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Centralised wage bargaining and regional unemployment

Annette S. Zeilstra and Linda A. Toolsema*

paper submitted to the 45th Congress
of the European Regional Science Association,
23-27 August 2005, Amsterdam.

Abstract

This paper studies regional labour markets in a country with centralised wage bargaining. We use a four-stage theoretical model with two regions and one sector. In the first stage the union and the employer federation engage in Nash bargaining at the national level according to a Right To Manage (RTM) model. In the second stage the individual employers determine the number of employees they want to hire given the outcome of the national wage bargaining. In the third stage individuals decide whether or not they want to migrate to another region and whether they want to participate in the labour market or not. In the fourth stage the product market clears. In this model, depending on the parameters, the level of migration and the change in participation determine the distribution of unemployment over the regions.

Keywords: wage bargaining, regional labour markets, regional unemployment, regional migration, regional participation

JEL classification: J21, J51, J61, J64

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1 Introduction

In a large part of Continental Europe wage bargaining is highly centralised. Sectoral wages are determined at the national level instead of at the company or regional level. In Austria, Belgium, Finland, Germany, Greece, Ireland, The Netherlands, Norway, Spain, and Sweden wage bargaining predominantly takes place at either the sectoral or national level (see OECD, 2004, Table 3.5; and European Commission 2003, Table 27). Moreover, the sectoral wages as negotiated by the union and the employer federation at the national level apply to a large part of the people working in that sector. Although **union density** decreased over the past decades, **collective bargaining coverage** remains high (OECD, 2004). Where **bargaining coverage** represents the real extent to which salaried workers are subject to the union-negotiated wages and other conditions of employment. Partly due to legal and administrative extensions of agreements, bargaining coverage in most of the abovementioned countries in 2000 varies between 79 and 96 percent. Exceptions are Ireland (66 percent) and Portugal (70 percent)¹. As a result sectoral wages do not vary as much across regions as they would have if they were to reflect regional labour market conditions. Wages do differ due to skill, firm size and sectoral differences, but less so due to differences in local labour market conditions (European Commission, 2003, p. 115). Both the European Commission (2003) and the OECD (1994, 2004) advocate decentralisation of wage bargaining so that wages can adjust more easily to local labour market conditions. However, the wage bargaining structure is deeply embedded in the economic and social fabric of a country and countries are therefore reluctant to follow these recommendations. As a consequence wage bargaining is still highly centralised in large parts of Continental Europe.

¹European Commission (2003, Table 27). According to OECD (2004, Table 3.5), however, coverage in Portugal exceeds 80 percent.

Other reasons for the slow implementation of reforms to decentralise wage bargaining are concerns for equity and social cohesion and doubts concerning the efficacy of these reforms for increasing employment (OECD, 2004).

We want to model regional labour markets with centralised wage bargaining, because of the prevalence of centralised wage bargaining and the high bargaining coverage in a large part of Continental Europe. The influence of wage-setting institutions on aggregate labour market performance has already been given a lot of attention in the literature.² The influence of regional unemployment on regional wages (the **wage curve**) is equally well researched. One of the possible theoretical explanations behind this empirical relationship involves wage bargaining at the local level (see the seminal book by Blanchflower and Oswald, 1994).

The influence of wage-setting institutions on regional labour markets on the other hand is less well researched. Theoretical articles combining wage bargaining and regional labour markets are scarce. The only article that we are aware of is by Faini (1999). Faini (1999) models the influence of regional trade unions on regional development in a two-region dual economy. By contrast, we model regional labour markets under centralised wage bargaining. Our framework allows one to study e.g. the influence of demand shocks, changes in bargaining power, and unemployment benefits on regional labour markets under centralised wage bargaining.

The theoretical framework consists of a four-stage model with two regions and one sector. In the first stage wages are determined by wage bargaining at the national level. The union and employer federation engage in Nash bargaining according to a Right To Manage (RTM) model. In the second stage individual employers maximise profits by choosing the optimal number of employees they want to hire given the outcome of the national wage bargaining. In

²Surveys of this literature are provided by, for example, Blau and Kahn (1999) and Nickell and Layard (1999).

the third stage individuals maximise their utility by deciding whether or not they want to migrate to another region and whether they want to participate in the labour market or not. In the fourth stage the product market clears. In this model, depending on the parameters, the change in participation and the level of migration determine the distribution of unemployment over the regions.

The remainder of the paper is structured as follows. First, we will develop the model in section 2. Next, the model is solved in section 3. Section 4 concludes.

2 The model

The union and the employer federation engage in Nash bargaining at the national level according to a **Right To Manage (RTM)** wage bargaining model. The union and the employer federation negotiate on the wage rate and the individual employers determine how many employees they want to hire.

The basic model has one sector and two regions ($r = 1, 2$). Each region has regional characteristics (c_r). Working-age people ($j = 1, \dots, J$) are either employed (E), unemployed (U), or inactive (I). People are identical in their characteristics and preferences. The aim is to model the behaviour of jobless people, with special attention to the behaviour of the jobless people in the region with the poorest labour market conditions i.e. the outflow region (**region 1**). Jobless individuals can either search for a job, or become inactive. A jobless person can either look for work in his own region, or in the other region. Due to the costs of moving etc. jobless workers only look for work outside their region if labour market conditions are more favourable in the other region³. A jobless individual can decide to search for a job in the other

³Leaving aside e.g. dramatical changes in regional characteristics.

region, but he waits for a job offer before he migrates. We concentrate on the situation in which employment rises, because we want to study both migration and participation behaviour.

The production, is determined by both supply and demand factors. Regional trade does occur, but transport costs are assumed to be zero. Each firm produces the same amount of goods and uses the same amount of labour and capital.

In the model four stages are distinguished. First, the employer federation and the union negotiate on the wage rate. Next, the firms decide how many employees they need and announce the number of people they want to hire or lay-off. Then, the unemployed workers choose whether or not they want to stay active in the labour market and whether or not they want to migrate to another region if they find a job in the other region. Finally, firms produce goods and consumers buy the goods. The price of the good is determined and the goods market clears.

2.1 Stage 1: Nash bargaining

The union and the employer federation engage in Nash bargaining at the national level according to a **Right To Manage (RTM)** wage bargaining model.

The union is assumed to maximise the sum of all people's income. For the case of inactive people the financial equivalent of their leisure which they incur because they do not search is taken as income. So, the union's objective is to maximise: $V = E^*(W)W + (J - E^*(W) - I)b + Ib^I$, where E^* is the number of employed people, W is wages and b are unemployment benefits. I is the number of inactive people (note that I is endogenously determined in our model), and b^I is their 'income'. Further we assume that to the union it does not matter whether you are unemployed or inactive, that is $b = b^I$ in this expression, so $V = E^*(W)W + (J - E^*(W))b$. We assume that the

value of the union's outside option if bargaining breaks down is given by $A = Jb$. This can be interpreted as non-union wages: each individual should now bargain with a firm himself, and has (practically) no bargaining power. This would result in a non-union wage equal to b , so total income would equal Jb . Alternatively, we could interpret this as all individuals receiving a benefit b .

The employer federation maximises the sum of all firms' profits, $\bar{\Pi} = \sum_{n=1}^N \Pi_n$. The employer federation's outside option is 0. Bargaining power is given by β for the union and $1 - \beta$ for the employer federation, with $0 < \beta < 1$.

2.2 Stage 2: Hire decision

Each employer ($n = 1, \dots, N$) determines the number of employees he wants to hire (E_n) in order to maximise profits. We assume that after migration there will be no unfilled vacancies.

2.3 Stage 3: Migration/participation decision

If employment rises in both regions and people do not quit, previously employed people stay employed. The jobless workers choose whether or not they want to stay active in the labour market and whether or not they want to migrate to another region if they find a job in the other region. Actual migration only occurs after finding a job in the other region.

The distribution of previously employed people over regions is the same as the current distribution of firms over regions. This reflects the fact that firms ($n = 1, \dots, N$) are identical, and the implicit assumption that the number of firms (or at least the distribution) has not changed. Note that relaxing this assumption implies that people may migrate because one region now has more firms and therefore more jobs. In our model, we abstract from this

effect. Instead, we focus on a **general** rise in employment and analyse the resulting migration and participation decision.

The migration and participation decision depend on labour market conditions i.e. the probability (ρ_r) of obtaining a job in region r , regional characteristics (c_r), wages (W), unemployment benefits (b), benefits of staying at home and not having to search for a job (H), and the costs of moving (F).

2.4 Stage 4: Production/consumption

The production function of firm n is given by

$$Y_n = \varphi E_n^\alpha,$$

with Y_n output of firm n , E_n employment at firm n , and φ and α parameters with $\varphi > 0$ and $0 < \alpha < 1$. Note that this is a Cobb-Douglas production function where capital is independent of n and taken as given (and incorporated in the parameter φ). Firm level demand is given by the constant-elasticity function

$$Y_n = \theta P_n^{-\varepsilon},$$

with Y_n the quantity demanded, P_n the price, $\theta > 0$ a parameter, and ε the price elasticity of demand for the firm's product which is treated as constant and exogenous (see Layard et al., 1991, Chapter 2; see also Lee and Pesaran, 1993). Note that ε is the firm specific elasticity of demand, not the elasticity of aggregate demand ε^{ad} , and we have $\varepsilon = \varepsilon^{ad}$ in case of monopoly or full collusion, $\varepsilon = N\varepsilon^{ad}$ for the symmetric Cournot case, and $\varepsilon = \infty$ with perfect competition. Thus, ε increases if aggregate demand is more elastic and if firms behave more competitively. We assume that $\varepsilon > 1$.

Demand and supply determine the product's price and the quantity demanded. The product market clears immediately.

3 Solution of the model

We use backward induction to solve for the equilibrium of the model. The solution of the model is split into two parts. First, stages 4, 2 and 1 are solved in section 3.1. Next stage 3 is solved in section 3.2.

3.1 Wages and employment

Since we assume for simplicity that parameters are such that in each region sufficient workers will be available to fill all vacancies (either living there, or coming from the other region), we can for now skip the solution of the third stage of our model. Even without solving this stage explicitly, we are able to solve for equilibrium price ($t = 4$), equilibrium employment ($t = 2$), and equilibrium wage ($t = 1$). The solution of the third stage describes equilibrium migration and participation. This is discussed in detail in section 3.2.

First consider $t = 4$. In this stage, the market is cleared and the equilibrium price is realised, which equals

$$P^* = \left(\frac{\varphi}{\theta} E_n^\alpha \right)^{-\frac{1}{\varepsilon}}.$$

(We use the superscript $*$ to denote equilibrium values of the variables.)

At $t = 2$, each firm maximises its profits Π_n by selecting E_n , the total employment (number of jobs) at this firm. We have

$$\begin{aligned} \Pi_n &= P_n^* \varphi E_n^\alpha - W E_n \\ &= \theta^{\frac{1}{\varepsilon}} \varphi^{1-\frac{1}{\varepsilon}} E_n^{\alpha(1-\frac{1}{\varepsilon})} - W E_n. \end{aligned}$$

The first-order condition (FOC) for profit maximisation gives

$$E_n^* = \left(\frac{\theta^{-\frac{1}{\varepsilon}} \varphi^{-(1-\frac{1}{\varepsilon})}}{\alpha \left(1 - \frac{1}{\varepsilon}\right)} W \right)^{\frac{1}{\alpha(1-\frac{1}{\varepsilon})-1}}.$$

The second-order condition (SOC) requires $\varepsilon > 1$ (which we assumed to hold). Imposing symmetry, we now conclude that total (national) employment is $E^* = NE_n^*$ and total regional employment is $E_r^* = N_r E_n^*$, for $r = 1, 2$. The Nash bargaining between the union and the employer federation at $t = 1$ results in a wage W which satisfies (since $A = Jb$)

$$\max_W (E^*(W) (W - b))^\beta \left(\bar{\Pi}(W) - \tilde{A} \right)^{1-\beta},$$

where $\bar{\Pi}(W)$ is given by

$$\begin{aligned} \bar{\Pi}(W) &= N \theta^{\frac{1}{\varepsilon}} \varphi^{1-\frac{1}{\varepsilon}} \left(\frac{E^*}{N} \right)^{\alpha(1-\frac{1}{\varepsilon})} - W E^* \\ &= N \left(\theta^{\frac{1}{\varepsilon}} \varphi^{1-\frac{1}{\varepsilon}} \left(\frac{\theta^{-\frac{1}{\varepsilon}} \varphi^{-(1-\frac{1}{\varepsilon})}}{\alpha(1-\frac{1}{\varepsilon})} \right)^{\frac{\alpha(1-\frac{1}{\varepsilon})}{\alpha(1-\frac{1}{\varepsilon})-1}} - \left(\frac{\theta^{-\frac{1}{\varepsilon}} \varphi^{-(1-\frac{1}{\varepsilon})}}{\alpha(1-\frac{1}{\varepsilon})} \right)^{\frac{1}{\alpha(1-\frac{1}{\varepsilon})-1}} \right) \\ &\quad * W^{\frac{\alpha(1-\frac{1}{\varepsilon})}{\alpha(1-\frac{1}{\varepsilon})-1}} \\ &= N \delta W^{\frac{\alpha(1-\frac{1}{\varepsilon})}{\alpha(1-\frac{1}{\varepsilon})-1}}, \end{aligned}$$

where we use δ to refer to the term between brackets, which is a function of parameters $(\theta, \varphi, \varepsilon, \text{ and } \alpha)$ only. The FOC for maximisation can be written as

$$\begin{aligned} \beta (E^*(W) (W - b))^{\beta-1} \left(E^*(W) + \frac{dE^*(W)}{dW} (W - b) \right) \left(\bar{\Pi}(W) - \tilde{A} \right)^{1-\beta} \\ + (E^*(W) (W - b))^\beta (1 - \beta) \left(\bar{\Pi}(W) - \tilde{A} \right)^{-\beta} \frac{d\bar{\Pi}(W)}{dW} = 0, \end{aligned}$$

which can be simplified into

$$\begin{aligned} \beta \left(E^*(W) + \frac{dE^*(W)}{dW} (W - b) \right) \left(\bar{\Pi}(W) - \tilde{A} \right) \\ + (1 - \beta) E^*(W) (W - b) \frac{d\bar{\Pi}(W)}{dW} = 0. \end{aligned}$$

Note that $\frac{d\bar{\Pi}(W)}{dW} = -E^*(W)$ by the envelope theorem, and we can derive

$$E^*(W) + \frac{dE^*(W)}{dW} (W - b) = \left(1 + \frac{1}{\alpha \left(1 - \frac{1}{\varepsilon}\right) - 1} \left(1 - \frac{b}{W}\right)\right) E^*(W)$$

and

$$\frac{\bar{\Pi}(W)}{E^*(W)} = \frac{\Pi(W)}{E_n^*(W)} = \frac{1 - \alpha \left(1 - \frac{1}{\varepsilon}\right)}{\alpha \left(1 - \frac{1}{\varepsilon}\right)} W.$$

Using this, the FOC can be solved for W to give the equilibrium wage

$$W^* = \left(1 + \beta \left(\frac{1}{\alpha \left(1 - \frac{1}{\varepsilon}\right)} - 1\right)\right) b.$$

Note that W^* depends only on the parameters $\alpha, \beta, \varepsilon$, and the unemployment benefit b . (It can be verified that $W^* > b$.) Substituting W^* into the expression for E^* , we see that employment depends on these parameters, as well as on N, θ , and φ .

3.2 Migration and participation

Now we turn to the equilibrium of the third stage of the model, in which working-age people decide in which region to search for a job, or to become inactive. Since all firms are ex ante identical and all individuals have the same utility function, the probability of an individual finding a job in a region is given by the number of jobs in that region net of previously employed, divided by the number of people searching for a job in this region. Abstracting from any migration and assuming that none of the J_r individuals becomes inactive, that is, the probability of finding a job in region r would be

$$\tilde{\rho}_r = \frac{E^* N_r / N - E_r^0}{J_r - E_r^0},$$

where E_r^0 represents the number of employed people in region r in the previous period ($t = 0$). Of course, if people migrate or become inactive, this probability changes.

It will be convenient in the following to denote by γ_r the fraction of previously jobless people in region r who will not search for a job in their own region r (either because they become inactive, or because they will search in the other region $s \neq r$). We use $\gamma_{r,M}$ to denote the fraction of previously jobless people in region r that has decided to search for a job in the other region (and migrates if and only if they find a job indeed), and $\gamma_{r,I}$ to denote the fraction of previously jobless people in region r that has decided to become inactive, so $\gamma_r = \gamma_{r,M} + \gamma_{r,I}$. Note that our assumptions imply that migration occurs only in one direction, so if migration occurs in equilibrium, we can characterise one region as the ‘outflow’ region and the other as the ‘inflow’ region. Without loss of generality, we assume that if migration occurs, region 1 is the outflow region and region 2 is the inflow region, so $\gamma_{2,M} = 0$. Taking into account migration and participation, the probabilities (ρ) of finding a job in respectively region 1 and region 2 are then

$$\rho_1 = \frac{E^* N_1 / N - E_1^0}{(1 - \gamma_{1,M} - \gamma_{1,I})(J_1 - E_1^0)}, \quad (1)$$

$$\rho_2 = \frac{E^* N_2 / N - E_2^0}{(1 - \gamma_{2,I})(J_2 - E_2^0) + \gamma_{1,M}(J_1 - E_1^0)} \quad (2)$$

(provided, of course, that these expressions are in between 0 and 1).

The individuals take decisions in turn, maximizing their expected utility. A jobless individual j currently living in region r has three options:

1. stay in his own region r and try to find a job there;
2. try to find a job in the other region s , and move there if and only if he has success;

3. stay in his own region r and become inactive.

(Formally, there will be a fourth possibility, which is to move to the other region and be inactive there. This possibility is ruled out by our assumption that regions are sufficiently similar and/or moving cost F is sufficiently high.) Expected utility in the first case is given by

$$EU_{jr}|_{\text{stay}} = \rho_r U_{jr}(W^*, c_r, 0) + (1 - \rho_r) U_{jr}(b, c_r, 0), \quad (3)$$

in the second case by

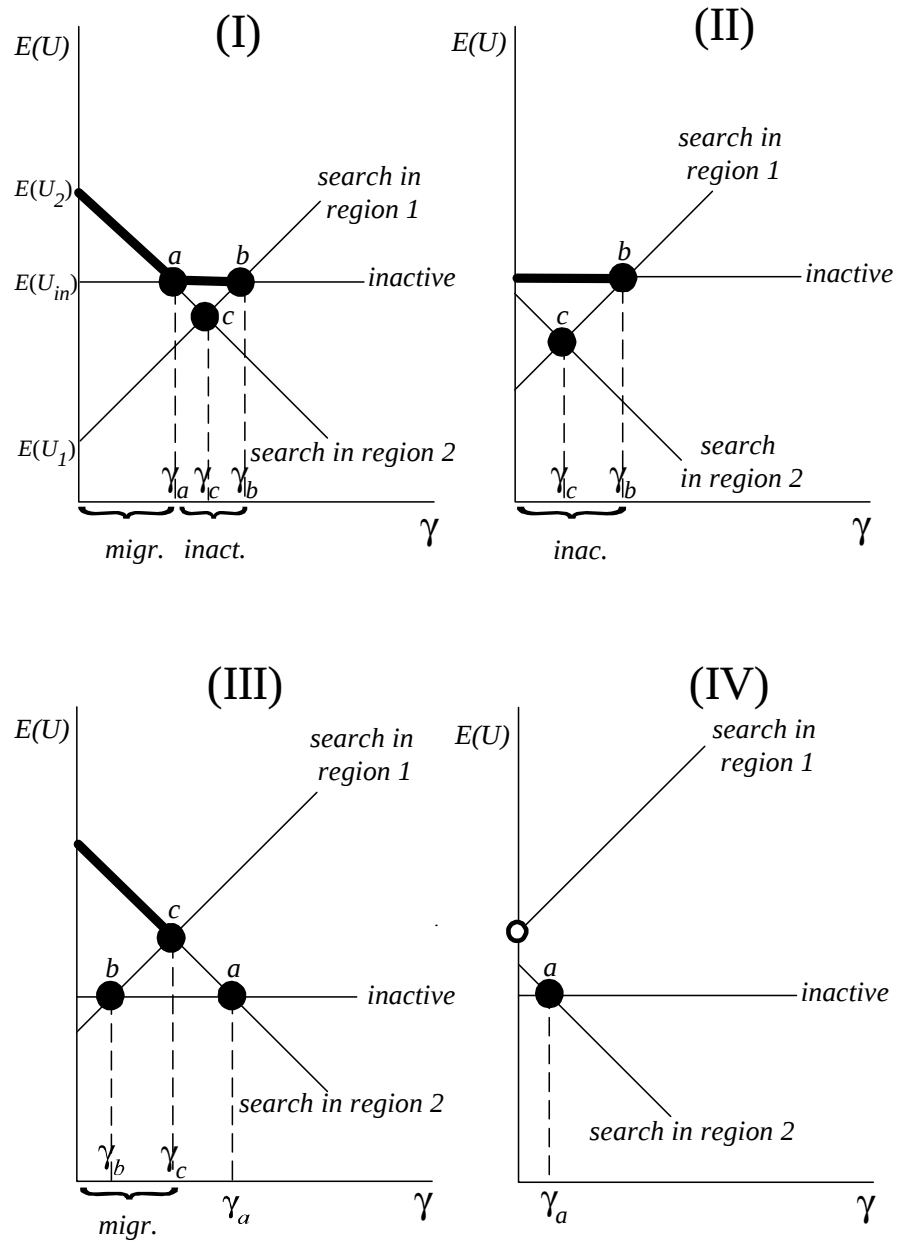
$$EU_{jr}|_{\text{move}} = \rho_s U_{jr}(W^* - F, c_s, 0) + (1 - \rho_s) U_{jr}(b, c_r, 0), \quad (4)$$

and in the third case by

$$EU_{jr}|_{\text{inactive}} = U_{jr}(0, c_r, H). \quad (5)$$

$U_{jr}(W^*, c_r, 0)$ represents the utility of an employed person receiving wage W^* . Note that in case of employment in the other region moving cost F are subtracted from W^* . The utility of a unemployed person receiving benefits b is equal to $U_{jr}(b, c_r, 0)$. The utility of an inactive person is equal to $U_{jr}(0, c_r, H)$, where H are the benefits of staying at home and not having to search for a job. Note that $u'(W^*) > 0$, $u''(W^*) < 0$, $u'(b) > 0$, $u''(b) < 0$, $u'(H) > 0$, and $u''(H) < 0$.

Depending on the values of the parameters, we may have four different cases for individuals in the outflow region 1, and two different cases for individuals in the inflow region 2. A graphic presentation of the four different cases of the migration/participation decision of a jobless individual in region 1 is depicted in figure 1. Since previously jobless individuals from region 1 take their migration/participation decision one after the other, the probability of obtaining a job in their own region (ρ_1), or in the other region (ρ_2) depends on the decision of all the individuals before them. Consequently the expected



Expected utility of a jobless individual living in region 1.

utility of looking for a job in the own region (equation 3), looking for a job in the other region (equation 4) and becoming inactive (equation 5) depends on the decisions of the individuals before them, as is shown in figure 1. Where γ on the horizontal axis depicts the number of people who plan to drop out of the labour market of region 1, either because they want to look for a job in the other region, or because they want to become inactive. Let us start with the situation in which some previously jobless people in region 1 decide to search for a job in the other region (region 2) and others decide to become inactive, see **part (I)** of figure 1. The first individual in region 1 who makes a migration/participation decision has an expected utility $E(U_2)$ if he chooses to search for a job in region 2, an expected utility $E(U_1)$ if he chooses to search for a job in his own region and an expected utility $E(U_{in})$ if he chooses to become inactive in his own region. Since $E(U_2) > E(U_{in}) > E(U_1)$ the first individual drops out of the labour market in region 1 and searches for a job in region 2. The number of people looking for a job has decreased by one in region 1 and has increased by one in region 2. This decreases the probability of obtaining a job and thereby expected utility of searching for a job in region 2 and increases the probability of obtaining a job and thereby expected utility of searching for a job in region 1. The expected utility of becoming inactive in region 1 is not affected. In other words, the expected utility of searching in the other region (equation 4) decreases in γ , because the probability of obtaining a job in the other region decreases if more people have already decided to look for a job in region 2. The expected utility of searching in their own region (equation 3) increases in γ , because the probability of obtaining a job in their own region increases if more people have already decided to drop out of the labour market in region 1. The expected utility of becoming inactive in region 1 (equation 5) does not depend on γ . The individuals who make their migration/participation decision one after the other will choose to search to look for work in the other region until the

expected utility of searching for a job in the other region equals the expected utility of becoming inactive in point a . After that the next individuals will decide to become inactive until the expected utility of becoming inactive equals the expected utility of searching for a job in their own region in point b . In sum, a fraction γ_a of the working age population in region 1 will look for a job in the other region and a fraction $(\gamma_b - \gamma_a)$ will become inactive.

Part (II) of figure 1 represents the situation in which the expected utility of searching for a job in the other region is much lower than in **part (I)** of figure 1 and people do not search in the other region. A fraction γ_b of the working age population chooses to become inactive, whereas the rest of the working age people who did not have a job in the previous period search for a job in region 1.

Part (III) of figure 1 represents the situation in which people either search for a job in their own region, or search for a job in the other region. A fraction γ_c of the working age population searches for a job in the other region. People do not become inactive.

Part (IV) of figure 1 represents the situation in which all jobless individuals choose to look for work in their own region.

The locations where the curves representing the expected utility of searching for a job in region 1, searching for a job in region 2, and becoming inactive intersect (points a , b , and c with corresponding γ_a , γ_b , and γ_c) determine the amount of migration and the number of people that become inactive. If $\gamma_b > \gamma_c > \gamma_a > 0$ we have the situation in **part (I)** of figure 1 and there will be both migration (γ_a) and nonparticipation ($\gamma_b - \gamma_a$). If $\gamma_b > \gamma_c$ and point a does not exist (the curves do not intersect) we have the situation in **part (II)** of figure 1 and a fraction γ_b of the working age population will become inactive, but no one will migrate. If $\gamma_a > \gamma_c > \gamma_b$ we have the situation in **part (III)** of figure 1 and a fraction γ_c of the working age population will

search for a job in the other region and no one will become inactive. If only the curves representing the expected utility of becoming inactive and the curve representing expected utility of searching in the other region intersect (in other words $\gamma_a > 0$ and the both points b and c do not exist) we have the situation as depicted in **part (IV)** of figure 1. All individuals will search for a job in their own region (region 1). The location of the points a, b , and c with corresponding γ_a, γ_b , and γ_c can be determined by using equations 1-5. The possible situations in the inflow region (region 2) are similar to the situations depicted in **part (II)** and **part (IV)** of figure 1. Individuals either search in their own region, or they become inactive

4 Concluding remarks

In a large part of Continental Europe sectoral wages are set at the national level. In this paper we have developed a framework to study e.g. the influence of demand shocks, changes in bargaining power, and unemployment benefits on regional labour markets under centralised wage bargaining.

For now we have abstracted from multilevel wage bargaining. Note, however, that even in countries with predominantly centralised wage bargaining actual wages may differ across individual firms and regions within a sector due to multilevel wage bargaining resulting in the so-called ‘wage drift’ at the local level. An example of a country with multilevel wage bargaining is Belgium (OECD, 2004).

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