US*, because there will be the same loss of getting a job for these workers as before the change. The number of workers who choose *RS* will increase. This is because of two effects. Firstly, because the unemployment spell will decrease more for a worker who chooses *RS* compared to *CS* and *MS*, and secondly, because *RS* gets longer employment spells in the home region, and hereby avoids the loss of interregional commuting or loss of place utility. This implies that the overall unemployment will have a tendency to increase, because search intensity of *RS* is lower. With longer employment spells the interregional commuting costs will increase compared to the moving costs, which are paid once in connection with the move. Therefore, *3 shifts upward. The overall effect on the number of workers who choose *MS* is ambiguous, but as illustrated in figure 3.2 it is likely that the number of workers who choose *MS* will decrease, but it will depend on actual equilibrium.

In table 3.1 comparative static is carried out. The effects of the economic expansion are repeated in the table. Better matching on the labour market would have created the same effects. By assuming that an economic recession results in more job separations and/or fewer job openings the result is just the opposite of the economic expansion.

When the conditions for the interregional commuters change it has no effect on unemployment, since it is still assumed that income of an interregional commuter is lower than income of employed workers in the home region and there is no leisure gain when commuting. The effect of an increase in the income of interregional commuters (lower interregional transport costs) and an increase in leisure for interregional commuters (lower interregional transport time) is identical. More unemployed workers choose *CS* in favour of *RS* and *MS*.

An income increase/unemployment benefit ratio would increase the regional search intensity and more workers would choose to search in both regions. Fewer workers choose US, since the payoff of the work increases. The effect of RS is ambiguous because of these two opposite effects. Some workers abandon RS in favour of CS and MS, but some workers choose RS in favour of US.

Table 3.1. Comparative static – basic search strategy effects with identical regions

	US	*RS*	*CS*	*MS*
Economic expansion (the separation rate, λ, is decreasing)	0	+	÷	+/÷
Transport costs, $I^E_{r,s}$, and leisure for commuters, $F^E_{r,s}$	0	÷	+	÷
Wage/unemployment benefit ratio (I^E / I^U)	÷	+/÷	+	+

4. Regional effects

The regional effects depend very much on what type of regional setting that has been analysed. This section analyses a setting with two larger regions that are identical, for instance two larger regions with stronger economic activity that are sufficiently close to each other so interregional commuting is an alternative, but also with sufficient distance so migration is an alternative.

Now consider two regions which a priori are identical. Because of an exogenous shock the wage in region *r* increases. The effects on the search strategies are presented in figure 4.1.

In the previous section an increase in the wage/unemployment ratio implied lower unemployment since the search strategies CS and MS increased, but when wage only increases in one region there are opposite effects. RS_r increases, but all other search strategies of the unemployed in region *r* decrease. The decrease in US_r results in increased search activity, but the decrease in CS_r and MS_r implies less search activity. Region *s* does not experience the same decrease in US, but some workers who choose US_s before the wage increase now search for a job in region *r* only, and when these workers get a job they migrate and will eventually use the search strategy RS_r in the future, even though they prefer to live in region *s*. This also implies for some workers who before chose MS_s but the total effect on MS_s is ambiguous because a number of workers in region *s* chose MS_s instead of RS_s. The decrease in MS_r reinforces the migration towards region *r*. After the wage increase the new population in region *r* will now consist of fewer workers who choose US_r, but more workers who choose RS_r, both from the original population, but also newcomers who before preferred US_s and MS_s. Interregional commuting from *r* to *s* decreases, but from *s* to *r* it increases.

The regional differences leave aspects which have to be dealt with in the two regions. In comparison with region *r*, region *s* will have more unemployed workers with longer unemployment spells (US) and fewer workers with medium-term unemployment spells (RS) and more workers

with only short unemployment spells (CS and MS). The increase in interregional commuters from *s* to *r* may imply congestion problems.

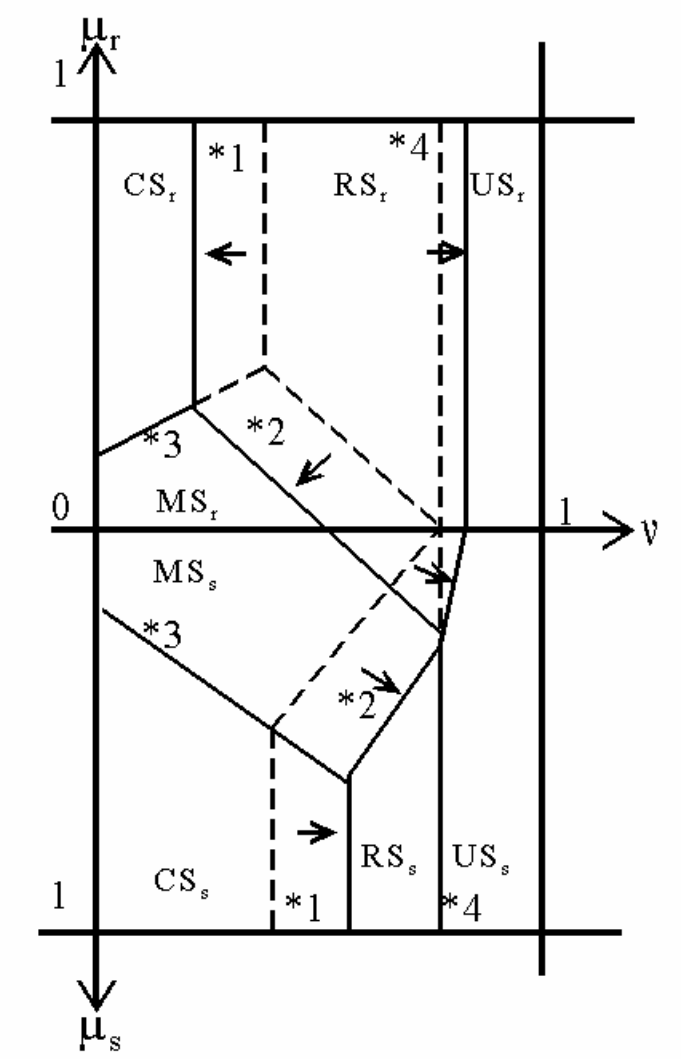

Figure 4.1. Increasing wage in region *r*

If the wage increase is sufficiently large or if sufficiently more job openings are available in region *r* no unemployed workers would choose RS_s, but instead choose to live in region *s*, but only search in region *r* which is the search strategy NS_s.

5. Conclusion

This paper describes how mobility can be improved by labour-market related conditions. A partial two-region labour-market search model extends the seminal work of Pissarides (2000), and different search strategies are examined. The mobility is improved when unemployed workers improve their search intensity, i.e. search in more regions. When workers are willing to commute

they experience time costs and travel costs and if workers migrate they experience a loss in place utility.

When regions are identical three main findings are found: A) Economic recession leads to higher mobility. More workers are willing to commute to other regions, but the effect on migration is ambiguous. B) Interregional transport cost and interregional commuting time reductions improve the overall mobility, but reduce the migration between regions. C) An increase in the wage/un-employment ratio increases mobility.

In a spatial world with non-identical regions results are not so clear. A) Economic recession in one region still imposes mobility for workers in this region, but it will reduce mobility in the other region. B) Mobility gains are still obtained if interregional transport costs are reduced, and still result in increasing interregional commuting and less migration. C) Higher wage in only one region yields ambiguous mobility in this region, but tends to increase mobility from other regions – leaving the overall mobility ambiguous. But it will increase the interregional commuting to the region with the higher wage and also increase migration to the region with the higher wage, partly permanent migration, and partly workers who always prefer to live in the region in which they are employed.

Improving the mobility does not necessarily improve welfare and therefore it would for instance be a misleading policy to limit the job openings or encourage shorter job spells, but it is important to take into account that it will result in better mobility. Decreasing the transport cost or cost of migration is the direct means to improve mobility, but the cost of these reductions is essential when welfare is estimated. Regional wage changes also affect mobility and in the right regional setup, regional taxes may have substantial effects on mobility.

References

Andersen, A.K. (1999). *Location and Commuting*. PhD dissertation. University of Copenhagen, Institute of Economics.

Burdett, K. (1978). A Theory of Employee Search and Quit Rates. *American Economic Review*, 68: 212-20.

Christensen, A.L.S., H. Christoffersen, K. Madsen-Østerbye, D.A. Smitt (1987). *Boligmarkedet i Danmark*. Akf forlaget, Copenhagen (in Danish).

Eliasson, K., U. Lindgren, O. Westerlund (2003). Geographical Labour Mobility: Migration or Commuting? *Regional Studies*, 37(8): 827-837.

Kanemoto, Y. (1987). Externalities in Space. In *Fundamentals of Pure and Applied Economics* 11 (Urban Dynamics and Urban Externalities), 43-103, (1987), also to appear in Encyclopaedia of Economics.

Larsen, M.M., N. Pilegaard, J.N. van Ommeren (2006). Transport costs in a multiregional equilibrium job search model. Forthcoming in the book "*Traffic, road pricing and the environment*" in the series "Advances in Spatial Science", published by Springer.

McFadyen, R.G. and J.P. Thomas (1997). Economic and Psychological Models of Job Search Behavior of the Unemployed. *Human Relations*, 50: 1461-1484.

Mortensen, D.T. (1994). The Cyclical Behavior of Job and Worker Flows. *Journal of Economic Dynamics and Control*. 18: 1121-42.

Nordisk Ministerråd (2002). *Nöjda så in i Norden?* Nordisk Ministerråd, Nord 2002:6, Copenhagen.

Pilegaard, N. (2003). *Essays in transport and the economy*. PhD dissertation. University of Copenhagen.

Pissarides, C.A. (2000). *Equilibrium Unemployment Theory*. 2. edition. Massachusetts Institute of Technology.

Schachter, J. (2001). *Why People Move: Exploring the March 2000 Current Population Survey, March 1999 to March 2000*. Current Populations reports, U.S. Census Bureau.

Tobin, J. (1972). Inflation and Unemployment. *American Economic Review* 62: 1-18.

Van Ommeren, J.N., P. Rietveld, P. Nijkamp (1997). Commuting: In Search of Jobs and Residences. *Journal of Urban Economics*, 42: 402-421.

Van Ommeren, J.N., P. Rietveld, S. Woudenberg (2004). *The effect of infrastructure improvements on regional labour markets: a multiregional equilibrium job search model*, mimeo, Free University Amsterdam.