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CENTRALIZED AND DECENTRALIZED DECISION MAKING ON SOCIAL INSURANCE IN AN INTEGRATED MARKET

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1. Introduction

In a world where markets become internationally more integrated the social question will be an important issue. Now this question is at stake in the European Community for "1992". The integration of capital and labour markets may intensify capital and labour flows within the EC. The size of these flows is partly determined by the level of social insurance. Because migration influences the financing and expenditure part of the social insurance system, policymakers have to take into account migration behaviour in decision making on social insurance. In recent years a lot of research has been done on the consequences of goods and capital flows on indirect and capital tax rates. Often one concludes that tax competition between the member states, which pushes the tax rates down, is likely to occur. It is important to analyse if this is also likely to happen with the level of social insurance. Another and related issue is whether centralisation of decision-making processes can be agreed upon to improve the welfare of all countries concerned. Is there a need for a European federal transfer structure or could downward pressures on the system be corrected by coordinating the decisions between the countries?

We focus the attention on the consequences for labour mobility to the level of social insurance systems from a public choice approach. Unlike most earlier models of social welfare, see for example Pauly (1973) and Brown and Oates (1987), both workers and beneficiaries are assumed to have political influence in determining the level of social insurance.[1] A second deviation from these models is that we do not base migration only on differences in social insurance systems. According to the migration literature, migration decisions are mainly determined by good labour opportunities and wage level in the migration country, unemployment rate in the home country and the amount of information about the migration country.

Therefore we consider two countries with a different level of social insurance and a different wage rate. Both the level of social insurance and the wage rate are affected by the size of the migration flow. These effects depend on the characteristics of the migrants. We discriminate between people who have good opportunites on the labour market and people who have less opportunities (further on we label these groups as low-risk and high-risk, respectively, where risks refer to the opportunities on the labour market). In case high-risks are mobile our results corresponds closely

[1]Actually, in the model of Brown and Oates the median voter is decisive in determining the size of the social welfare system. However, as the beneficiaries are assumed to be in the minority, they have no effective say in the decision-making process.

to the results in literature, but in case low-risks are mobile our results deviate from the existing results. Migration of low-risk workers has a positive effect on the tax rate in our model, if the negative effects of an increase of low-risk workers on the wage rate outweigh the positive effects of that increase on the social insurance system. So, if the mobility of the low-risk group is much larger than the mobility of the high-risk group, the results of our model suggest that European economic integration does not necessarily cause a deterioration of the social insurance level. In that case, coordination of decision making could even lower the average benefit level, contrary to the case when the high-risk group is mobile.

In this paper decision making on social insurance is modeled analogous to Verbon (1990). In the second section we introduce this model and extend it for migration of low-risk and high-risk workers. In the following two sections we examine the tax rates, which result from the decision-making process, in a partial and general equilibrium analysis, respectively. We compare the tax and benefit rates with the situation in which migration was not possible. To cover the process of increasing integration the effects of an exogenous change in mobility costs are examined in section five. The effects of coordinated decision making between the countries including the possibility of a grant structure are considered in section six. We end the paper by comparing the results and discussing briefly some possible extensions of the model.

2. A model of decision making on social insurance and migration behaviour

We develop a two-country model to study the consequences of migration on political decision making with regard to social insurance. Social insurance systems have two important characteristics. Firstly, they insure people against the risk of losing their labour income, for example because of illness, disability or dismissal.[2] Secondly, the systems are redistributive, because people do not face the same risk, but they pay the same tax rate and get the same benefit rate. So money is redistributed from people who have low risks to people who have high risks. Both characteristics are captured in our model by assuming two groups, which have different risks of being unemployed, but are equal in all other aspects. These risks are assumed to be exogenous and equal to λ_1 and λ_2 with $\lambda_1 < \lambda_2$. Every worker receives a wage rate, w, and pays a contribution, τw, to the social insurance system, while every worker out of the production

[2]So, if we use expressions like "the risk of being unemployed" in this paper, we do not only imply unemployment, but also illness and disability.

process receives a benefit, ηw. Both groups have a say in the decision on the level of the tax rate, τ, and the benefit rate, η.

Migration flows change the workers-beneficiaries ratio in the country from which people migrate, the home country, and in the country to which they migrate, the migration country. These changes will affect the decisions made on the financing and expenditure part of the social insurance system. Assuming that A is the migration country, the closed budget constraint of the system is equal to

$$\left[\lambda_1(N_1^A+M_1)+\lambda_2(N_2^A+M_2)\right]\eta^A w^A = \left[(1-\lambda_1)(N_1^A+M_1)+(1-\lambda_2)(N_2^A+M_2)\right]\tau^A w^A \qquad (1)$$

where N_i^I represents the initial size of group i (i=1,2) in country I, M_i the size of the net migration flow of group i from country B to A, which is assumed to be endogenous, and w^I the wage rate in country I. We assume that a worker faces in both countries the same risk of being jobless. Given the definition of M_i the budget constraint of country B has the same structure, except for the negative signs before M_i.

Because high-risk and low-risk workers face a different risk, they desire a different level of social insurance to cover their risk of being jobless. Both groups of workers form an interest group to pursue their wishes in the political decision making process. The interest groups have political influence by voting and by lobbying. So the relative political strength of a group depends on factors like the size of the group and lobbying costs. Decisions with regard to the insurance system are made according to the following function, which will be labeled as the political decision-making function[3]

$$D^I = \xi^I E(U_1^I) + (1-\xi^I)E(U_2^I) \qquad for\ I = A, B \qquad (2)$$

where ξ^I represents the relative political weight of group 1 in the decision making process of country I, which is assumed to be exogenous. $E(U_i^I)$, the expected utility of a member of group i in country I, is defined by

[3]See Coughlin et al. (1990) for a behavioural underpinning of the political decision- making function.

$$E(U_i^I) = (1-\lambda_i)U((1-\tau^I)w^I) + \lambda_i U(\eta^I w^I) \qquad for\ i = 1,2\ \ and\ \ I = A, B \tag{3}$$

where $U(\,)$ represents the utility of net wage and benefit level respectively. It is assumed that the indirect utility function is two times continuously differentiable, marginal utility is strictly decreasing, and the Inada conditions are fulfilled. Using equation (1) and (3) we can rewrite D^I as follows[4]

$$\begin{gathered} D = \delta_1 U((1-\tau)w) + \delta_2 U(\gamma\tau w) \quad with \\ \delta_1 = \xi(1-\lambda_1) + (1-\xi)(1-\lambda_2) \ \ and \ \ \delta_2 = \xi\lambda_1 + (1-\xi)\lambda_2 \end{gathered} \tag{4}$$

$$\gamma = \frac{[(1-\lambda_1)(N_1+M_1) + (1-\lambda_2)(N_2+M_2)]}{[\lambda_1(N_1+M_1) + \lambda_2(N_2+M_2)]} \tag{5}$$

The reverse of the workers-beneficiaries ratio, $\frac{1}{\gamma}$, can be interpreted as the price of the social insurance system. If insurance only would be possible within the own risk group, each group would choose for full insurance, i.e. net labour income equal to benefit payment. However, by pooling both risk groups into one comprehensive social insurance system, the system is no longer actuarially fair. Obviously, as high-risk workers gain from pooling, they prefer a more than complete coverage of their risk, while the reverse is true for low-risk workers. Whether less or more than full insurance will actually be chosen depends on the political weights of the groups and the price, $\frac{1}{\gamma}$, of the social insurance system. In case both groups have influence, it is clear that $\frac{\partial E(U_1)}{\partial \tau}<0$ and $\frac{\partial E(U_2)}{\partial \tau}>0$, if these derivatives are evaluated at the tax rate that is politically chosen.

Individuals from both risk groups are assumed to have the opportunity to move to another country. Corresponding to the 'human capital' approach of migration,[5] people migrate if their expected welfare in the migration country outweigh their expected welfare in the home country plus migration costs. These costs which consist of physical and psychological costs do even exist if all barriers to labour mobility are removed in the process of economic integration. So people move from country B to A if

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[4]Because we do not want to mess up the equations with too many supscripts, we neglect I when it is not confusing. If there is no superscript I, the equation refers to country A. The equations for country B are dropped, because they are nearly similar to those of country A.

[5]See for a survey on determinants of migration, Greenwood (1975).

$$E(U_i^A) > E(U_i^B) + C_i \qquad i = 1,2 \tag{6}$$

where C_i represents the migration costs for a member of group i.[6] For simplicity we only consider the migration flow from country B to A. The higher expected utility in country A is a consequence of an other population structure and/or political constellation and/or the labour productivity, compared with country B.

Migration is in equilibrium if no one has an incentive to migrate anymore. This is the case if the difference between the expected utilities is equal to the migration costs or if all members of a group have migrated to one country. In the model these possibilities can be discriminated from each other by the validity of the stability condition of migration, see Stiglitz (1977). If the stability condition holds, there is an internal equilibrium of the labour force in both countries. So

$$E(U_i^A) = E(U_i^B) + C_i \quad if \quad \frac{\partial E(U_i^A)}{\partial M_i} - \frac{\partial E(U_i^B)}{\partial M_i} < 0 \qquad i=1,2 \tag{7}$$

If an internal equilibrium exists, then it follows that, apart from differences in the wage rate, the migration flow is determined by differences in the social insurance system that outweigh migration costs, $M_i = M_i(\tau^A, \tau^B, C_i) \quad i=1,2$. If the migration equilibrium is distorted by a change in the social insurance system, migration will occur, until a new equilibrium situation is reached, which is guaranteed by the validity of the stability condition. The relation between changes in the tax rate and changes in the size of the migration flow can be obtained by differentiating the migration equilibrium condition, equation (7).

$$\frac{\partial M_i}{\partial \tau^I} = \frac{\partial E(U_i^I)/\partial \tau^I}{\partial E(U_i^J)/\partial M_i - \partial E(U_i^I)/\partial M_i} \quad for I \neq J,\ I,J=A,B \ and \ i=1,2 \tag{8}$$

The denominator of this expression is equal to (minus) the stability condition. Because $\frac{\partial E(U_1^A)}{\partial \tau^A} < 0$ $\left(\frac{\partial E(U_2^A)}{\partial \tau^A} > 0\right)$, it follows that $\frac{\partial M_1}{\partial \tau^A} < 0$ $\left(\frac{\partial M_2}{\partial \tau^A} > 0\right)$ in case the migration equilibrium is stable. The results for the home country are the opposite. Secondly, as a consequence of our micro-economic based migration function, $\frac{\partial M_i}{\partial \tau}$ depends on τ^A, τ^B and M_i. This relationship is more general than in Brown and Oates (1987), where it is assumed that the elasticity of the size of the migration flow to the benefit rate is constant.

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[6]For simplicity we assume that $\frac{\partial C_i}{\partial M_i} = 0$, instead of positive. If the latter assumption is reasonable, our results will even hold with less stringent assumptions on the congestion effects.

The assumption is used throughout that policymakers know that the level of social insurance is a determinant of migration decisions and will take this into account in their decisions on social insurance. Because policymakers know migration behaviour, they will decide on a level of social insurance that is optimal taking into account the migration flow that result from their decision. So, at first, policymakers set a level of social insurance, and afterwards, workers take the migration decision. This relation between migration and decision making on social insurance is analogous to Pauly (1973) and Starrett (1980), who also captured the influence of migration to decision making. It is important to note that, because the social insurance system is not actuarially fair, migration behaviour influences the price of the system. For that reason, it is not a good strategy for policymakers to be myopic on migration behaviour in their decision making, as Boadway (1982) argues in a slightly different context.

On the other hand, it is assumed that policymakers take the tax rate in the other country as given. As a consequence member states do not cooperate or even coordinate their decisions. This framework provides us with the means to study tax competition as in Mintz and Tulkens (1986). Therefore policymakers of both countries maximise the political welfare of their country by taking the level of social insurance in the other country as given.

Policymakers will not only take the effects of migration behaviour on the social insurance system into account, but also the effects on the real wage rate. Therefore we consider a production function, $F(N_e)$ with $\frac{\partial F(N_e)}{\partial N_e} > 0$, $\frac{\partial^2 F(N_e)}{\partial (N_e)^2} < 0$, $\frac{\partial^3 F(N_e)}{\partial (N_e)^3} > 0$ and $N_e = (1-\lambda_1)(N_1+M_1) + (1-\lambda_2)(N_2+M_2)$.[7] The only production factor is labour to highlight the impact of labour mobility between the countries. Because the wage rate is determined by marginal labour productivity, an increase in the labour force by migration lowers the wage rate in country A, $\frac{\partial w(N_e)}{\partial M_i} = \frac{\partial w(N_e)}{\partial N_e}\frac{\partial N_e}{\partial M_i} = (1-\lambda_i)\frac{\partial^2 F(N_e)}{\partial (N_e)^2} < 0$ and raises it in B. Given these assumptions we derive, for later purposes, the expected marginal utility of group i with respect to the size of the migration flow.

$$\frac{\partial E(U_i)}{\partial M_j} = (1-\lambda_i)(1-\tau)\frac{\partial w}{\partial M_j}U'((1-\tau)w) + \lambda_i\left[\tau\frac{\partial \gamma}{\partial M_j}w + \tau\gamma\frac{\partial w}{\partial M_j}\right]U'(\tau\gamma w) \quad \textit{for } i, j = 1,2 \qquad (9)$$

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[7]Notice that both groups of workers are equally productive in spite of their different probabilities of getting temporarily laid off. For country B, the size of the migration flow has to be substracted from the initial size of the groups.

3. Decision making on social insurance: a partial equilibrium analysis

In this section we discuss the optimal tax rate if policymakers take into account the migrati flow, given the level of social insurance in the other country. The political decision-maki function, equation (4), is maximized taking into account the effect of a change in the system migration behaviour. The first order condition is equal to[8]

$$\frac{dD}{d\tau} = \delta_1(-w+(1-\tau)\frac{\partial w}{\partial \tau})U'((1-\tau)w) + \delta_2(\gamma w+\tau\frac{\partial \gamma}{\partial \tau}w+\tau\gamma\frac{\partial w}{\partial \tau})U'(\tau\gamma w) = 0$$

The first part of this equation measures the negative effect of an increase in the tax rat utility of the net wages, the marginal cost, while the second part measures the positive (the utility of the benefit level, the marginal benefit. In the optimum the marginal cost equ marginal benefit. The marginal cost arises from two effects. One is the direct effect or wage and the other one is the indirect effect on the wage rate, $\frac{\partial w}{\partial \tau} = \frac{\partial w}{\partial M_i}\frac{\partial M_i}{\partial \tau}$ *for* $i=1$ marginal benefit can be decomposed in three effects. First, the direct effect of the tax rate the indirect effect on the price of the social insurance system through the induced migrati $\frac{\partial \gamma}{\partial \tau} = \frac{\partial \gamma}{\partial M_i}\frac{\partial M_i}{\partial \tau}$ *for* $i=1,2$, and the third effect is caused by the changing wage rate. For dete of the signs of these derivatives it essential to know if the stability condition is satis simplify the analysis, we assume from now on that only one group is mobile at the san The mobility costs of the mobile group can be offset by the expected utility differential, v mobility costs of the other group are assumed to be too large to take migration into acc course this assumption is analogous with the distinction between the mobility of the rich a in the fiscal federalism literature.

First we discuss migration of high-risks. From equation (5) and the assumptions a production function we derive that $\frac{\partial \gamma}{\partial M_2}$ and $\frac{\partial w}{\partial M_2}$ both have a negative (positive) sig migration (home) country. Because policymakers take the tax rate in the other country $\frac{\partial M_i}{\partial \tau}$ follows from equation (8). From equation (9) it follows that migration unambiguous the expected utility of both risk-groups in country A and raises it in B. This implies stability condition holds and therefore $\frac{\partial \gamma}{\partial \tau}$ and $\frac{\partial w}{\partial \tau}$ have a negative sign for both countries.

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[8]We will assume that the second order condition for maximisation is fulfilled. can not prove this in general, this condition appears to hold in the numerical simulat model.

Given these results it follows that the tax rate in both countries will be lower, given the tax rate in the other country, compared to the case when migration is not possible. This can be seen by evaluating equation (10) in the point where the tax rate is optimal if no migration would occur (the wage rate and the price of the system are exogenous), $\frac{dD}{d\tau}$ is negative. The reason is quite clear. Because an inflow of high-risk workers implies a decrease in utility for both groups, see equation (9), both groups opt for a lower tax rate in order to prevent an increase in the size of the high-risk group in their country. In country B both groups desire a lower tax rate to stimulate emigration. As a result the benefit rate in A is definitely lower, but there are opposite effects on the benefit rate in country B: the decrease of the tax rate and of the number of allowances. It is not known a priori which effect dominates. Note that in countries with rigid wage rates, policymakers will set higher tax rates than in countries with flexible wage rates.

In case low-risk workers are mobile, it is not guaranteed that the stability condition is fulfilled. The negative congestion effects of migration in country A ($\frac{\partial w}{\partial M_1}<0$) may be compensated by the decrease of the price of the system ($\frac{\partial \gamma}{\partial M_1}>0$), see equation (9). Barring this unlikely case, we assume that the congestion effects on the wage rate dominate these on the social insurance system near the equilibrium, so $\frac{\partial E(U_1^A)}{\partial M_1}<0$ and $\frac{\partial E(U_1^B)}{\partial M_1}>0$. Given these assumptions it holds for both countries that $\frac{\partial w}{\partial \tau}$ has a negative sign and $\frac{\partial \gamma}{\partial \tau}$ has a positive sign.

These two opposite effects complicates the comparison with the tax rates in the nonmigration case. The congestion effects on the labour market will have an upward effect on the tax rate, because policymakers want to decrease the number of low-risks. On the other hand, as low-risk workers, are net contributors to the system, there is a tendency to decrease the tax rate. If the first order condition is evaluated in the point where migration is not possible, tax rates will be higher in an integrated market if the following equation is fulfilled.

$$\delta_1(1-\tau)\frac{\partial w}{\partial \tau}U'((1-\tau)w) + \delta_2\tau\left[\frac{\partial \gamma}{\partial \tau}w+\gamma\frac{\partial w}{\partial \tau}\right]U'(\tau\gamma w) = \frac{\partial D}{\partial M_1}\frac{\partial M_1}{\partial \tau}>0 \qquad (11)$$

In other words, if $\frac{\partial D^A}{\partial M_1}=\xi\frac{\partial E(U_1)}{\partial M_1}+(1-\xi)\frac{\partial E(U_2)}{\partial M_1}$ has a negative sign, the tax rate in country A is higher if low-risk workers are mobile. As can be seen from equation (9), if $\frac{\partial E(U_1^A)}{\partial M_1}<0$, it is nevertheless possible that $\frac{\partial E(U_2^A)}{\partial M_1}>0$, provided that the parameter λ_2 is large enough compared with λ_1. In that case the tax rate will be lower in country A if the relative political power of the high-risk group is large enough.[9] We will concentrate on the case that $\frac{\partial D^A}{\partial M_1} < 0$ and $\frac{\partial D^B}{\partial M_1} > 0$. The tax rates of both countries will be higher compared to the nonmigration equilibrium, given the tax rate in the other country. This implies that the benefit rate in the migration country will be raised, due to the higher tax rate and lower price of the system, while the change in the benefit rate of the home country is ambiguous, due to the opposite effects of a higher tax rate and a higher price of the system.

Note that if wages are not influenced by the size of the migration flow, it follows from equation (9) that $\frac{\partial E(U_1^A)}{\partial M_1} > 0$ and $\frac{\partial E(U_1^B)}{\partial M_1} < 0$, so the stability condition will not hold. If the expected utility differential between country A and B outweighs migration costs, see equation (7), all low-risk workers migrate to country A. As a consequence of the migration of low-risk workers, the expected utility of both groups increases in country A. This is due to the fact that low-risk workers are net contributors to the social insurance system. By lowering tax rates policymakers in the migration and home country try to stimulate immigration and prevent emigration, respectively.[10] The country with the more favourable political and/or population conditions or higher wage level will attract all low-risk workers. We conclude that, if congestion effects on the labour market are not relevant, mobility of the low-risk group will lead to a gathering of this group in one country only due to the economics of scale of emigration by this group.[11]

4. Decision making on social insurance: a general equilibrium analysis

In the previous section the optimal tax rate was derived given the tax rate of the other country. However, it is of interest to consider the relation among the tax rates in the two countries and to examine the Nash-equilibrium that result from maximisation of the decision-making functions of both countries given the optimal tax rate of the other country. We will pursue this by deriving the

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[9]Note, that we have the paradoxical result that if the political power of the high-risk group and their probability of getting laid off are relatively high, this will lead to a worsening of the social insurance system as measured by the tax rate.

[10]This result is well known in the literature on 'brain drains'. Bhagwati and Hamada (1982) derive from their model that less developed countries lower tax rates to prevent migration of the higher educated.

[11]Note that this conclusion implies that if low-risks are mobile one has to assume congestion costs that outweigh the scale effects of migration to guarantee an internal equilibrium. If high-risks are mobile, these scale effects do not exist, so the introduction of congestion effects on the labour market are not necessary to guarantee an internal equilibrium.

reaction functions. From the first order condition it follows that the level of the tax rate depends on the size of the migration flow and the tax rate of the other country, so $\hat{\tau}^I = \tau(M_i, \tau^J)$ *for* $i=1,2$ *and* $I \neq J$. The differential form of this function can be found by differentiating the first order condition, equation (10), with respect to both tax rates and the migration flow. We find

$$\frac{\partial^2 D^I}{\partial(\tau^I)^2} d\tau^I + \frac{\partial^2 D^I}{\partial\tau^I \partial M_i} dM_i + \frac{\partial^2 D^I}{\partial\tau^I \partial\tau^J} d\tau^J = 0 \quad for\ I,J=A,B\ and\ I \neq J\ and\ i=1,2 \tag{12}$$

On the other hand the size of the migration flow depends on both tax rates. By differentiating the migration equilibrium condition this relation can be written as

$$\frac{\partial E(U_2^A)}{\partial\tau^A} d\tau^A + \left[\frac{\partial E(U_2^A)}{\partial M_i} - \frac{\partial E(U_2^B)}{\partial M_i}\right] dM_i = \frac{\partial E(U_2^B)}{\partial\tau^B} d\tau^B \quad for\ i=1,2 \tag{13}$$

If the conditions of the implicit function theorem are fulfilled, the solutions of the tax rates can be written as a function of the other tax rate. Information about these reaction functions can be obtained by substituting equation (13) into (12).

$$\frac{d^2 D^I}{d(\tau^I)^2} d\tau^I = - \frac{d^2 D^I}{d\tau^I d\tau^J} d\tau^J \quad I,J=A,B \quad I \neq J\ and\ i=1,2 \tag{14}$$

where the total derivatives consist of the partial derivatives from equation (12) and (13). The relation between the total and partial derivatives and their signs are discussed in the appendix. Equation (14) gives the derivatives of the reaction functions, i.e. it describes how the tax rate of one country reacts to a change in the tax rate of the other country. Notice that $\frac{d^2D}{d\tau^2}$ has a negative sign, because of the second order condition for welfare maximisation. Under some plausible assumptions $\frac{d^2D^I}{d\tau^I d\tau^J}$ has a negative sign for both countries irrespective of the risk of being unemployed of the mobile group. This result is based on the assumptions that the utility function is strongly curved, i.e. that the absolute value of the elasticity of the marginal utility of the net wage and benefit are relatively large, and, secondly, that the social insurance system has such a high coverage that the effects of the change in the price of the system dominates the effects of the change in the wage rate. The economic implication of the first assumption is that the income effect of changes on the benefit and wage level dominates the possibly opposed substitution effect. So, if the tax rate in the home country is raised and as a consequence less people with a high risk of being jobless migrate, policymakers in the migration country will lower the tax rate, because of the dominance of the income effect. For further details we refer to the appendix.

From these results it follows that both total derivatives in equation (14) have a negative sign, so the reaction curves have a negative slope in the neighbourhood of the equilibrium. From our simulations it follows that the absolute value of the slope of the reaction curve of country A is always larger than the absolute value of the slope of the reaction curve of country B in the Nash-equilibrium, independent of the risk of the migrants.[12] We know from the partial analysis in section 3 that both countries set a lower tax rate if migration of high-risks is possible, given the tax rate in the other country. As a result in the Nash-equilibrium tax rates will be lower compared with the situation where migration of high-risk workers is not possible. This is illustrated in figure 1.

{insert figure 1}

So in correspondence with results in literature, e.g. Brown and Oates (1987), the labour mobility of high-risks will lead to a lower average level of the social insurance tax rate, because the federal states want to diminish the size of high-risk workers. Because of the outflow of high-risk workers in the home country, it is not necessarily true that the benefit rate in that country is also lower. However our simulation results, see table 1, suggests that the decrease in the tax rate is of more importance for the benefit rate than the outflow of migrants.

In case the low-risk workers are mobile, the results are the opposite. Following the same reasoning as above we conclude that the level of both tax rates in the Nash-equilibrium is higher than in the nonmigration case. The benefit rates in both countries are also higher, if in the home country the effect of the change in the tax rate on the benefit rate dominates the effect of the outflow of low-risk workers. This is the case in our simulations, see table 1.

5. The effects of increasing integration

Since the European economic integration is an ongoing process, it is also important to analyse the effects of removing barriers to labour mobility. The measures of the European Community to ease migration can be represented in the model by decreasing mobility costs. Such changes in costs can

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[12]Note that this implies that the equilibrium is numerically stable.

be due to policy measures such as the abolition of border control in the Community or the disappearance of the borders alltogether in the FRG and the former GDR. On the other hand, information campaigns about job possibilities in other countries and the organisation of exchange programs, are examples of policy measures aimed at decreasing the psychological barriers to migration.

The effects of a change in mobility costs can be found by a comparative-static analysis. Starting from the Nash-equilibrium described by equation (14) the effects of a change in mobility costs follows by totally differentiating both first order conditions and the migration equilibrium condition. From the migration equilibrium it follows that the extra inflow of migrants into the migration country is determined by the initial effect of the decrease in mobility costs and the inflow that result from the changes in the tax rates.

$$dM_i = \frac{\partial M_i}{\partial \tau^A} d\tau^A + \frac{\partial M_i}{\partial \tau^B} d\tau^B + \left[\frac{\partial E(U_i^A)}{\partial M_i} - \frac{\partial E(U_i^B)}{\partial M_i} \right]^{-1} dC \qquad (15)$$

If dM_i is substituted in de differentiated first order conditions, see equation (12), it follows that

$$\frac{d^2 D^I}{d(\tau^I)^2} d\tau^I + \frac{d^2 D^I}{d\tau^I d\tau^J} d\tau^J + \frac{\partial^2 D^I}{\partial \tau^I \partial M_i} \left[\frac{\partial E(U_i^A)}{\partial M_i} - \frac{\partial E(U_i^B)}{\partial M_i} \right]^{-1} dC = 0 \quad I,J = A,B,\ I \neq J \qquad (16)$$

From equation (16) we can solve the changes in the tax rates as a function of the change in mobility costs. If we define s_I as minus the slope of the reaction curve, see equation (14), this relation is equal to

$$\left(1 - \frac{s_B}{s_A}\right) d\tau^I = \left(\frac{d^2 D^I}{d(\tau^I)^2}\right)^{-1} \left(- \frac{\partial^2 D^I}{\partial \tau^I \partial M_i} + \frac{\frac{d^2 D^I}{d\tau^I d\tau^J} \frac{\partial^2 D^J}{\partial \tau^J \partial M_i}}{\frac{d^2 D^J}{d(\tau^J)^2}} \right) \left(\frac{\partial E(U_i^A)}{\partial M_i} - \frac{\partial E(U_i^B)}{\partial M_i} \right)^{-1} dC \quad for I,J = A,B,\ I \neq J \qquad (17)$$

If $s_A > s_B$ [13], the left hand side of this equation has a positive sign. Given the signs of the partial and total derivatives, as is discussed in the appendix, the sign on the right hand side of equation (17) is negative (positive) for mobility of the high-risk (low-risk) group in the migration country. As a result, if high-risk workers are mobile, the tax rate is raised in the migration country and it

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[13] This implies that the equilibrium is locally stable. In the numerical simulations with the model this condition always appeared to hold.

is lowered in the home country. This is illustrated in figure 2. If low-risks are mobile, the signs of the changes are reversed.

{insert figure 2}

Given the fact that $\frac{d\tau^A}{dC}<0$ and $\frac{d\tau^B}{dC}>0$, we can conclude from equation (15) that lower mobility costs increase the size of the migration flow. Lower mobility costs stimulate migration. As discussed in the appendix this has two effects on the benefit levels. On the one hand the marginal benefit with respect to the tax rate is changed. This effect could be positive or negative, so the effect on the level of the tax rate is ambiguous. On the other hand, the increase (decrease) of high-risk workers in the migration (home) country raises (lowers) the marginal utility of the benefit level. The second effect induces policymakers in the migration (home) country to raise (lower) the tax rate. Because we have assumed that the second effect dominates, policymakers in the migration country will raise the tax rate, while policymakers in the home country will lower it. An analogous reasoning can be held, if low-risks migrate. This implies that in case the social insurance system in the migration country is better than in the home country, the systems will diverge from each other.

On the other hand it is possible that the migration effect on the marginal utility of the benefit dominates the effect on the marginal benefit. In that case the signs of the partial second order derivatives to the tax rate and the size of the migration flow are reversed. According to our numerical results, $\frac{d^2D^J}{d\tau^J d\tau^J}$ is positive for both countries, so the term on the right hand side of equation (17) has an ambiguous sign. Tax rates could be raised or lowered, even the change in the size of the migration flow is not determined. This is illustrated in figure 3, where is assumed that high-risk workers are mobile.

{insert figure 3}

The results we obtained by lowering mobility costs deviate from Gramlich (1985). This is caused by the fact that Gramlich represents increasing mobility by raising his exogenous elasticity of the tax rate to the migration flow. So migration behaviour is more sensitive to changes in the tax rate. Such a change in the elasticity is comparable to the situation that migration becomes possible, when this was initially not the case. As a consequence policymakers in the migration country will lower the tax rate. In our case lower mobility costs imply that people get the incentive to migrate because of the differences in expected utility, but does not necessarily imply that people are more sensitive to changes in the tax rate.

6. Coordination of decision making

Policymakers maximise the decision-making function in their country, while taking the decisions in the other country as given. As is well known, such behaviour is inefficient, because both countries neglect the benefits and costs of their own decisions accruing to the other country, e.g. if the migration country lowers (raises) the tax rate to prevent migration of high-risk (low-risk) workers, the home country faces the costs of less migration. Such externalities can be taken into account if policymakers of both countries coordinate their decisions. In this section we examine the desirability of coordination and the effects for the level of social insurance. We use the term 'coordination' to characterise the situation that countries decide autonomously on the level of social insurance in taking into account the external effects to the other country. Coordination will only be agreed upon if both countries gain from it. If we write the political decision-making function in the Nash-equilibrium as $D^I = D^I(\hat{\tau}^I, M_i(\hat{\tau}^I, \hat{\tau}^J))$ *for* $I \neq J$ *and* $I,J \in \{A,B\}, i = 1,2,$ coordination will be strictly 'welfare'-improving if

$$dD^I = \frac{\partial D^I}{\partial \tau^I} d\tau^I + \frac{\partial D^I}{\partial M_i}\left[\frac{\partial M_i}{\partial \tau^I} d\tau^I + \frac{\partial M_i}{\partial \tau^J} d\tau^J\right] > 0 \quad for\ I \neq J \quad and \quad I,J \in \{A,B\},\ i = 1,2 \tag{18}$$

If this expression is evaluated in the Nash-equilibrium, the first and second term on the right hand side of equation (10) cancel out for both countries. As $\frac{\partial D^A}{\partial M_i}\frac{\partial M_i}{\partial \tau^B}$ and $\frac{\partial D^B}{\partial M_i}\frac{\partial M_i}{\partial \tau^A}$ are both positive in case high-risk workers are mobile, both countries want to coordinate their actions only if the other tax rate is raised compared with the Nash-equilibrium. In case low-risks are mobile both expressions have a negative sign and policymakers only want to coordinate if the tax rate in the other country is lowered. Let us suppose that the countries agree to coordinate their actions by acting 'as if' they maximise the following welfare function

$$D^{I'} = D^A + D^B \quad for \quad I = A,B \tag{19}$$

The first order condition for policymakers in country I becomes now

$$\frac{dD^{I'}}{d\tau^I} = \frac{\partial D^I}{\partial \tau^I} + \frac{\partial D^I}{\partial M_i}\frac{\partial M_i}{\partial \tau^I} + \frac{\partial D^J}{\partial M_i}\frac{\partial M_i}{\partial \tau^I} = 0 \quad for \quad I \neq J \ and \ I,J \in \{A,B\},\ i=1,2 \tag{20}$$

If we evaluate this expression in the Nash-equilibrium, we find that $\frac{dD^{I'}}{d\tau^I}>0$ *for* $I=A,B$ if high-risks migrate and $\frac{dD^{I'}}{d\tau^I}<0$ *for* $I=A,B$ if low-risks migrate. So indeed, in both countries policymakers want to coordinate their decisions according to equation (19). By this coordination arrangement the costs of migration are internalized.

In the case that high-risk workers are mobile, policymakers in country A raise the tax rate in order to lower the size of high-risk workers in country B. In the same way policymakers in country B raise the tax rate, because migration is costly for the migration country. Both tax rates and the average benefit rate wil be higher compared to the Nash-equilibrium when countries coordinate their actions. Remarkably, one tax rate is even higher than the corresponding nonmigration tax rate. If the term $\left[\frac{\partial D^A}{\partial M_i} + \frac{\partial D^B}{\partial M_i}\right]\frac{\partial M_i}{\partial \tau^A}$ is positive, the tax rate in country A will be higher, because the (positive) migration effects on the social insurance system in the home country are larger than the (negative) effects in the migration country. If these effects are smaller (so the term in brackets is negative), the tax rate of country B is higher than the nonmigration tax rate. We conclude that coordination of decision making on social insurance prevents a worsening of the system compared with the Nash-equilibrium and could possibly sustain a level of social insurance that is comparable with the nonmigration level, if high-risk workers are mobile. In our simulation results, see table 1, this conjecture appears to hold. Note that we have established that there will be tax competition in a decentralized system of social insurance if the high-risks are mobile. This confirms the results of Gramlich (1985), Gramlich-Laren (1984) en Brown and Oates (1987)

Although policymakers have the same motives if low-risks are mobile, the results are the opposite. Policymakers in both countries lower the tax rate to diminish the costs accruing to the other country. If the negative welfare effects of migration in country A dominate the positive welfare effects of migration in country B, $\left[\frac{\partial D^A}{\partial M_1} + \frac{\partial D^B}{\partial M_1}\right]<0$ the tax rate in country A is still higher than before economic integration, but the tax rate in B is lower.

For policy matters it is essential to know the degree of mobility of both groups. According to Greenwood (1975) and Heijke (1987), higher educated are far more mobile than lower educated. This statement is based on arguments like the amount of information that higher educated have about labour opportunities abroad, and the quality of these labour opportunities. If we roughly identify higher educated with low-risk workers, migration of low-risk workers is more likely than migration of high-risk workers. So in the European Community, coordination of social insurance systems does not necessarily protect the expenditures on social insurance, but could deteriorate them if countries do not want to attract low-risk workers.[14] On the other hand, if this last assumption is not valid, coordination would protect the level of social insurance.

Until now coordination only means that policymakers take into account the welfare effects of their decisions on the other country. The cooperation of the countries could be extended by introducing transfer payments between the countries into to direct the migration flow. Although in equilibrium people have no incentive to migrate, the allocation of the population between the countries is in general not efficient, even when there are not any migration costs. It may be Pareto improving if one country transfers a grant to the other country, to prevent or stimulate migration.[15] If the migration country pays a grant to the other country, potential migrants have fewer incentives to migrate because the welfare differential has been diminished. If the increase in welfare of country A, caused by less expenditures on social insurance, is not dominated by the costs of the grant and if the increase of welfare in country B, caused by the transfer payment, is not dominated by the extra expenditures on allowances, the grant is Pareto improving.

In our social insurance model the introduction of a grant implies that one country partly finances the social insurance system of the other country, so the system is only closed for the countries together, but not for both countries apart. The grant appears on the expenditure side in the budget constraint of the donor country and on the financing side in the constraint of the receiving country. As a consequence the grant has a direct effect on utility of both groups in the two countries, which implies a change in the preferred tax rates. Moreover, the grant and the concomitant tax change induce a migration flow, so $M_i = M_i(\tau^A, \tau^B, S)$. If we write the political decision making function as $D^I = D^I(\tau^I, S, M_i(\tau^I, \tau^J, S))$ *for* $I \neq J$ *and* $I, J \in \{A, B\}$, $i = 1,2$, then the grant is strictly Pareto improving if

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[14]Of course, coordination is efficient, but that is not the issue here.

[15]See for a more detailed discussion on the efficiency of grants Boadway and Flatters (1982).

$$dD^I = \frac{\partial D^I}{\partial \tau^I}d\tau^I + \frac{\partial D^I}{\partial S}dS + \frac{\partial D^I}{\partial M_i}\left[\frac{\partial M_i}{\partial \tau^I}d\tau^I + \frac{\partial M_i}{\partial \tau^J}d\tau^J + \frac{\partial M_i}{\partial S}dS\right] > 0 \text{ for } I \neq J \text{ and } I,J \in \{A,B\} \quad (21)$$

Because we are interested in the question if the introduction of a grant in an economic community is welfare improving for both countries compared with coordination, we evaluate equation (21) in the point where the tax rates are optimal according to equation (20). So

$$dD^I = \left[\frac{\partial D^I}{\partial S} + \frac{\partial D^I}{\partial M_i}\frac{\partial M_i}{\partial S}\right]dS + \frac{\partial D^I}{\partial M_i}\frac{\partial M_i}{\partial \tau^J}d\tau^J - \frac{\partial D^J}{\partial M_i}\frac{\partial M_i}{\partial \tau^I}d\tau^I \text{ for } I \neq J \text{ and } I,J \in \{A,B\} \quad (22)$$

If we assume that the grant is transferred from country A to B, $\frac{\partial D^A}{\partial S}$ has a negative sign and $\frac{\partial D^B}{\partial S}$ a positive sign. Because the grant raises welfare in the home country, the migration flow diminishes, so the sign of $\frac{\partial M_i}{\partial S}$ *for* $i = 1,2$ is negative. So the expression preceeding dS can be positive or negative. We assume that for one country the expression preceeding dS is positive and for the other country it is negative. The expressions preceeding $d\tau^B$ and $d\tau^A$ have a positive sign, if high-risks are mobile and a negative sign if low-risks migrate.

If we combine both inequalities of equation (22), a grant is strictly welfare improving if the changes of both tax rates and the size of the grant fulfil the following condition

$$-\left[\frac{\partial D^B}{\partial S} + \frac{\partial D^B}{\partial M_i}\frac{\partial M_i}{\partial S}\right]dS < \frac{\partial D^B}{\partial M_i}\frac{\partial M_i}{\partial \tau^A}d\tau^A - \frac{\partial D^A}{\partial M_i}\frac{\partial M_i}{\partial \tau^B}d\tau^B < \left[\frac{\partial D^A}{\partial S} + \frac{\partial D^A}{\partial M_i}\frac{\partial M_i}{\partial S}\right]dS \quad (23)$$

So, if the coefficient preceeding dS is positive for country A, policymakers in country A raise the tax rate to finance the grant, while policymakers in country B lower the tax rate. In that case the negative direct welfare effects of the grant on country A are dominated by the positive welfare effects of the decreasing size of the migration flow, while in country B the welfare gains of the grant dominate the welfare costs of an increased labour supply. Because we have assumed that for high- and low-risk workers congestion costs on the labour market dominate these costs on the social insurance system, this result is valid for the mobility of both groups.

In the analysis above both countries decide on their own contributions and outlays on the social insurance system. Countries could also decide to integrate their social insurance systems completely, so that contributions and benefit levels are equal in both countries. In that case people have no incentive to migrate in this model if the wages in both countries are equal. The problem is that the individual countries differ from each other in the population structure and/or political constellation. In that case the tax rates of country A and B that fit equation (20) in a decentralized system where decisions are coordinated are not the same. The optimal tax rate in a centralized system can not fulfil this equation, which implies that a global social insurance system is not efficient, compared to coordinated decision making in a decentralized system.

7. Conclusions

We studied different aspects of the influence of migration on decision making on social insurance systems. Clearly, if labour mobility increases due to economic integration this will affect decision making. The results depend on the mobility of the groups and the congestion effects on the economy, especially the labour market. The effects of migration of high-risk workers correspond with the results in literature. Migration has a downward pressure on the average level of social insurance benefits, although it is not clear in our model whether the benefit level in the migration country is also lower. In examining mobility of the low-risk group the existence of congestion effects on the labour market appeared to be of crucial importance. If the countries only differ in social insurance systems all low-risk workers migrate to the country with lower tax rates, because they prefer lower rates. As countries want to attract low-risk workers, they compete against each other by lowering tax rates. If countries consider migration as a cost, they raise tax rates to try to reduce the size of the low-risk group. In this case the possibility of migration could even result in a higher level of social insurance in both countries. Because it is expected that low-risk workers are much more mobile than high-risk workers in Europe and there exists congestion costs in most countries, the European integration will probably not worsen the level of social insurance, according to our model.

Coordination of decision making on social insurance could (partially) offset the consequences of migration on the level of social insurance. If countries take the welfare effects on the other into account one country will set a higher tax rate than in the nonmigration case and the other country a lower tax rate. The benefit levels may change even less. If countries face congestion effects on the economy and low-risk workers are mobile coordination could even lower the tax rates. A federal grant structure between the countries could be in the interest of all countries because it influences migration flows and a more favourable population structure in both countries is possible. A disadvantage of the grant structure is that the precise size of the grant and the necessary corresponding tax changes can be hard to be established. The advantage of both coordination measures is that countries hold their autonomous decision power on social insurance and that all countries profit from cooperation.

The importance of modeling economic congestion effects raises some questions about the economic structure of the model. Contrary to the facts, capital is immobile in the model. This has consequences for the sensitivity for the wage level to migration flows. If for example capital flows have the same direction as migration flows, the downward pressure on wage levels could be (partly) offset by the increase of capital. Even more important is the fact that the flow of capital can be influenced by labour costs and therefore the level of social insurance. The mobility of capital could imply a downward pressure on the level of social insurance. These issues will be taken up in further research.

Appendix

In this appendix we give the relation between the second order total derivatives of the political welfare function and the partial derivatives and we discuss their signs. Given these signs we can determinate the slope of the reaction curves, equation (14) and the effects of a change in the mobility costs. The second order condition of maximisation for the political welfare function, equation (4), is equal to

$$\frac{d^2D}{d\tau^2} = \frac{\partial^2 D}{\partial \tau^2} + \frac{\partial^2 D}{\partial \tau\, \partial M_i}\frac{\partial M_i}{\partial \tau} < 0 \qquad \text{(A1)}$$

It appeared in our simulations that this condition was always fulfilled.

The other total derivative of equation (14) is equal to

$$\frac{d^2D^i}{d\tau^i d\tau^j} = \frac{\partial^2 D^i}{\partial \tau^i \partial M_i}\frac{\partial M_i}{\partial \tau^j} + \frac{\partial^2 D^i}{\partial \tau^i \partial \tau^j} \qquad \text{(A2)}$$

We need to know the signs of the partial derivatives in order to say something about the sign of the total derivative. The expression $\frac{\partial^2 D}{\partial \tau\, \partial M_i}$ can be written as

$$\frac{\partial^2 D}{\partial\tau\partial M_i} = \delta_1\frac{\partial^2 L}{\partial\tau\partial M_i}U'(L) + \delta_1\frac{\partial L}{\partial\tau}\frac{\partial L}{\partial M_i}U''(L) + \delta_2\frac{\partial^2 B}{\partial\tau\partial M_i}U'(B) + \frac{\partial B}{\partial\tau}\frac{\partial B}{\partial M_i}U''(B) \quad \text{(A3)}$$

where L represents the net wage level and B the benefit level. From the first order condition we know that $\frac{\partial L}{\partial\tau}<0$, $\frac{\partial L}{\partial M_i}>0$ in the home country and $\frac{\partial B}{\partial\tau}>0$. Equation (A3) consists of four terms. The first (third) measures the effect of an increase of the migration flow on the marginal net wage (benefit) to the tax rate. These effects, which can be interpreted as price effects, consists of substitution and income effects. The price effects can be positive or negative. If they are negative, policymakers have an incentive to lower the tax rate. The second (fourth) term measures the negative (positive) effect of an increase in the migration flow on the marginal utility of the net wage (benefit). These can be interpreted as income effects. Because of the negative effect of an increase in the size of high-risk workers in the migration country on the marginal utility of the net wage policymakers want to lower the tax rate, but because of the positive effect on the marginal utility of the benefit they want to raise it. To make some plausible assumption about the sign of equation (A3), we define the elasticity of the marginal utility, $\sigma_x=\frac{xU''(x)}{U'(x)}$ (<0). A larger absolute value of the elasticity of marginal utility implies that the income effects become more important relative to the substitution effects. Equation (A3) becomes now

$$\frac{\partial^2 D}{\partial\tau\partial M_i} = \delta_1\frac{\partial L}{\partial\tau}\frac{\partial L}{\partial M_i}\frac{U'(L)}{L}(\epsilon_L+\sigma_L) + \delta_2\frac{\partial B}{\partial\tau}\frac{\partial B}{\partial M_i}\frac{U'(B)}{B}(\epsilon_B+\sigma_B) \quad \text{(A4)}$$

with $\epsilon_x = \frac{\partial^2 x}{\partial\tau\partial M_i}x/\frac{\partial x}{\partial\tau}\frac{\partial x}{\partial M_i}$. With the help of the first order condition equation (A4) can be rewritten as

$$\frac{\partial^2 D}{\partial\tau\partial M_i} = \delta_1\frac{\partial L}{\partial\tau}U'(L)\left[L^{-1}\frac{\partial L}{\partial M_i}(\epsilon_L+\sigma_L) - B^{-1}\frac{\partial B}{\partial M_i}(\epsilon_B+\sigma_B)\right] \quad \text{(A5)}$$

The term in brackets has no clear cut sign. Therefore we make a simplifying assumption. We assume that the coverage of the risk in the system is on a level such that changes in the price of the system, caused by migration, have more impact than changes on the wage rate, which is in general the case if the coverage is high enough. Note that $\frac{\partial L}{\partial M_i} = (1-\tau)\frac{\partial w}{\partial M_i}$ and $\frac{\partial B}{\partial M_i} = \tau\gamma\frac{\partial w}{\partial M_i}+\tau\frac{\partial\gamma}{\partial M_i}w$. In case of full insurance it holds that $1-\tau=\tau\gamma$ and $\epsilon_L+\sigma_L$ is approximately equal to $\epsilon_B+\sigma_B$, so that the term in brackets reduces to $-B^{-1}\tau\frac{\partial\gamma}{\partial M_i}w(\epsilon_B+\sigma_B)$. If $\epsilon_B+\sigma_B<0$, for example because the income effect is dominant, the sign of equation (A5) is positive (negative) if the high-risks (low-risks) are mobile for the migration country. The results for the home country are the opposite.

The other partial second order derivative in equation (12) reads

$$\frac{\partial^2 D^I}{\partial\tau^I\partial\tau^J} = \left(\delta_1(1-\tau^I)\frac{\partial w^I}{\partial M_i}U'((1-\tau^I)w^I) + \delta_2\left[\tau^I\frac{\partial\gamma^I}{\partial M_i}w^I + \tau^I\gamma^I\frac{\partial w^I}{\partial M_i}\right]U'(\tau^I\gamma^I w^I)\right)\frac{\partial^2 M_i}{\partial\tau^I\partial\tau^J} \quad \text{(A6)}$$

where

$$\frac{\partial^2 M_i}{\partial\tau^I\partial\tau^J} = \frac{-\frac{\partial E(U_i^I)}{\partial\tau^I}\frac{\partial^2 E(U_i^J)}{\partial M_i\partial\tau^J}}{\left[\frac{\partial E(U_i^J)}{\partial M_i} - \frac{\partial E(U_i^I)}{\partial M_i}\right]^2} \quad \text{(A7)}$$

and

$$\frac{\partial^2 E(U_i)}{\partial M_i\partial\tau} = -(1-\lambda_i)\frac{\partial w}{\partial M_i}U'((1-\tau)w)(1+\sigma_L) + \lambda_i\left(\frac{\partial\gamma}{\partial M_i}w + \gamma\frac{\partial w}{\partial M_i}\right)U'(\tau\gamma w)(1+\sigma_B) \quad \text{(A8)}$$

The sign of equation (A8) depends also on the assumptions about the curvature of the utility function and the coverage of the social insurance system. We assume that the absolute value of the elasticity of marginal utility of the net wage (σ_L) and the benefit level (σ_B) are larger than one and that the coverage is such that the effect of the change in the price of the system dominates that of the change in the wage rate. The simulation results support these assumptions. So it follows that $\frac{\partial^2 E(U_i)}{\partial M_i\partial\tau}$ is positive (negative) for the migration country if high-risks (low-risks) are mobile. The results for the home country are the opposite. From equation (A7) it follows that the sign of $\frac{\partial^2 M_i}{\partial\tau^I\partial\tau^J}$ is positive (negative) for the migration (home) country. Because we have assumed that congestion effects on the labour market dominate these on the social insurance system, see equation (11), the sign of (A8) is negative in both cases for both countries.

With these results it is possible to determine the sign of $\frac{d^2 D^I}{d\tau^I d\tau^J}$. From equation (A2) it follows that for both the migration and home country the sign of this total derivative is negative, independent of the group that migrates, given that, firstly, the curvature of the utility function is strong enough and, secondly, there is enough coverage of the risk so that changes in the price of the system dominates changes in the wage rate.

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FIGURE 1.

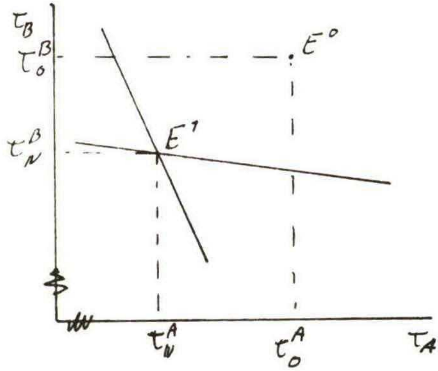

FIGURE 2

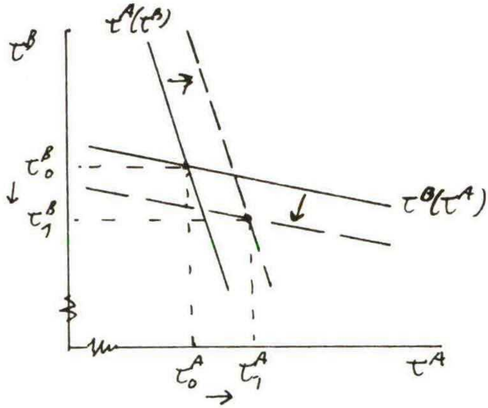

FIGURE 3.

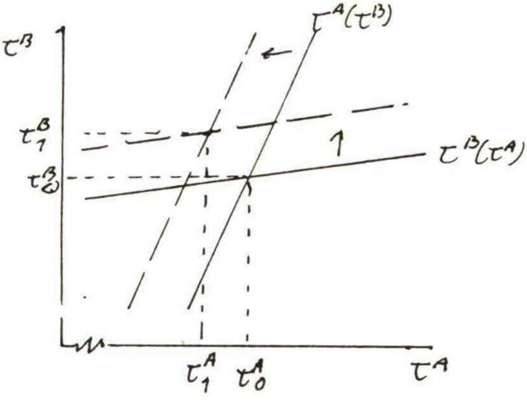

Table 1

In the simulations we specified for the utility and political welfare function a CES function with coefficient $1-\alpha$. α is set at 1.5. The production function is specified as a Cobb Douglas function with decreasing returns to scale, the coefficient is set at 0.75. The scale coefficients of the production function are: $A^A = 1.05$ and $A^B = 1.00$. The risks of being jobless of the low and high-risk workers are set at $\lambda_1 = 0.15$ and $\lambda_2 = 0.30$. We assume that the initial population consists of 5 million low-risk workers and 5 million high-risks workers in both countries. The political influence of the low-risks is set at $\xi^A = 0.50$ and $\xi^B = 0.60$. The political weight of the low-risk workers in the home country is higher, so that high-risk people have an incentive to migrate to country A. For the same reason ξ^B is set at 0.4 if low-risk workers are mobile. $\bar{\eta}$ represents the weighted average benefit rate for both countries.

In both tables we analyse three cases: firstly, a comparision of the situations that migration is not possible and policymakers take into account migration behaviour ($C = 1.05$), secondly, declining mobility costs ($C = 1.05$ and $C = 1.04$) and, thirdly, a comparison of the situations with and without coordination.

Table 1A: High-risk workers migrate

CASE	τ^A (%)	τ^B (%)	η^A (%)	η^B (%)	$\bar{\eta}$ (%)	M_2 (10^5)
No migration	22.5	21.5	77.5	74.0	75.8	0.0
C = 1.05	19.1	15.5	64.2	54.9	59.9	5.42
C = 1.04	19.3	15.1	64.6	54.1	59.9	7.85
Coordination C = 1.05	22.5	21.5	77.4	74.2	75.8	0.72
Coordination C = 1.04	22.7	21.3	77.3	74.2	75.8	2.25

Table 1B: Low-risk workers migrate

CASE	τ^A (%)	τ^B (%)	η^A (%)	η^B (%)	$\bar{\eta}$ (%)	M_1 (10^5)
No migration	22.5	25.5	77.5	81.0	79.2	0.0
C = 1.05	25.8	27.9	90.2	94.7	92.4	3.20
C = 1.04	25.6	28.1	90.5	94.2	92.3	6.17
Coordination C = 1.05	22.5	23.5	77.8	80.6	79.2	1.10
Coordination C = 1.04	22.4	23.7	78.2	80.2	79.2	3.72

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