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Why Don't Labor and Capital Flow Between Young and Old Countries?

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Abstract

To counter the effects of population aging in rich industrialized countries, raising immigration from and raising capital exports to younger developing countries are often seen as alternative solutions. In this paper, we explicitly account for mobility constraints in the form of immigration restrictions in industrialized countries and expropriation risk in developing countries to investigate whether efficiency gains from factor movements are likely to be realized. We set up a one-period general equilibrium model of two economies with young and old individuals. Emigration from the developing country weakens its young generation's expropriation preferences, permitting more FDI. However, if the bulk of capital is invested abroad, the old investor's utility gain from immigration is low. Our model suggests that large differences in age structures do not unambiguously encourage large factor flows, when the level of factor flows is determined by policy.

JEL classification: D78, F21, F22, J10
Keywords: Demographic Change, Political Economy, Immigration Policy, International Investment

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1 Introduction

All industrialized countries and many developing countries are facing a decline in birth rates and an increase in life expectancy resulting in population aging. However, the projected evolution of old-age dependency-ratios in various world regions differs widely and thus seems to offer the possibility of large efficiency gains from capital and labor movements. While the United Nations' report on replacement migration calculates the size of labor movements necessary to offset the effects of aging in low-fertility countries (United Nations Population Division 2001), the INGENUE (2001) model and the model by Brooks (2003) simulate the effects of demographic trends on the size of international capital flows under the assumption that capital is perfectly mobile while labor is not. Brooks (2003) predicts that the US and the EU will be large capital exporters until their baby boomers retire around 2020, but that capital flows would be considerably lower if risk was taken into account. Additionally, Facchini and Mayda (2008) make restrictive immigration policies responsible for low observed international labor flows.

In this paper, we aim to fill a gap and account for endogenous policies. We investigate whether increasing factor movements is feasible in a world with two open economies and endogenous policy. In particular, we assume policies to be determined by the respective median voter's preferences. The policy decision in the industrialized country is how many immigrants to admit, while in the developing country, imported capital can either be expropriated or not. High emigration from the developing country may change the identity of the median voter there from young to old, and induce an equilibrium with no foreign direct investment (FDI). Even if the median voter is always young in the developing country and old in the industrialized country, marginal changes in population growth rates alter the politically feasible volume of immigration and FDI.

In our model, both countries' policies are interdependent. The larger the share of capital invested in the developing country, the less immigrants are admitted to the industrialized country. This is because a larger labor force abroad implies higher returns on the capital invested there. Lower emigration from the developing country is equivalent to a higher labor force there. This has three effects on expropriation preferences. First, the wage loss in case of expropriation is proportional to the wage level without expropriation, which is lower the lower emigration. Second, returns on FDI (to be distributed in case of expropriation) rise. These first two effects clearly lead to weaker expropriation preferences. However, third, these returns are distributed among a larger number of recipients. In our model, expropriation preferences decrease in emigration, despite the lower number of recipients.

However, if migration is sufficiently high to reverse the majority in the developing country, equilibrium FDI drops to zero.

The results of our model contribute to the understanding of the low level of factor flows between industrialized and developing countries. We find that labor and capital flows between young and old countries are restricted by policies. We are also able to capture the notions that less developed countries receive less FDI and that immigration preferences are driven by economic as well as non-economic considerations. Furthermore, the existent demographic diversity does not necessarily induce factor flows. Admitting immigrants is more attractive for the industrialized country's old median voter the younger the developing country. However, then, expropriation preferences of the young median voter are higher, at least for a given level of emigration. The age structure in the industrialized country only affects expropriation preferences in the developing country via emigration. Furthermore, immigration preferences in the industrialized country do not necessarily increase with the share of old.

Our analysis draws on two strands of literature. The first one deals with the impediments to capital flows from rich to poor countries. Contrary to Lucas (1990), Alfaro et al. (2008) find that bad institutional quality does play a major role in explaining the low level of capital investment in poor countries. Several authors have explicitly dealt with expropriation risk of FDI, see e.g. Cole and English (1991) and Thomas and Worrall (1994). Both papers model dynamic games between international investors and a host-country government under the assumption that investors punish expropriation by withholding future investment. The authors find that in order to avoid expropriation, FDI must not exceed a critical threshold. Additionally, Harms (2002) shows in a theoretical model that the taxation of foreign capital is more likely if the host country is poor.

The second strand of literature we build on is the analysis of endogenous immigration policy. In the static models by Benhabib (1996) and Mazza and van Winden (1996), individuals support admitting immigrants if these are different from themselves. Preferences may be reversed if immigrants receive political rights, which is also an important prediction of the dynamic models of Dolmas and Huffman (2004) and Ortega (2005). In our model, capital owners' immigration preferences are limited, although immigrants do not have any political rights. This is because migration raises the capital intensity and thus lowers returns on the part of capital invested in the developing country, although it raises capital returns in the industrialized country. As we do, Sand and Razin (2007) analyze the impact of aging on immigration and also on redistribution policy. Since they consider an infinite time horizon, the median voter's identity may change not only due to native population aging

but also due to the immigration of individuals who have more children than natives. This may restrain the old's preference for admitting immigrants. We focus on the effect of marginal changes in the population share of both generations. In contrast to Sand and Razin, we therefore assume that the median voter in the industrialized country is always old. Our model is novel in combining the political economy of immigration and of expropriation risk.

We set up the economic model in section 2. Section 3 analyzes equilibrium policies, given simultaneity of the investment and migration policy decisions. In section 4 we examine the impact of marginal changes in parameters on the equilibrium, while section 5 extends our analysis to the case where investment takes place after the migration policy decision. Section 6 concludes.

2 The Economic Model

We consider an industrialized country (IC) and a developing country (DC), both populated by young and old individuals. The size of the total population is normalized to one in both countries:

$$N^y + N^o \equiv 1 \qquad \text{and} \qquad N^{y*} + N^{o*} \equiv 1 \ ,$$

where the asterisk denotes the developing country's variables. We assume that the old are in the majority in the industrialized country, while the opposite holds for the developing country.

In both countries a homogeneous good can be produced with a Cobb-Douglas production function:

$$Y = AK^{\alpha}L^{1-\alpha} \quad \text{and} \quad Y^* = \tilde{A}(K^*)^{\alpha}(L^*)^{1-\alpha} \ .$$

The old generation in the industrialized country owns a capital stock $\bar{k} \cdot N^o$. Meanwhile, the old in the developing country do not own any productive capital, only an endowment e^* which they can consume, as in Cole and English (1991). As Harms and an de Meulen (2009) argue, financial institutions are rudimentary in many developing countries, and savings often take the form of tangible assets.

Production in the developing country thus hinges on capital inflows from the industrialized country ($K^* = \bar{k} \cdot N^o - K$). The young in both countries exogenously supply one unit of labor. We set depreciation to zero for simplicity.[1] We assume that total factor productivity (TFP) in the industrialized country A exceeds TFP in the developing country. This results from a less

[1]Note that this simplification does not drive our results. In the limiting case with full depreciation, the net utility gain from expropriation is independent from the level of FDI.

favorable business climate, for instance a worse infrastructure, in the developing country. However, investors bring along their expertise. Therefore, TFP $\tilde{A}$ exceeds the level A^* the developing country would achieve without the foreign investors' expertise:

$$\tilde{A} = \frac{1}{\theta} A^* \quad \text{with} \quad 0 < \theta < 1 \, .$$

Defining M as the migration from the developing to the industrialized country, factor prices are given by

$$\begin{aligned} w &= (1-\alpha) A \left(\frac{K}{N^y + M} \right)^{\alpha} \quad \text{and} \quad r = \alpha A \left(\frac{K}{N^y + M} \right)^{\alpha - 1} \, , \\ w^* &= (1-\alpha) \tilde{A} \left(\frac{K^*}{N^{y*} - M} \right)^{\alpha} \quad \text{and} \quad r^* = \alpha \tilde{A} \left(\frac{K^*}{N^{y*} - M} \right)^{\alpha - 1} \end{aligned} \tag{1}$$

in the industrialized and the developing country respectively. Note that assuming a more general CES production function would allow a wider range of possible factor price elasticities with respect to migration and FDI. We will refer to the implications for our model throughout the text.

Expropriation refers to the seizure of the capital stock and is assumed to be always total. If there were no costs to expropriation, the developing country would be subject to a classical time-inconsistency problem and would always expropriate. Consequently, no capital would flow there. However, expropriation usually comes at some cost. As expropriation leaves foreign investors without any capital, it is sensible to assume them to withdraw their expertise, as in Eaton and Gersovitz (1984).[2] The seized capital stock is still used for production. However, TFP drops further below its level in the industrialized country to A^*, thereby lowering output and the young's wages. The old do not incur any cost from expropriation. We assume that the benefit from expropriation (the gross return to capital) is distributed equally among the developing country's old and those young who have not emigrated. Each inhabitant of the developing country thus receives a transfer t with

$$t = \frac{T}{1 - M} = \frac{(1 + \theta r^*) K^*}{1 - M} \, . \tag{2}$$

Immigration to the industrialized country affects its citizens' welfare in two ways. First, it alters factor prices. The young generation clearly suffers since wages decline. The old generation benefits from increasing capital returns on the part of capital invested at home k and suffers from decreasing

[2] In a setting with a larger time horizon, one could also argue that expropriation reduces future capital inflows, see Cole and English (1991) and Thomas and Worrall (1994).

returns on that part invested in the foreign developing country k^*. It is important to be aware that k and k^* do not denote the capital intensities in production (K/L and K^*/L^*) but rather the capital used in home and foreign production per investor (K/N^o and K^*/N^o). Second, we assume that immigration causes a disutility d^γ to all of the industrialized country's citizens, proportional to the ratio of immigrants to natives $M/(N^y + N^o) = M$. We assume γ to be equal to one.[3] This disutility captures different non-monetary costs related to the integration of immigrants in a tractable way. Immigration may reduce natives' utility due to an increased heterogeneity of social norms and customs as in Hillman (2002). In the presence of social security, natives may also resent immigration if immigrants are entitled to benefits, see e.g. Sinn (2005), or if immigration can tilt the political balance in favor of more redistribution as in Ortega (2005). Individuals' utility is linear in consumption:

$$U^i = c^i - d \cdot M \quad \text{and} \quad U^{i*} = c^{i*} \qquad i = y, o \,,$$

with

$$\begin{aligned} c^y &= w \\ c^o &= k(1+r) + k^*(1+r^*) \end{aligned}$$

and

$$c^{y*} = \begin{cases} w & \text{in case of emigration} \\ w^* & \text{in case of non-expropriation} \\ \theta w^* + t & \text{in case of expropriation} \end{cases}$$

$$c^{o*} = \begin{cases} e^* & \text{in case of non-expropriation} \\ e^* + t & \text{in case of expropriation} \end{cases} .$$

We assume the sequence of events illustrated in figure 1. First, the industrialized country's old allocate their capital to both countries and at the same time, the industrialized country's median voter determines maximum immigration. Second, the developing country's young migrate before third, the developing country's median voter decides whether to expropriate the foreign capital stock. Fourth, production and consumption take place. We solve the model by backward induction, that is, we start with the expropriation decision.

[3]The choice of γ does not have any qualitative effect on our results. With $\gamma = 1$, the disutility caused by immigration increases linearly with the population share of immigrants.

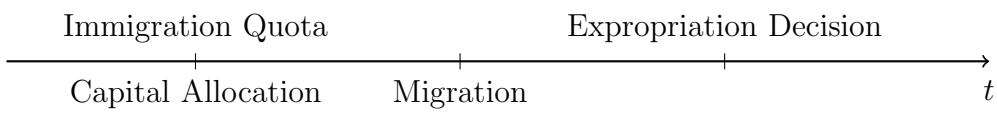

Figure 1: Sequence of Events

The chosen sequence of events is reasonable for the following reasons. Expropriation of the capital stock can only take place after capital has been installed. We assume the expropriation decision to be taken right before production starts, that is after capital investment and labor migration. Moreover, it does not matter when labor actually migrates since the size of labor flows is determined by policy, as we show below. With respect to capital allocation and migration policy, we begin by assuming simultaneity. One could also argue that the implementation of migration policy decisions requires a longer lead time than the allocation of capital. We therefore extend our model to this sequential timing in section 5.

3 Equilibrium Policy

We now come to the determination of the model equilibrium and thereafter, we investigate the impact of different model parameters on the equilibrium. When deciding whether to expropriate in the third step, the developing country faces given levels of capital imports K^* and migration M. If the median voter is old (because of high emigration, that is $M > N^{y*} - N^{o*}$), any foreign capital is always expropriated. The young who have not emigrated benefit from the transfer like the old, but additionally suffer from a reduced wage rate due to a drop in TFP. We define the *non-expropriation constraint* K^{*max} as the level of FDI for which the median voter in the developing country is indifferent between expropriation and non-expropriation. Since an old median voter always prefers expropriation, we have

$$K^{*max} = 0 \,, \qquad M > N^{y*} - N^{o*} \,.$$

A young median voter prefers non-expropriation if the transfer does not compensate for the wage loss:

$$(1-\theta)w^* > t \,.$$

Using (2), this can be written as

$$(1-\theta)w^* > \frac{K^*}{1-M} + \frac{K^* \cdot \theta r^*}{1-M} \,. \tag{3}$$

An inflow of capital has three effects, a wage effect $(1-\theta)w^*$, a return effect $K^* \cdot \theta r^*/(1-M)$ and an effect on the seizable capital stock $K^*/(1-M)$. Subsuming the wage and the return effect yields

$$\left[\frac{\frac{1-\theta}{\theta}A^*(1-\alpha)-\alpha A^*(N^{y*}-M)/(1-M)}{(N^{y*}-M)^{\alpha}}\right](K^*)^{\alpha} > \frac{K^*}{1-M} \ .$$

Note that the sign of the left hand side is independent from the level of FDI, K^*. Given that the capital stock effect is non-negative, a necessary condition for positive FDI for all M between 0 and N^{y*} is that the wage effect is larger than the return effect, which is fulfilled for sufficiently low θ:

$$\theta < 1 + \frac{1-\alpha}{(1-\alpha)+\alpha N^{y*}} \ .$$

This means that expropriation has to be costly. Note that relaxing our assumption of no depreciation would decrease expropriation preferences due to a lower distributable capital stock. Given that the wage effect is larger than the return effect, expropriation would never take place in the limiting case with a depreciation rate of 100%.

From (3) we can derive a critical level of capital imports that serves as an upper bound for capital inflows for each level of migration smaller than $N^{y*}-N^{o*}$:

$$K^{*max} = (A^*)^{\frac{1}{1-\alpha}}\left[\frac{\frac{1-\theta}{\theta}(1-\alpha)(1-M)-\alpha(N^{y*}-M)}{(N^{y*}-M)^{\alpha}}\right]^{\frac{1}{1-\alpha}} \ , \qquad M \leq N^{y*}-N^{o*} \ . \tag{4}$$

This is an upper bound because the effect of an inflow of capital on the seizable capital stock dominates the wage and return effects for high levels of K^*.

We can calculate the derivative of the *non-expropriation constraint* with respect to emigration as

$$\frac{dK^{*max}}{dM} = \left(\frac{K^{*max}}{N^{y*}-M}\right)^{\alpha}\left[\frac{1-\theta}{\theta}A^*\left(\frac{\alpha(1-M)}{N^{y*}-M}-1\right)+\alpha A^*\right] \ .$$

A necessary and sufficient condition for $dK^{*max}/dM > 0$ for all M between 0 and N^{y*} is given by

$$\theta > \frac{1-2\alpha}{1-\alpha} \ ,$$

which we assume to be fulfilled. Emigration has three effects. First, wages increase and so does the wage effect of expropriation. Second, capital returns

and the return effect decrease. Both of these effects lower expropriation preferences. Third, the number or recipients of a possible transfer decreases, making expropriation more attractive. The parameter θ has two opposing effects on the derivative dK^{*max}/dM. Even though the marginal effect on the wage loss becomes smaller if θ increases, FDI to be distributed in case of expropriation decreases, as (4) shows.

In summary, expropriation has to be costly for non-expropriation compatible FDI to be larger than zero. However, the non-expropriation compatible level of FDI only increases in emigration if expropriation costs are not too high, i.e. if θ is not too low. Note that less elastic wages and capital returns translate into less elastic costs and benefits of expropriation in equation (3), implying a larger risk of expropriation. The effect of a growing seizable capital stock dominates the wage and return effects. Furthermore, weak reactions of factor prices may imply that emigration causes a higher preference for expropriation, since the number of transfer recipients declines.

In the preceding step, the developing country's young would migrate until utility and thus wages in both countries are equal, if they faced no migration restriction. This would yield an *emigration constraint*. However, in our model the migration restriction imposed by the industrialized country, the *immigration policy constraint* M^{max}, turns out to be binding, as we show below. Immigration policy is determined by the industrialized country's median voter, who is always an old individual. Immigration from the developing country increases the capital return on that part of capital invested in the industrialized country and decreases the capital return on the part invested in the developing country. Be aware that foreign capital returns only accrue to the industrialized country's investors if $K^* \leq K^{*max}$. However, the median voter in the industrialized country anticipates that investors will never invest more than the non-expropriation compatible level of FDI. For convenience, we therefore leave the constraint $K^* \leq K^{*max}$ out of the median voter's maximization problem. Assuming non-expropriation, maximizing the old's indirect utility function yields the following first-order condition for every value of K^* between zero and $\bar{k}N^o$:

$$k\frac{dr}{dM} + k^*\frac{dr^*}{dM} = d \;, \tag{5}$$

with

$$\frac{dr}{dM} = \frac{1-\alpha}{N^y + M}r \quad \text{and} \quad \frac{dr^*}{dM} = -\frac{1-\alpha}{N^{y*} - M}r^* \;.$$

Equation (5) illustrates that immigrants are admitted as long as the marginal gain from immigration, $k(dr/dM)$, outweighs the marginal cost, $-k^*(dr^*/dM) + d$. Less elastic factor prices would imply that both these

marginal gains and costs decrease. M^{max} is likely to be lower, especially if the bulk of capital is invested at home. The first-order condition can also be written as

$$\frac{\alpha(w - w^*)}{N^o} = d \, . \tag{6}$$

Note that for unrestricted migration the wage rates in both countries are equal, and the left-hand side is zero. This is a solution for the *immigration policy constraint* only if $d = 0$, i.e. there are no costs of integrating immigrants. Intuitively, M^{max} must be smaller than unrestricted migration for any d larger than zero. Hence, we can abstract from the *emigration constraint* as equilibrium migration is always determined by the industrialized country's policy. For $K^* = 0$, we can show that

$$M^{max} = \bar{k} \left(\frac{(1-\alpha)\alpha A}{d} \right)^{1/\alpha} (N^o)^{(\alpha-1)/\alpha} - N^y \, . \tag{7}$$

For any $K^* > 0$, we cannot solve explicitly for M^{max}. However, the left-hand side of equation (5) clearly declines with M. With larger capital exports, investors place a higher weight on foreign capital returns. These become large for low levels of migration. Therefore, chosen immigration is a declining function of FDI. Using the implicit function theorem, we can show that the derivative of the industrialized median voter's preferred level of migration to FDI is

$$\frac{dM^{max}}{dK^*} = -\frac{\frac{r}{N^y+M} + \frac{r^*}{N^{y*}-M}}{\frac{K}{N^y+M} \cdot \frac{r}{N^y+M} + \frac{K^*}{N^{y*}-M} \cdot \frac{r^*}{N^{y*}-M}} \quad < 0 \, .$$

At the same time with the immigration policy decision, the industrialized country's old allocate their capital endowment. In the absence of expropriation risk, they would export the share of capital necessary to equalize capital returns in both countries. We call the level of capital exports in the absence of expropriation risk K^{*opt}, the *investment constraint*, with

$$K^{*opt} = \frac{(A/\tilde{A})^{\frac{1}{\alpha-1}} \bar{k} \cdot N^o (N^{y*} - M)}{(N^y + M) + (A/\tilde{A})^{\frac{1}{\alpha-1}} (N^{y*} - M)} \, . \tag{8}$$

Obviously, the difference in capital returns and thus the optimal level of capital exports is lower the higher immigration, such that K^{*opt} is a declining function of M. It is straightforward to understand that no FDI exceeding the non-expropriation compatible level is an optimal choice. This is because in case of expropriation, investors only receive a positive return on the part of capital invested at home. Consequently, utility can be increased by investing a larger fraction of capital at home and reducing FDI. If the non-expropriation compatible level of FDI is not sufficient to equalize returns,

it does not pay to further reduce FDI, foregoing high capital returns in the developing country. Therefore, actual FDI is given by the minimum of K^{*opt} and K^{*max}. We assume that, although investors are atomistic, their capital is administered by a mutual fund, which ensures that actual total capital flows to the developing country do not exceed the level compatible with the *non-expropriation constraint*.

Our equilibrium is thus characterized by the three equations (4),(5) and (8), leaving out the *emigration constraint* since migration is always determined by the *immigration policy constraint*. Basically, the model can be summarized as a game between the industrialized country's investors and the industrialized country's median voter, subject to the *non-expropriation constraint*. The minimum of $K^{*opt}(M)$ and $K^{*max}(M)$ is the investors' best response to the median voter's choice of immigration M. Analogously, the median voter's best response to any choice of FDI assuming non-expropriation is given by the *immigration policy constraint* $M^{max}|_{K^*}$. The intersection of best responses then determines a Nash equilibrium. Figure 3 shows the three equations for $\alpha = 0.35$, $A = 1$, $A^* = 0.6$, $\theta = 0.75$, $N^y = 0.44$, $N^{y*} = 0.57$ and $d = 0.18$.

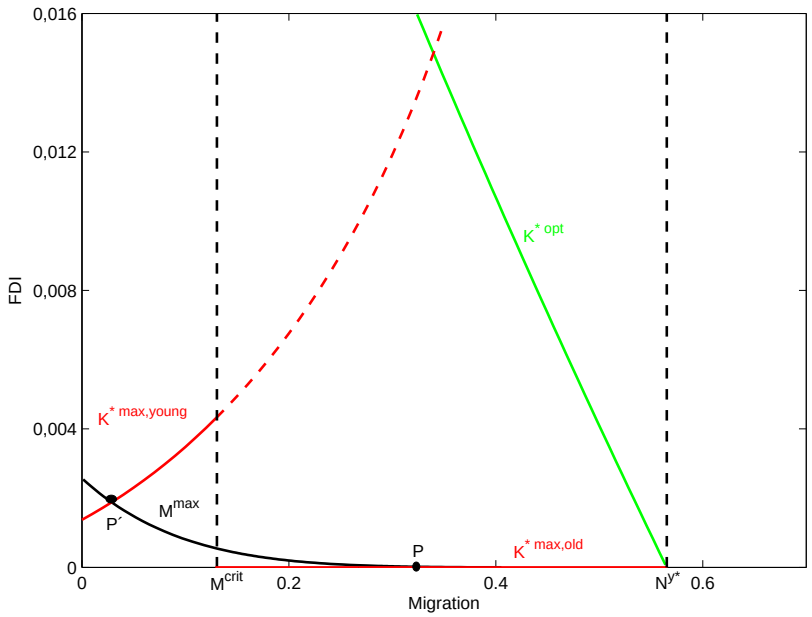

Figure 2: Migration and FDI in Equilibrium

In choosing our benchmark parameters we adhere to common assumptions

in the literature. According to Börsch-Supan et al. (2003), the production share of capital is usually set between 0.3 and 0.4, so our benchmark is $\alpha = 0.35$. We normalize TFP in the industrialized country A to 1, since what matters for our analysis is the relative size of A, $\tilde{A}$ and A^*. According to Dreher et al. (2007), developing countries' average TFP relative to the US is 0.53 if only official output is considered and 0.84 if the shadow economy is also taken into account. We set the developing country's TFP to $A^* = 0.6$ and the industrialized country's investors' TFP in the developing country to the intermediate value $\tilde{A} = 0.8$, which yields $\theta = 0.75$. In order to determine the relative sizes of the young and old generations, we look at the United Nations' Population Division's statistics on children per woman.[4] For the period of 2000-2005, total fertility in the world's more developed regions was about 1.6, while it was 2.6 for the world's less developed regions excluding the least developed regions. With the total population normalized to one in both countries, the resulting sizes of the young generations are $N^y = 0.44$ and $N^{y*} = 0.57$. We choose the level of the capital stock per investor to be $\bar{k} = 0.16$, implying an autarky capital intensity of about 0.2 in the industrialized country. The disutility parameter d is, of course, rather arbitrary since we have not explicitly modeled immigration-related costs. We call the threshold value of migration for which there remain as many old as young individuals in the developing country $M^{crit} = N^{y*} - N^{o*}$. We further define a critical immigration cost d^{crit}, which solves the *immigration policy constraint* (5) for $M = M^{crit}$ and $K^* = K^{*max}(M^{crit})$. For any $d < d^{crit}$, the *immigration policy constraint* and the *non-expropriation constraint* intersect at some migration level larger than M^{crit}. Consequently, the median voter in the developing country is young if and only if $d \geq d^{crit}$. Given that all other parameters are set to their benchmark values, $d^{crit} = 0.14$.

Other than in the case of migration, the individually optimal level of capital exports, K^{*opt}, is not necessarily higher than the policy-induced level K^{*max}. This is the case if the median voter in the developing country is old, but may not be the case if she or he is young, since then, the former is a decreasing and the latter an increasing function of migration. However, we make the assumption that at the critical migration level M^{crit}, the young-median-voter's *non-expropriation constraint* binds, i.e. $K^{*max}(M^{crit}) < K^{*opt}(M^{crit})$. Then, in any young-median-voter equilibrium, FDI is also determined by the *non-expropriation constraint*.

For $d > d^{crit}$, figure 2 illustrates two equilibria, an old-median-voter equilibrium labeled P and a young-median-voter equilibrium labeled P'.

[4] United Nations Population Division (2006)

Proposition 1 *Given that $d \geq d^{crit}$, there is at least a young-median-voter equilibrium. Additionally, there is an old-median-voter equilibrium for sufficiently small d.*

Since $d \geq d^{crit}$, the developing country's young median voter's *non-expropriation constraint* and the *immigration policy constraint* intersect at $M \leq M^{crit}$. This is the young-median-voter equilibrium. It is unique if $M^{max}(K^* = 0) \leq M^{crit}$. Then, the industrialized country never admits more than M^{crit} migrants and the median voter's identity in the developing country never changes. Conversely, if $M^{max}(K^* = 0) > M^{crit}$, P is also an equilibrium, with an old median voter in the developing country. In P FDI equals zero, while for migration it holds that $M^{crit} < M \leq N^{y*}$. Note that if migration does not cause any cost ($d = 0$), the industrialized country's median voter would like to admit an infinite number of immigrants. Nevertheless, N^{y*} must be the upper bound for immigration.

If both equilibria exist, we have to compare the industrialized country's old's indirect utility in order to determine which equilibrium is more plausible.[5] We find that the industrialized country's old always prefer the young-median-voter equilibrium P'. Starting from equilibrium P' we ask how utility changes as we move along the *immigration policy constraint* toward P. The utility change is approximately given by

$$dU^o = \frac{\partial U^o}{\partial M} dM + \frac{\partial U^o}{\partial K^*} dK^* \qquad < 0 \ ,$$

where $dM > 0$ and $dK^* < 0$ (see figure 2). Using the envelope theorem, $\partial U^o / \partial M = 0$, while $\partial U^o / \partial K^* > 0$ since $r^* > r$.

Proposition 2 *Given that $d < d^{crit}$, there is always an old-median-voter equilibrium (P). Additionally, there is a young-median-voter equilibrium (P') which is not characterized by the intersection of the policy functions.*

Figure 3 shows the case $d < d^{crit}$ (for $d = 0.12$). Although with $d < d^{crit}$ there is no point of intersection between M^{max} and K^{*max} with positive FDI, we can show that point P' may also be an equilibrium. Intuitively, permitting FDI to be expropriated is never an optimal choice. For any migration larger than M^{crit}, FDI is always expropriated. Consequently, we can only have an equilibrium with positive FDI ($0 < K^* < K^{*max}$) for migration levels equal to or below M^{crit}. Within this area of possible equilibria, the highest utility is clearly achieved at P', the point closest to utility maximizing K^{*opt}

[5] Although both equilibria may be realized, the one which generates higher utility for both players can be seen as a focal point.

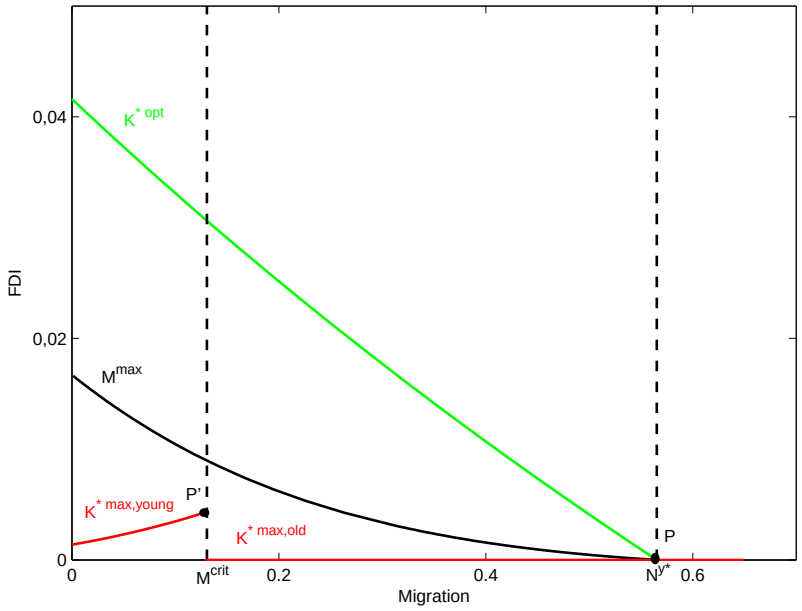

Figure 3: Equilibrium for $d < d^{crit}$

and M^{max}. In summary, neither the investors nor the industrialized country's median voter have an incentive to deviate from point P'. While the investors would like to export more, the median voter favors admitting more immigrants. However, increasing FDI and admitting more immigrants would both lead to expropriation.

As in the case where $d > d^{crit}$, we thus find two possible equilibria, one equilibrium with positive FDI and a corner solution with an old median voter in the developing country and no FDI. Other than in the former case, we cannot rank these two equilibria without further restricting the model parameters. If the industrialized country's inhabitants are sufficiently averse to immigration, the majority in the developing country is never reversed by labor flows. However, it is not possible to exclude an old-median-voter equilibrium theoretically.

4 Comparative Statics

We now come to the effect of marginal changes in the model parameters on the young-median-voter equilibrium. Changes in the *immigration policy*

constraint also apply to the old-median-voter equilibrium, while the old median voter's *non-expropriation constraint* always restricts FDI to zero. In the absence of political mobility constraints, larger demographic diversity would clearly boost both capital and labor movements. Now, the level of factor flows is determined by policy.

A larger share of the old generation in the industrialized country's population implies a larger capital stock $\bar{k}N^o$. As N^o does not have any impact on expropriation preferences, FDI would only increase if migration rose. However, a larger share of old does not unambiguously boost migration. With an exogenous capital endowment per investor $\bar{k}$ and given FDI $K^* = K^{*max}$, the share of $\bar{k}$ invested at home must increase. Investors consequently place a higher weight on domestic capital returns, preferring higher migration. Note, however, that the impact of immigration on domestic capital returns is also altered. This change in the derivative is given by

$$\frac{\partial^2 r}{\partial M \partial N^o} = \frac{1-\alpha}{(N^y+M)^2} r + \frac{1-\alpha}{N^y+M}\frac{\partial r}{\partial N^o}$$

$$\text{with} \qquad \frac{\partial r}{\partial N^o} = -\frac{1-\alpha}{N^y+M} r \left[1 + \frac{\bar{k}(N^y+M)}{\bar{k}N^o - K^*}\right] \qquad < 0\,.$$

Intuitively, the marginal effect of migration on the capital return in the industrialized country may be weakened by a larger share of old because the capital return itself is lowered not only by a decrease in the labor force but also by an increase in the capital stock. In summary, it is possible that a higher fraction of old in the industrialized country implies higher migration and thereby higher FDI, but this must not be the case. Using, again, the implicit function theorem, the derivative of M^{max} with respect to N^o can be shown to be

$$\frac{dM^{max}}{dN^o} = \frac{\frac{k^*}{N^o}\left[\frac{r}{N^y+M} + \frac{r^*}{N^{y*}-M}\right] + k\frac{1-\alpha}{N^y+M}\left[\frac{r}{N^y+M} + \frac{\partial r}{\partial N^o}\right]}{k\frac{\alpha}{N^y+M}\frac{r}{N^y+M} + k^*\frac{\alpha}{N^{y*}-M}\frac{r^*}{N^{y*}-M}}\,.$$

For our benchmark parameter values, an increase in N^o enhances factor flows. Nevertheless, factor flows are still restrained by policy.

Demographic diversity may also be caused by a high share of young individuals in the developing country. A larger N^{y*} affects the wage and return effects of FDI in the same way as lower emigration since both are equivalent to a larger labor force L^*. Wages decrease while capital returns increase, making expropriation more worthwhile:

$$\frac{dK^{*max}}{dN^{y*}} = -\alpha A^* \left(\frac{K^{*max}}{N^{y*}-M}\right)^{\alpha}\left[1 + \frac{1-\theta}{\theta}\frac{1-M}{N^{y*}-M}\right] \qquad < 0\,.$$

For a given level of migration, our model implies that younger countries have a higher preference for expropriation. Note that the industrialized country's median voter's preferred level of migration increases with lower FDI. The direct effect on immigration policy is also unambiguously positive. While the international allocation of capital is unaffected, a larger N^{y*} reduces the negative marginal effect of emigration on the capital return in the developing country. The derivative is

$$\frac{dM^{max}}{dN^{y*}} = \frac{k^* \frac{\alpha(1-\alpha)}{N^{y*}-M} \frac{r^*}{N^{y*}-M}}{k \frac{\alpha}{N^y+M} \frac{r}{N^y+M} + k^* \frac{\alpha}{N^{y*}-M} \frac{r^*}{N^{y*}-M}} \qquad > 0 \; .$$

N^{y*} also has an indirect effect on FDI, via migration. More emigration counteracts the direct negative effect of N^{y*} on FDI. For our benchmark parameter values, a larger labor force in the developing country still implies a lower non-expropriation compatible level of FDI.

The political economy of factor movements is determined by the model parameters A^* and θ as well as d. The former two influence FDI flows via the cost of expropriation, while the latter raises the cost of immigration the respective median voter bears. With $\tilde{A} = A^*$, no positive level of FDI would be feasible, whereas immigration is restricted only in case of positive costs of integrating immigrants. The *non-expropriation constraint* is relaxed as the developing country becomes more productive:

$$\frac{dK^{*max}}{dA^*} = \frac{1}{1-\alpha} \frac{1}{A^*} K^{*max} \qquad > 0 \; .$$

The wage and return effect of FDI both increase by the same factor. Since the capital stock effect of FDI is not affected by A^*, the costs of expropriation increase by more than the benefits. Recall that the wage effect is larger than the return effect for any positive level of K^{*max}. The relaxation of the *non-expropriation constraint* hinges on the wage loss increasing with A^*, which holds because the productivity gap $\tilde{A} - A^* = [(1-\theta)/\theta] A^*$ increases with A^*. This assumption allows us to replicate the stylized fact that the extent of political risk is higher in less developed countries. The direct effect on migration is negative:

$$\frac{dM^{max}}{dA^*} = -\frac{k^* \frac{\alpha}{A^*} \frac{1-\alpha}{N^{y*}-M} r^*}{k \frac{\alpha}{N^y+M} \frac{r}{N^y+M} + k^* \frac{\alpha}{N^{y*}-M} \frac{r^*}{N^{y*}-M}} \qquad < 0 \; .$$

Intuitively, the marginal effect of migration on the capital return in the developing country is enhanced by a larger A^* because the capital return itself is higher. The indirect effect on migration via FDI is also negative, such that

migration unambiguously declines. On the contrary, the positive direct effect on FDI is counteracted by declining migration.

Note that the productivity gap is also contingent on the parameter θ. As we do not have any data on this parameter, we also investigate how the model equilibrium is affected by changes in θ. An increment in θ reduces the productivity $\tilde{A}$, attenuating the wage effect but leaving the return effect unchanged. As a consequence, expropriation preferences increase:

$$\frac{dK^{*max}}{d\theta} = -\frac{1-M}{(\theta)^2}\left(\frac{K^{*max}}{N^{y*}-M}\right)^{\alpha} \qquad < 0 \ .$$

The direct effect on migration is positive. Since $\tilde{A}$ decreases with θ, the marginal capital return loss from emigration is reduced:

$$\frac{dM^{max}}{d\theta} = \frac{k^* \frac{1}{\theta} \frac{1-\alpha}{N^{y*}-M} r^*}{k \frac{\alpha}{N^y+M} \frac{r}{N^y+M} + k^* \frac{\alpha}{N^{y*}-M} \frac{r^*}{N^{y*}-M}} \qquad > 0 \ .$$

Naturally, the higher individuals' disutility from integrating immigrants, the more restrictive is immigration policy.[6] A policy which lowers this immigration related disutility would not only spur the integration of immigrants but also protect industrialized countries' FDI flows. Remember that this only holds as long as the young are in the majority in the developing country.

5 Extension: Equilibrium Policy in a Sequential Setting

We now investigate the sensitivity of the model results to the timing of the capital allocation and migration policy decisions. As we explained in section 2, it is sensible to assume that the expropriation decision takes place last. Furthermore, equilibrium migration is never determined by migrants' preferences, and therefore the timing of their migration decision has no impact on the equilibrium. As we argued above, it is plausible that the implementation of migration policy decisions requires a longer lead time than the allocation of capital. Therefore, we now elaborate on the young-median-voter equilibrium with the immigration policy decision taking place before the capital allocation decision. The old-median-voter equilibrium is not contingent on the timing. Since a migration level above M^{crit} always corresponds to zero FDI, the optimal immigration level is still given by equation (7).

[6] Asked about their worries and concerns in the 2007 wave of the German Socio-Economic Panel (SOEP), 34.44% of respondents said they were very concerned and 46.07% of respondents said they were somewhat concerned about immigration to Germany.

In this setting, the old median voter in the industrialized country anticipates how investors react to the immigration policy decision, i.e. $K^* = \min\{K^{*opt}(M), K^{*max}(M)\}$, still assuming that capital is administered by a mutual fund. Recall that we made the assumption that at the critical immigration level M^{crit}, and thus for all levels of migration, the *non-expropriation constraint* binds. Consequently, the median voter's decision problem can be written as

$$\text{Max} \quad \frac{\bar{k}N^o - K^{*max}(M)}{N^o}(1+r) + \frac{K^{*max}(M)}{N^o}(1+r^*) - d \cdot M$$

$$\text{where} \quad r = \alpha A \left(\frac{\bar{k}N^o - K^{*max}(M)}{N^y + M}\right)^{\alpha-1}, \quad r^* = \alpha \cdot \frac{1}{\theta} A^* \left(\frac{K^{*max}(M)}{N^{y*} - M}\right)^{\alpha-1}.$$

The first-order condition for a maximum reduces to

$$\frac{\alpha}{N^o}\left[(r^* - r)\frac{\partial K^{*max}}{\partial M} + (w - w^*)\right] = d\,. \tag{9}$$

Comparing equation (9) to equation (6), it is easy to verify that migration is now higher if $r^* > r$. The difference is that the median voter can now loosen the *non-expropriation constraint* by choosing a higher level of migration. The industrialized country's old favor increasing FDI if $r^* > r$, implying that FDI is restricted by the *non-expropriation constraint*. In summary, this sequence of decisions results in higher levels of both migration and FDI.

6 Conclusion

This contribution has explicitly accounted for endogenous policies determined by immigration and expropriation preferences. It is novel in modeling the interplay of policies in limiting factor flows. We have set up a one-period model of two countries with heterogeneous agents, young and old. Accounting for demographic diversity, we have assumed an old median voter in the industrialized country but a young median voter in the developing country.

In equilibrium, factor flows are politically restricted, thus leaving room for efficiency gains from removing mobility barriers. E.g. if the immigration-related disutility that natives incur can be lowered, both migration and FDI increase. This clearly enhances efficiency. This result is subject to one caveat, as there is the possibility that emigration changes the median voter's identity in the developing country. Then FDI drops to zero, as the expropriation of any foreign capital is certain. We therefore conclude that even though migration protects an aging country's stock of FDI, the aging country does not benefit from completely depriving host countries of their labor force.

While larger demographic diversity would boost factor flows in the absence of mobility constraints, it does not have an unambiguous effect in our setting. A large size of the old generation in the industrialized country implies that a large share of capital has to be invested at home. Capital returns achieved at home thus receive a higher weight, enhancing immigration preferences. However, it is possible that the positive effect of migration on these capital returns is now weaker. If migration does increase, this also has an indirect positive effect on FDI. A large size of the young generation in the developing country has an unambiguously negative effect on FDI and an unambiguously positive effect on migration. It is equivalent to a large labor force, implying low wages, and low wage losses in case of expropriation, and high capital returns to be distributed in case of expropriation. The positive effect on migration stems from the fact that high capital returns also lead to a reduced negative marginal effect of emigration. Enhanced migration does at least attenuate the negative effect on FDI.

The model may further be extended in various directions. First, we could allow for economic mobility barriers. If moving is costly for the migrants, our results do not change, unless the (political) demand for migrants would then exceed individually optimal migration. Second, a wider range of elasticities could be allowed for in production. With weaker factor price effects, factor flows would be further restricted, and migration might not ease expropriation risk. Third, since in industrialized countries much of the debate concerning migration and capital investment is related to the sustainability of pensions systems, it would be promising to introduce a pension system to the model.

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