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Tim Krieger

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University of Paderborn
Warburger Strasse 100
33098 Paderborn / Germany

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Abstract

In a median-voter framework with pensions and immigration we show that too few unskilled immigrants are allowed into the country because the unskilled native median voter is concerned with negative effects on his wage. He does not consider the positive effects to other groups in society. When return migration is allowed for, the median voter is more willing to accept immigration because he can shift some of the burden to future generations.

Keywords: migration, return migration, unfunded pension systems, voting

JEL-Classification: H55, J61, D72

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*Address for correspondence: Tim Krieger, Department of Economics, Chair of Public Economics, University of Paderborn, Warburger Str. 100, 33098 Paderborn, Germany, ph. +49-5251-60-2117, fax: +49-5251-60-5005, email: tim.krieger@notes.uni-paderborn.de. Earlier versions of this paper, one of which circulated under the title "Public Pensions and Low-Skill Immigration: Determinants of Unskilled Native Voter Behavior", were presented at EPCS conference 2004 in Berlin, at Caisse des Dépôts et Consignations' Pensions Workshop 2006 in Bordeaux and at the 2006 conference of the Verein für Socialpolitik in Bayreuth. The author would like to thank Sheetal K. Chand, Robert Fenge as well as the conference and workshop participants for helpful discussions.

1 Introduction

In most Western countries, the ageing of societies imposes a major challenge to the welfare systems, in particular to unfunded or pay-as-you-go (PAYG) pension systems. There is a need for pension reforms which are, however, usually highly unpopular among voters. This is the case in particular when the parameters of the public pension system are changed, e.g. by raising contribution rates, lowering benefits or delaying retirement age. A different reform option would be to increase the number of contributors to the pension system. While increasing the domestic fertility rate is for several reasons a difficult task and higher labor force participation of women only a transitory effect, allowing foreign workers into the country appears to be a feasible solution. Razin and Sadka (1999) show that immigration may in fact lead to an unambiguous welfare gain to all generations in the host country. This positive effect can be explained by the fact that immigrants start paying contributions to the unfunded pension system after they entered the country. The additional contributions may be used for raising benefits or lowering contribution rates. The domestic population gains from a positive externality induced by the immigrants.

When the immigrants retire and start to receive benefits themselves, there is a need for additional contributions. However, because the immigrants have children a sufficient amount of additional contributions is collected to support both retired natives and immigrants. Because of this natives are indifferent with respect to immigration in all following periods. Note that this presupposes that the 'perfect assimilation hypothesis' holds which states that immigrants have the same fertility as natives and that their children have the same skill distribution as natives' children.[1] Hence, the underlying assumption is that immigrants enter a country and found a 'dynasty' (Sinn, 2001), i.e. all descendants of the initial immigrants will stay in the host country for all times. Given this, Sinn (2001) has calculated that the benefit which an immigrant dynasty creates for the host-country's pension system equals the gross total contribution of the initial immigrant.[2]

However, the assumption that immigrant dynasties stay in the country until the infinite future appears to be rather strong. In fact, often immigrants move to a country only for

[1] If the perfect assimilation hypothesis does not hold, it can be shown that natives have an additional benefit from immigration if the immigrants' children are more numerous and better skilled relative to the natives' children. Obviously, this would have am impact on voting models dealing with immigration (see Krieger, 2004).

[2] In the case of Germany, this amounts to about €175,000 (Sinn, 2001).

	1985/89		1990/94		1995/99	
	total	% of imm.	total	% of imm.	total	% of imm.
B	33.000	82,9	31.200	58,0	34.600	65,9
D	369.400	66,7	583.700	61,5	591.600	87,1
DK	9.800	48,8	9.900	47,1	14.000	45,2
FIN	1.100	35,5	1.300	13,4	1.900	24,1
I	25.100	85,4	6.500	9,8	na	na
LUX	5.000	69,4	5.500	57,9	6.000	59,4
NL	22.300	39,3	21.000	26,3	21.600	28,3
S	13.200	32,7	15.000	28,1	14.600	43,1
UK	80.600	63,2	91.800	67,2	92.300	48,0

Table 1: *Non-native emigrants from selected EU-member countries, total annual averages and relative to the number of immigrants (Source: Europäische Kommission, 2002, p. 22; own calculations)*

a certain time period and return afterwards to their home country. During their stay they acquire pension claims which can eventually be transferred to their home country. The extensive literature on migration and public pensions[3] usually neglects the problem of return migration, but return migration is an empirical fact and certainly not negligible (see Dustmann, 1996). This is confirmed by Table 1 which shows the total number of non-native emigrants from selected EU-member countries. The absolute number of emigrants is particularly high in Germany, although it is still outnumbered by the number of immigrants, as the share of emigrants in the total number of immigrants shows.[4] The latter has been large in Belgium and Italy in the 1980s and in Germany in the 1990s.

As long as there are more immigrants than emigrants or return migrants, the positive externality of immigration still induces a positive, albeit reduced welfare gain. In terms of voting models, however, return migration may lead to a sub-optimal voting outcome. Several authors have modeled domestic voting decisions on immigration policy which take into account the effects of immigration on unfunded pension systems (see, e.g., Scholten and Thum, 1996, Haupt and Peters, 1998, or Krieger, 2003). These models assume that

[3]For a recent overview, see Krieger (2006).

[4]Note that in 1997 and 1998 there were more emigrants than immigrants in Germany (see Krieger, 2006).

different groups in society, which are distinguished by age or skill, have different preferences with respect to the level of (unskilled) immigration. Accordingly, the median voter's prefered number of immigrants may not correspond to the socially optimal number.

In our model, we will introduce a general framework with differently aged and skilled groups in society which vote on immigration, given an unfunded pension system. We will then introduce the possibility of return migration into the model and investigate how the voting outcome is influenced by this. Our findings suggest that a combination of wage and pension effects leads to a higher preference for unskilled immigration today when migrants return to their home countries after worklife. However, this outcome results from the fact that the median voter can shift the cost of return migration to future generations.

Our paper proceeds as follows. In Section 2, we introduce a basic model of a voting decision on immigration when the pension system has to be taken into account. The voting outcome is presented in Section 3, while section 4 compares this outcome with the welfare optimum. Section 5 allows for return migration and adds some further extensions. This includes also the question (in 5.4) which role citizenship legislation plays in this context. Section 6 concludes.

2 The Model

2.1 Basic assumptions

Consider the following overlapping-generations framework. In each period t the population consists of retirees and workers where workers are either skilled, S_t, or unskilled, U_t. The total labor force is L_t and retirees are simply workers born in period $t-1$, i.e. $L_{t-1} \equiv S_{t-1}+U_{t-1}$. We assume unskilled immigration where immigrants adopt the natives' fertility pattern immediately after immigration, i.e. natives and immigrants will have the same number of children on average in the period following immigration. Furthermore, we assume that the skill distribution among the natives' and the immigrants' offspring is identical, i.e. the ratio of skilled and unskilled workers is the same for both groups.

The society consists of three groups (skilled and unskilled workers, retirees) who vote on immigration policy in a median-voter setting. The total labor force in t may be written as

$$L_t \equiv S_t + U_t + M_t \tag{1}$$

where M_t are unskilled immigrants which will be allowed into the country after a vote. Immigration policy can be described by the immigration ratio which is the ratio of total labor force and native labor force:

$$\rho_t = \frac{S_t + U_t + M_t}{S_t + U_t}. \tag{2}$$

Choosing $\rho_t > 1$ implies that immigrants are allowed into the country. For further reference note that $M_t = (S_t + U_t)(\rho_t - 1)$.

The population growth rate n_t is given by the ratio of the labor force today and in the previous period. Hence, we have

$$n_t = \frac{S_t + U_t}{S_{t-1} + U_{t-1}} - 1. \tag{3}$$

Among today's retirees there may be some former immigrants. They are not explicitly noted because in terms of pensions they are considered as identical to natives after one period. We can also define the dependency rate as the ratio of retirees to total labor force, i.e.[5]

$$D_t(\rho_t) = \frac{L_{t-1}}{L_t} = \frac{S_{t-1} + U_{t-1}}{S_t + U_t + M_t} = \frac{1}{(1 + n_t)\rho_t}. \tag{4}$$

Let us further assume that $Y = F(S, U)$ is a linearly homogeneous production function with the usual properties:

$$F_S > 0, F_U > 0, F_{SS} < 0, F_{UU} < 0, F_{SU} > 0.$$

In flexible labor markets wages depend on immigration as the total number of unskilled workers increases with each immigrant. The output after immigration may be written as $Y = F(S, U + M)$. In terms of the immigration ratio we get the following expressions for the wages of skilled and unskilled workers:

$$w_t^S(\rho_t) \quad with \quad \partial w_t^S / \partial \rho_t \quad > \quad 0 \quad and \tag{5}$$

$$w_t^U(\rho_t) \quad with \quad \partial w_t^U / \partial \rho_t \quad < \quad 0. \tag{6}$$

[5] We assume that the dependency rate is usually smaller than 1 when immigration takes place. So, even if the population is ageing, this can still be compensated by a sufficiently high immigration ratio.

2.2 The pension system

After immigration has taken place, the PAYG pension system's budget equation is given by

$$c_t(w_t^S S_t + w_t^U (U_t + M_t)) = p_t \omega_t (S_{t-1} + U_{t-1}) \tag{7}$$

where c_t is the contribution rate, p_t is the replacement rate and ω_t is the average wage given by $\omega_t = \alpha w_t^S + (1-\alpha) w_t^U$ with $\alpha = S_t/(S_t + U_t + M_t)$. Here, each retiree receives the same basic pension which is related to the average wage. The latter depends on immigration as well ($\omega_t(\rho_t)$), thus $\partial\omega_t(\rho_t)/\partial\rho_t = \left(S_t(w_t^U - w_t^S)\right)/(S_t + U_t + M_t)^2 < 0$ if $w_t^U < w_t^S$.

Following Scholten and Thum (1996), we assume a fixed-replacement rate regime with $p_t = p$.[6] Therefore, contribution rates have to adjust endogenously to changes of the underlying parameters such as fertility rates, life expectancy or the number of immigrants. From (4), (7) and the definition of ω_t follows

$$c_t = \frac{p}{(1+n_t)\rho_t} = pD_t(\rho_t). \tag{8}$$

3 Voting Outcome

We can now investigate the outcome of a vote on the immigration ratio where $\rho_t > 1$ indicates a positive prefered level of immigration while zero immigration is chosen if $\rho_t = 1$. Consider first the group of retirees where each retiree will receive a pension of $p\omega_t(\rho_t)$. Since p is constant and $\partial\omega_t(\rho_t)/\partial\rho_t < 0$, retirees will unambiguously lose from immigration and vote for $\rho_t = 1$. Under a pension system in which only the contribution rate can change the retirees will not gain from the fact that there are more contributors to the system. Instead they will lose because unskilled immigrants will drive down average wages.

Before we investigate the voting behavior of skilled and unskilled workers, recall the assumption that immigrants have the same number of children as natives and that immigrants' offspring have the same skill distribution as the natives' offspring. If no further

[6] Note that this is different from Razin and Sadka (1999) who assume a fixed-contribution rate regime. However, almost all Western countries have so called defined-benefit systems (see, e.g., Werding, 2003) which can be considered as equivalent to our fixed-replacement rate system.

immigration takes place in the future, then the ratio of skilled and unskilled workers remains unchanged in period $t+1$. Hence, the average wage will not change and we get $\omega_t = \omega_{t+1}$. Clearly, if one takes future pension benefits into account when voting on immigration, additional immigrants will not only drive down today's average wage but also the future average wage ($\partial\omega_{t+1}(\rho_t)/\partial\rho_t < 0$).

Since immigration will always cause a gain to the domestic population which stems from the positive externality generated by the increasing number of contributors, it is likely that further immigration will occur in the succeeding periods. Still assuming unskilled immigration, ω_{t+1} will decrease further due to $\rho_{t+1} > 1$. The negative pension effect anticipated by today's workers becomes even more pronounced. Qualitatively, however, there is no difference, so in order to simplify the analysis we will follow Scholten and Thum (1996) by assuming that voters are myopic. Hence, ρ_{t+1} is taken as given and not considered in the optimization problem of the young generation, i.e. we assume $\partial\omega_{t+1}/\partial\rho_{t+1} = 0$.

Given this, skilled and unskilled workers favor the immigration policy ρ_t which maximizes today's net income plus the future pension benefit:

$$V^i(\rho_t) = w_t^i(\rho_t)\left[1 - pD_t(\rho_t)\right] + p\omega_{t+1}(\rho_t), \quad i = S, U. \tag{9}$$

The first-order condition of the workers turns out to be

$$V_{\rho_t}^i = \frac{\partial w_t^i}{\partial \rho_t}\left[1 - pD_t(\rho_t)\right] + \frac{w_t^i p D_t(\rho_t)}{\rho_t} + p\frac{\partial \omega_{t+1}(\rho_t)}{\partial \rho_t} = 0, \quad i = S, U, \tag{10}$$

where we used the fact that $\partial D_t(\rho_t)/\partial\rho_t = -D_t(\rho_t)/\rho_t$ according to (4). The first term of (10) describes the direct wage effect of unskilled immigration on domestic workers. It is positive for skilled workers and negative for unskilled workers since $\partial w_t^S/\partial\rho_t > 0$ and $\partial w_t^U/\partial\rho_t < 0$. The second term is positive (and larger for skilled workers) because the dependency rate (4) falls with an increasing number of incoming workers. This implies that contribution rates can be lowered which increases net income. The third term is negative and identical for both groups, S and U. Therefore, immigration has more positive effects for skilled workers than for unskilled workers, who face an additional negative wage effect in addition to the negative pension effect. Only the decrease in contribution rates benefits the unskilled. Applying the median-voter theorem we can thus conclude that skilled workers favor a larger immigration ratio than unskilled workers which makes the unskilled workers the median-voter group since retirees prefer zero immigration (we exclude the possibility that one of the three groups in society has a majority of votes).

We can now determine the optimal immigration ratio chosen by the median voter. For an explicit solution, we define the elasticities of wages with respect to unskilled immigration in period t as follows:

$$\epsilon^i \equiv \frac{\partial w^i_{t+1}}{\partial \rho_t} \cdot \frac{\rho_t}{w^i_{t+1}}$$

where ϵ^U is the elasticity of the unskilled worker's wage and ϵ is the elasticity of the average wage ω (both in period t and $t+1$). We will assume the immigration elasticities to be constant over time. Let λ be the ratio of the average wage and the unskilled worker's wage: $\lambda \equiv \omega_t / w^U_t = 1 - \alpha(w^U_t - w^S_t)/w^U_t > 1$.

Recalling that $D_t(\rho_t) = 1/\left[(1+n_t)\rho_t\right]$ and that $\omega_{t+1} = \alpha w^S_t + (1-\alpha) w^U_t$ with $\alpha = S_t/(S_t + U_t + M_t)$ and using constant immigration elasticities, we can rewrite $V^U_{\rho_t}$ from (10) as

$$\epsilon^U \left[1 - \frac{p}{(1+n_t)\rho_t}\right] + \frac{p}{(1+n_t)\rho_t} + p\epsilon\lambda = 0.$$

Solving for ρ_t gives the median voter's prefered immigration level. Given strictly negative elasticities ϵ^U and ϵ, the median voter chooses the immigration ratio

$$\rho^{Med}_t = \frac{p(\epsilon^U - 1)}{(1+n_t)(\epsilon^U + p\epsilon\lambda)} > 0. \tag{11}$$

For elasticities being sufficiently small negative numbers,[7] low fertility rates and λ not excessively high, ρ^{Med}_t is greater than 1 such that a positive number of immigrants is chosen by the median voter. This follows immediately since for small immigration elasticities the numerator would be slightly larger than p in absolute terms while the denominator is smaller than p if we assume the fertility rate to be close to zero. Then, the entire term will be greater than 1.

In order to give a rough idea of the level of desired immigration which follows from our model, let us plug in some numbers. Friedberg and Hunt (1995) find that wage elasticity of immigration is -0.1 on average, which gives us a proxy for ϵ. It is reasonable to assume that in case of unskilled labor and unskilled immigrants the elasticity is slightly more negative; hence, let $\epsilon^U = -0.15$. Furthermore, let us assume that the ratio of average wage

[7] Friedberg and Hunt (1995), e.g., show in a survey of empirical studies that immigration elasticities are in fact small negative numbers

to unskilled workers' wages is $\lambda = 1.3$, the reproduction rate 0.02 and the replacement rate 0.6, then we obtain

$$\rho_t^{Med} = \frac{0.6 \cdot (-0.15 - 1)}{(1 + 0.02)(-0.15 + 0.6 \cdot (-0.1) \cdot 1.3)} = 2.97 > 0.$$

From $M_t = (S_t + U_t)(\rho_t - 1)$ follows that the desired number of immigrants is 1.97 times the number of workers. While this result should not be taken too literally (as only two potential impact factors are considered), it indicates quite clearly that the positive externality benefitting the pension system appears to be very substantial compared to the negative wage reaction. In this sense, the voting decision does not impose too strong a restriction on immigration.

However, our findings are sensitive to parameter changes. An increase in λ which measures the income dispersion leads to a decrease in the prefered number of immigrants ($\partial \rho_t^{Med} / \partial \lambda < 0$). Unskilled natives are afraid that immigration will worsen their income position even further. This is a widespread fear in many countries although immigration elasticities are actually low. Therefore, it seems that people may overestimate this effect.

The signs of the derivatives of the immigration ratio with respect to both immigration elasticities, ϵ^U and ϵ, are positive ($\partial \rho_t^{Med} / \partial \epsilon^U > 0$ and $\rho_t^{Med} / \partial \epsilon > 0$). Since the elasticities are negative, this implies that a smaller negative wage reaction to unskilled immigration allows for a higher equilibrium level of immigration to be prefered by the median voter. Furthermore, the derivatives of ρ_t^{Med} with respect to the reproduction rate and the replacement rate have the expected signs ($\partial \rho_t^{Med} / \partial n_t < 0$ and $\rho_t^{Med} / \partial p > 0$). The more native offspring there are, the fewer immigrants are needed. Higher pension benefits per retiree require additional contributors who may be immigrants.

4 The Welfare Optimum

Suppose, instead of a majority rule, a government caring about the welfare of all living and yet unborn future generations. Then, we can simply consider a representative generation to describe the normative benchmark case of a utilitarian optimum which we denote by ρ^*. This implies that we maximize steady-state utility of an arbitrary generation by considering lifetime income of both skilled and unskilled workers:

$$\max_{\rho} W^{Gov}(\rho) = \left[U \cdot w^U(\rho) + S \cdot w^S(\rho)\right] \left[1 - pD(\rho)\right] + (U + S)\, p\omega(\rho) \tag{12}$$

The first-order condition which determines the socially optimal immigration policy ρ^* can now be compared to the median voter outcome. We get

$$U\left(\frac{\partial w_t^U}{\partial \rho_t}\left[1-pD_t(\rho_t)\right]+\frac{w_t^U pD_t(\rho_t)}{\rho_t}+p\frac{\partial \omega_{t+1}(\rho_t)}{\partial \rho_t}\right) \\ +S\left(\frac{\partial w_t^S}{\partial \rho_t}\left[1-pD_t(\rho_t)\right]+\frac{w_t^S pD_t(\rho_t)}{\rho_t}+p\frac{\partial \omega_{t+1}(\rho_t)}{\partial \rho_t}\right)=0 \quad (13)$$

Since we are interested in the difference between the social optimum and the median voter's optimal choice, it suffices to investigate the condition at the point where ρ is optimally chosen by the median voter. This is the case when the first bracketed term in (13) becomes zero and thus fulfils optimality condition (10) for U. The terms that remain thereafter describe the deviation of the planner's solution from the median voter's choice and correspond to the optimality condition of the skilled workers. Immigration is expanded beyond the median-voter outcome as long as the benefits from higher wages and from lower contribution rates exceed the cost of a lower pension income received by skilled workers. We already know that skilled workers prefer a higher immigration ratio than unskilled workers. Hence, the democratically adopted immigration policy given by the median voter's choice, ρ^{Med}, is too small compared to the social optimum: $\rho^{Med} < \rho^*$.

This result can be explained by the fact that the welfare of a representative generation is the average welfare of all its members, hence, optimal immigration policy should be averaged over these members' prefered levels. This approach is justified because it cannot be foreseen whether a yet unborn person will become a skilled or an unskilled worker in the future.

5 Return migration

In this section, we will extend our model by considering the possibility of return migration. Let us assume that any immigrant who enters the country will leave the country after one period and return to his home country to enjoy his retirement. This is clearly a strong and somewhat unrealistic assumption but we will use this simplification to analyze the most extreme case of return migration that may occur. Two further assumptions will be made. First, by returning to their home country the former immigrants will take their children with them. An explanation for this may be that the children's residence permit is connected to their parents' stay in the host country. Another reason may be that parents

are concerned about their children adopting a lifestyle perceived not to be in line with traditional views and cultural heritage (see Dustman, 2003). Second, return migrants keep their claims against the host country's pension system, i.e. any pension benefits they receive are paid for by the former host country. This assumption is in line with EU regulations[8] and common in international labor migration, at least between Western countries.

5.1 Basic scenario

The consequences of these assumptions can best be seen from the budget equation of the host country's pension system. In period t, this equation is given by $c_t = p/[(1+n_t)\rho_t]$. In period $t+1$, the group of retirees consists of all contributors to the pension system in period t, i.e. $S_t + U_t + M_t$, since all of them acquired claims to pension benefits. However, due to return migration the number of contributors in $t+1$ is reduced as the immigrants' offspring leave the country with their parents. This implies a major problem for the PAYG system as its functioning presupposes that each entrant to the social contract will not only support his parents but will also have children who will support him in old age. This is no longer the case here, thus the returning migrants' pensions have to be financed by the natives' offspring alone. We can now write down the equation for the contribution rate which prevails under these circumstances (assuming $n_t = n_{t+1}$):

$$c_{t+1} = p\frac{S_t + U_t + M_t}{(1+n_t)(S_t+U_t)} = p\frac{\rho_t}{(1+n_t)}. \tag{14}$$

The derivative of c_{t+1} with respect to immigration in period t is positive ($\partial c_{t+1}/\partial\rho_t > 0$), which is no surprise under a pure fixed-replacement rate regime. The entire burden of return migration is to be carried by the next generation and no altruism of the retirees is assumed. The median voter in period t has no reason to care about the problems resulting from return migration. On the contrary, he will allow even more immigrants into the country. Recall the median voter's optimality condition:

$$\frac{\partial w_t^U}{\partial \rho_t}\left[1 - pD_t(\rho_t)\right] + \frac{w_t^U pD_t(\rho_t)}{\rho_t} + p\frac{\partial \omega_{t+1}(\rho_t)}{\partial \rho_t} = 0.$$

[8] In particular, Council Regulation (EEC) No 1408/71 and implementing Council Regulation (EEC) No 574/72. For more detailed information on the EU regulations, see, e.g., Übelmesser (2004).

The negative third term resulted from the assumption that the ratio of the factors of production, i.e. skilled and unskilled labor, does not change from t to $t+1$. Allowing immigrants into the country in period t will therefore have an impact on both ω_t and ω_{t+1} compared to the situation without immigration. With return migration, however, we also return to the skilled/unskilled labor ratio that prevailed before immigration took place in t. Hence, in the optimization problem of the median voter ρ_t no longer affects ω_{t+1}. The third term vanishes and, since it was negative, more immigrants will be allowed into the country.

This can easily be seen if we solve the resulting first-order condition

$$\frac{\partial w_t^U}{\partial \rho_t}\left[1-\frac{p}{(1+n_t)\rho_t}\right]+\frac{pw_t^U}{(1+n_t)\rho_t^2}=0$$

for ρ_t which gives

$$\rho_t^{RM}=\frac{p(\epsilon^U-1)}{(1+n_t)\epsilon^U}>0 \tag{15}$$

which differs from ρ_t^{Med} only by the term $p\epsilon\lambda$ which no longer shows up in the denominator. Hence, there is one negative effect less in the return migration scenario and we can conclude that $\rho_t^{Med}<\rho_t^{RM}$. Using the numerical example from Section 3, we find that $\rho_t^{RM}=4.51$. Hence, while without return migration the number of migrants exceeds the number the workers by factor 2, considering return migration increases the factor to 3.5.

5.2 Revising the generational contract

One of the consequences of the fact that the contribution rate in $t+1$ increases is that a reaction to this increase of the young generation in $t+1$ becomes more likely. Possible reactions are to allow even more immigrants into the country in order to lower the contribution rate or to exit the pension system by either substituting labor with leisure or by emigrating.

It might be the case, though, that it is impossible to raise the next period's contribution rate by the necessary extent because of institutional constraints. In that case, changes in the way the pension system operates may be conducted such that the replacement rate is lowered to balance the pension system again. We may interpret this as a renegotiation of the generational contract in period $t+1$ in which some of the burden is shifted from the young generation born in $t+1$ to the retirees born in t.

This implies that the effects of immigration in period t still prevail in $t+1$. The generation born in period t will take this into account. In this case, the pension benefit in $t+1$ will consist of two parts. First, there is the fixed-replacement rate part which is still independent of immigration. This part of the burden caused by return migration is solely carried by the generation born in $t+1$. We will denote this constant term as P. The second part of the benefit is the share of the burden to be carried by the generation born in t. Here, it is easiest to think of the calculation of the benefit in terms of a fixed-contribution rate regime. Hence, regarding the total pension benefit we assume that there is a share β, $0 \leq \beta \leq 1$, which is based on a fixed-contribution rate calculation, and a share $1-\beta$ which is based on a fixed-replacement rate calcuation. For simplicity, we assume that voters correctly anticipate β.

The endogenous replacement rate of the fixed-contribution rate regime follows from rewriting (14) as

$$p_{t+1} = c\frac{(1+n)}{\rho_t}. \tag{16}$$

The unskilled workers' optimization problem now becomes

$$\max_{\rho_t} V^U(\rho_t) = w_t^U(\rho_t)\left[1 - pD_t(\rho_t)\right] + \beta \cdot p_{t+1}(\rho_t)\omega_{t+1} + (1-\beta)\,P \tag{17}$$

where the average wage does not depend on immigration due to the occurrence of return migration. The first-order condition turns out to be

$$V_{\rho_t}^U = \frac{\partial w_t^U}{\partial \rho_t}\left[1 - pD_t(\rho_t)\right] + \frac{w_t^U\, pD_t(\rho_t)}{\rho_t} + \beta\frac{\partial p_{t+1}(\rho_t)}{\partial \rho_t}\omega_{t+1} = 0 \tag{18}$$

which differs from the baseline model by not having the negative average wage effect on the pension benefit. Instead, there is a negative effect on the replacement rate because $\partial p_{t+1}/\partial \rho_t = -c\,(1+n_t)\,/\rho_t^2$. A priori, we cannot state which impact the substitution of two negative effects has on the optimal immigration level. Compared to the previous model with return migration there is clearly a reduction in the prefered immigration ratio as an additional negative effect has to be taken account of.

Solving (18) for ρ_t leads to

$$\rho_t^{RM2} = \frac{p(\epsilon^U - 1) + \beta c(1+n_t)^2\overline{\lambda}}{(1+n_t)\epsilon^U} > 0 \tag{19}$$

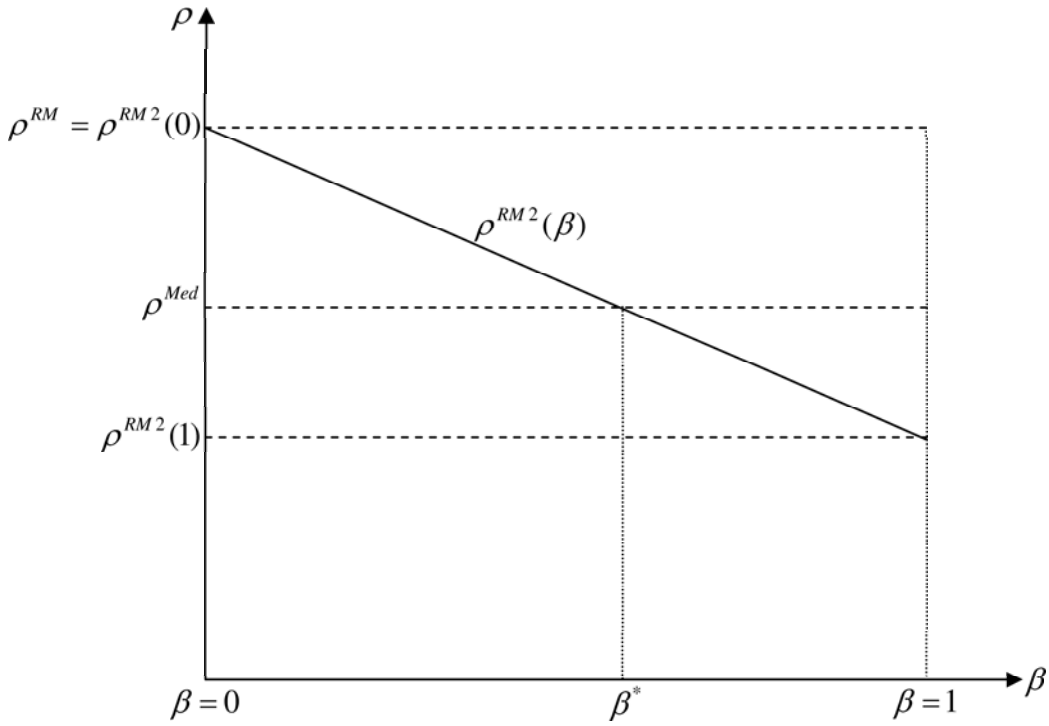

Figure 1: *The impact of β on the median voter's prefered number of immigrants.*

where $\overline{\lambda} = \omega_{t+1}/w_t^U$. This is smaller than ρ_t^{RM} due to the positive term $c(1+n_t)^2\lambda$ which makes the numerator less negative. A comparison with ρ_t^{Med} depends critically on the value of β. If the renegotiation of the generational contract imposes a sufficiently large burden on the retirees in $t+1$, the positive effect of the disappearance of the average wage effect on pensions is more than offset. Then, ρ_t^{RM2} is smaller than the median-voter outcome of the baseline model.

This can be seen from Figure 1 where the median voter's prefered level of immigration is related to β. While ρ^{Med} and ρ^{RM} are constant with $\rho^{RM} > \rho^{Med}$, ρ^{RM2} depends on β. In fact, when $\beta = 0$ the entire burden of unskilled immigration is shifted to the next generation such that $\rho^{RM} = \rho^{RM2}$. The more β is raised, the less immigration is supported by the median voter. At β^* the positive effect of a smaller negative wage effect is just cancelled by the next generation's ability to shift back some of the burden via a change of the pension system. Hence, at β^* the median voter chooses a number of immigrants just as if return migration does not play a role at all, i.e. he chooses ρ^{Med}. If β is increased beyond β^*, the change in the pension system becomes the dominant effect and the prefered level of immigration falls even below ρ^{Med}.

Returning to the numerical example from Section 3 and assuming further that the

contribution rate is 20 percent ($c = 0.2$) and that $\overline{\lambda} = \lambda$, we get $\rho^{RM2} = 2.74$ for $\beta = 1$. This implies that ρ^{RM2} equals ρ^{Med} for $\beta^* = 0.871$.

5.3 Partial return migration and immigrants' fertility

In a final step, we assume that only some of the immigrants' children will follow their parents and return to their parents' home country. Often, immigrants' children are born in the host country and have much closer ties to this country than to their parents' home country. If the children were allowed to stay in the host country, many of them may choose to do so, although sometimes to their parents' disapproval. In our model, we will assume that a share of $1 - \gamma$, $0 \leq \gamma \leq 1$, of the immigrants' offspring will stay, i.e. γ measures the number of returning children. Note that this will have an effect on the next period's average wage ω_{t+1}, such that $\partial\omega_{t+1}/\partial\rho_t \neq 0$. We further assume that the immigrants' fertility rate $\widetilde{n}$ is higher than the natives', i.e. $\widetilde{n} > n$. This is more realistic than the 'perfect assimilation hypothesis' which assumes $\widetilde{n} = n$.

While the previous assumptions generalize the model, some simplifying assumptions have to be made to keep the calculations tractable. Let us normalize the native population to one, i.e. $S_t + U_t = 1$, from which follows that $\rho_t = 1 + M_t$ according to (2). Furthermore, we assume that $\beta = 1$, i.e. the next generation succeeds in entirely changing the fixed-replacement rate regime into a fixed-contribution rate regime. These assumptions are sufficiently weak not to impose qualitative restrictions on our findings. Rewriting equation (14) in terms of a fixed-contribution rate regime and introducing the previously stated assumptions, we get

$$c = p_{t+1}(\rho_t) \cdot \frac{S_t + U_t + M_t}{(1 + n_t)(S_t + U_t) + (1 + \widetilde{n})(1 - \gamma)M_t}. \tag{20}$$

Compared to (2), the immigrants' children now show up in the denominator by multiplying the number of immigrants, M_t, with the higher fertility rate $\widetilde{n}$ and $(1 - \gamma)$ which measures the share of non-returning immigrant children. Solving (20) for $p_{t+1}(\rho_t)$ allows us to formulate the optimization problem of today's median voter. In his voting decision, he has to fully internalize the impact of immigration on the pension system. No longer he can shift a burden resulting from immigration to future generations.

$$\max_{\rho_t} V^U(\rho_t) = w_t^U(\rho_t)\left[1 - pD_t(\rho_t)\right] + p_{t+1}(\rho_t)\omega_{t+1}(\rho_t) \tag{21}$$

The first-order condition with respect to unskilled immigration is given by

$$V_{\rho_t}^U = \frac{\partial w_t^U}{\partial \rho_t}\left[1 - pD_t(\rho_t)\right] + \frac{w_t^U pD_t(\rho_t)}{\rho_t} + \frac{\partial p_{t+1}(\rho_t)}{\partial \rho_t}\omega_{t+1} + \frac{\partial \omega_{t+1}(\rho_t)}{\partial \rho_t}p_{t+1} = 0. \tag{22}$$

While the first two terms again describe the direct wage effect and the dependency rate effect, the last term adds a negative effect compared to the previous scenario in which all immigrants' offspring leave the country.

Here again, the underlying assumption is that the children inherit their parents skill level (recall Section 3). With respect to immigrants, there is some discussion whether this assumption is correct.[9] In our model immigrants' children would be neutral with respect to future average wages if they had exactly the same skill distribution as natives (despite their parents being unskilled). However, given a rather weak school performance of children with immigrant background in several European countries there could be a noticeable effect.[10] In the basic version of our model, we did not explicitly model this effect on average wages in $t+1$. If we had, the effect would be stronger here because only a fraction of the immigrants' offspring stays in the country. Nevertheless, in order to keep the results comparable, we assume that immigration elasticities of wages are constant.

The third term in (22) is particularly important as it contains the effects on the future pension system. Using (20), we can rewrite the derivative of the replacement rate with respect to immigration as

$$\frac{\partial p_{t+1}(\rho_t)}{\partial \rho_t} = \frac{c(1 + n_t + (1 + \widetilde{n}_t)(1 - \gamma)(\rho_t - 1))}{\rho_t}. \tag{23}$$

[9]Gang and Zimmermann (2000), e.g., show that the vast majority of guest workers entering Germany in the 1960s was recruited to perform manual work in blue collar jobs and most of them had only very basic school education. This changed substantially for their children. While only 9 percent of the Turkish fathers migrating to Germany held a basic degree, among young Turks this number increased to 57 percent in 1984.

[10]One should not ignore, however, that in the past often highly educated immigrants entered western countries (e.g., immigrants from the eastern European countries moving to the EU-15) and accepted unskilled jobs. One reason for this is that certificates and qualification levels are not acknowledged or not comparable in the target country or that, because of initial difficulties in adapting to the new environment, employers prefer native workers in the first place.

Unless ρ_t sufficiently smaller than 1 (which would indicate substantial emigration), this derivative is positive. Furthermore, it is easy to see that the higher the fertility rate of immigrants, the higher the replacement rate will be ($\partial^2 p_{t+1}/\partial\rho_t\partial\widetilde{n}_t > 0$). This is because the number of contributors is relatively higher while the contribution itself is constant. The fewer immigrant children join their parents when returning to their home country (small γ), the more contributors there are and the higher the replacement rate will be ($\partial^2 p_{t+1}/\partial\rho_t\partial\gamma < 0$).

After some calculations we can derive the median voter's prefered level of immigration from (22):

$$\rho_t^{RM3} = \frac{p(\epsilon^U - 1) + c(1+n_t)\overline{\lambda}(\epsilon - 1)(\widetilde{n}_t(1-\gamma) - n_t - \gamma)}{(1+n_t)\left[\epsilon^U + c\epsilon\overline{\lambda}(1+\widetilde{n}_t)(1-\gamma)\right]} \tag{24}$$

This solution[11] is highly dependent on parameter values when it comes to determining how prefered immigration changes with different levels of γ and other variables. As we learned from (22), several factors affect the voting outcome. Therefore, changing a single parameter may have effects on all four partial reactions. The level of return migration is particularly influential to the third and fourth (partial) effect. Depending on whether the effect on the pension system, i.e. replacement rate, or on wages is stronger, a change in γ has different consequences. For our numerical example we argued before that the replacement rate effect is stronger than the wage effect. Hence, a higher probability of children returning to their parents' home country will have a negative effect on the prefered level of immigration in t. The left graph in Figure 2 represents a stylized version of our numerical example, in which we show how the voting outcome in t depends on future return migration, given by γ, and immigrants' fertility $\widetilde{n}$. Note that for any given γ, a higher fertility rate of immigrants always leads to a higher prefered level of immigration (here: $\widetilde{n}_1 < \widetilde{n}_2 < \widetilde{n}_3 < \widetilde{n}_4$). Only when all immigrants' children leave the country ($\gamma = 1$), immigrants' fertility has no longer an effect. The right graph in Figure 2 shows the voting outcome when the average wage effect in period $t+1$ dominates the replacement rate effect. In order to derive this outcome, ϵ must be sufficiently negative, which is, however, hardly supported by empirical evidence (see Friedberg and Hunt, 1995).

[11] We can easily check that this result equals ρ_t^{RM2} when we set our parameter values accordingly, i.e. $\beta = 1$ (pure fixed-contribution rate regime), $n_t = \widetilde{n}_t$ (identical fertility rates), $\gamma = 1$ (all immigrant children leave the country) and $\epsilon = 0$ (no average wage reaction in $t+1$ when *all* children return with their parents).

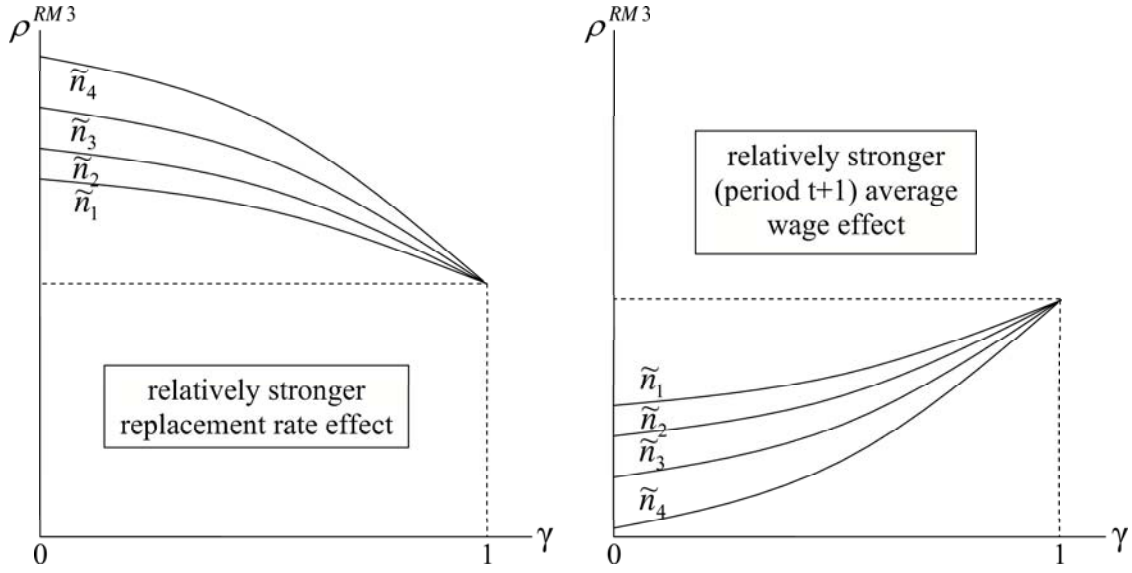

Figure 2: *The effect of partial return migration and immigrants' fertility on the median voter's prefered number of immigrants (based on the numerical example from Section 3).*

5.4 The role of nationality law

Our previous discussion rests strongly on the assumptions regarding the return migration behavior of immigrants' children. Depending on whether the burden of immigrants' pension claims can be shifted to future generations, the share of children staying in the host country has a strong impact on the voting outcome. Whether or not these children are allowed to stay in the host country (even if their parents are leaving) is ultimately determined by the host country's citizenship legislation.

In legal terms, two general types of citizenship legislation exist. *Jus soli* ("right of the soil") refers to citizenship acquisition derived from birth in the territory (Bauböck, 2005). The purest form of ius soli exists in the U.S. where anybody born in the territory automatically acquires U.S. citizenship. Often, ius soli is somewhat restricted, e.g., by requiring that parents must have legal residence. This type of citizenship acquisition is not what our model is about in the first place. At least when immigrants' children reached a certain age, we would expect that a substantial share may decide to stay in the host country. They have become acquainted with the host country and often have only weak ties to their parents' home country. Even if they return with their parents, the host country's citizenship allows them to easily come back later for work (which includes paying contributions to the pension

system).

Matters are different when citizenship is granted on the basis of *ius sanguinis* ("right of the blood") which refers to citizenship acquisition by descent from a citizen parent. According to Bauböck (2005), this type of legislation is internationally the dominant rule for determining citizenship at birth.[12] Ius sanguinis is particularly relevant for our model as return migration of the initial generation of immigrants automatically revokes the residence permit of their children. Under ius sanguinis immigrants' children have to leave the country with their parents. If this rule is strictly enforced, this is exactly the situation described in section 5.1.

If enforcement of children's return is not overly strict or if ius soli applies, the situation is closer to section 5.3's version of the model. The same applies if regular naturalization of initial immigrants is rather easy or if dual citizenship is tolerated. In case of return migration of naturalized immigrants to their home countries, their children can usually stay as they also have acquired the host country's citizenship.

Table 2 shows European countries' citizenship acquisition legislation in comparison. Ius soli at birth applies earliest in the second generation, i.e. parents must have legal residence in those countries in which ius soli applies. Citizenship is not granted to newborns of women who give birth during a short-term stay. In the majority of the EU-15 countries, ius sanguinis is the rule. Somewhat less restricted is entitlement when immigrants enter the country and already have children. Regular naturalization is possible in all countries after a minimum residence of 3 to 10 years; for some specific groups even faster naturalization is possible, e.g. for Portuguese citizens in Spain. Toleration of dual citizenship is the rule rather than the exception in the EU-15 countries.

6 Conclusions

Immigration has positive effects on the domestic pension system. Therefore, it is often argued that a more liberal immigration policy should be introduced in ageing countries. But despite the positive effect imposed by immigrants via a reduction in contribution rates, public opinion about immigration is often negative.

The previously introduced median-voter model gives some possible explanations for these

[12]Note that many ius soli countries apply ius sanguinis when it comes to children of nationals born abroad (at least in the first generation).

	Ius soli		Naturalization/dual nationality	
	at birth for 2nd or 3rd generation	entitlement after birth for 2nd generation	minimum residence for regular naturalization	toleration of dual nationality
A	no	no	4 (10) years for (non-) EU citizens	no
B	3rd gen.	10 years res. of parents	3 years	yes
DK	no	no	7 years, 2 years for Nordic citizens	no
FIN	no	6 years res.: at age 18-22	6 years	yes
F	automatic for 3rd gen.	5 years res.: at age 11-18	5 years	yes
D	2nd gen., parent with 8 years res. and perm. permit	no	8 years	no, with many exemptions
GR	no	no	8 years	renunciation required in practice
IRL	2nd gen., except asylum seekers	yes	4 years	yes
I	no	cont. res.: at age 18	4 (10) years for (non-) EU citizens	yes
LUX	no	5 years: at age 18	10 years	no
NL	3rd gen. if parent has main res. in NL and was born in NL	cont. res.: at age 18-25	5 years	no, but many exemptions
P	2nd gen., if parent resident since 10 years (6 years for Lusophone citizens)	no	10 years (6 years for Lusophone citizens)	yes
S	no	no	5 years	yes
E	no	1 year res.: at age 18-20	10 years (2 years for citizens of Portugal and some Hispanic states)	no, except citizens of Portugal and some Hispanic states
UK	2nd gen., if parent has been permanent resident for 4 years	if parent acquires permanent res. and if cont. res.: until age 10	5 years	yes

Table 2: *Citizenship legislation in EU member countries (source: Bauböck, 2005, p. 24-25).*

findings. In our model's basic version the fear that unskilled foreign workers may compete with or even substitute domestic workers and thus reduce gross wages will lead to less acceptance of immigration although empirically the impact on wages is rather small. As the unskilled median voter ignores any further positive effects of immigration on other groups in society, the prefered level of unskilled immigration is too small compared to the social optimum.

But the negative wage effect is only one of several potential factors influencing the median voter outcome that should be taken into consideration. In our model, we considered return migration as a further influential factor. We find that this form of migration has no additional impact on the median voter in the first place if the median voter is able to let the following generation pay for the pension benefits to former temporary immigrants. The possibility of shifting the burden to the next generation induces the median voter to choose an even higher immigration level as before. But even then, he ignores the fact that fellow members of his generation would gain from further immigration. However, as soon as the young generation has to carry some of the burden from return migration today's median voter will become more and more reluctant to support immigration.

When only some of the immigrants' children return with their parents, the effect on today's voting outcome is ambiguous, depending on the strength of two opposing effects. Effects on future wages and on pensions may offset each other. An additional important aspect of the applicability of our model is whether citizenship legislation follows the legal rules of ius soli or ius sanguinis. Our model fits best to the "right of the blood", which is also the dominant rule of citizenship acquisition legislation internationally.

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