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Abstract:

A major concern in Western Europe and especially in Germany is that with the EU eastern enlargement inflows of workers occur, which will be net beneficiaries of the domestic social security systems. We introduce a model and present evidence by comparing pension systems in the main source and target countries (Poland, Hungary, Czech Republic; Germany) that show that immigrants most likely have to face a burden from entering the German pension system. Only if the total number of immigrants is sufficiently large the burden may change into a gain. We conclude that if migration takes place, it will do so *despite* – not *because of* – the existence of the pension systems.

(JEL-Classification: H55, H73, F15, F22).

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1. Introduction

In 2004, eight central and eastern European countries will join the European Union. Due to large differences in national per-capita incomes inflows of workers from these countries can be expected - a "trek westwards" (Straubhaar, 2001). Projections assume that about two to five million people will migrate to the EU in the next 15 years.

Immigration is therefore an important topic in the political debate of some western European countries, in particular in Germany which is assumed to become the main target country for migrants. Germany therefore advocated a seven year transitional period of restricted freedom of movement for citizens of the accession countries (which was also used during the southern enlargement). Otherwise, it is sometimes feared, migrants will not only move westwards to find jobs and enter the labor markets, but "migrate into the social security systems", causing a burden on the domestic population.

It is, however, often neglected that entering the social security systems does not necessarily imply that immigrants will become net beneficiaries of these systems. It may even be that immigrants are (forced) net contributors, putting a burden on the immigrants instead. Sometimes immigrants may simply help to stabilize a certain branch of the domestic social security system. In this regard pension systems may be a particularly striking case because immigration increases the number of contributors to the pay-as-you-go financed German pension system.

In our paper, we will show in a simple model that immigration into an ageing country with a pay-as-you-go financed pension system will impose a burden on immigrants, if the source country is less aging and/or has a fully funded pension system, because the implicit rate of return on contributions is decreasing by entering the target country's pension system. Migrants should therefore be not too "happy" about migrating into a different pension system as the expected gain from the income differential between the target and the source country will be lowered. Only if the total number of immigrants is sufficiently large (which can, however, not be foreseen by a potential migrant), a gain from migration will possibly accrue to the migrant. We will furthermore show that changing the burden into a gain will become increasingly difficult if, e.g., the accession country has a more favorable age structure than the target country or if its pension system involves less redistribution, both intergenerational and intragenerational.

Based on this model we will investigate differences in the pension systems of the main source and target countries for east-west migration after the EU enlargement, i.e. Poland, Hungary, the Czech Republic and Germany, respectively. We find that the expected immigration is clearly beneficial to the German pension system, not only

because of an increase in the number of contributors but also, e.g., because of an improvement of the age structure of contributors. On the other hand, total immigration is likely to be too small to induce a gain from entering the German pension system on immigrants. They will consider this fact as a burden because in their home countries dependency ratios are more favorable and the newly reformed pension system involve at least less intergenerational redistribution.

Our paper proceeds as follows: First, we briefly investigate the relationship between immigration and pension systems (section 2). Then, we introduce our model and explain its main results (section 3). In section 4, we review the literature on the expected migration potential from the central and eastern European countries to Germany and the rest of the EU. Furthermore, we investigate in this chapter the age structure and skill distribution in Germany, the accession countries and among migrants. Section 5 presents the pension systems in the four countries under consideration and compares some aspects of these pension systems with regard to the findings of our model. Finally, section 6 concludes by summarizing our main results.

2. The economics of migration and pension systems

Pension systems which are pay-as-you-go (PAYG) financed are closely linked to the composition of the domestic population. In this type of pension system, intergenerational redistribution from the young to the old takes place, so contributions and benefits depend on the number of contributors and on the number of retired individuals. Migration may change the composition of the population and will therefore potentially have an impact on the PAYG system. This is not the case with a funded pension system where contributions are equivalent to private savings. In the following, we will briefly review the effects of migration on pension systems.

In PAYG pension systems, total contributions collected from the working generation L_t (i.e. $\tau_t \cdot L_t$, τ_t being the contribution per worker) are immediately redistributed to those who are retired, L_{t-1} . Let p_t be the pension benefit in period t and let $n_t = L_t/L_{t-1} - 1$ be the population growth rate, then the pension system is balanced if

$$(1) \quad \tau_t \cdot L_t = p_t \cdot L_{t-1} \Rightarrow p_t = \tau_t(1 + n_t)$$

This makes the impact of migration rather obvious as it changes the size of the labor force L_t . In the destination country, the number of potential contributors to the pension system increases, provided that the immigrants get into work (otherwise, they will not to become members of the pension system). The more immigrants enter the country, the

more the domestic population gains unless some countereffect occurs, e.g. negative changes in the marginal productivity of labor. Empirical investigations show, however, a rather low impact of immigration on the destination country's wages even if one expects substitutability between domestic workers and immigrants (Friedberg/Hunt, 1995; Bauer, 1998). Hence, due to migration-effects on the pension-systems, the destination country becomes even more and the source country (where exactly the opposite happens) even less attractive for mobile workers.

In addition to this quantitative effect, a qualitative effect is likely to occur. This happens if the composition of the domestic population is not only numerically changed but also with regard to its age or skill distribution. In fact, even if net migration is zero the qualitative effect occurs if, e.g., out-migrants are old and immigrants are young on average. There is a positive effect on the domestic pension system if, e.g., immigrants

- are on average younger than the domestic population as they will pay contributions relatively longer than natives; this will benefit the average-age domestic worker in the first years of his retirement,
- have relatively more children than natives which means that the immigrants' offspring will not only support their own parents after retirement but also domestic parents with fewer offspring,
- have a higher average skill level compared to the domestic workers which means that they will contribute relatively more to the pension system than natives¹,
- have a lower unemployment rate than natives,
- offer labor that is a complement to domestic labor which helps to lower unemployment.

Obviously, the opposite holds as well: if immigrants are unskilled, have very few children and are very likely to become unemployed, there might be a negative effect. Usually, however, immigrants are expected to induce a *positive* externality on the native population. Sinn (2001) estimates the positive fiscal externality to the German population via the pension system to be about €175,000 per immigrant. One reason for this result is that during the last 15 years the average immigrant women had about 35% more children than the average German women (Sinn, 2001).

Comparing these outcomes with a fully funded (FF) pension system, we find that the FF system is in principle not influenced by immigration. The reason is that contributions are collected in individual accounts and after retirement will be turned into an annuity from

¹ Only if there is a strict equivalence between contributions and benefits, this problem will not arise. However, all real-world pension systems redistribute between the rich and the poor.

which pension benefits will be paid. Unlike the PAYG where the (implicit) rate of return is the population growth rate plus the growth rate of wages (here, the latter has been neglected for simplicity), in the FF system it is simply the market interest rate r .

$$(2) \quad p_{t+1} = \tau_t \cdot (1 + r_{t+1}).$$

While on an aggregate level it seems that migration has a positive effect on a PAYG pension system, this may be different from an individual migrant's perspective. An individual benefits from the pension system if the net public pension wealth, $NPPW$ (Feldstein, 1974), is positive, i.e. the difference of the present value of retirement benefits minus the present value of the contributions to the pension system:

$$(3) \quad NPPW = \sum_{t=R}^D \frac{p_t}{(1+r)^t} - \sum_{t=0}^R \frac{\tau_t}{(1+r)^t} \Rightarrow NPPW = \frac{p_{t+1}}{1+r_{(t+1)}} - \tau_t$$

where R is the age of retirement and D the end of life.² If this difference turns negative which is typical for ageing societies with a PAYG pension system, the $NPPW$ can be interpreted as an implicit tax on income (Wildasin, 1999). The fewer contributors there are, the higher the contribution rate and/or the lower the expected future pension benefit will be. Therefore, there is clearly a disincentive to migrate into an ageing society with a PAYG pension system. It makes a slight difference though, whether you enter a defined-benefit system or a (notional) defined-contribution PAYG system. In the first case, there are few ways to escape increasing contribution rates (pension benefits are kept constant despite fewer contributors), unless the number of immigrants is so large that contribution rate increases are actually being stopped (see section 3). From an individual's point of view the ladder can hardly be foreseen. In a system which concentrates on keeping contribution rates unchanged future benefits will shrink. The level of *intergenerational* redistribution remains constant while it is increasing in the previous case. Ageing causes the same problems as before, but now one has the choice whether to accept the lower future benefits, whether to invest in child rearing³ or whether to engage in capital-market investments.

There is another issue which concerns a potential migrant: the amount of *intragenerational* redistribution within the pension system. Beveridgian pension systems induce strong redistribution between the rich and the poor by introducing basic pensions, Bismarckian systems keep a tight link between contributions and benefits such that there

² The second part of (3) is the $NPPW$ for the two-periods scenario employed in section 3 of this paper.

³ Clearly, there is the possibility of free-rider behavior (see Apolte (2002) and Sinn (2001)).

is only little redistribution.⁴ Depending on whether a member of a pension system is rich or poor, he likes or dislikes one system or the other. If a high-earning individual moves from a Bismarckian to a Beveridgian system, he will c.p. be worse off as his future pension benefit will fall back to the basic pension level.

In a sense, FF systems are pure Bismarckian pension systems as they operate with a tight link between contributions and benefits. All contributions plus the interest paid on them will be paid back. The *NPPW* is therefore zero and no redistribution has taken place.

3. A simple model

In the following, we will introduce a very simple model which will explain some of the effects discussed above. We consider the case of a country which is up to join an economic union which is ageing at a relatively higher rate, both the joining country and the economic union having a PAYG financed pension system. In particular, we presume that at the time of joining the economic union workers of the joining country are attracted by a substantial wage differential which is sufficiently large to override negative incentives imposed by the pension system. Migrants will enter the country despite the fact that they have to enter the pension system. If the wage differential were small though, it would be unattractive to migrate from the individual migrant's point of view. However, we will show that a sufficiently large number of migrants will lead to falling contribution rates which are attractive for both natives and immigrants.

Let there be two countries where country A is the core area and country B is the joining country. In a framework which is similar to Homburg/Richter (1993), individuals maximize lifetime utility and face the following intertemporal budget constraint:

$$(4) \quad c_t + \frac{z_{t+1}}{1+r_{t+1}} = w_t^i + \bar{p} \frac{n_t^i - r_{t+1}}{(1+r_{t+1})(1+n_t^i)} \quad \text{for } i = A, B,^5$$

which makes use of the fact that - in contrast to Homburg/Richter (1993) and different from equation (1) - countries define the pension benefit as exogenously given, while the contribution rate adjusts endogenously, i.e.

$$(5) \quad p_t^i L_{t-1}^i = \tau_t^i L_t^i \Rightarrow \tau_t^i = \bar{p} \frac{L_t^i}{L_{t-1}^i}.$$

⁴ But even the very Bismarckian German system involves some degree of intragenerational redistribution as has been shown by Börsch-Supan/Reid-Held (2001).

⁵ Here, c_t is consumption during the working life, z_{t+1} is consumption during retirement, and w_{t+1}^i is the country-specific wage rate.

This is common in many European countries which have pension systems of the defined-benefit (DB) type.⁶ The pension benefits are assumed to differ by a fixed fraction α between both countries; for simplicity we set $\alpha = 1$. The ratio L_t^i/L_{t-1}^i is the inverse of the dependency ratio which measures the ratio of retirees (aged 65 and older) to population in working age (aged 15 to 64).

Migration of workers from the joining country may start as soon as borders are being opened for them (here, retirees are immobile).⁷ It requires, however, that the location-dependent income, which is the right-hand side of (4), is larger in the core area than in the joining country:

$$(6) \quad w_t^A + \bar{p} \frac{n_t^A - r_{t+1}}{(1+r_{t+1})(1+n_t^A)} > w_t^B + \bar{p} \frac{n_t^B - r_{t+1}}{(1+r_{t+1})(1+n_t^B)} .$$

Substituting for n^i and τ_t^i , we find that migration takes place until

$$(7) \quad w_t^A - \bar{p} \left[\frac{L_{t-1}^A}{L_t^A} - \frac{L_{t-1}^B}{L_t^B} \right] = w_t^B .$$

We simply assume here, instead of explicitly adding a term which measures migration cost, that the core area's wage is already net of migration cost (from the viewpoint of a potential migrant). The bracketed term measures the difference in the national pension systems by comparing national dependency ratios and is determined by the difference in the fertility of the domestic population. If fertility is lower in the core area, as we will assume in the following, the incentive to leave the joining country is lowered. It is simply the difference of both countries' *NPPW*, i.e. $\Delta NPPW$.

Clearly, the wage differential decreases with a larger number of migrants because in both countries marginal productivities of labor change. Eventually, marginal productivities of labor should equalize, taking into account the pension differential. At the outset, wage differentials - e.g. between Germany and the EU accession countries - are probably much larger than the differences in the pension systems, so the negative impact will not matter too much. Nevertheless is the effect of the pension system negative for each single individual as it reduces the expected income gain from migration. This can be seen from Figure 1 where marginal productivities for two regions are shown:

⁶ See Wagener (2001) for evidence from Germany.

⁷ It is assumed that retirees receive their pensions from the pension system they contributed to.

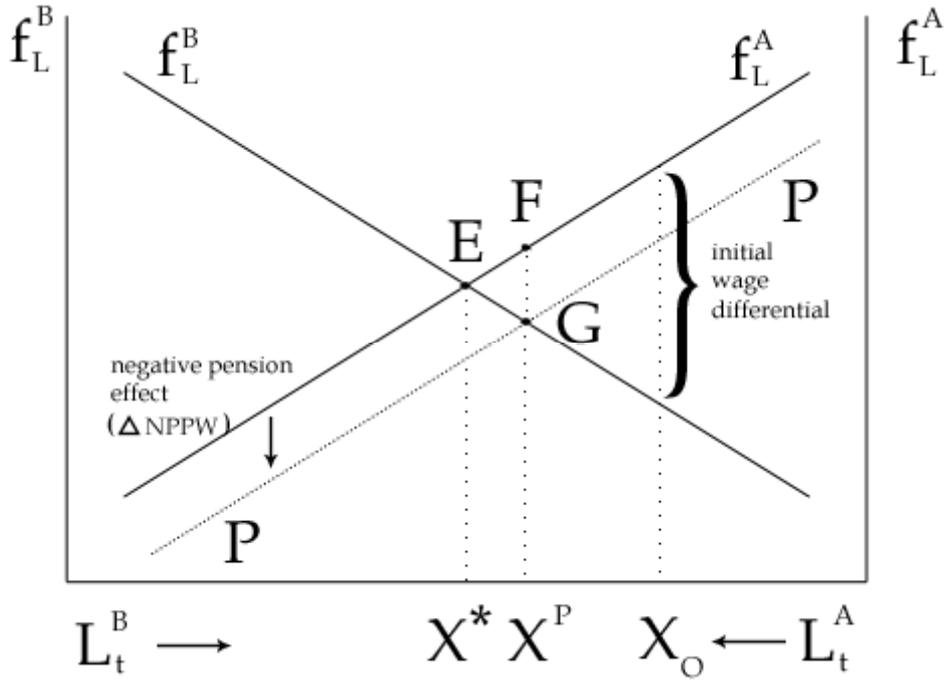


Figure 1: Interregional allocation of workers if a PAYG pension system exists

The marginal productivity in the core area (f_L^A) is shifted downwards by the negative pension effect. The resulting curve is PP. The wage differential is therefore smaller at the outset which is X_0 where the number of young migrants X is zero ($X_0 = 0$). An artificial migration disincentive is created which leads to a lower than optimal number of migrants, i.e. X^P instead of X^* . The welfare loss is given by triangle EFG.

So far, the analysis neglects the fact that migration has a positive effect on the core area's pension system because the number of contributors increases. Under the given pension system, contribution rates can shrink according to (5). However, we assumed that contribution rates at the outset are more favorable in the joining country (recall that fertility rates in the core area are lower), therefore a single migrant will not change the performance of the pension systems substantially and still consider the pension system as a burden. But if there is a sufficiently large number of migrants, the performance of the pension system improves in the core area and worsens in the joining country. At some point, the core area's pension system will do even better than the joining country's, i.e. contribution rates will be lower. The pension systems have the same contribution rate if the bracketed term in (7) vanishes. We can therefore derive the "break-even migration level" from the following equation:

$$(8) \quad \frac{L_{t-1}^A}{L_t^A + X} = \frac{L_{t-1}^B}{L_t^B - X} \Rightarrow \bar{X} = \frac{L_{t-1}^A L_t^B - L_{t-1}^B L_t^A}{L_{t-1}^A + L_{t-1}^B} = \frac{L_{t-1}^A L_{t-1}^B (n_t^B - n_t^A)}{L_{t-1}^A + L_{t-1}^B}.$$

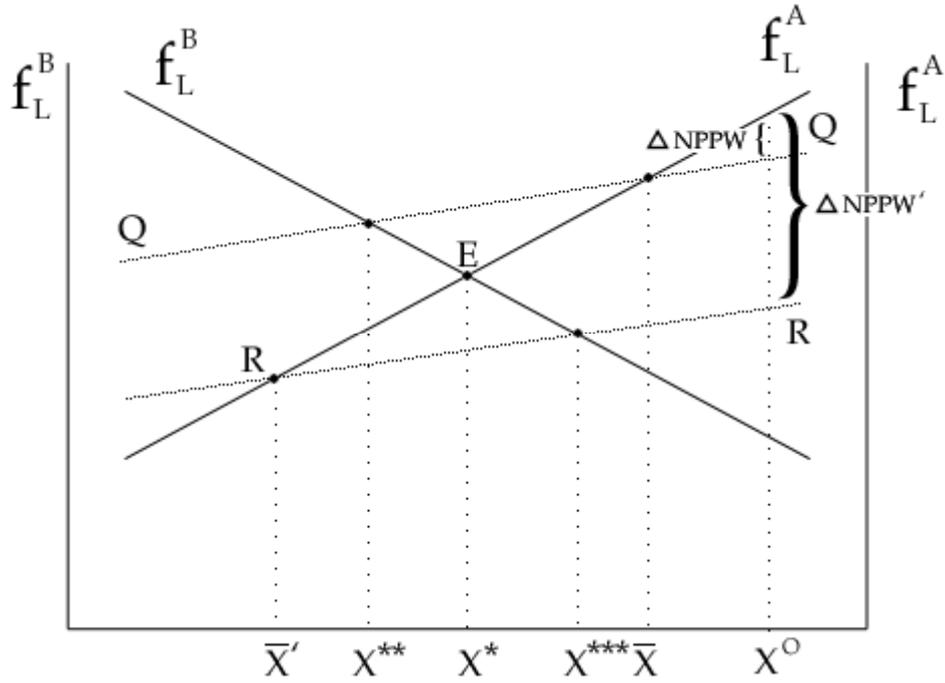


Figure 2: Interregional allocation of workers in case of endogenous determination of the contribution rate

Any migration level beyond \bar{X} will positively add to the wage differential and creates an additional positive migration incentive. This can be seen from Figure 2 where the QQ line which intersects the marginal productivity curve of country A at the break-even migration level \bar{X} .⁸ If migration is beyond this level, the new optimal migration level will be X^{**} which is nevertheless an artificially induced result. Notice that the break-even level may lie beyond X^* where marginal productivities equalize. In this case, shown by the RR curve, the impact of the pension system is negative for all migrants as $\bar{X}' > X^*$. The optimal migration level X^{***} is below X^* . The reason is that net wages equalize when the *NPPW* difference is still negative. This scenario is analogous to the case discussed in Figure 1.

⁸ At the outset, there is a positive difference between the *NPPW*s of both countries which lowers the marginal product of labor in country A, i.e. $f_L^A - \Delta NPPW$. Clearly, f_L^A falls if immigration X takes place. $\Delta NPPW$, however, is reduced since $d(\Delta NPPW)/dX = -p[L_{t-1}^A/(L_t^A + X)^2 + L_{t-1}^B/(L_t^B - X)^2] < 0$. Therefore, the QQ curve approaches the f_L^A -curve as X increases and eventually goes beyond it.

The following graph shows again the derivation of the break-even migration level, here in terms of contribution rates to the pension system. The curves are derived from the equation for the contribution rate given by (5), taking into account migration X .⁹

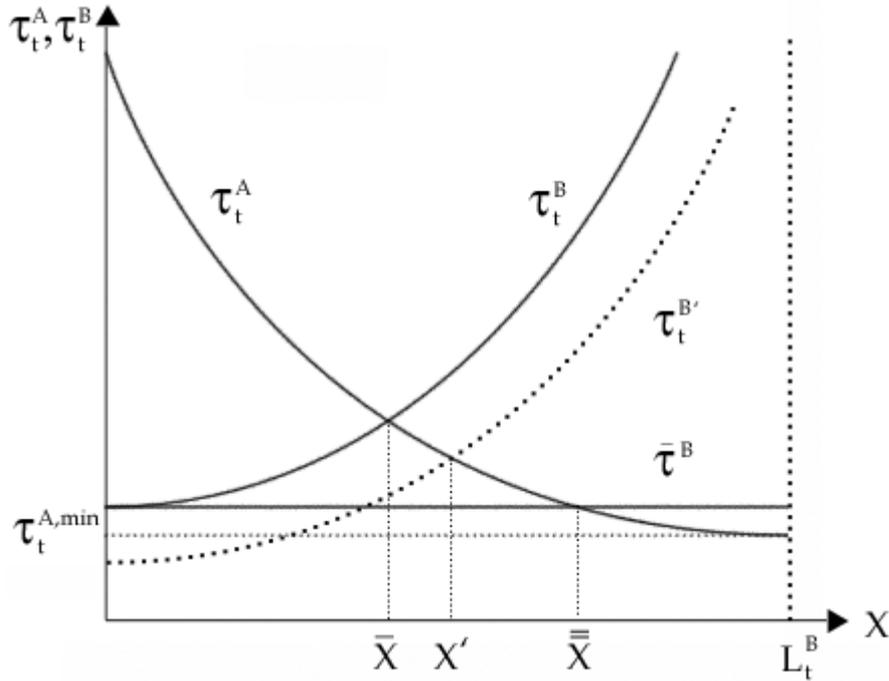


Figure 3: The change in national contribution rates caused by migration

From Figure 3 we again see that both pension systems are equal for migration level \bar{X} where both contribution rates are the same. If all citizens of country B are moving to the core area, the minimum contribution rate $\tau_t^{A,\min}$ can be reached in A. To the left of \bar{X} , the contribution rate in the core area is higher than in the joining country, so entering the pension system is not (yet) attractive, only the wage differential induces migration.

Here, a problem of coordination failure may arise because a single potential migrant does not consider the positive externality he induces on other potential migrants. A single migrant will not noticeably change the core area's pension system, a sufficiently large number of migrants, however, will induce contribution rates to fall below the joining country's level. Both the citizen's of the core area and the migrants will gain from this

⁹ Considering migration X , we have $\tau_t^A = \bar{\rho}L_{t-1}^A / (L_t^A + X)$ and $\tau_t^B = \bar{\rho}L_{t-1}^B / (L_t^B - X)$ with the derivatives $d\tau_t^A / dX = -\bar{\rho}L_{t-1}^A / (L_t^A + X)^2 < 0$ and $d\tau_t^B / dX = \bar{\rho}L_{t-1}^B / (L_t^B - X)^2 > 0$, which leads to the curves shown in the graph. At the maximum possible migration level L_t^B , $\tau_t^A = \bar{\rho}L_{t-1}^A / (L_t^A + L_t^B) \equiv \tau_t^{A,\min}$ and τ_t^B approaching infinity as the denominator is zero.

reduction in contribution rates. Whether this happens or not depends on whether the wage differential is large enough to induce at least \bar{X} potential migrants to move.

It should be noted that this result follows from the fixed pension benefit assumption because this allows both natives and immigrants to gain from immigration. Furthermore, we assumed the migration equilibrium to be stable at least in the short run.¹⁰ Long-run stability is much more difficult to guarantee (see Hange, 2001, 74-79, for a discussion of this issue). The problem that arises is with the next generation that has to pay for an increased number of retirees. If the fertility of immigrants is still relatively higher after entering the core area, it is the immigrants' children that will face too high contribution rates compared to a scenario without migration in the preceding period. Some children may therefore consider to migrate to country B in $t+1$ where the number of retirees is less due to migration in t . The process of migration and re-migration may extend to all future periods. However, this is probably not a major concern of today's migrants.

Let us briefly assume that the joining country's pension system is not fixing the pension benefit, but the contribution rate as it is the case in a notional defined-contribution system. The contribution rate is now τ_t^{-B} , regardless of the number of migrants. Therefore, more migrants, i.e. \bar{X} , are needed to break even, as can be seen from Figure 3.

Let us finally assume that the joining country's pension system consists not only of a PAYG pillar, but also of a funded pillar, leaving the replacement income \bar{p} unchanged. The funded pillar will cover a share β of the pension benefit. If dynamic efficiency holds, i.e. $r > n$, contributions τ_t^B can fall by more than β because contributions to the funded pillar yield a higher return. Therefore, contributions in the joining country are relatively lower than in the core area. This leads a shift downwards of the τ_t^B curve in Figure 3 to a new $\tau_t^{B'}$ curve. Hence, the new break-even level of migration is X' which shows that the difference between the two pension systems is larger under this scenario.

Summarizing our findings, we conclude that if there is a relatively low number of migrants, migrants will face a burden by entering the core area's pension system, assuming a higher reproduction rate in the joining country. If, however, the number is sufficiently large, both immigrants and natives will gain from migration. Moving from a system with defined contribution rates or with a larger funded pillar to a system without, tends to increase the burden which lowers the income gain possible if there were no

pension systems at all. The pension system causes an artificial migration disincentive which leads to a too low (but nevertheless quite substantial) migration from the joining country to the core area.

4. The expected migration potential following the EU eastern enlargement

After the theoretical considerations of the previous sections, we will now briefly summarize three major studies on east-west migration which estimate the number of expected immigrants. Furthermore, we add data on important differences between the major source and destination countries of migrants, i.e. Poland, Hungary, the Czech Republic and Germany, respectively. These informations regard the list of impact factors on a target country's pension system which was presented in section 2.

The before mentioned studies were conducted by Bauer/Zimmermann (1999), the European Integration Consortium (2001) and Sinn et al. (2001). While the first study is concerned with immigration into the entire EU, the latter two studies primarily concentrate on the expected inflow of migrants to Germany as until 1998 more than two thirds of the migrants to the EU-15 from the 10 central and eastern European countries¹¹ (CEECs) applying for membership in the EU went to Germany (European Integration Consortium, 2001, 104). Forecasts of the future migration potential assume that the 1998 distribution of migrants across the EU countries will remain constant over time. Therefore, Germany is expected to be the main destination country for immigration.

The estimates of the immigration potential to Germany range from two million up to five million people in the first 15 years after accession, depending on the underlying forecast model and the chosen scenario. The results represent only rough estimates due to definition and statistical problems as well as problems in capturing the individual factors influencing migration decisions (Brücker, 2001a). Furthermore all estimations are based on econometric models using historical data, taking into account the experience from past migration to Germany, especially in the context of the EU southern enlargement, which may not be able to give a sufficiently exact base for estimating the future migration potential from the CEECs.

The most important explanatory variable for migration in the estimation models is the income differential between source and target country (countries), expressed as the difference in GDP per capita in purchasing power parities (ppp). This is just the previous

¹⁰ For this to hold, the increase in the number of contributors in country A must decrease wages more than contributions to the pension system. Otherwise, all workers of the joining country will immediately move to country A (leaving country B deserted) as all of them will unambiguously gain from migration.

¹¹ Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

section's wage differential. In 1998, this measure was 33, 40 and 47 percent of the EU-15's one for Poland, Hungary and the Czech Republic, respectively (Brücker, 2001b, 7). It does not account for tax payments and transfers influencing disposable income (Flaig, 2001), so a comprehensive perspective considering long-term disposable income is missing. Sinn et al. (2001) consider potential net contributions to or benefits out of the German social security systems to migrants to show that fiscal activity can distort migration decisions. Surveys conducted in some CEECs find evidence for a significant impact of differences in social security systems on migration decisions (Bauer/Zimmermann, 1999, 97-100). Other studies argue that there is no empirical evidence for the relevance of social security systems in the migration decision (Brücker/Trübswetter/Weise, 2000, 325).

Despite this ambiguity, the findings are in line with our theoretical argument. In the first place, it is the wage differential which drives migration decisions. Whether or not the pension system has, among other things, a positive or negative impact on expected incomes depends on the total number of migrants. These effects are difficult to predict (or even to recognize) and potential migrants may therefore neglect or misjudge them, leading to ambiguous empirical evidence. This may turn out as a costly mistake: Wildasin (1999, 267-270) shows that the loss in *NPPW* by migrating between six European countries may amount to up to almost 40% of lifetime wealth.

In the following, we will turn to the factors (listed in section 2) which have an impact on pension systems. In particular, we consider the age distributions and fertility rates in Germany, the accession countries and among potential migrants. Furthermore, we will look at skill distributions and unemployment probabilities.

Age structures of the population in the EU member countries and in the CEECs differ significantly. Although birth rates have fallen considerably since the beginning of transition in the CEEC-10 (but are expected to recover in the future), the average age of the workforce will remain rather low for the next one or two decades in comparison with EU levels (European Integration Consortium, 2001, 25) due to relatively high birth rates before 1990. Almost every CEEC has relatively smaller age groups beyond age 65 and relatively larger cohorts for ages 0 to 14 (Bauer/Zimmermann, 1999, 42-43). Table 1 lists selected demographic projections for Poland, Hungary, the Czech Republic and Germany.¹²

¹² Note that these projections include already some net migration (see Dang/Antolin/Oxley, 2001)

	Life expectancy at birth				Annual growth rate of working-age population	Annual growth rate of elderly population	Old-age dependency ratio in %		
	males		females				2000	2000-2035	2035-2050
	2000	2050	2000	2050	2000-2050	2000-2050			
POL	69.9	78.5	78.2	84.7	-0.45	1.55	20.4	38.4	55.2
HUN	66.8	74.6	75.2	81.1	-0.67	0.71	23.7	34.9	47.2
CZ	71.5	75.2	78.4	81.5	-0.77	1.17	21.9	42.3	57.5
GER	74.7	80.0	80.8	85.0	-0.46	0.93	26.6	54.1	53.2

Table 1: Selected demographic projections; Source: Dang/Antolin/Oxley (2001)

For pension systems the average annual growth rate of the working-age population is important. Abstracting from the problem of unemployment, this rate is negative for all countries and therefore reduces the effect of the positive growth of the wage rate – the internal return of the PAYG pillar is going to be lowered. On a 2000-2050 time horizon, this growth rate is less negative in Germany than in Hungary and the Czech Republic because fertility has stabilized earlier at a low level. But recall that the growth rate of wages has to be added to the population growth rate in order to realistically calculate the implicit return. During the economic catch-up process in the CEECs, growth rates will be higher than in Germany, so the disadvantage for these two countries will (at least partly) be offset.

Next to the reproduction pattern of a society, the development of longevity plays an important role as well. According to Table 1, life expectancy at birth is expected to increase in all countries and for both sexes. It is much more instructive, however, to consider growth rates of both age groups the working population and the retirees jointly, e.g. by looking at the old-age dependency ratio which is used in equation (7) to measure the differences in pension systems. Figure 4 shows that the ageing process in Germany is far more advanced than in the accession countries (Dang/Antolin/Oxley, 2001). The 30% level will be reached in Germany in 2004, but only in 2015, 2020 and 2021, respectively, in the other countries. When the dependency ratio peaks in Germany at about 55% in 2035, even the most advanced Czech Republic reaches only about 42%. Only at the very end of the projection's time horizon will the accession countries catch up.

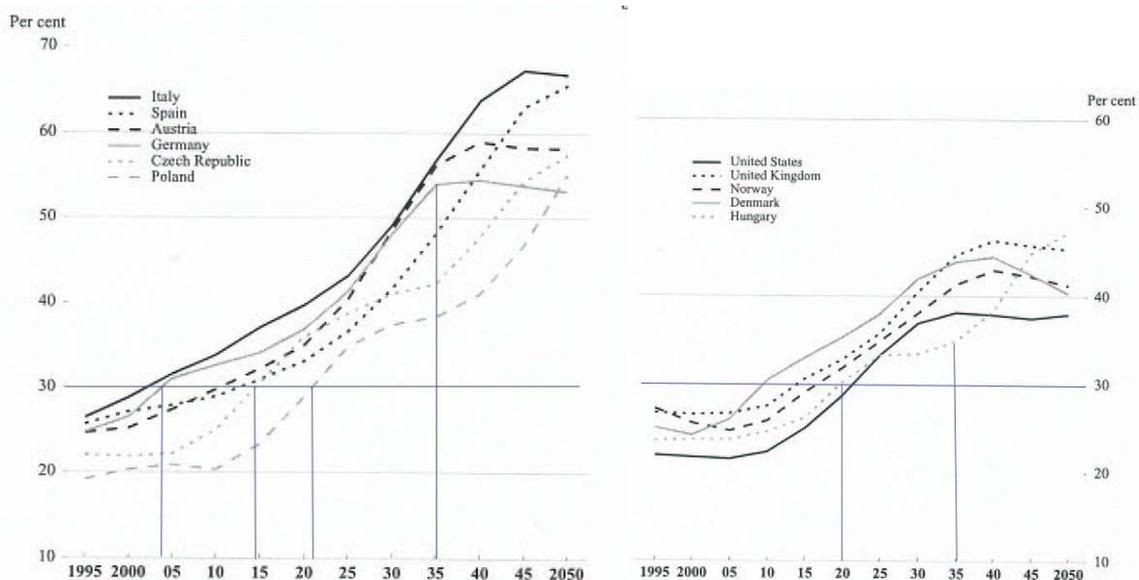


Figure 4: Old-age dependency ratios in selected countries; Source: Dang/Antolin/Oxley, 2001, 30.

This shows that the change from an accession country's PAYG pension system to the German one will go along with a decrease in the implicit return on pension contributions. This was the underlying assumption in equation (7).

While the dependency ratio gives an idea of a country's age structure, it is mainly the age structure of immigrants that matters for the target country's pension system. Empirically, a relatively higher mobility of younger people in comparison to the older ones can be observed, which can be explained on the basis of human capital theory as expected lifetime gains from migrating are smaller for older people (Bauer/Zimmermann, 1999, 15). The lower age groups are on average more prone to migration and they have in the majority of the CEECs a higher share in the population compared to the EU-15. Hence, it can be expected that the potential migrants from the CEEC-10 are on average considerably younger than the population in the target countries. This assumption is confirmed by empirical results based on microanalytical surveys, which show that 57,7% of the potential emigrants from the Czech Republic, 54,3% from Hungary and 51,1% from Poland are younger than 30 (Fassmann/Münz, 2002, 77). A further indicator for the plausibility of this assumption is the current age structure of already immigrated employees from the CEECs to EU-15: On average, these workers are significantly younger than nationals and foreign workers in the EU. In EU-15 on average only 55% of all workers are aged 25-44, while among workers from the CEECs it is almost 70% (European Integration Consortium, 2001, 55).

The migration probability of old, unemployed or poor people is below average. This is partly because they are less mobile and partly because they have less opportunities to

enter the labor market or the social security systems of the western European countries than other population groups. EU directive 1408/71 prevents that old people can enter a possibly more generous pension system. The mobility of unemployed and poor people is limited by their reduced ability to pay movement costs as a result of their relatively low income. These costs even rise, if an immigration into unemployment is taken into account. The participation of unemployed and poor immigrants in the general social security system of the destination country is usually prevented by several safety measures¹³. Only a very basic social assistance may be applicable. In Germany, for example, a means-tested social assistance cannot be claimed by immigrants without the German citizenship in the case of unemployment; beyond that, the need of means-tested social assistance by such an immigrant can justify his or her expulsion from Germany, even if he or she has an EU-citizenship (Sinn et al., 1999, 155-157).

Regarding the skill distribution one should consider the qualification level of potential migrants from the CEEC-10: On average, one can expect a rather high education level of the migrants from CEEC-10, even in comparison to the one of the population in the EU-15. This can be explained firstly by the generally high education levels in the CEECs compared to other countries with similar per capita incomes (e.g. European Integration Consortium, 2001, 26). Sinn et al. (2001, 71) emphasize that the general education level in the CEEC will even increase in the future. Secondly, as human capital theory points out, it can be expected, that the average qualification level of migrants is higher than the overall qualification level in a given source country. The individual migration probability is positively correlated with higher education which enhances individuals' ability of information collection and processing, thereby reducing the risks and costs of migration (Bauer/Zimmermann, 1999, 15). Empirically, it can be observed that migrants already emigrated from the CEEC-10 have a higher endowment with human capital in comparison to past migration from other countries to EU-15; possibly even in comparison to the EU-15 (e.g. European Integration Consortium, 2001, 55).¹⁴ Surveys show that 55,1% of the potential emigrants from the Czech Republic, 57,2% from Hungary and 50,5% from Poland have a intermediate, high or academic education level (Fassmann/Münz, 2002, 77-78).

¹³ For an overview of corresponding safety measures in the German social security system, see Sinn et al. (2001, 121-159).

¹⁴ That migrants from the CEECs are mostly employed in the low skilled sector (European Integration Consortium, 2001, 56-57) only seemingly contradicts this fact: It is the result of limited access to labor markets in the EU-15, as certificates and qualification records are not acknowledged by the EU-15 authorities (e.g. Sinn et al., 2001, 48). It can be expected, however, that the accession process will lead to an approval of these records, i.e. that existing labor market barriers for higher educated jobs will be removed.

Much of past migration to Germany took place in a time of higher economic growth and employment levels in Germany (Brücker/Trübswetter/Weise, 2000), i.e. in a time with a high demand for foreign workforce, especially for low-skilled workers. As general economic conditions have worsened in the meantime and due to technological and structural changes of the economy, the low-skilled migrant labor market is characterised by an ongoing decreasing demand and a corresponding rise in the unemployment rate and/or decreasing wages (Sinn et al., 2001, 65-70). Immigration into unemployment causes high migration costs as migrants which are unemployed immediately after immigration do not receive any public transfers in the target country. Decreasing wages in the low-skill labor market segment lower the income-gap for low-skilled workers between sending and receiving countries. Therefore there are low, and decreasing, migration incentives for low-skill workers from the CEEC-10 (Sinn et al., 2001, 101).¹⁵

In sum, empirical evidence indicates that within the CEECs the highest potential mobility prevails within the younger population groups, especially when they have a comparatively high education level (Sinn et al., 2001, 104). Therefore we can conclude that the German pension system will gain from eastern European immigrants not only because of the previously described quantitative effect but also because of the qualitative effect.

On the other hand, it turned out that the German pension system imposes a burden on individual migrants from the accession countries, at least for low levels of total migration. Migrants would most likely prefer not to enter the German pension system if they had a choice option. Schnabel (2000) shows that among young cohorts of self-employed Germans who are not *mandatory* members of the German public pension system, voluntary participation is close to zero. With regard to migrants the same attitude can be expected. Only if immigration is sufficiently large, the German pension system may be viewed as having a positive impact on immigrants, but projections show that very large numbers of immigrants are needed to stabilize the age structure of the German population and thus to possibly drive down contribution rates.

According to the estimations presented in this section an average yearly inflow of 130.000 to 330.000 persons from the accession countries is expected over the next 15 years. The United Nations (2000, 37) estimate at the same time that an average yearly immigration of 324.000 persons is needed just to keep total population constant until 2050. The dependency ratio nevertheless increases under this scenario because the average

¹⁵ Some groups of low-skilled workers will nevertheless be welcome in western Europe, e.g. nurses, agricultural workers or dustmen.

age is rising. A net immigration of 3.4 million persons per year is needed to keep this ratio constant as well. This enormous number neglects, however, that productivity growth and thus the growth of the wage rates adds to the implicit return of the PAYG system and that there will possibly be an effect due to a decrease of the dependency ratio in the home countries if migration takes place. In order to achieve a balanced pension system, the necessary immigration can therefore be lower. Nevertheless, in Germany quite substantial net migration is needed to stabilize the pension system and even more is needed to end up beyond the break-even level of our model. Therefore, the pension system will most likely impose a burden on immigrants

5. A comparison of pension systems in Eastern Europe and Germany

In this next section, our analysis will investigate in even more detail the institutional aspects of the pension systems of the four countries under consideration. This will allow us to derive further evidence on whether it is favorable for eastern European migrants to enter the German pension system. We will not only briefly describe the pension systems and reforms in these countries, but also take a closer look at the relative sizes of the pillars of the pension systems and at the methods of financing the PAYG pillar, both potentially having an impact on the individual migrant as we learned from sections 2 and 3: A relatively lower level of funding makes the target country's pension system less attractive. Furthermore, migrating from countries with a defined-contribution system to a country with a defined-benefit system or having more intragenerational redistribution (e.g. by changing from a Beveridgian to a Bismarckian pension system) is likely to impose a burden on the individual migrant.

5.1 The pension systems of Poland, Hungary, the Czech Republic and Germany

Although there were also country-specific reasons, why pension reforms became necessary in CEECs in the 1990s, some general features can be extracted. After the breakdown of the socialist economies, the former pension systems could no longer be sustained. The systems were often considered unfair and ineffective and faced major financing problems due to sharply increasing unemployment, bankruptcies and problems of collecting contributions. Public confidence in the pension systems was very low. Since fundamental reforms take time and need to be backed by strong public support, in the beginning only gradual reforms were introduced to overcome the most pressing problems. However, this was not sufficient to keep up the sustainability in the long run when the ageing of societies will become the main challenge. Hence, in the second half of the 1990s

fundamental reforms were introduced in Poland and Hungary, a step which is yet to be taken in the Czech Republic. Obviously, the situation is different for the mature German pension system where for political reasons only gradual reforms are possible. Here, the very rapid ageing process is the main challenge.

Poland

In Poland, a new pension system was introduced in 1999. It replaced the existing PAYG system with a three-pillar system. The new first pillar is a notional defined contribution (NDC) system which bases benefits on individual contributions during the working years. The contribution rate is fixed by law at 12.22% and will be the same for all future cohorts, hence, in principle the government abstains from the possibility to change contribution rates.¹⁶ Pension benefits will therefore adjust endogenously to changes in the underlying parameters. They are indexed at a rate of 75% of the growth of the covered wage bill which is affected by both average wage growth and growth of the labor force. The sum of uprated contributions forms the basis for the individual's pension (Chlon/Góra/Rutkowski, 1999, 20). The benefit is adjusted by both the value of contributions paid during the entire work life and life expectancy. The minimum retirement age will increase to 60 years for women and to 65 years for men. Furthermore pension rights for certain non-contributory periods are recognized, e.g. for maternity, child-leave, mandatory military service etc.

Like the first pillar, the second pillar is mandatory. It consists of individual, privately managed savings accounts. The contribution rate is fixed at a level of 7.3%, so the total contribution rate from both mandatory parts is 19.52% of gross earnings. All contributions to licensed pension funds are paid equally by employers and employees. There is a guarantee on a relative rate of return which is 50% of the average rate of return of all pension funds (Chlon/Góra/Rutkowski, 1999, 31). At the age of retirement, the collected contributions of the insuree and the returns from the capital market have to be converted into an annuity.

As usual, the third pillar is savings or voluntary contributions to private pension funds, e.g. by long-term savings plans or occupational-pension programs. This pillar is very flexible, allowing individuals to reallocate income over the lifecycle according to their preferences and needs. Taxation is done by using the pre-paid expenditure tax approach, i.e. contributions are made out of taxed income. Investment returns and benefit

¹⁶ At least, increases in the contribution rates can be excluded. The rates may eventually be reduced when the pension system has matured (Chlon/Góra/Rutkowski, 1999, 21).

withdrawals are tax exempt. This is different from the first two pillars where contributions are tax deductible. After retirement, personal income tax has to be paid on the benefits.

Hungary

The Hungarian pension reform introduced a new pension system in 1998 which is basically in line with recommendations by the World Bank (1995). The old one-pillar mandatory PAYG system with unindexed retirement benefits was replaced by a three-pillar pension system.

Basis for the first pillar of the new pension system of 1998 was a reformed¹⁷ and downsized version of the earlier defined-benefit PAYG pension system. The main elements of this reform were the following (Rocha/Vittas, 2001): The retirement age was raised to 62 years for both sexes as well as the number of years of service to 40 to be eligible for early retirement without penalty. At the same time, penalties for early retirement and rewards for late retirement were increased. Backward net wage indexation was substituted by the “Swiss” indexation formula which gives the same weight to net wage and consumer price changes. Furthermore, some redistributive elements of the benefit formula were removed as it was one of the main goals of the reform to tighten the link between contributions and benefits.

The total contribution rate in the reformed pension system is supposed to be 30% for all workers, 8% are paid by employees and 22% by the employers. Starting in 2002, young workers are supposed (though this step has been postponed for some time recently) to pay 22 percentage points of the total contribution rate to the unfunded pillar and 8 percentage points to the funded pillar.

In the second pillar mandatory contributions are to be placed in pension funds which are legally structured in a similar way as the previously existing third-pillar mutual benefit funds (Palacios/Rocha, 1998). The main difference is, however, that at retirement the accumulated capital becomes part of a real insurance pool that shares mortality risk (Augusztinovics et al., 2002, 40). The capital is turned into an annuity which is expected to follow the same indexation rule as the public pillar (though there are no products on the market yet that fulfill this condition).

The third pillar consists of the typical voluntary private pension scheme which is mainly constructed as mutual associations.

Czech Republic

In contrast to Poland and Hungary, the Czech Republic has not (yet) conducted a fundamental systemic reform of its pension system. Instead, a number of gradual reforms was enacted in the course of the 1990s which aimed at improving the existing PAYG financed public pension system and complementing it with a *voluntary* private pillar¹⁸ (Müller, 2002, 113). So far, it seems that the reforms are not sufficient to guarantee long-run stability.

This first pillar is PAYG financed and of the defined-benefit type. It mixes flat-rate and earnings-related pension benefits (Laurson, 2000). The inclusion of this basic flat rate redistributive element (CZK 1,310 per month) into the public pension system stands in contrast to the Polish or Hungarian systems where intragenerational redistribution has been transferred from the pension system to the state budget.¹⁹

The earnings-related part of the pension benefit is calculated on the basis of average earnings from a certain number of working years which will be raised to 30 by 2016. There are, however, nominal thresholds incorporated into the calculation of the personal assessment base. At present, earnings up to CZK 6,600 are fully considered, beyond this sum only fractions are added (Mácha, 2002, 81). The pension benefits are indexed to consumer price inflation. The total contribution rate is 26% of gross wages, 19.5% being paid by the employers and 6.5% by the insuree. The statutory retirement age is being raised gradually to 62 for men and 57-61 for women, depending on the number of children reared. The accrual factor for old-age pensions is 1.5 per year of membership.

The first pillar of the pension system is supplemented by a voluntary defined-contribution type pension fund system introduced in 1994. The minimum contribution per month is CZK 100 and there are certain minimum participation times (Jelínek/Schneider, 1999, 260-261). At the end of the savings period or at the time of retirement, the member of the pension fund receives either a lump-sum payment or a regular pension from an annuity.

The government subsidizes participation in the private pension funds. A person contributing the minimum amount of CZK 100 receives a subsidy of CZK 40. With increasing contributions, the subsidy falls in relative terms. If the contribution exceeds CZK 500 per month, a flat subsidy of CZK 120 is paid. Participation in the supplementary

¹⁷ Some reforms of the PAYG system, like the increase of the retirement age, were enacted already before 1998 because otherwise the system would have been in serious trouble already in the early 1990s (Augusztinovics et al., 2002, 30-32).

¹⁸ There is no mandatory private pillar, so the Czech Republic has basically a two-pillar system.

¹⁹ Also, the public pension pillar has not yet been completely separated from the state budget (Müller, 2002, 121-122).

pension funds has developed rather disappointingly, especially among the younger cohorts. Less than 10% of all participants are aged 30 and younger (Jelínek/Schneider, 1999, 264). Low participation rates among the young are partly offset by rather high rates among those aged 45 and older. The state subsidy is the main reason for this development because it provides a relatively high return on savings compared to the capital market²⁰. The pension funds are used as a short-term savings system.

Germany

Until very recently, the German pension system has basically been a one-pillar, defined-benefit PAYG system of the Bismarckian type. On average, 85% of old-age income stems from the public pension pillar. Less than 5% are covered by (voluntary) occupational pensions and about 10% by savings, earnings and family transfers (Börsch-Supan, 2001, 15).

In the German public pension system contributions are mandatory for almost all dependent workers (except for certain groups), about 90% of the work force are covered by it (Börsch-Supan/Reil-Held/Schnabel, 2001, 165). The contribution rate of 19.5% is levied equally on employees and employers. There is, however, a federal grant of about 30% of overall revenues that would increase the contribution rate by another 8 percentage points if it were levied as a payroll tax (Börsch-Supan, 2001, 16).

The German pension formula in its very basic version consists of four factors (Börsch-Supan, 2001, 17; Rürup, 2000): the individual contribution level, the years of service, adjustment factors, and the current pension value. The individual contribution level is the ratio of individual gross earning to average gross earnings in a certain year. This ratio gives the amount of earnings points for a certain year. At retirement, the sum of earnings points of all years of service (including bonus earnings points for child rearing etc.) is taken to calculate the pension benefit (Schmähl, 1999, 101). This number is adjusted by the pension type factor and by the access factor which takes into account the time of retirement. These factors are 1.0 for old-age pensions at the age of 65 and will be reduced (increased) by 0.003 (0.005) per month of early (late) retirement, corresponding to a reduction of the pension benefit by about 3.6% for each year of early pension payment (Rürup, 2000).

The current pension value represents the value of one earnings point in the year of retirement. It is the “dynamic element” in the German pension formula (Schmähl, 1999, 101-102) and determines the income (re-)distribution between workers and retirees

²⁰ The minimum time of participation to become eligible for a pension is just 5 years.

(Börsch-Supan, 2001, 17). It is derived from a benchmark pension (which is supposed to guarantee living standard security) that an insured person can achieve after 45 years of insurance at the average wage level. After several, sometimes rather erratic changes the adjustment of the current pension value now follows the “modified gross wage indexation rule”, introduced in 2002. Benefits are related to the development of the gross wage minus the contributions to the pension system, thus, both retirees and workers are affected by the increasing old-age dependency ratio.²¹ Furthermore, starting in 2011 only 90% of the gross wage growth will be considered in the pension formula.

The goal of the recent pension reform is to keep the contribution rate below a long-term level of 22%. This means in principle that the net replacement rate is free to adjust, but the government de facto guarantees that the level will not fall below 67% - a twofold goal which can hardly be achieved (see Bonin, 2001). To allow members of pension system to make up the (accepted) decrease in the replacement ratio of about 3 percentage points, a supplementary voluntary private pension scheme has been introduced. After phasing in the system between 2002 and 2008, finally up to 4% of gross wage can be saved for retirement in licensed private pension funds or occupational pension plans. The government supports these old-age savings with direct payments or tax deductions. The state subsidy will be €154 per person and €185 per child in 2008; thus, there is a bonus for child-rearing.²² The new private pillar is complemented by a move towards a system of deferred taxation in which contributions to the individual savings accounts, but not pensions are tax exempt (Bonin, 2001). This has important consequences: Regardless of citizenship, every worker can participate in the new pillar and will receive the state subsidy if he is unlimitedly liable to income taxation. After retirement, the beneficiaries are obliged to live in Germany where pensions will be taxed. Otherwise, they have to pay back the subsidy. Hence, migrants who are planning to return to their home country in old age will not benefit from the state grant in the new pension pillar.

Pension funds can not pay out collected contributions until age 60. They have to provide a life-long annuity or a fixed yearly payment of no more than 3.6% of the capital until age 85 (the rest is annuitized then). There is a guarantee that the nominal value of the fund at retirement is at least equivalent to the accumulated contributions (Bonin, 2001).

²¹ If total pension benefits increase strongly in one period, contribution rates necessarily go up which in turn decreases the increase of the benefits in the next period.

²² See Sinn (2001) who suggests that only parents should be allowed to stay in the PAYG system while those without children should be compelled to enter an additional and mandatory funded system.

5.2 Comparing different aspects of the pension systems

Table 2 briefly summarizes our previous findings and gives further characteristics of the pension systems we are most interested in. Except for Poland, all countries have defined-benefit systems, so only potential Polish migrants face the problem of migrating into a "different" type of pension system which tends to increase the break-even level of migration. With regard to intragenerational redistribution, nothing changes by migrating from Poland or Hungary to Germany since all three pension systems are Bismarckian. Only for potential Czech migrants this criterion matters. If the migrant expects to be rather high earning (at least in the future), he may find the German pension system attractive in this respect.

Furthermore, the relative size of unfunded and funded pension pillars can be considered. The model in section 3 predicts that a relatively larger funded pillar in the joining country increases the break-even level, so it is more likely that the pension system is considered as a burden. Although the estimates in Table 2 are only very rough, it is clear that the funded pillar in all three accession country exceeds the German one by far. The projections show that in Poland a slightly higher replacement income from the second pillar than from the first pillar is expected. In Hungary, there is a guarantee that the second-pillar benefit cannot be lower than 25% of the first-pillar benefit while in the Czech Republic the government targets at a level of 17-27%. Müller (1997, 227) expects about 1/4 to 1/3 of old-age income in Eastern European countries to stem from funded sources. Compared to this, the new German funded pillar remains small. It is supposed to make up the reduction in the replacement rate of the PAYG system from 70% to 67%. Even if the funds perform very well, only 5% to 10% of the replacement income will be covered by them.

		POL	HUN	CZ	GER
First pillar	financing method	PAYG-NDC	PAYG-DB	PAYG-DB	PAYG-DB
	intragenerational redistribution	Bismarckian	Bismarckian	some Beveridgian elements	Bismarckian
Second pillar		mandatory	mandatory	voluntary	voluntary
Expected replacement income in %	total	62	~57	65-75	70
	from first pillar	30	45	55-60	67
	from second pillar	32	min. 11.25	10-15	3
	$\frac{\text{second pillar}}{\text{total}}$	>50	min. 25	17-27	~5
Expected public pension spending in % of GDP	2000	10.8	6.0	7.8	11.8
	2050	8.3	7.2	14.6	16.9

Table 2: Selected characteristics of the pension systems; Source: Chlon/Gora/Rutkowski (1999, 40), Palacios/Rocha (1997, 22-24), Mácha (2002, 88), Dang/Antolin/Oxley (2001, 49), own calculations. Note: Based on a full career average worker.

The relative size of the first two pillars may also be used as a first measure of the level of redistribution within the pension system because the second funded pillar does usually not involve redistributive elements, while the first pillar does. Especially if coming to a foreign country without ethnic or family ties – which could be considered as social and information networks –, the willingness of migrants to participate in inter- and intragenerational redistribution as net contributors is most likely low. This holds even more if migration is considered to be only temporary because then only a partial or even no reflux of benefits can be expected in old age.

A further measure for the level of intergenerational redistribution is the amount of public pension spending relative to GDP. It shows the overall size of the PAYG pillar and indicates once more its importance in Germany: The share will increase from 11.8% in 2000 to 16.9% in 2050²³. A similar development (though at a lower level) will occur in the Czech Republic where the increase will be from 7.8% to 14.6%. It is striking that this happens in countries which introduced only gradual reforms and hints at the necessity of further reforms in the future. In marked contrast are Hungary and Poland where the share remains almost constant or is even decreasing: in Hungary from 6.0% to 7.2% and in Poland from 10.8% to 8.3% (Dang/Antolin/Oxley, 2001). This is due to the fact that the replacement income will increasingly come from the funded pillar and less from the PAYG pillar.

The demographic risk displayed in this projection for Germany (and the Czech Republic) also hints to the necessity of further reform which carries in it a certain political risk as it cannot be projected exactly which groups in society may lose from them. It is certainly preferable to be member of a pension system which can be considered as relatively stable without prospects of major reforms in the future. However, Bismarckian systems substantially reduce the political risk because contributions are considered to be legal claims to property rights. The German constitutional court, for example, has shown to be very reliable in abandoning problematic regulations in the pension laws. The property-rights character of contributions has been strengthened in several court decisions.

So far, we have mainly pointed at the redistributive aspects of funded and PAYG financed pension pillars. But having pillars of different size should have an impact on the average return on contributions since it is usually assumed that funded pension systems

²³ This estimation rests on a baseline scenario of 300,000 net immigrants in 2000 falling to 20,000 net immigrants in 2050. A sensitivity analysis shows that an increase of net immigration by 50% relative to the baseline will lower the share by 1 percentage point (Dang/Antolin/Oxley, 2001). This shows that even massive migration from Eastern Europe to Germany will have only slight effects on the pension system.

earn a higher return.²⁴ Recall that the internal rate of return in the PAYG system can be measured by the growth rate of total wages which is roughly the growth rate of the average wage rate (productivity of labor) plus the population growth rate (number of contributors). In Germany, this rate of return has been falling from 2.8% to 1.5% p.a. over the last four decades. At the same time the real return on ten year German government bonds was constantly around 4% p.a. (Sinn, 2000). From the point of view of an individual which is possibly myopic²⁵ and not overly interested in intergenerational redistribution, it has therefore been more attractive to participate in the funded pillar or to just put the money into a savings account. Our model therefore predicts that the break-even level of migration is higher if the joining country has a relatively larger funded pillar.

One can expect that the rates of return on government bonds in the Eastern European countries will be above the German ones for some time because economic growth will be higher as a result of an economic convergence process (e.g. Fassmann/Münz, 2002, 90-95). On the other hand, risk of default or inflation will remain high. Eventually, rates will converge to Western European levels (especially if the Eastern European countries enter the EMU).

The internal rate of return in the PAYG system is most likely to even worsen in the future if immigration does not take place. While German wages grow roughly at the same speed as long-run productivity growth, Eastern European wages are increasing comparatively higher during the catch-up process, which already started at the end of the last decade (Sinn et al., 1999, 34-38), and are eventually going to converge to the European standard, although the latter is going to take a long time (Fassmann/Münz, 2002, 90-95).

Therefore, we can expect that the average (implicit) return on contributions to the domestic pension system is higher in the accession countries than in Germany. Although we did not model this scenario explicitly in section 3, it should be obvious that this makes the German pension system system less attractive compared to the other ones. Only a sufficiently large immigration may offset this effect by driving down contribution rates.

²⁴ From a theoretical point of view, the difference in the rates of returns may also be explained by intergenerational redistribution: The lower rate of return in the PAYG system then is just the mirror image of the introductory gains of older generations (see Sinn, 2000).

²⁵ We will not enter the debate whether in the long run the market interest rate will fall if "too many" members of pension funds will sell their assets at the same time in order to retire while there may be "too few" young persons willing to buy the assets.

6. Conclusions

While immigration might be a burden for the domestic population in one or the other way, this is certainly not true for the domestic pension system. The quantitative effect of having more contributors will be beneficial and help to keep contribution rates low or pension benefits high. This holds even more if there is an additional qualitative effect of immigration, e.g. if immigration improves the age structure or the skill distribution in a country. At least with regard to the age structure this is certainly true in the case of east-west migration. Migration into this part of the social security system is certainly not a problem.

Quite on the contrary might the pension system of a target country induce a negative migration incentive if it imposes a burden on immigrants. This conclusion can be derived from the model introduced in this paper. If the dependency ratio is lower in the source country, the potential gain from a wage differential between target and source country is reduced. In the case of east-west migration from Poland, Hungary or the Czech Republic to Germany the number of migrants will be somewhat reduced (but still substantial according to most projections), unless pension issues are completely ignored by the immigrants. But our model also shows that a sufficiently large number of immigrants will turn the burden imposed by the pension system into a gain which should give an artificial migration incentive. This gain stems from the fact that contributions to the pension system may fall below the source country's level because we consider a realistic defined-benefit pension system in the target country. The problem is, however, that potential migrants cannot be sure whether the total number of migrants is sufficiently large and will therefore abstain from migrating - a coordination failure occurs. We also find that projected numbers of immigrants can hardly stabilize the German pension system, let alone drive down contribution rates.

Further analyses showed that the real world pension system may even aggravate the model's predictions. Not only is the ageing process (measured by the dependency ratio) far more advanced in Germany than in the eastern European accession countries, but also the latest reforms in these countries will substantially improve the performance of their pension systems. The introduction of significant funded pillars reduces the amount of redistribution in the pension systems compared to Germany. In particular Poland moved to a pension system with a very strong funded pillar with no inter- or intragenerational redistribution and a Bismarckian PAYG-NDC pillar with very little intragenerational redistribution. As implied by our model this will increase the migration disincentive induced by the pension system even further. Next to redistribution, the average return on

contributions matters as well. The larger funded pillars and the fact that the growth rate of wages is higher during the catch-up process in the accession countries should lead to a higher average return on contributions to both pillars. Only beyond the break-even level of migration with falling contribution rates in the target country, a countereffect occurs.

Because projected immigration is probably not sufficient to drive down contribution rates in Germany, we conclude that the German pension system imposes a burden on potential immigrants from the eastern European accession countries. While Germans should be happy about each immigrant which becomes a new contributor to the German pension system, the immigrants are probably rather unhappy because the pension system imposes a burden on them. So, migration takes place despite - not because of - the German pension system. Public perception is quite contrary to this finding though: many Germans believe that immigration is harmful, while eastern European are complaining about the German claim for a seven year period of restricted mobility for citizens of the new EU member countries.

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