

# Wage bargaining, the size of unions, and regional unemployment insurance

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## Abstract

This study examines how the effects of a regionalisation of unemployment insurance (UI) depend on the size of unions relative to the labour force. For this purpose, we compare the outcome of two models with central and with regional UI, respectively. These models combine elements from bargaining theory and migration theory with self-financing UI. Our results demonstrate the importance of the bargaining structure in the debate on regionalising UI. Most importantly, it depends on the size of the unions whether efficiency favours regional or central UI.

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# 1 Introduction

The risk of a specific worker to become unemployed depends among other things on the branch of industry, age, education, and on the region, where he or she supplies labour. These characteristics can in principle be observed by the unemployment insurance (UI) authority. Nonetheless, it is customary, to levy obligatory UI taxes or to pay UI benefits regardless of the specific risk a worker bears. This implies that workers with a relatively low risk of becoming unemployed (involuntarily) subsidise workers with a systematically high risk. Such a subsidy leads to a distortion of workers' decisions, e.g. where to supply labour. This paper investigates the effects of regionalising UI under the assumptions that UI is self-financing, and that UI taxes (not benefits) are adjusted to equilibrate the budget. Such a measure would bring about UI taxes that reflect perfectly the risk of unemployment within each region. Intuition suggests that this would enhance welfare, and that agents from the rich region profit to the disadvantage of agents from the poor region.

Labour markets do not clear because the wage rate, bargained between trade unions and employers, is binding (right-to-manage-approach). Unions maximise the expected utility of a representative worker. This expected utility is affected, among other things, by UI taxes employed workers have to pay, and by UI benefits unemployed workers receive. If contributions are adjusted to balance the UI's budget, they are dependent on the rate of unemployment, and thus on the bargained wages. The extent to which unions take into account the interplay between wages and contributions crucially depends on the size of a union relative to the total workforce. It is rational for a union to neglect the externality its policy implies for other unions. This is valid even though each union could be better off, if all unions would take this effect into account. The larger a union is, the more of the negative impact of a higher wage on employment is internal and is thus taken into account. For myopic unions (decentralised bargaining), the effect of the bargained wage on the UI tax rate is negligible. Since every union neglects it, the total size of this externality is yet considerable. If there is only one single union, the negative impact would be entirely internal. It is interesting to analyse how the size of a union affects the assessment of a regionalisation of UI because the way UI is organised has an effect on how elastic UI contributions react on variations of unemployment.

The role of the bargaining structure on wages is analysed in a seminal paper by Calmfors and Driffill (1988). In that study, the so-called "hump-shape hypothesis" is put forward. According to Calmfors and Driffill, centralisation of the wage bar-

gain has two contrary effects on net wages. On the one hand, more of an increase of nominal wages can be shifted by raising output prices if the bargain is more central. This causes firms to accept higher wages. On the other hand, the aggregated price level rises more if the bargain is relatively central, which reduces real profits (Calmfors and Driffill, 1988, p. 39). Even though we do not consider the impact of the bargaining structure on prices, it may be worth comparing our results with those derived in that study.

Another important aspect is the role of migration. Economists advocating the regionalisation of UI sometimes point to the allocative advantages it is supposed to have (Welfens, 1998, p. 293). The line of reasoning is that workers migrate to regions which are less concerned by unemployment and thus characterised by lower UI contributions. Regionalisation thereby serves as a substitute for higher differences of wages which do not reflect the relative regional scarcity of labour. However, this point of view is rather superficial. As long as unemployment persists in both regions, there is no direct efficiency gain from reallocating workers from one region to the other. But migration affects the UI tax rate, depending on the conditions of eligibility. If wages react on variations of the UI tax rate, efficiency may be affected indirectly. It is not quite clear, however, if it is improved or worsened by the regionalisation of UI.

Since the effects of regionalising UI are subject to a complex interplay of wages, UI taxes, and migration, a formal model is an adequate mean to simplify the matter. In the following section, an analytical framework is established to analyse the effects of a regionalisation of UI for different degrees of centralisation of the bargain. Since many effects are ambiguous in general, the model is calibrated in section 3. Our results confirm the importance of the degree of centralisation of wage bargaining for the assessment of the regionalisation of UI by workers and employers, and for the efficiency of the measure. Section 4 contains some concluding remarks.

## 2 Formal analysis

We employ the following simplifying assumptions and standardisations:

- A1** A federal state consists of two regions ( $i \in 1, 2$ ) which differ only with respect to the endowment with an immobile, inelastically and costlessly supplied factor of production subsequently referred to as infrastructure,  $x^i$ . Region 1 is assumed to possess more infrastructure than region 2,  $x^1 > x^2$ , without loss

of generality. Region 1 is subsequently referred to as the *rich* region, whereas region 2 is named *poor*.

- A2** In each region,  $K$  identical firms produce a single homogeneous good which is taken as numeraire.  $K$  is assumed to be sufficiently large that firms behave as price-taker on every market. The technology of a representative firm shall be described by the production function

$$f^i = f(n^i, x^i),$$

where  $n$  symbolises labour input. Denoting derivatives with subscripts, it is assumed that  $f_{n^i} > 0$ ,  $f_{x^i} > 0$ ,  $f_{n^i n^i} < 0$ . Infrastructure enhances the productivity of labour, so that the cross-derivative is positive,  $f_{n^i x^i} > 0$ . There are no fixed costs, so that the profits of a firm can be written as

$$\pi^i = f(n^i, x^i) - n^i w^i, \quad (1)$$

where  $w$  represents the gross wage rate per unit labour. Profit maximisation yields the inverse labour demand function:

$$f_{n^i} = w. \quad (2)$$

- A3**  $M$  identical workers inelastically supply one unit of labour. They share the same concave utility function:

$$u^i = u(c^{i,j}),$$

where  $c$  stands for consumption of the homogenous good, and where the superscript  $j$  with  $j \in e, u$ , indicates whether a worker is employed ( $j = e$ ) or not ( $j = u$ ). Consumption reads  $c^{i,e} = (1 - \tau^i)w^i$  in the case of employment, where  $\tau$  is the proportional UI tax rate, and  $c^{i,u} = \beta^i \bar{w}^i$ , with  $\bar{w}$  denoting the wage level used to calculate UI benefits, and  $\beta$  standing for the benefit rate, in the case of unemployment. Workers maximise expected utility by choosing the region where they supply labour.

- A4** Ex ante, there live half of the workers in each region. Migration occurs only in one direction, namely, from the poor to the rich region. If a worker migrates, costs corresponding with an annuity of  $k$  arise. In both regions, workers are distributed equally over firms, sharing the same employment opportunities (Creedy and McDonald, 1991, p. 348). The number of workers per firm is denoted by  $m$ .

**A5** All (employed and unemployed) workers are members of a trade union. The gross wage rate is subject to a bargain between a union and  $pK$  firms, where the exogenous variable  $p \in (0, 1]$  is the degree of centralisation of the bargain, or, put differently, the size of a union. If  $p \rightarrow 0$ , the share of workers represented by a specific union is negligible (atomistic structure or decentralised bargain). If  $p = 1$ , one single union represents all workers of a region. It is assumed, that the degree of centralisation is equal in both regions. Firms retain control over employment (right-to-manage-approach, see Nickell and Andrews (1983), and, for adaptations of the model with UI, e.g. Pissarides (1998), and Holmlund (1998)).

**A6** Unions maximise the expected utility of a representative member (see e.g. Oswald, 1985, p. 163), acknowledging the budget constraint of UI, as well as employment and wages elsewhere in the federal state. We employ the symmetric Nash solution to the bargaining problem which maximises the geometric mean of a union's and the corresponding firms' payoff. Firms attain zero profits if the bargain breaks down, so that the payoff of an agreement equals the value of the profits (Creedy and McDonald, 1991, p. 350). The 'threat point' of a union is given by the situation when all of its members receive UI benefits. The payoff of a union,  $G$ , is thus the difference between the expected utility of a representative worker in the case of an agreement, and the utility of an unemployed worker (Farber, 1986, p. 1070):

$$\begin{aligned}
 G &= \frac{n}{m}u[(1 - \tau)w] + \left(1 - \frac{n}{m}\right)u[\beta\bar{w}] - u[\beta\bar{w}] \\
 &= \frac{n}{m}\{u[(1 - \tau)w] - u[\beta\bar{w}]\}.
 \end{aligned}
 \tag{3}$$

**A7** The UI is obliged to balance its budget. Alternatively, it is assumed that the budget(s) is (are) to be balanced within each region (regional UI), or on the whole (central or federal UI).

The cases of regionally, and centrally equilibrated UI budget(s) are considered separately within the following two subsections.

## 2.1 Central UI

### UI budget constraint

Since all firms as well as all unions are identical, the outcome of the bargain is uniform within each region ex post. Then, the wage level used to calculate UI benefits equals the wage rate within each region,  $\bar{w}^i = w^i$ . The UI budget constraint in the case of central UI reads

$$n^1 K \tau w^1 + n^2 K \tau w^2 = (m^1 - n^1) K \beta w^1 + (m^2 - n^2) K \beta w^2. \quad (4)$$

The left-hand side of equation (4) collects the revenues, and the right-hand side stands for the expenditures of the UI, for the two regions respectively.

The reaction of UI taxes on variations of wages and / or employment is transparent to the unions, i.e. they are aware of the UI's budget constraint. But, in contrast to the UI authority, unions have an influence on wages and employment of some part of the workforce. Consequently, each union differentiates between  $pKm$  workers represented by itself, and  $(1-p)Km$  workers represented by other unions. Ex ante, unions regard the wage rate for the represented workers as being subject of the bargain, while the wage rate elsewhere is taken as exogenous. In analogy, employment within corresponding firms is viewed as being dependent on the wage rate to be negotiated, while employment elsewhere in the region and in the other region is taken as given by each union. The UI budget constraint from the point of view of a union from region 1 reads

$$\begin{aligned} & \tau \bar{n}^1 (1-p) K \bar{w}^1 + \tau n^1 p K w^1 + \tau \bar{n}^2 K \bar{w}^2 \\ = & \beta (m^1 - \bar{n}^1) (1-p) K \bar{w}^1 + \beta (m^1 - n^1) p K \bar{w}^1 + \beta (m^2 - \bar{n}^2) K \bar{w}^2, \end{aligned} \quad (5)$$

where  $n^i$  and  $w^i$  carry a bar if they are exogenous from the point of view of the respective union. The first term on either side of equation (5) symbolises the revenues and expenditures related to workers from region 1, which are not member of the considered union. The second term stands for the respective values related to the members of the union. The third term represents UI revenues and expenditures within region 2. A parallel consideration yields the UI budget constraint from the point of view of a union from region 2:

$$\begin{aligned} & \tau \bar{n}^2 (1-p) K \bar{w}^2 + \tau n^2 p K w^2 + \tau \bar{n}^1 K \bar{w}^1 \\ = & \beta (m^2 - \bar{n}^2) (1-p) K \bar{w}^2 + \beta (m^2 - n^2) p K \bar{w}^2 + \beta (m^1 - \bar{n}^1) K \bar{w}^1. \end{aligned} \quad (6)$$

These expressions are equivalent to (4) ex post, i.e. if  $\bar{w}^1 = w^1$ ,  $\bar{w}^2 = w^2$ ,  $\bar{n}^1 = n^1$  and  $\bar{n}^2 = n^2$ .

## The bargaining problem

If the wage is determined by the Nash solution to the bargaining problem, the Lagrangian to be maximised for region 1 is

$$\begin{aligned} \max_{n^1, \tau, w^1, \lambda^1, \mu^1} \mathcal{L}^1 &= G^1 \cdot pK\pi^1 + \lambda^1 [f_{n^1}(n^1, x^1) - w^1] \\ &+ \mu^1 [\tau \bar{n}^1 (1-p) \bar{w}^1 + \tau n^1 p w^1 + \tau \bar{n}^2 w^2 \\ &- \beta(m^1 - \bar{n}^1)(1-p) \bar{w}^1 - \beta(m^1 - n^1) p w^1 - \beta(m^2 - \bar{n}^2) w^2]. \end{aligned} \quad (7)$$

The geometric mean of the payoffs of a union and of the corresponding  $pK$  firms, defined in equations (1) and (3), is maximised subject to two constraints. The first constraint is the labour demand curve to be met, given by equation (2). This must be the case because firms are free to choose the profit maximising amount of labour (right-to-manage-approach). The second constraint is that of UI being self-financing. The union considers thus, that a higher wage leads to a smaller number of employed workers (first constraint), and that this smaller number of workers increases the UI tax rate to be payed by its members (second constraint). A parallel consideration yields the Lagrangian for a representative union in region 2

$$\begin{aligned} \max_{n^2, \tau, w^2, \lambda^2, \mu^2} \mathcal{L}^2 &= G^2 \cdot pK\pi^2 + \lambda^2 [f_{n^2}(n^2, x^2) - w^2] \\ &+ \mu^2 [\tau \bar{n}^2 (1-p) \bar{w}^2 + \tau n^2 p w^2 + \tau \bar{n}^1 w^1 \\ &- \beta(m^2 - \bar{n}^2)(1-p) \bar{w}^2 - \beta(m^2 - n^2) p w^2 - \beta(m^1 - \bar{n}^1) w^1]. \end{aligned} \quad (8)$$

## Migration

Starting point is a situation where workers are distributed equally across regions, workers from the poor region emigrate to the rich region, enhancing thereby expected utility. Expected utility in turn depends on the probability of being employed, i.e. on the number of workers applying for a given number of jobs. The more workers immigrate in region 1, the smaller is the chance of becoming employed there on the one hand. On the other hand, emigration raises the probability of employment in region 2. Migration thereby aligns the expected utilities of workers from region 2 in the cases of emigration and of remaining. In equilibrium, workers from region 2 are indifferent between emigrating and resting in their home region. The condition for a migration equilibrium reads

$$\frac{n^1}{m^1} u[(1-\tau)w^1 - k] + \left(1 - \frac{n^1}{m^1}\right) u[\beta w^1 - k] = \frac{n^2}{m^2} u[(1-\tau)w^2] + \left(1 - \frac{n^2}{m^2}\right) u[\beta w^2]. \quad (9)$$

The left-hand side of equation (9) represents the expected utility of a worker from the poor region in the case of emigration to the rich region. The right-hand side of the equation stands for the expected utility of a worker from the poor region in the case of resting there. The model is closed by the condition that the number of workers within the federal state is given, i.e. each immigrant in region 1 is an emigrant from region 2:

$$(m^1 + m^2)K = M. \quad (10)$$

Equations (9) and (10) jointly determine the number of workers per firm within each region,  $m^1$  and  $m^2$ , for given wages,  $w^i$ , for given employment,  $n^i$ , and for a given UI tax rate,  $\tau$ . The equilibrium values of these variables result from the first-order conditions of the maximisation problems (7) and (8) together with the information that the bargain solutions within each region are identical.

## 2.2 Regional UI

### UI budget constraints

With regional UI, the revenues of UI correspond with the respective expenditures within each region. This circumstance is expressed by the following equations:

$$\tau^1 n^1 K w^1 = \beta(m^1 - n^1)K w^1 \quad (11)$$

and

$$\tau^2 n^2 K w^2 = \beta(m^2 - n^2)K w^2. \quad (12)$$

These budget constraints contain only exogenous, or region-specific variables. Therefore, the only economic interaction between the two regions is migration. If a union from region 1 differentiates between members and workers who are represented by other unions, the budget constraint is

$$\tau^1 \bar{n}^1 (1 - p) K \bar{w}^1 + \tau^1 n^1 p K w^1 = \beta(m^1 - \bar{n}^1) (1 - p) K \bar{w}^1 + \beta(m^1 - n^1) p K \bar{w}^1. \quad (13)$$

The respective constraint for a union from region 2 reads

$$\tau^2 \bar{n}^2 (1 - p) K \bar{w}^2 + \tau^2 n^2 p K w^2 = \beta(m^2 - \bar{n}^2) (1 - p) K \bar{w}^2 + \beta(m^2 - n^2) p K \bar{w}^2. \quad (14)$$

Ex post, equations (11) and (13), as well as equations (12) and (14) are equivalent.



## The bargaining problem

The Nash product to be maximised consists of the expected utility function of a representative member of a union, and the profit function multiplied by the number of firms per union. The maximisation is subject to two constraints. First, a point on the (inverse) labour demand function (2) must be realised. Second, the resulting combination of wage rate and employment must be compatible with an equilibrated UI budget. The maximisation problems read

$$\begin{aligned} \max_{n^1, \tau^1, w^1, \lambda^1, \mu^1} \mathcal{L}^1 &= G^1 \cdot pK\pi^1 + \lambda^1 [f_{n^1}(n^1, x^1) - w^1] \\ &+ \mu^1 [\tau^1 \bar{n}^1 (1-p) \bar{w}^1 + \tau^1 n^1 p w^1 \\ &- \beta(m^1 - \bar{n}^1)(1-p) \bar{w}^1 - \beta(m^1 - n^1) p \bar{w}^1] \end{aligned} \quad (15)$$

and

$$\begin{aligned} \max_{n^2, \tau^2, w^2, \lambda^2, \mu^2} \mathcal{L}^2 &= G^2 \cdot pK\pi^2 + \lambda^2 [f_{n^2}(n^2, x^2) - w^2] \\ &+ \mu^2 [\tau^2 \bar{n}^2 (1-p) \bar{w}^2 + \tau^2 n^2 p w^2 \\ &- \beta(m^2 - \bar{n}^2)(1-p) \bar{w}^2 - \beta(m^2 - n^2) p \bar{w}^2]. \end{aligned} \quad (16)$$

The first-order conditions of these Lagrangians yield the equilibrium values of  $n^i$ ,  $w^i$  and  $\tau^i$ , while the distribution of workers on regions is determined as follows.

## Migration

The condition for an equilibrium with respect to migration decisions of workers from the poor region remains nearly unchanged. Merely regarding the superscripts of  $\tau$  some differences emerge:

$$\begin{aligned} \frac{n^1}{m^1} u[(1 - \tau^1)w^1 - k] + \left(1 - \frac{n^1}{m^1}\right) u[\beta w^1 - k] \\ = \frac{n^2}{m^2} u[(1 - \tau^2)w^2] + \left(1 - \frac{n^2}{m^2}\right) u[\beta w^2]. \end{aligned} \quad (17)$$

The interpretation of this equilibrium condition is analogous to equation (9). Again, the model is closed by a condition stating that each immigrant in region 1 is at the same time emigrant from region 2:

$$(m^1 + m^2)K = M. \quad (18)$$

Equations (17) and (18) simultaneously determine the number of workers attached to firms in region 1 and region 2.

The model determines the equilibrium values of  $n^i$ ,  $w^i$ ,  $\tau^i$  and  $m^i$ . The equations necessary to solve for these variables are the first-order conditions of the maximisation problems (15) and (16), as well as equations (17) and (18). As a by-product, the Lagrange multiplier  $\lambda^i$  and  $\mu^i$  can be calculated. They show how the respective value of the Nash product reacts if the marginal productivity of labour rises ( $\lambda^i$ ) or if the UI is marginally subsidised ( $\mu^i$ ). The complexity of the equations exhibits that the solutions can be derived numerically only, which is subject of the following section.

### 3 A numerical specification

There are two requirements the functions and parameter values used to calibrate a model have to fulfil. On the one hand, they should be in a plausible range for the results and predictions of the model to have a weight. On the other hand, they should be as simple as possible. Here, the specifications are mainly due to the second aim. Nevertheless, most of the results can be expected to hold if more realistic functions and parameter values are assumed.

The chosen utility function and the production function read:

$$\text{utility function} \quad u(c) = \sqrt{c},$$

$$\text{production function} \quad f(n, x) = \frac{1}{a} \left( nx - \frac{1}{2}n^2 \right),$$

where  $a$  is a positive parameter. Both functions have the assumed properties, i.e. positive first derivatives, and negative second derivatives with respect to consumption and employment, respectively<sup>1</sup>. The cross-derivative of the production function is positive, so that infrastructure has a positive effect on the productivity of labour. The labour demand function can be obtained by partially differentiating  $f(\cdot)$ , and rearranging:  $n = x - aw$ . The values for the exogenous parameters are given in table 1.

parameter	$a$	$\beta$	$k$	$K$	$M$	$x^1$	$x^2$
value	0.6	0.57	0.27	1	1	1	0.6

**Table 1: parameter values**

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<sup>1</sup>The signs of the derivatives only follow if  $x > n$ , which is guaranteed by the choice of the parameters made hereafter.

## Central UI

With the assumed functions and parameters it is possible to calculate the values of the endogenous variables for different degrees of centralisation of the bargain. Table 2 gives the results for wages, number of workers and employment per firm in both regions, as well as the UI tax rate necessary for an equilibrated budget. The calibration is performed for a degree of centralisation of the bargain of  $p = 0.00, 0.05, 0.15$  and  $0.20$ . The case  $p \rightarrow 0$  corresponds with decentralised bargaining, which is the standard in bargaining theory. If  $p > 0.20$ , no inner solution can be found for the assumed functions and parameter values.

$p$	0.00	0.05	0.10	0.15	0.20
$n^1$	0.578	0.585	0.591	0.597	0.602
$m^1$	0.612	0.609	0.607	0.606	0.604
$w^1$	0.703	0.692	0.682	0.672	0.664
$n^2$	0.347	0.350	0.352	0.354	0.356
$m^2$	0.388	0.391	0.393	0.394	0.396
$w^2$	0.422	0.417	0.414	0.410	0.407
$\tau$	0.042	0.035	0.029	0.024	0.019

**Table 2: numerical results, central UI**

Table 2 shows that a higher degree of centralisation of the bargain leads to lower wages in both regions. This implies higher employment and, thereby, lower UI contributions. Equilibrium migration from the poor to the rich region is slightly lower when unions are larger. This result is due to the fact that wage differences are higher in the rich region. A union has more members in region 1 because there are more workers in region 1, while the number of unions is equal. Therefore, the concession a union from region 1 makes with respect to the wage rate has more influence on the UI tax rate than a reduction of the wage rate in region 2. This causes wages to react more elastically on variations of  $p$  than in region 2. The employment effect which works in the opposite direction with respect to migration, does not compensate the former effect. In the case of a monopoly union, the positive effect of a higher wage rate exactly corresponds with the negative effect of lower employment at the margin. With wage bargaining, the wage rate must be lower, so that the positive effect of a higher wage rate overcompensates the negative effect of a lower employment probability on expected utilities. This means that before migration the expected utility decreases more in region 1 with an increasing size of the unions, so that migration is lower.

## Regional UI

Table 3 states the corresponding results for the endogenous variables in the case of regional UI budgets. If the size of the union exceeds 20% of the labour force, no inner solution can be found for the given functions and parameter values.

$p$	0.00	0.05	0.10	0.15	0.20
$n^1$	0.582	0.590	0.598	0.605	0.612
$m^1$	0.617	0.616	0.616	0.615	0.615
$w^1$	0.697	0.683	0.670	0.658	0.646
$\tau^1$	0.034	0.025	0.017	0.009	0.002
$n^2$	0.337	0.344	0.349	0.354	0.359
$m^2$	0.383	0.384	0.384	0.385	0.385
$w^2$	0.438	0.427	0.418	0.410	0.402
$\tau^2$	0.078	0.066	0.057	0.049	0.042

**Table 3: numerical results, regional UI**

Qualitatively, the results are the same as for the case of central UI. Equilibrium wages negatively depend on the degree of centralisation of the wage bargain because unions take into account that a higher wage rate has a negative influence on aggregated employment, which in turn tends to raise the regional equilibrium UI tax rate. The larger a union is, the more of this effect is internal from its point of view. Lower equilibrium wages yield higher employment, which leads to lower UI taxes in both regions. However, one important difference with reference to the model with central UI emerges: Migration is almost not affected by the size of the unions. This result is due to the fact that wages in region 2 react much more elastically on variations of  $p$  in the case of regional UI, so that there is less difference between the processes evolving in both regions.

## Comparison of the models

Figure 1 shows the preferences of firms and workers concerning the organisation of UI for different sizes of the unions relative to the total labour force. Positive values signify that the expected utility or the profits are higher with a central UI, negative values signify that regional UI is preferred. The definitions and interpretations of the curves are:

$$Fi \equiv \pi_C^i - \pi_R^i \begin{cases} > 0 & \text{firms from region } i \text{ prefer central UI} \\ < 0 & \text{firms from region } i \text{ prefer regional UI} \end{cases}$$

$$Wi \equiv Eu_C^i - Eu_R^i \begin{cases} > 0 & \text{workers from region } i \text{ prefer central UI} \\ < 0 & \text{workers from region } i \text{ prefer regional UI,} \end{cases}$$

where the subscripts  $C$  and  $R$  stand for "model with central UI" and "model with regional UI", respectively.

Apart from the preferences of the agents, an efficiency criterion,  $z$ , is used to assess the measure. For this aim the total production in both regions has to be calculated, lowered by the total costs of migration. Related to one firm from each region, the variable is defined as follows:

$$z \equiv f(n^1, x^1) + f(n^2, x^2) - k \left( m^1 - \frac{M}{2K} \right).$$

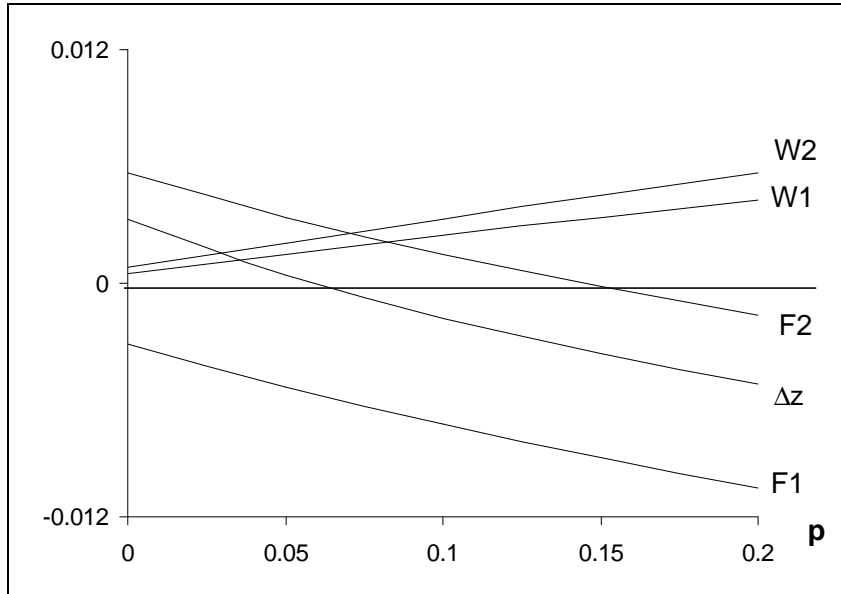
The number of workers per firm is  $M/2K$  ex ante since workers are distributed evenly across all firms (see assumption A4). To find out under which arrangement more income rests for consumption, the difference between  $z$  in the case of central UI and  $z$  in the case of regional UI is calculated:

$$\begin{aligned} \Delta z = z_C - z_R &= f_C(n^1, x^1) + f_C(n^2, x^2) \\ &\quad - [f_R(n^1, x^1) + f_R(n^2, x^2)] - k (m_C^1 - m_R^1). \end{aligned} \quad (20)$$

Again, positive values signify an advantage of central UI and negative ones that regional UI is preferable. If, for instance, the value of  $\Delta z$  is positiv, it is *potentially* possible that all workers and firms are better off with central UI if the excess of production is distributed appropriately.

The results depicted in figure 1 underline the importance of the bargaining structure for an assessment of the question whether UI should be regional or not. With small unions, firms from the poor region prefer UI on the central (federal) level, whereas regional UI allows higher profits when a union comprises more than 15% of the labour force. The efficiency criterion also advocates federal UI if  $p$  is small and regionally differentiated UI if  $p$  is above a certain point (0.07). In contrast, workers from both regions are always better off with federal UI, and firms from the rich region make higher profits with regional UI. The preference towards uniform or regional UI is the stronger, the larger unions are.

The described results can be explained by the functional courses of the wages, given in tables 2 and 3. Equilibrium wages are lower if unions are larger. The reason is that unions take the negative effect of wages on aggregated employment



**Figure 1: Comparison of the central and the regional model**

into account and consider thus that higher wages cause the UI tax rate(s) to rise. This effect is stronger if UI is regional because there are only half as many unions relevant for the budget constraint of UI. Therefore, it is not surprising that regional UI is the more advantageous for firms, the higher the degree of centralisation of the bargain is. The inverse accounts for workers. Ex ante, lower wages are to the disadvantage of all workers because the expected utility is lowered. Ex post, some workers can yet be better off because the probability of entering employment rises. Preferences of workers from both regions must be parallel because of the compensating effect of migration. A smaller wage rate leads to higher employment and enhances thus total production, which causes the efficiency criterion to favour regional UI when  $p$  is relatively high. The fact that efficiency is higher with central UI when  $p$  is small, is due to the more intense migration in the case of regional UI. The additional migration costs lower consumption possibilities so that firms from region 2 and workers from both regions could potentially compensate firms from region 1 for the disadvantage they suffer from federal UI.

## 4 Conclusion

Calmfors and Driffill (1988) deal with the degree of centralisation of wage bargaining in a completely different context. However, one parallel is that centralisation of the bargain can be viewed as an internalisation of externalities which results in lower wages. Except from other things, the main difference is that the source of wage

differences in that paper has to do with the extent to which firms can shift higher wages to higher output prices, i.e. it lies on the labour demand side. In contrast, the cause of the effects here lies in the behavior of the unions, while we abstract from price effects.

This study examines the effects of the bargaining structure on the assessment of centrally vs. regionally equilibrated UI budgets. For this aim, two models are contrasted, one with either organisational form of UI. The models are characterised by a relatively complex structure, stemming from the requirements to include a rather elaborated bargaining setup, UI and migration decisions of workers. On the one hand, an obvious objection to be made is thus that the results can only be derived numerically. On the other hand, the findings are traced back to plausible interactions between the endogenous variables. Our main results are:

1. With the assumed functions and parameter values, workers from both regions are always in favour of central UI and firms from the rich region are always better off with regional UI. In contrast, firms from the poor region prefer central UI with relatively decentral wage bargaining, and prefer regional UI with relatively central wage bargaining. The efficiency criterion favours central UI in the former case and regional UI in the latter case.
2. The more workers a union represents in relation to the total number of workers, the lower is the equilibrium wage rate for a given organisational form of UI.
3. The effect of the bargaining structure on the resulting wage rate is stronger in the case of regional UI than in the case of central UI.

Result 1 contradicts the initial intuition that economic agents from the poor regions prefer central UI, whereas agents from the rich region prefer regional UI in general, and that regionalisation of UI generally enhances efficiency. Even though other specifications of the model may alter the results to some extent, the mere possibility of our results shows that sweeping and intuitive judgements are not appropriate when dealing with this complex subject (see also Sanner, 2001).

The effects of the bargaining structure on profits and expected utilities of workers can be traced back to differences of wages. In the given context, the preferability of higher wages is reduced because they come along with higher UI taxes. Hence, the union is ready to agree on lower wages than a union which neglects this effect. Consequently, the standard assumption of decentralised bargaining seems to

be inadequate when dealing with self-financing UI. This argument is even more important when central and regional UI are being compared, because the influence of an agreement on wages between a union the corresponding firms on UI parameters is stronger in the case of regional UI. Put differently, regionalisation of UI acts as a discipline on union wage demands if the bargain concerns a non-negligible portion of the total workforce.

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