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# **DISKUSSIONSBEITRÄGE**

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**Intergenerational Redistribution and Labor Mobility: A Survey**

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# Intergenerational Redistribution and Labor Mobility: A Survey

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## **Abstract**

Increasing labor mobility has an impact on all redistributive policy measures undertaken by national governments. This paper focuses on intergenerational redistribution, in particular PAYG financed public pension systems, and surveys some of the recent literature on this topic. Two different strands in the literature are covered: In the median-voter framework, policy outcomes depend on both the structure of the population and on the design of the public pension system. In addition, we look at the welfare-theoretical literature which addresses the harmonization of social security policies.

**Keywords:** Public pensions, competition of social policies.

**JEL classification:** H55, R23

# 1 Introduction

The European countries and the Commission of the European Union promote the mobility of goods, services, and production factors in order to deepen European integration. Outside the EU, the process of globalization increases mobility as well. At the same time, social security remains a national policy task. Just recently, in December 2000, the Treaty of Nice confirmed that all issues of social security policy within the EU still have to be decided on by unanimous vote. In practice, this implies that major advances towards an integrated European social security policy cannot be expected in the coming years.

At the same time, labor mobility is likely to increase further in the future. This obviously has an impact on European social security systems which raises some important questions: How much of the recent problems of the national social security systems can be explained by the process of European integration? Is there an impact on the efficiency of factor allocation or on the provision of social security if the social security systems remain a national task and no coordination between European countries takes place? To which level of government should social policy be assigned, in order to achieve the normative objectives of the EU?

In this paper, we will try to give at least some answers to these questions by surveying some of the recent literature on *intergenerational* redistribution and labor mobility in open economies<sup>1</sup>. These issues have recently been discussed by a number of authors, including Breyer/Kolmar (1996, 2000, 2001), Haupt/Peters (1998, 1999), Homburg/Richter (1993), Konrad (1995), Razin/Sadka (1999, 2000a, 2000b), and Wildasin (1999) in two separate strands of the literature. One part of the literature deals with nationally optimal social policy mostly focuses on a median voter framework. This literature shows that policy outcomes may differ depending on the structure of the population, or on the design of the public pension system. The implication for the EU is that all issues of social security harmonization have to take into account the outcome of the underlying national political process. As the analysis is positive in nature, we cannot conclude, however, whether the final outcome

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<sup>1</sup>The literature on *intragenerational* redistribution was recently reviewed by Cremer et al. (1996).

is desirable from a welfare point of view.

The second strand in the literature explicitly addresses the harmonization of social security policies, employing the concept of benevolent dictator governments. This allows to find desirable outcomes in the above mentioned sense. The results may, however, be biased because of an incomplete picture of the political process in the national arena.

In this paper, we analyze and contrast these two disparate approaches to intergenerational redistribution under increasing labor mobility. In all cases, we focus on PAYG financed social security such as public pensions systems. Usually the models are based on an OLG framework. Fully funded pension systems will be neglected since they are not intergenerationally redistributive. Furthermore they do not play a major role in the EU member states' public pension systems.

In section 2, we will start out by discussing the basic issues of migration and public pensions. It will be shown in a very simple framework how international differences in the public pension systems induce migration and may result in welfare losses. Section 3 turns to the question how countries adapt to increasing labor mobility by choosing their nationally optimal policy. In the median-voter framework, we will discuss how the voting process changes if migration becomes possible. Furthermore, the role of the immigrants' skill levels is analyzed in a dynamic framework. The section ends with an investigation of the impact of labor mobility on the immobile factors such as land. After having reviewed the literature on nationally optimal policy, section 4 asks for the conditions of global efficiency. If migration distorts global efficiency, policy harmonization has to be considered as a measure to overcome the problem. Section 5 concludes by summarizing the main findings.

## **2 Basic issues of migration and public pensions**

Only a few decades ago, international exchange was limited to trade in goods and services. The lack of mobility of production factors made European countries basically were closed economies with centralized social security systems. Today, in comparison, we have a confederation with mobile factors of production between the

member states of the union<sup>2</sup>. Mobility is even promoted by European politics. What we do not have (yet), however, is a federation with a strong central government level. This role is fulfilled only partly by the EU Commission and the European Council. Almost all important redistributive policy measures remain in the responsibility of the member states. As a consequence, increasing factor mobility may put pressure on national redistributive systems<sup>3</sup>.

It is a well-known fact from the traditional literature on fiscal federalism that in order to avoid migration incentives redistribution policy is best carried out at a *central* government level which has a geographical scope that coincides with the relevant factor markets. With increasing factor mobility the market is the EU (see Wildasin (1999)) and the term "central" refers to the EU solution. In the absence of a centralized social security policy, inefficiencies and prisoner's dilemma situations cannot be excluded.

In today's Europe one therefore finds the topic of whether to harmonize European social security systems or not addressed frequently in the recent literature. One of the main interests of this area of research is whether national social security systems are still efficient under the circumstances of increasing labor mobility or if some form of policy adjustment has to be considered. According to Kolmar (1999), four different qualities of adjustment for public pension systems can be distinguished : (i) cooperation, which is the weakest form of adjustment, (ii) coordination, which introduces some link between the contribution rates between different systems, (iii) harmonization with equal contribution rates in all countries, or (iv) consolidation, which is the introduction of a single union-wide public-pension system.

The basic fiscal federalism arguments can easily be shown in the traditional framework of a static general equilibrium model. For this, we will first introduce the

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<sup>2</sup>Regarding labor mobility, Schneider (1996) gives some interesting data for the EU member states on employment abroad and the willingness to work abroad. Employment abroad ranges from just 2% of work force in Germany and the Netherlands to 10% in Denmark, 11% in Portugal and up to 23% in Ireland. The willingness to work abroad is low in Germany (28%), Greece (31%), and Belgium (34%), while it is high in Britain (57%), Portugal (56%), Denmark (52%), or France (50%).

<sup>3</sup>See Breyer/Kolmar (1996, 2000).

concept of the net public pension wealth  $NPPW$  (see Feldstein (1974)). This measure equals gross public pension wealth which is the present value of retirement benefits less the present value of the contributions to the public pension plan.

For simplicity, one can assume a proportional payroll tax  $\tau_i$  as contribution to the social security system and a lump-sum annuity  $b_i$  as benefit. Furthermore, it is assumed that the retirement and the end of life occur with certainty at age  $R$  or at age  $D$ , respectively. Then, from the lifetime budget constraint of a worker in country  $i$  one can easily derive the net public pension wealth which is

$$NPPW^i = \sum_{t=R}^D \frac{b_i}{(1+r)^t} - \sum_{t=0}^R \frac{\tau_i w_i}{(1+r)^t}$$

The  $NPPW$  might be positive or negative. If we assume the marginal productivity of labor ( $MPL$ ) to be equal in all countries, then a lifetime utility maximizing individual will choose the country with the maximum  $NPPW$  as place of residence. Hence, the  $NPPW_i$  is a measure of the fiscal incentive to reside in country  $i$ .

Wildasin (1999) finds in his empirical analysis for seven European countries that the  $NPPW$  is negative in all countries for young individuals and families (see Table 1). In some countries like France or Italy, the  $NPPW$  is still positive for middle-aged individuals but this is probably due to delayed reforms of the pension systems.

#### INSERT TABLE 1

The reduction in lifetime income is quite substantial in most countries. It goes up to ninety-thousand Euros (or 31 percent of total lifetime income) for a young Dutch single. The differences in  $NPPW$  for different national social security systems create strong incentives for migration. The same young Dutch single will gain 15 percent of lifetime income by moving to Germany and even 25 percent by moving to France. In order to derive the actual migration incentive, however, one has to compare these numbers to the migration costs.

Using the concept of the  $NPPW$  we will now discuss how public pension systems influence the allocation of a fixed amount of labor between two countries (see figure 1) if labor is mobile. Let  $MPL_i$  be the marginal productivity of labor in country  $i$ . We



assume that the allocation of labor  $L^*$  is efficient in the beginning, i.e. the marginal productivity of labor is equal in both countries:  $MPL_i = MPL_j$ . Furthermore the  $NPPW$  shall be zero in both countries. No migration will occur in this scenario.

INSERT FIGURE 1

Now we assume that in country  $i$  the situation changes and the  $NPPW_i$  turns negative. One reason might be a reform of the pension system due to the ageing of society. If there is no labor mobility, the  $MPL_i$  curve shifts down and we find that a migration incentive occurs since the wage in country  $j$  is larger now than the net-of- $NPPW$  wage in country  $i$ . If we allow for migration, some individuals move to country  $j$  and the new allocation of labor is  $L'$  where wages equalize.  $L^* - L'$  young workers will move to country  $j$ . This allocation is inefficient since we have  $MPL_i > MPL_j$ . Total contributions to the public pension system are reduced. The consequence for country  $i$  will either be to reduce pension benefits, which is clearly a welfare loss to the retirees, or to increase contributions. This will reduce the  $NPPW_i$  further and induce even more migration. The welfare loss can be measured by the triangle  $ABC$ .

Furthermore, some countries may find it impossible to sustain redistributive measures in the face of social policy competition and labor mobility. The reasoning for this is quite simple if one distinguishes two different population groups: mobile young workers and immobile retirees. This assumption is not unrealistic as by EU regulation retirees in Europe hold their pension claims always against the country where they paid their contributions regardless of their country of residence. Young workers are at least partially mobile. Even if this is only a small segment of the work force, the potential distortion through artificial migration incentives for this group can already cause substantial welfare losses (Breyer/Kolmar (2001)).

The losers will always be those who cannot escape and those who benefit from redistribution (see Sinn (1990)). This holds for retirees, the poor, land owners and similar groups. These groups are rather price inelastic and will hardly ever or never migrate. With sufficiently high mobility of young workers, a redistributive system can only be sustained if redistribution takes place among the immobile groups. This is a basic lesson from the theory of optimal taxation.

### 3 Nationally optimal public-pension policies

From the previous section we learned that labor mobility will induce welfare losses and may cause social policy competition. Sustaining redistributive system becomes increasingly difficult. In the following, we will take the viewpoint of a single member country of the European Union and investigate which consequences increasing labor mobility has on nationally optimal public pension policy<sup>4</sup>.

In the recent literature we basically find small open-economy models<sup>5</sup> with two approaches for looking at the impact of increased labor mobility on public pension policy. One approach is to investigate how migration changes the political decision-making process in a country by using median-voter models<sup>6</sup>. A second strand of literature analyzes what effect migration of workers with different skill levels has on the public pension system.

#### 3.1 Voting on immigration and public pensions

In the recent literature the public choice approach towards migration has gained increasing attention (see e.g. Goodspeed (1998)). The increasing factor mobility induced by the European integration changes the pie that can be distributed in each country. Under the changing conditions, national groups and parties try to use their political influence to maximize their share of social output. In their home country's political decision-making process they influence effective factor prices via tax incidence or social protection, which will in turn determine the level and distribution of social output between factor owners.

There is a number of papers in this field on static redistributive policy measures<sup>7</sup>

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<sup>4</sup>We will not discuss the case of completely immobile labor in which repercussions from the capital market cause impacts on nationally optimal public pension policy. See e.g. Kolmar (1997, 2001) or Persson (1985) for further details.

<sup>5</sup>There are almost no large open-economy models in the literature. One of the rare exceptions is Breyer/Wildasin (1993).

<sup>6</sup>See Breyer/Craig (1997) on the empirical relevance of voting on social security.

<sup>7</sup>To name just a few recent articles: Lejour/Verbon (1996) who analyse decentralized social insurance policies with mobile capital. Similar are Persson/Tabellini (1992) and Gabszewicz/van

but only few are done on intergenerational redistribution. The latter ones usually combine an OLG framework with a median-voter model. Two groups of models will be discussed in the following. Firstly, models that investigate how *immigration* of foreign workers influences the public pension system and which impact this has on the political process. Secondly, models that ask whether the political power of gerontocrats is changed if the young generation can opt out of the system by *emigration*. A model from the first group is Scholten/Thum (1996) who build on the traditional three-generations voting model introduced by Browning (1975) and Sjoblom (1985). In Scholten/Thum's model, however, the voters decide on immigration policy, not on the social security contribution rate. Immigration will have different effects on each of the three living generations since the amount of immigration will not only have an impact on current and expected pensions payments but also on wages<sup>8</sup>.

The model was extended by Haupt/Peters (1998)<sup>9</sup>. While individuals in the Scholten/Thum model are myopic, Haupt/Peters assume that rationally behaving voters today anticipate the effect on future generations' voting behavior. Furthermore, Haupt/Peters look at two different policy regimes with either a fixed contribution rate or a constant replacement ratio while Scholten/Thum consider only the latter case<sup>10</sup>.

The Haupt/Peters model assumes a young and a middle-aged generation which constitute the labor force and pay contributions to the public pension system. In old age people will retire and receive a pension benefit which is proportional to gross wages. The total labor force is  $L_t = z_{t-1} + z_t$  where  $z_t = n_t + m_t$  is the size of the generation born in period  $t$ . This includes  $n_t$  domestic young workers and  $m_t$  immigrants which are assumed to be young at the time of immigration. The immigration ratio describes the relation of total labor supply with and without immigration:  $\gamma_t \equiv (z_{t-1} + n_t + m_t)/(z_{t-1} + n_t)$ . The reproduction rate  $x_t \equiv n_t/z_{t-1}$  is constant.

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Ypersele (1996). Verbon (1990) considers a mobile labor force in a intragenerational-redistribution framework.

<sup>8</sup>One must not forget that immigration to one country may - at the same time - cause serious problems for the emigration countries to sustain their pension systems (see Hauser (2001)).

<sup>9</sup>In the following discussion, we will therefore follow the model by Haupt/Peters (1998).

<sup>10</sup>This distinction is similar to the distinction of tax rate competition versus expenditure competition in the tax literature. See e.g. Wildasin (1988) or Hindriks (1999).

Finally, the dependency ratio  $D_t = z_{t-2}/L_t$  gives the relation of retirees to the current labor force. It depends on domestic reproduction and on immigration policy<sup>11</sup>. An increase in either of the two variables leads to a smaller dependency ratio, i.e.  $\partial D/\partial x < 0$  and  $\partial D/\partial \gamma < 0$ . Immigration has a drawback as it reduces gross wages at least temporarily according to  $w_t(\gamma_t)$  with  $\partial w/\partial \gamma < 0$ . Intergenerational redistribution takes place through a PAYG public pension system. Its budget constraint is given by  $b_t w_t = D_t q_t w_t$  where  $b_t$  is the contribution rate and  $q_t$  is the pension benefit. Two different policy regimes are possible.

In the first regime ( $q$ -policy regime or Scholten/Thum case) the replacement ratio is fixed at the level  $q$ , i.e.  $b_t = qD_t$ . In each period the same portion  $q$  of gross wage will be paid as benefit to the retirees. The contribution rate now depends on the voting process since immigration influences the dependency ratio  $D_t$ . The second regime ( $b$ -policy regime) is just the opposite. Here, the contribution rate  $b$  is fixed at a certain level of gross wage. The political decision on immigration now influences the pension benefit via  $D_t$  in  $q_t = bD_t^{-1}$ .

In the  $q$ -policy regime, retirees will be worse off as their pension benefit  $q$  is a fixed share of the gross wage which falls due to immigration. Therefore they will vote for a restrictive immigration policy ( $\gamma_t = 1$ ). The active generations have to face shrinking gross wages as well, but at the same time total pensions will be collected from more workers. Hence, the contribution rate can be lowered and the effect on net wages is ambiguous. Compared to a member of the middle-aged generation, a young worker is likely to gain more from immigration as she will do so in two periods ( $t$  and  $t + 1$ ). The young generation therefore is more in favor of a liberal immigration policy than the middle-aged generation. However, the middle-aged generation is the median voter and will be decisive in the political process.

In order to find the politically chosen immigration policy, one has to maximize the middle-aged generation's lifetime utility from the remaining lifetime income stream. In contrast to Scholten/Thum, Haupt/Peters introduce a reaction function  $\gamma_{t+1} = f_{t+1}(\gamma_t)$  which allows rational voters to anticipate the effect of their decision in the future. The optimal immigration policy chosen by myopic voters is given if a

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<sup>11</sup>This dependency is either *only on current* (Scholten/Thum) or *on current and past* immigration policy (Haupt/Peters).

marginal reduction of net wages equals the marginal reduction of the contribution rate due to a more favorable dependency ratio.

A rationally behaving median voter faces an additional term (Stackelberg term) as each median voter plays a Stackelberg game with the median voter in the next period. The Stackelberg term is positive since the reaction function is decreasing in  $\gamma$ . Hence, a rational median voter is in favor of a more liberal immigration policy than a myopic median voter. The intuition for this result is rather simple. A more liberal immigration policy will reduce the tax burden in the next two periods due to the improved dependency ratio, i.e. this period's and next period's median voter will be better off. Therefore, in the following period there is less need for immigration and a more restrictive immigration policy can be chosen. This improves the expected pension benefit of today's median voter since future gross wages will decrease less due to less immigration in the next period. Hence, today's median voter has an incentive to behave more liberally and to allow more immigrants into the country since this behavior will induce a positive effect on his future pension payment.

The  $b$ -policy regime is somewhat more complex. If a reasonable immigration elasticity of wages is assumed ( $-1 < \eta < 0$ ), the old generation will advocate a boundless immigration. This is because the increase in pension benefits due to immigration and therefore higher total contributions overcompensates the decrease in pension benefits from falling gross wages.

The young generation will vote in favor of completely stopping immigration ( $\gamma^* = 1$ ) since they face decreasing gross wages but have no other gain from immigration. Again, the members of the middle-aged generation decide which number of immigrants is allowed in. The utility from their remaining lifetime income does not depend on previous decisions on immigration policy  $\gamma_{t-1}$ , so myopic and rational policy coincide in this case. Since the function is strictly convex the optimal policy decision is either no immigration at all ( $\gamma^* = 1$ ) or maximum possible immigration without lowering wages too much to still attract immigrants ( $\gamma^* = \bar{\gamma}$ ). Whether the negative effect in the remaining working period or the positive effect in the retirement period dominates depends on the parameter values. The median voter will choose a complete stop of immigration, if the cost from immigration due to falling gross wages cannot be compensated by higher future pension benefits. This is usually the case if

the share of pensions in lifetime income is neglectable. For a laissez-faire policy the argument can be reversed.

In sum, the results are not robust with respect to changes in parameter values. As shown by Haupt/Peters, if one compares both policy regimes one finds that a change from  $q$ - to  $b$ -policy will turn incentives of the generations upside down.

We will now turn to the second group of models. So far the models assumed that young workers have no influence on the final political decision since they are not the median voter generation. The traditional view is to have the older generations introduce a suboptimally high level of redistribution. Haupt/Peters(1999), however, assume that the young generation has an exit option by emigrating to a neighboring country if its tax burden in the home country is getting too large. This limits the power of the gerontocrats, i.e. median voters who belong to the retired generation. A two-fold voting process will be considered. First, there is a political decision (voting by hand) on the amount of intergenerational redistribution, and second, the young generation will vote by feet on whether it will accept the redistribution decision<sup>12</sup>. This decision can be modelled as a two-stage game.

If one assumes myopic individuals, this framework is very similar to the literature on tax competition, especially to the case of commodity taxation with Leviathan governments and mobile consumers (see Kanbur/Keen (1993)). An additional element comes into the model by the assumption of individuals behaving rationally if they anticipate the effect of today's decisions on their future pension payments.

By choosing their place of residence, the current young generation decides not only on its net wages but also on their pensions. The migration decision depends on two variables. First, it is the comparison of lifetime incomes that creates a migration incentive. Second, people have different intensities of attachment-to-home  $s$  (see Mansoorian/Myers (1993)) which strengthens or weakens the incentive. The migration preferences are distributed according to a density  $f(s)$  and people differ only with respect to  $s$ .

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<sup>12</sup>Here only the young generation is voting by feet. In principle, the old generation can vote by feet as well (see Smith Conway/Houtenville(1998)). In Europe, however, this is not a relevant problem since by regulation retirees keep their pension claims always against the country where they paid their contributions.

Assuming a balanced PAYG public pension system with contribution rates  $a$  and  $b$  (for country  $A$  and  $B$ ), one can formulate the retiree's payoff functions for each country. A retiree's payoff is his contribution rate times the migration ratio compounded with the population growth rate. The migration ratio relates the size of the labor force after migration to the size of the young generation born in the country. It also depends on the relative size of the old generations in both countries. Interpreting the migration ratio as the relative demand of young workers for living in a region, one can think of the retirees as revenue maximizing duopolists in Bertrand competition.

Next, we will discuss the Nash equilibrium in a game with myopic migrants. Contribution rates are now equivalent to taxes and lead to the well-known results from the literature on tax competition.<sup>13</sup> In each country, the old generation chooses the contribution rate as to maximize its payoff holding the other country's contribution rate constant. One finds a symmetric Nash equilibrium ( $a^* = b^*$ ) if the old generation has the same size in both countries. If the old generations differ in size, the "larger" country will choose a higher contribution rate. This is because the migration ratio is higher in a small country. Lowering the rates will decrease total contributions collected from the natives by a small amount. At the same time a large amount of additional contributions will be made by immigrants if the small country undercuts its neighbor. The gain is sufficiently high to overcompensate the losses. The reasoning is just reversed for the large country.

Due to the fact that the small country has a positive net migration, the median voter in the small country receives a higher pension benefit than her neighbor. Contributions per retiree are higher than in the large country.

Turning now to rational migrants who include the discounted pension benefit into their net-income calculation, one finds that the Nash contribution rates are higher than in the case of myopic migrants. A high contribution rate today forces many workers to emigrate to the other country. Due to this the number of retirees in the next period will be low (small country)<sup>14</sup>. We learned, however, from the previous

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<sup>13</sup>See e.g. Kanbur/Keen (1993) for the case of commodity taxation and Wilson (1991) or Bucovetsky (1991) for the case of capital taxation.

<sup>14</sup>A doomsday scenario as in Konrad (1995a) is assumed. Since the world ends after period 2,

that the retirees in a small country receive higher pension benefits than the retirees in a large country. Hence, there is an incentive to raise contribution rates in period 1<sup>15</sup>.

The idea of limiting gerontocratic power can also be found in Hagen/Walz (1995)<sup>16</sup>. Compared with the previous model, young workers now have an additional exit option by working in the shadow economy. Two symmetric countries  $k = i, j$  will be considered. Young workers receive either a net-of-social-security-tax income of  $(1 - \tau^k)w$  in the official sector or an income  $\sigma$  from the shadow sector. It is assumed that  $\sigma < w$ , i.e. gross wages in the official sector are higher than in the shadow sector. Old individuals either work at a fixed wage rate  $\beta w$  ( $\beta < 1$ ) or receive a pension benefit  $b^k$ . The pension system has to be balanced at  $\gamma b^k = \tau^k w$  in each period where  $\gamma_t = N_{t+1}^k / N_t^k$  is the dependency ratio. The budget constraints of members of the young and old generation are given by  $c_t = \max[w(1 - \tau_t), \sigma]$  and  $z_{t+1} = \max[b_t, \beta w]$ . The lifetime utility of a representative individual is given by  $U_t = \ln c_t - ms + \delta \ln z_{t+1}$  where  $\delta$  is the subjective discount rate,  $s$  the cost of migration and  $m$  a dummy variable (being 1 in the case of migration).

The young generation in period  $t$  faces the question whether to migrate or not. Since the model does not assume convex mobility costs or an attachment-to-home, it results in a bang-bang solution which depends on the parameter values for the cost of migration  $s$  and the dependency ratio  $\gamma$ . Migration might take place whenever the increase in lifetime income from migration exceeds the cost of migration (migration condition). Too high migration costs clearly prevent migration. For reasonably low levels of  $s$ , the migration decision depends only on the value of  $\gamma$ .

If one assumes that the migration condition holds, a low dependency ratio will actually lead to migration of the working generation of, say, country  $i$  to country  $j$  in period  $t$ . The reason for this is the fact that generation  $t$  can expect the next generations to stay in their home countries. Hence, it will receive a pension benefit after migration. A one-time effect occurs with only generation  $t$  migrating.

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the generation born in the last period will migrate myopically.

<sup>15</sup>Tax harmonization issues will be discussed in section 4.

<sup>16</sup>See also Breyer/Stolte (2000) who investigate changes in the labor/leisure choice of young workers in order to avoid excessive taxation through the old generation.



If the dependency ratio increases further one finds that migration discontinuously jumps back to zero. Generation  $t + 1$  now has a migration incentive as well. If generation  $t$  moves to country  $j$ , the next period's young generation will leave for country  $i$  where no old generation lives anymore and no taxes have to be paid. This leaves the old people in country  $j$  without pension benefits as there are no contributors left. Old-age income from work cannot compensate this loss in income. Anticipating this problem the young generation in period  $t$  decides to stay in their home country. Due to this behavior the next generation will not have an incentive to migrate anymore.

If, however, the dependency ratio will increase still further generation  $t$  will no longer try to save the social security system from destruction. Although they anticipate that their offspring will migrate they will migrate themselves because the incentive becomes very strong. The social security system cannot be sustained as each generation has a migration incentive which is strong enough to induce migration in every period.

Furthermore, Hagen/Walz look at the case in which social security policy will be decided on in a voting process. The benchmark case is a pension scheme  $(\tau^p, b^p)$  chosen by a benevolent social planner who maximizes lifetime utility of each generation. In a closed economy, the bundle  $(\tau^C, b^C)$  is the (too large and therefore inefficient) choice of the median voter, who is a member of the old generation. The only constraint on the tax rate is to keep the working generation in the official sector. In an open economy the possibility of migration limits her choice even further<sup>17</sup>.

In the case of uncoordinated policies each median voter chooses a policy taking the other median voter's choice as given. If the policy variable is the tax rate and policies are symmetric ( $\tau^i = \tau^j = \tilde{\tau} \leq \tau^C$ ), a Nash equilibrium in pure strategies exists for  $\tilde{\tau} = \tau^C$ . Here the migration condition does not bind due to high migration costs. The old generation has an incentive to increase its pension benefit by raising the tax rate to an inefficiently high level.

As in Haupt/Peters (1999) a second policy regime assumes the retirement income

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<sup>17</sup>The time structure is the same as in Haupt/Peters (1999): first there is a political vote (voting by hand), then the young generation decides whether to stay or to migrate (voting by feet).

as choice variable. Here one finds a Nash equilibrium in pure strategies even for low costs of migration. Let  $b^N$  be the retirement income that makes young individuals just indifferent between migration and staying at home. Individuals will therefore vote for the largest possible retirement income that still keeps their offspring from migrating in  $t + 1$ , i.e. they choose  $b^N$ . No differing level of retirement income  $b^*$  which is adopted in both countries can be a Nash equilibrium. Only choosing  $b^C$  in both countries will be a Nash equilibrium under certain conditions, e.g. the young generation's incentive to migrate to the other country must be eliminated. It follows that there are either one ( $b^N$ ) or two ( $b^N, b^C$ ) Nash equilibria<sup>18</sup>. From the point of view of the old generation,  $b^N$  dominates  $b^C$  under the given assumptions.

Next, coordinated social security policies are to be investigated. The old generation can be expected to vote in favor of coordination as this will reduce the young generation's opportunities to opt out. It is again useful to distinguish which parameter is to be coordinated. With tax rate coordination, i.e.  $\tau^i = \tau^j$ , we find that there is no migration incentive for the young generation<sup>19</sup> anymore, so the old generation will choose  $\tau^C$  in both countries. This solution, however, suffers from cartel instability. It is profitable for each country to undercut  $\tau^C$  to attract immigrants. If the countries coordinate retirement incomes instead, the old generation will choose the Nash equilibrium with the highest retirement income. This solution is stable as lowering  $b$  decreases the retirement income while raising  $b$  causes a migration incentive for the young. Here, coordination only pays in the sense that it assures that the largest level of  $b$  will be adopted.

Finally, it is the integration of social security systems which is clearly favored by the old generation. This scenario replicates the closed economy case. Migration is not an option anymore, leaving the shadow sector as the only way to avoid excessive taxation. Hence, the old generation will vote for the pension system  $(\tau^C, b^C)$ . The burden of this inefficient solution has to be carried by the young generation.

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<sup>18</sup>Actually,  $b^N$  splits up into two implicit solutions with  $b_2^N > b_1^N$ , so the old generation prefers  $b_2^N$ .

<sup>19</sup>See Homburg/Richter (1993) who show that it is not sufficient to coordinate only tax rates.

### 3.2 Education and skill

Education plays an important role in the discussion on immigration. Germany for example recently introduced a green-card system to allow highly skilled and urgently needed IT workers into the country. At the same time, Germany and the EU are very reluctant to pass general immigration regulations. It is feared that with no restriction on immigration, a large inflow of low-earning, low-skilled workers is likely to occur. This is often assumed to be a challenge to national social security systems as people expect immigrants to be net beneficiaries to the welfare state<sup>20</sup>. Furthermore, a depression of wages in the unskilled labor market segment is feared. Hence, there is some resistance against immigration in the host countries<sup>21</sup>. This, however, might be too short-sighted. In countries with ageing societies the inflow of young migrants might help to improve the dependency ratio and thus to stabilize the public pension system.

The latter effect has been shown by Razin/Sadka (1999). They use a two-generations infinite horizon model with immigration of young unskilled workers and fixed factor prices. The assumption of fixed factor prices is crucial for the final result that no generation will have to face a welfare loss from immigration, even if the immigrants are net beneficiaries of the pension system. The reason for this is that the net costs imposed by the immigrants are transferred into the infinite future.<sup>22</sup>

The models assumes that  $e$  is a measure of an individual's skill level. A low value of  $e$  corresponds to a highly skilled person as she needs to spend only little time

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<sup>20</sup>There is an ongoing debate on this topic. It is argued that immigrants are immediately subject to taxation but will not be eligible for all welfare programs. See Borjas (1995) and LaLonde/Topel (1997) for general facts on immigration.

<sup>21</sup>Razin/Sadka (1996) show this effect in a model with two factors of production: skilled and unskilled labor. The immigration of unskilled workers leads to falling wages for the unskilled workers and increasing wages for the skilled. A simple redistribution system, namely a subsidy financed by a lump-sum tax on skilled workers, is assumed. Since in a democracy migrants cannot be excluded from (at least some) of the entitlement programs, migration changes the income redistribution frontier in a systematic way. This leads to a welfare loss and resistance of the domestic work force towards immigration.

<sup>22</sup>The model makes use of the concept of the economy as an everlasting machinery, despite finitely living individuals (Samuelson (1958)).

on education. Assuming the length of a working period to be one time unit, highly skilled individuals earn a pre-tax income  $W(e) = w(1 - e)$ . Low skilled individuals with large  $e$  may decide not to acquire skill at all. Their pre-tax income is  $W(e) = qw$  due to a low productivity level  $q < 1$ . Thus there is a cutoff level making individuals indifferent between receiving education or not at  $e^* = 1 - q$ .

#### Optimization

within the traditional OLG framework yields  $V_1^e \equiv v_1^e(W(e)(1 - \tau), b_1, r)$  for the young generation where  $\tau$  is a flat social security contribution rate. Indirect utility is strictly increasing in the social security demogrant benefit  $b_1$  they receive in their old age. The  $1/(1 + n)$  members of the old generation have an indirect utility of  $V_0^e \equiv v_0^e(b_0, r)$ .

In period 0,  $m$  immigrants are allowed into the country. They are assumed to be young and low-skilled. Hence, they contribute  $qm$  to the labor force. Once they enter the country, they adopt the reproduction rate of the domestic population. Their offspring will have an identical ability distribution as the native population.

The pension system resembles the simplest case of a PAYG system. In each period total contributions of  $T = twL$  are collected from the young,  $L$  being the labor supply which is a rather complex term due to the modelling of skill levels. Total contributions are distributed among the members of the old generation. This happens in each period.

Immigration makes the old generation better off since the number of contributors and therefore the demogrant benefit increases. Hence, we have a positive externality for the domestic population in the period of immigration. The young generation is indifferent in this period since wages are fixed, so there is no negative effect on them. When this period's young workers become old, they will still be indifferent due to the fact that the demogrant benefit  $b_1$  does not depend on immigration. This is because the immigrants adopt the native population's reproduction pattern. They raise enough children to be supported by them without depending on the domestic offspring.

Due to fixed factor prices, a steady state is reached after just one period. All generations will receive a demogrant benefit of  $b_1$ . Only individuals which are old in

the immigration period will be better off<sup>23</sup>. One can consider redistributing some of the first generation's gain to the following generations to make them better off as well. No generation would vote against immigration in case of a political decision. This result holds even in the case of immigrants being net beneficiaries of the public pension system, in the sense that  $NPPW = \frac{b_1}{1+r} - tqw > 0$ . Razin/Sadka (1999) show that under fairly realistic assumptions no generation will be worse off, even if this condition holds, because the welfare cost associated with the positive  $NPPW$  will be deferred into the infinite future. From this, one can conclude that there is an incentive for a country to behave strategically in order to induce unlimited immigration. It is even reasonable to compete with other countries for immigrants. Clearly, this result depends heavily on the fixed factor price assumption. Razin/Sadka (2000b) deals with this problem by introducing flexible factor prices into the previous framework. Migration will then generate a downward pressure on wages which may overturn the welfare gains in the model above.

Their model now assumes a CES production function with a wage rate of  $w_t = f(k_t) - (1 + r_t)k_t \equiv f(k_t) - k_t f'(k_t)$ . The capital-labor ratio  $k_t = K_t/L_t$  itself depends on the wage rate. Hence,  $w_t$ ,  $k_t$ , and  $b_t$  will change over time and the steady state will be reached only after an infinite number of periods. A simulation analysis is carried out to show the effect of migration on the welfare of different generations and skill levels. In the initial steady state there is no migration. In the first period an inflow of  $m$  low-skilled workers occurs. After an infinite number of periods a new steady state is reached which is identical to the initial one. The welfare loss or gain, respectively, of all generations is measured by the percentage increase in life-time utility that will restore utility to its pre-migration level.

As immigrants enter the country in the Cobb-Douglas case ( $\sigma = 1$ ), the capital-labor ratio rises in period 0 and then falls monotonically back to its steady state level. The old generation gains in two ways: first,  $b_0$  rises, and second, the rate of return on capital increases. The pension benefit in the next period, however, falls below the steady-state level and then rises monotonically back to the initial level.

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<sup>23</sup>This result depends on the fact that contribution rate is fixed as in the Haupt/Peters' (1998)  $b$ -policy. One could as well fix the benefit as in Scholten/Thum (1996). Then, the young generation would be better off and the old generation would be indifferent.

So, all following generations will lose from migration in the CD case. Razin/Sadka also analyze a second case with a high elasticity of substitution ( $\sigma = 3.33$ ). In this case not only will the initial old generation gain, but also the highest skilled workers born in the immigration period (retirees in period 1). This is because the latter group owns a larger share of the capital stock and are therefore less affected by the downward pressure on wages.

The low skilled workers of all generations lose in any case. Thus, the immigrants are net contributors to the system as their NPPW is negative. Their net contributions do not suffice to support the gain to the retirees in period 0 and the highly skilled born in this period. This makes all other individuals of all generations worse off.

Razin/Sadka (2000a) takes up the previous model again. While the basic set-up is the same as before, the analysis is here carried out in a static framework. Two issues are investigated. First, it is asked whether a more developed welfare state with more taxes and more transfers attracts immigration of various skill levels. One indeed finds  $dm/d\tau > 0$ , however, the welfare state attracts more low skilled and less high skilled workers. Second, the question is raised how migration affects the income distribution among the native born and in turn their attitude towards migration. The model finds that although there is no deadweight loss from redistribution, there is a loss from the point of view of native-born workers because immigrants usually are net beneficiaries of the welfare system. A portion of the tax revenues collected from the domestic population "leaks" to the immigrants.

The model is extended by a democratic voting process. The voting decision is on whether to have heavier taxation and more intensive redistribution. This is supported by the low-skilled workers. Low-income immigrants who are net beneficiaries of the welfare system will vote in favor of higher taxes and transfers. Since there is a leakage, they share some of the benefits at the expense of the native-born voters. Hence, redistribution becomes more costly to the latter. More immigration then leads to native born people supporting lower tax rates.

### 3.3 The impact on immobile factors

One of the results from section 2 is that the owners of immobile factors have to carry the burden from redistributive policy, as mobile factors are able to escape from taxation. In the following, we will turn to models that explicitly examine the impact of increasing labor mobility on immobile factors such as infrastructure or land.

Konrad (1995) looks at a gerontocratic regime with a non-altruistic old generation that decides on the levels of investment in public infrastructure and in public education, respectively. The economy is characterized by underinvestment of infrastructure goods and education due to public provision (see also Konrad (1995b)). Introducing fiscal federalism then may aggravate the underinvestment problem with respect to education, but at the same time may help to overcome the underinvestment problem in public infrastructure provision. This is a direct consequence of the fact that education is embodied in the young generation while infrastructure is not.

There is a simple PAYG pension system assumed in Konrad's model with a social security tax levied on the young generation and the revenues being distributed to the old generation. The tax rate is assumed to be exogenous which rules out tax competition, so the amount of redistribution can only be influenced by changing the tax base. The stock of social capital has a positive effect on private production. Any public investment increases the tax base for social security taxation and thus the pension benefit of the old generation.

A subgame-perfect Nash equilibrium is derived in a two-stage game. In stage 1, the old generation decides on investment levels according to the maximization of their net-of-investment income from pension benefits. In stage 2, the young individuals decide on migration by maximizing net income which depends on the choice of location. This game structure is similar to Haupt/Peters (1999).

The model finds that infrastructure and education investment play a very similar role in a closed economy without migration. Whenever the tax rate  $\tau$  of the redistributive tax is smaller than 1, the level of public investment in both infrastructure and education is suboptimally small. Migration changes the incentives for the old. Investments in children's education are less attractive since in equilibrium some chil-

dren will migrate and take their embodied human capital with them. This implies that the return on educational investment is even less than  $\tau$ . Investments in infrastructure have quite different impacts. First, infrastructure will always remain in the country. Second, a large stock of infrastructure attracts workers from other countries including the human capital they acquired elsewhere. Since the old generations in all countries are aware of the advantage of infrastructure investment, there will be a shift from educational to infrastructure investment in all countries. The effect is similar to a prisoner's dilemma. Konrad shows that a co-operative policy of shifting investment from the infrastructure sector to the education sector by all countries will yield a strict Pareto improvement.

Hange (2000) introduces land as an immobile factor into an economy similar to the one employed by Homburg/Richter (1993) and Breyer/Kolmar (2001) which will be discussed in more detail in the next section. Consider an integrated economic region (confederation) consisting of many small open economies. Assume zero population growth in the confederation, perfectly integrated goods and capital markets, and an inelastic supply of one unit of labor by each member of the young generation. Land owners are at the same time producers and maximize  $F^{it}(N_t^i, L^i) - w_t^i N_t^i$  yielding the optimal labor input at  $w_t^i = F_N^{it}$ .  $L^i$  is the fixed amount of land available in region  $i$ . At a price of  $q_t^i$ , individuals can buy land  $l_t^i$  in region  $i$  from which they receive the rent  $\rho_t^i$  per unit. Land is sold in the retirement period at price  $q_{t+1}^i$ . Each individual can save or dissave without limit at the interest rate  $r$ . In equilibrium returns from savings and land ownership must equal. The public pension system is PAYG financed. A contribution  $b_t^i$  is collected from every worker in jurisdiction  $i$  and the total sum of contributions is distributed to the retirees in the same period. The aim of the representative individual is to maximize lifetime utility by choosing an optimal consumption path, i.e. it will maximize  $u(c_t, z_{t+1})$  under the intertemporal budget constraint

$$c_t + \frac{z_{t+1}}{1 + r_{t+1}} = F_N^{it}(N_t^i, L^i) - b_{t+1}^i \left( \frac{N_{t+1}^i}{N_t^i} \frac{1}{1 + r_{t+1}} - 1 \right).$$

The RHS is the expected lifetime income of an individual born in period  $t$  in region  $i$ . The second term of the RHS is the net public pension wealth of that region ( $NPPW^i$ ). After the young workers get to know factor prices and social security



contributions, they will choose their location. This is the same time structure as in Haupt/Peters (1999). The locational choice depends on the comparison of expected lifetime income in region  $i$  with the income outside region  $i$ , i.e. with the exogenously given world wage rate  $\bar{w}$ . A migration equilibrium is given by

$$F_N^{it}(N_t^i, L^i) + b_{t+1}^i \left( \frac{N_{t+1}^i}{N_t^i} \frac{1}{1+r} - 1 \right) = \bar{w}.$$

We will now distinguish the two different policy regimes as in Haupt/Peters (1998)<sup>24</sup>. First we will discuss the case of a fixed contribution rate, i.e.  $b_t^i = b^i > 0 \forall t$ . The per-capita benefit now is  $p_t^i = \frac{N_t^i}{N_{t-1}^i} b^i$  from the public budget constraint and the internal gross return can be written as  $1 + \theta_t^i = p_{t+1}^i / b^i = N_{t+1}^i / N_t^i$ , i.e. the reproduction rate. If  $N_{t+1}^i < N_t^i$ , the return is negative and the resulting burden has to be carried solely by the retirees of period  $t+1$ . The young generation in that period will always receive  $\bar{w}$  since it will emigrate otherwise. Under this policy regime, the growth path  $N_t^i = N_{t+1}^i = N$  in region  $i$  for all  $t$  is a unique steady state equilibrium under perfect foresight. It will be reached in the first period. The migration equilibrium condition can therefore be rewritten as  $F_N^{it}(N_t^i, L^i) - b^i \frac{r}{1+r} = \bar{w}$ , i.e. the regional PAYG system levies a locational head tax of  $b^i \frac{r}{1+r}$  on mobile individuals.

Now the effect of an unexpected permanent change of the contribution rate in period  $t$  can be investigated. One finds that  $\frac{dN_t^i}{db^i} = \frac{r}{(1+r)F_{NN}^{it}} < 0$ . The young generation will emigrate until the reduction in lifetime income due to higher contributions equals the increase in gross wages due to the decrease in population. Consumption possibilities will therefore not change in this or any following generation. Hence, only members of generation  $t-1$  will suffer from this change in old age consumption. They face a loss from the ownership of land as the increase in the contribution rate will decrease the number of workers as well as the price and the rent for land. Furthermore, as the number of contributors decreases, the pension benefit will become smaller. At the same time there is an counteracting effect from the increase in contribution rates. The total effect strongly depends on who owns the land. If the retirees own all the domestic land the policy change clearly has a negative effect on old age consumption in period  $t$ . In all other cases, e.g. if foreigners own some of the land, it depends

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<sup>24</sup>We will not find this distinction in Homburg/Richter (1993) and Breyer/Kolmar (2001).

critically on the size of the migration elasticity whether a higher contribution rate will increase the per-capita pension benefit enough to overcompensate the loss of contributions through a high number of emigrating young workers. Thus, in the case of fixed contribution rates there will be an excess burden which is to be carried by the retirees and the land owners in the region.

In the second policy regime a fixed per-capita pension benefit is assumed, i.e.  $p_t^i = p^i > 0 \forall t$ . Hence, the contribution rate is endogenous:  $b_t^i = \frac{N_{t-1}^i}{N_t^i} p^i$ . The internal gross return of the PAYG system becomes  $1 + \theta_t^i = p^i / b_t^i = N_t^i / N_{t-1}^i$ . Comparing this to the internal return from the first policy regime, one finds that the contributions in the fixed benefit regime will earn a return equal to the reproduction rate of the previous generation, rather than earning a return that is equal to the reproduction rate of today's generation. The net return in the constant benefit regime is therefore independent of the future population growth.

Again, the effect of an unexpected permanent increase of per-capita pension benefits will be considered. The long-run migration equilibrium<sup>25</sup> with  $N_t^i = N_{t+1}^i = N^i$  is  $F_N^i(N^i, L^i) - p^i \frac{r}{1+r} = \bar{w}$ . Differentiating with respect to  $p^i$  gives  $\frac{dN^i}{dp^i} = \frac{r}{(1+r)F_{NN}^i} < 0$ . This is exactly the same effect as a permanent change in the contribution rate in the first regime. The only difference is that here the steady state does not occur immediately but after a cyclical process of adaptations.

As the young workers of period  $t$  and all following generations will again earn  $\bar{w}$ , only the old generation born in the previous period will be affected. They loose from the ownership of land. If the pension benefit is raised, the number of workers, the price of land and the rent from land decrease in the next period. At the same time the benefit increases by  $dp^i$ . If the old generation owns all the land, the per-capita pension benefit decreases unambiguously. This confirms the central statement of fiscal federalism theory: redistribution between mobile and immobile factor owners causes an excess burden in a small open economy. However, while under the first regime the retirees carry some of the burden independent of their land ownership, under the second regime only the land owners carry the burden. This can be seen from the fact that if a retiree does not own any land, her consumption possibilities

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<sup>25</sup>In the long-run, Hange finds that a policy with a constant per-capita pension benefit might be unsustainable.

increase by  $dp^i$  but no loss from land ownership occurs.

## 4 Policy harmonization and global efficiency

From the previous sections we know that in the process of European integration, national governments are forced to adapt to increasing factor mobility. Nationally optimal policy changes and there may arise incentives to behave strategically. Under these circumstances, substantial welfare losses can be expected to occur. A possible countermeasure to this problem is policy harmonization in the most general sense of the word. It is hoped that this will help to maintain or to restore global efficiency.

We will therefore turn to models which explicitly take the perspective of an entire economic union with two or more member countries. We will not, however, consider the self interest of EU bureaucrats and politicians to whom the integration process offers new opportunities beyond the ones available at the national level. This group has a strong incentive to transfer political power to the EU. One always has to keep in mind that in the discussion on harmonizing or even consolidating social security systems at the EU level, European bureaucracy and central administration will at least partly behave in a rent-seeking manner. See Vaubel (1994) for a comprehensive survey on this topic.

Instead we look at models of intergenerational redistribution in a multi-jurisdictional framework with migration as a means of equalizing differences in lifetime utility between countries. Starting with Homburg/Richter (1993) some research has been done on general-equilibrium models which deal with the question whether there is a need for harmonizing social security contributions in the European Union. Since contribution rates to pension systems differ between countries, one could argue that this already causes migration. Young people move to countries with low contribution rates, while old people move to countries with high pension payments. Harmonization might then be a proper instrument to overcome those population shifts.

Homburg/Richter, however, argue that harmonization of contribution rates is not sufficient to avoid inefficient migration. Hence, national PAYG-pension schemes will - even in the case of perfect mobility - in general lead to an inefficient allocation of

labor across countries. In their model, members of a national social security system face an implicit tax equal to the contribution rate times the difference between the net return to the social security contribution (which is the growth rate of the labor force) and the capital market return. The net return to the PAYG contribution depends on migration flows. Since workers will migrate to the country with the lowest implicit tax, returns in the home country will shrink. Allocational distortions will occur as with each emigrant the return decreases and even more emigration is induced.

In the following, we will use the framework that was previously introduced in the discussion of Hange's (2000) model. The same assumptions will apply in the following. Except for the fact that no immobile factor is considered in the Homburg/Richter model, there is mainly one major difference between the models. Hange analyzes how workers in one country maximize their utility given an exogenous income  $\bar{w}$  outside the country. Homburg/Richter, in comparison, look at how simultaneous optimization by individuals in all countries influences the locational decision. They assume countries which differ with respect to the optimal capital-labor ratio.

Here, a migration equilibrium is given if the total population is distributed over regions  $i$  and  $j$  so as to maximize lifetime utility of each individual. No migration incentives must be left, i.e. expected lifetime income must be equal in both regions. If the allocation of labor is interregionally efficient, marginal productivity of labor is equalized in both regions:  $F_N^{it} = F_N^{jt}$ . From these two facts follows the condition for an interregional equilibrium:

$$b^i \left( \frac{N_{t+1}^i}{N_t^i} \frac{1}{1 + r_{t+1}} - 1 \right) = b^j \left( \frac{N_{t+1}^j}{N_t^j} \frac{1}{1 + r_{t+1}} - 1 \right)$$

or  $NPPW^i = NPPW^j$ . The net public pension wealth needs to be equal in both regions. Hence, a time path of distribution of people is interregionally efficient iff either one of the two following conditions holds: (i)  $b^k = 0$  for  $k = i, j$ , i.e. the PAYG pension system is converted into a fully funded one, or (ii)  $b^i = b^j$  and  $\frac{N_{t+1}^i}{N_t^i} = \frac{N_{t+1}^j}{N_t^j} = 1$ , i.e. premiums are harmonized between regions and the region-specific populations are constant over time. Thus a stationary state with no migration is needed to sustain the PAYG system. This, however, is "more an analytical fiction than a positive

approach” (Homburg/Richter (1993), p. 59). With population growth, efficiency requires that both contribution rates and expected population growth rates would have to be equal across countries. As one can see from Table 2, net reproduction rates differ substantially between EU member countries. In France e.g. it is more than 30 percent higher than in the neighboring Spain.

## INSERT TABLE 2

The previous framework has been extended by Schneider (1996). He finds that migration due to differences in premiums will make it increasingly difficult for countries to keep the *NPPW* positive. Using Homburg/Richter’s notation for the equilibrium condition which is  $b^i(n_t^i - r_t) = b^j(n_t^j - r_t) \forall t$ <sup>26</sup>, one can clearly see that the population losing country does have a negative *NPPW* from the first period on. But the winning country also faces the task to keep the growth rate above the interest rate. Under the crucial assumption of a confederation with no population growth, the winning country will finally have zero population growth when the other country is completely deserted. Rational governments with perfect foresight will therefore set  $b_t^k = 0$  at the outset which is just condition (i) from Homburg/Richter. Schneider makes similar arguments in the cases of non-perfect foresight regarding future population growth and time-variable premiums  $b_t^k$ . Regarding harmonization his arguments follow Homburg/Richter closely.

While Homburg/Richter and Schneider find that in general a consolidation of pension systems is needed to avoid migration incentives, Breyer/Kolmar (2001) argue that the harmonization of contribution rates is sufficient for efficiency. They show that with free mobility and perfect foresight, condition (ii) will be met from the first period of labor mobility on. For this to hold, they prove that with harmonized contribution rates and perfect foresight it is a consistent belief to assume that in the next period  $N_{t_0+1}^k = N_{t_0}^k$  ( $t_0$  being the first period of efficiency,  $k = i, j$ ) holds<sup>27</sup>.

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<sup>26</sup>Here,  $n_t^k$  is the growth rate of the labour force while  $1 + n_t^k$  is the implicit rate of return of the PAYG system. The term in brackets is similar to Aaron’s condition (see Aaron (1966)).

<sup>27</sup>A similar proof was employed in the model by Razin/Sadka (1999).

This constitutes a migration equilibrium with an efficient allocation of labor from the first period on which will not change over time.

In a next step, Breyer/Kolmar question the assumption of perfect mobility. They introduce a mobile population segment with  $\hat{\alpha}_t^k \in [0, 1]$  being the fraction of the population born in region  $k$  at time  $t$  with zero mobility costs and allow for  $\hat{\alpha}_t^k < 1$ . Hence, workers are divided into a mobile and an immobile segment. One can think of two groups with low and high attachment-to-home. It is assumed that fertility rates  $\beta^k = \frac{\bar{N}_{t+1}^k}{N_t^k}$  differ regionally<sup>28</sup>. Mobile workers migrate as long as there are differences in expected lifetime income, immobile workers always stay in their home country. Due to restricted mobility additional constraints have to be taken into consideration. Migration now occurs according to  $N_t^k \geq (1 - \hat{\alpha}_t^k)\bar{N}_t^k$ , i.e. after migration at least the immobile segment of workers remains in the country.

Mobile individuals behave in the same way as before. They migrate as long as there is a differential in the effective incomes<sup>29</sup> of both regions. Migration comes to an end if either (i) the effective income is equal in both regions, i.e.  $F_N^i(K_t^i, N_t^i) + b^i(\frac{N_{t+1}^i}{N_t^i} \frac{1}{1+r_{t+1}} - 1) = F_N^j(K_t^j, N_t^j) + b^j(\frac{N_{t+1}^j}{N_t^j} \frac{1}{1+r_{t+1}} - 1)$ , or if (ii) there is maximum migration and country  $j$ 's income is higher or equal than country  $i$ 's income, i.e.  $N_t^i = (1 - \hat{\alpha}_t^i)\bar{N}_t^i$ ,  $N_t^j = \bar{N}_t^j + \hat{\alpha}_t^i \bar{N}_t^i$  and  $F_N^i + b^i(\frac{N_{t+1}^i}{N_t^i} \frac{1}{1+r_{t+1}} - 1) < F_N^j + b^j(\frac{N_{t+1}^j}{N_t^j} \frac{1}{1+r_{t+1}} - 1)$ . Here, consolidation of public pension systems is sufficient for an interregionally efficient allocation of labor as in this case the internal rate of return is the population growth rate. Labor then migrates to the region with the highest productivity until maximum migration takes place.

For the partial mobility case, Breyer/Kolmar furthermore ask whether efficient equilibria can arise even without consolidation. They analyze different scenarios of future mobility pattern in order to extract minimum policy requirements that are consistent with an efficient labor allocation. They find that in a scenario with currently restricted mobility and perfect mobility thereafter, the harmonization of contribution rates is a necessary and sufficient condition for interregional efficiency.

In those scenarios in which future mobility is too small for first-best efficiency,

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<sup>28</sup> $\bar{N}$  is the fertility-caused size of population while  $N$  is the population after migration took place.

<sup>29</sup>We assume in the following w.l.o.g. that effective income is higher in country  $j$  than in country  $i$ .

coordination requirements become more complicated. This is because coordination has to be decided on *before* migration, but the coordination schemes depend on *post* migration marginal productivities. Therefore, it is the temporal structure of the problem and the underlying information structure that makes it almost impossible to calculate the correct coordination scheme *ex ante*.

For the case of unrestricted mobility, Breyer/Kolmar analyze whether national authorities have an incentive to deviate from the optimal policy of harmonizing contribution rates. They assume a benevolent regional planner who seeks to maximize regional welfare by the choice of the regional contribution rate  $b^k$ . She maximizes the indirect utility of a representative member of the currently young generation given that the old generation will not be worse off and that the budget of the pension system is balanced. By construction, the regionally chosen contribution rate is efficient from this region's point of view.

A political equilibrium  $\{b^i, b^j\}$  is obtained if both region's first-order conditions are fulfilled simultaneously. Since regions differ with respect to their optimal capital-labor ratio,  $b^i = b^j$  cannot be a political equilibrium. Capital-intensive regions then become net capital importers while labor-intensive regions become net capital exporters if individual savings are the same due to factor-price equalization. If the interest rate is assumed to increase in contribution rates, a capital-importing country has an incentive to reduce contribution rates since this will allow to reduce interest payments. The capital-exporting country faces just the opposite incentive. Compared to an autarky equilibrium, this will cause an undersupply of public pensions for the net borrowing country. For a net lender no general conclusion can be drawn regarding the supply of pension benefits because different externalities interact.

From section 3.1 we learned that migration and social competition is disadvantageous for the gerontocratic median-voter generation in Haupt/Peters' (1999) model. Pensions are unambiguously reduced as compared to the case without labor mobility. We will therefore discuss whether interregional coordination will improve the median voter's position. Two possible strategies are considered: either a harmonization with identical contribution rates in all countries or the imposition of a minimum rate which limits undercutting and thus a possibly too low pension level.

The result is in line with the findings from the literature on tax competition. The implementation of a minimum contribution rate will lead to pension levels in all regions which exceed the ones in the uncoordinated Nash equilibrium. Both region's retirees gain at the expense of both young generations. The reason is that a rise in one region's contribution rate also induces an increase in the other region's rate. This cannot happen under a harmonization strategy which fixes contribution rates at an average of the pre-existing rates. In sum, the strategy space is larger in the case of a minimum contribution rate than in the harmonization case.

Comparing the two models discussed above, one finds that the benevolent planner approach neglects the fact that policy coordination has to be supported by the populations of all member countries, if we realistically assume democratic societies. Policy coordination by benevolent planners assumes that no group of individuals in any of the countries will be worse off. Haupt/Peters (1999), however, show that coordination is just a means of the old generation to improve their situation at the expense of the young generation. Therefore, the outcome of coordination policy strongly depends on the population structure as well as on the design of the public pension system (recall Haupt/Peters (1998)).

Hence, in the median-voter model of Haupt/Peters a minimum contribution rate will find the unanimous support of the relevant political actors (i.e. the median voters which are retirees) in both countries. This, however, is not a Pareto improvement in the sense that all relevant actors (including the workers) are made better off. This positive analysis shows that the outcome of social policy harmonization depends heavily on this policy's impact on the politically relevant groups at the national level.

## 5 Concluding remarks

In this paper, we reviewed some of the recent literature on intergenerational redistribution in the face of increasing labor mobility. Most of the results are in line with what one would expect from the theory of fiscal federalism in a static framework. The intertemporal approach, however, introduces additional and new effects. Some



findings get even more pronounced, others are less clear than they appear in a static world.

The models show that migration caused by incentives from differing public pension systems can induce inefficiencies. This result holds in a static and in an intertemporal framework. The same is true for the provision of social security which becomes increasingly difficult if labor mobility increases. In a general-equilibrium framework with a benevolent planner, one can see that non-harmonization leads to individuals moving to the country with the lowest implicit tax, i.e. the highest *NPPW*. In a dynamic model this effect is aggravated. Emigration lowers the population growth rate which causes the *NPPW* to decrease even further, thereby generating additional incentives to leave the country. This emphasizes the need for policy harmonization to avoid inefficient migration incentives. In the intertemporal framework it can be shown that harmonization of contribution rates is in general not sufficient to achieve an efficient labor allocation. Only an integrated European pension system can maintain efficiency under all possible circumstances, yet it is not a necessary condition for all cases. The benevolent planner approach neglects, however, the fact that the outcome of harmonization policy may depend on the previously determined result of each country's political process. If this process is not considered to its full extent, the results from harmonization policy may be biased.

On a national level, we find that voting on immigration leads to interesting effects. Depending on the design of the public pension system, incentives of the different generations may turn upside down. The young generation will gain from a system with an exogenously fixed replacement ratio and an endogenous contribution rate, but will lose from the opposite case. Therefore, it will be strongly in favor of immigration in the first case. Exactly the opposite holds for the old generation. Furthermore, it is shown in a voting model that introducing mobility for the home country's young generation will limit the power of gerontocrats.

If no negative wage effect occurs, all generations will be in favor of immigration. The immigrants will improve the dependency ratio and therefore at least some generations will gain but no generation will lose from immigration. This result holds even if the immigrants are low skilled. If, however, immigration leads to falling gross wages, especially young and unskilled native workers will lose from immigration.

We furthermore find that the increasingly mobile factors are able to shift the tax burden towards the owners of immobile factors such as land, or towards the immobile old generation. At the same time, public investment in mobile factors decreases, e.g. investment in the education of young workers. The old generation which is assumed to be in power prefers public goods such as infrastructure which remain in the country they live in.

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FIGURE 1: The allocation of a fixed amount of labor between two countries

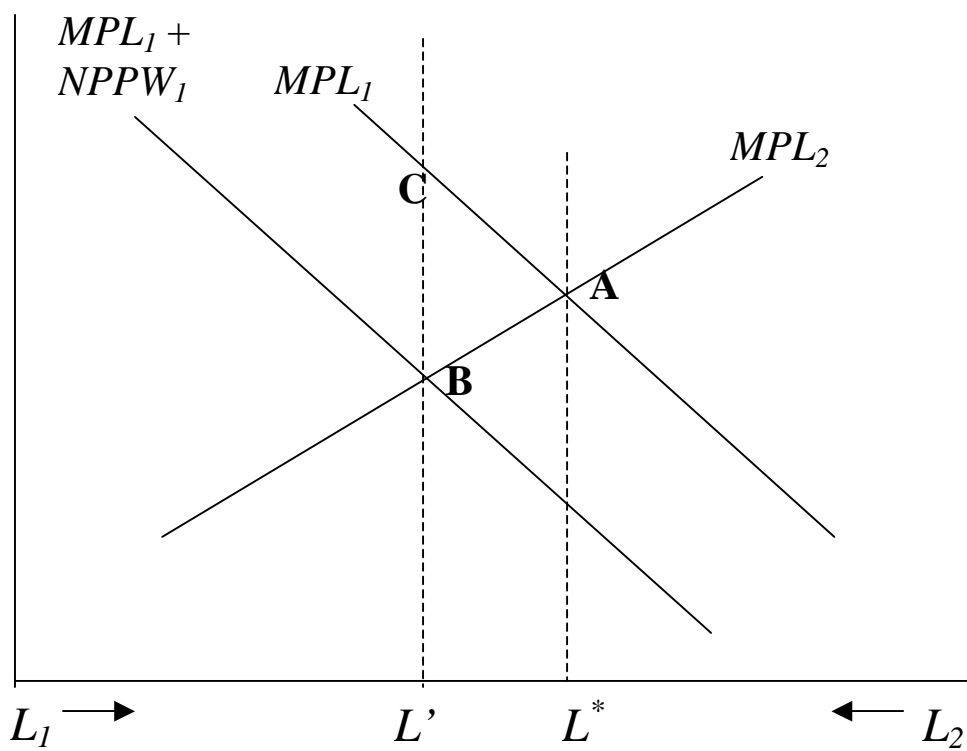


Table 1: Net public pension wealth in different European countries

<b><i>NPPW</i></b>	Single age 20	Married age 20	Single age 40	Married age 40
Belgium	-30152 -13%	-28224 -12%	-20240 -8%	-15503 -6%
Denmark	-11438 -3%	-7289 -2%	-3707 -1%	6701 2%
Germany	-53059 -16%	-53059 -16%	-38758 -11%	-38758 -11%
France	-13634 -6%	-9652 -4%	15558 8%	24786 12%
Italy	-28698 -13%	-28698 -13%	18173 9%	18173 9%
Luxembourg	-33543 -11%	-33543 -11%	-15939 -5%	-15939 -5%
Netherlands	-91018 -31%	-87810 -30%	-84439 -28%	-76772 -25%

In Euro and as percentage of lifetime wealth.

Source: Wildasin (1999)



Table 2: Net reproduction rates in European countries

	1970/75	1980/85	1990/95
Belgium	0,92	0,76	0,79
Denmark	0,94	0,68	0,82
France	1,10	0,90	0,87
Germany	0,77	0,70	0,72
Greece	1,06	0,91	0,70
Italy	1,05	0,74	0,63
Netherlands	0,94	0,73	0,82
Portugal	1,25	0,93	0,70
Spain	1,32	0,84	0,66
United Kingdom	0,97	0,87	0,90

Source: Kolmar (1999)

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