The Demographics of Expropriation Risk

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Abstract

It is often argued that capital flows to developing countries could prevent a looming "asset price meltdown" in aging industrialized economies. In this paper, we scrutinize this argument using a two-country model that explicitly accounts for capital market imperfections in the form of expropriation risk. We relate a government's decision to expropriate foreign investors to conflicting distributional interests within the host-country population and analyze the effect of varying the population growth rate. While higher population growth would, indeed, spur foreign investments in a world of perfect capital markets, it reduces the volume of capital inflows if the risk of expropriation is taken into account. However, this effect may vanish over time, and in the medium run, higher population growth may raise the feasible volume of foreign investment.

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1 Introduction

It is often argued that international investment could be a means to prevent the looming "asset price meltdown" associated with demographic change in industrial countries: if declining birth rates and massive savings raise the capital labor ratio in rich economies, directing investments to countries with higher population growth could prevent a sharp drop of the return on capital (Brooks (2003); INGENUE (2001)). In fact, the projected evolution of old-age dependency ratios in different world regions seems to offer a high potential for demographically induced international investments (see Figure 1).

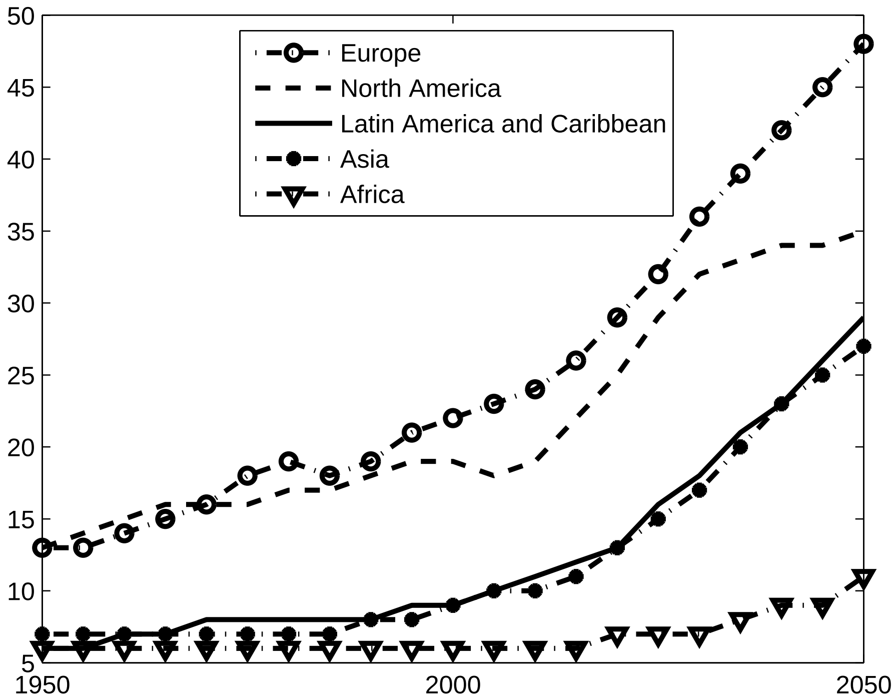


Figure 1: The evolution of old-age dependency ratios in different world regions. Source: United Nations

However, the high degree of capital mobility that is required to exploit this potential is rarely given in countries with a complementary demographic structure: information asymmetries, corruption, a weak legal system and the risk of – outright or creeping – expropriation are factors which limit the flow of capital from (aging) rich to (younger) poor countries. In fact, there is broad empirical support for the notion that, apart from productivity differences

(Lucas (1990)), "bad institutions" and insecure property rights are a major impediment that prevents larger capital flows from rich to poor countries (see Alfaro et al. (2005)).

The aim of this paper is to incorporate capital market imperfections in the form of expropriation risk into a fairly standard two-country model with overlapping generations and to explore how demographic variables affect the feasible volume of international capital flows. We develop a theoretical framework, in which the rich "industrialized" country is characterized by a low birth rate and high total factor productivity (TFP), while population growth is high and TFP low in the poor "developing country". All international capital flows take the form of (greenfield) foreign direct investments (FDI). Since foreign firms not only export their physical capital, but also their higher productivity, the asymmetric demographic evolution combined with a lower initial capital-labor ratio in the developing economy creates a high incentive for capital flows from the rich to the poor country. However, international investments are constrained by the fact that foreign investors account for the host-country government's incentive to expropriate their returns.

Any model dealing with the possibility of expropriation or default in international capital flows has to make an assumption on the host country government's objective function as well as on the costs that are associated with violating foreign investors' property rights. In this paper, we assume that the government maximizes a "political support function" whose value is determined by the utility levels of the generations currently alive. As for the costs, we follow Eaton and Gersovitz (1984) in assuming that expropriation results in a drop of host-country productivity. More specifically, we assume that foreign firms withdraw their expertise in the wake of expropriation, thus lowering average labor productivity and wages in the host country. As a consequence, a government that is comparing the (political) costs and benefits of expropriation has to assess the relative strength of three effects: a *transfer effect* which comes along with redistributing the proceeds from expropriation among the host-country population, a *wage effect* which hurts domestic workers, and a *return effect* which benefits domestic capital-owners. Since factor ownership depends on agents' life cycle, this possibly gives rise to a distributional conflict along demographic lines, with young agents opposing and old agents supporting expropriation.

After characterizing the equilibrium that would emerge in a world with secure property rights, we show that there is a *constrained* volume of foreign investment which must not be exceeded to prevent the host-country government from expropriating foreign firms. Using numerical simulations, we derive the evolution of foreign investment over time, and we analyze the impact of a varying population growth rate. Most importantly, we show, that a higher population growth rate may lower the constrained level of foreign investment in the short run, but raise it in the long run. This non-monotonic effect results from the multi-faceted effects of demographic variables in the model: on the one hand, high population growth depresses domestic capital accumulation and raises labor supply. Both factors lead to a larger labor supply in the foreign sector. This, in turn, raises the relative importance of the return effect and the transfer effect, while it dampens the impact of wage losses in case of an expropriation. On the other hand, however, a higher population growth rate increases the weight of the young generation which, ceteris paribus, faces higher costs from expropriation. Our numerical results suggest that the relative importance of these opposing effects changes over time: while the detrimental effect of a high population growth rate dominates immediately after the removal of investment barriers, the gains from expropriating foreign investors diminish as the domestic wage level and the domestic per-capita income picks up.

Our paper is related to several contributions on the determinants and consequences of expropriation in international investment. Moreover, there is a very large literature on the risk of default in international lending, as surveyed by Eaton and Fernandez (1995) and Sturzenegger and Zettelmeyer (2006).[1] While our model abstracts from international loans and exclusively focuses on direct investments, we adopt the fundamental problem that – absent a supranational enforcement mechanism or some other commitment device – a host country government has an incentive to infringe the property rights of foreign investors unless the costs of expropriation outweigh the benefits.[2]

Cole and English (1991) as well as Thomas and Worrall (1994) model repeated games between transnational investors and a host-country government, assuming that foreigners withhold future investments once expropriation has occurred.[3] They show that expropriation takes place if the immediate benefits dominate the costs of a future embargo . As a consequence, foreign investments must not exceed a critical threshold, which is implicitly defined by the government's indifference between expropriation and non-

[1]Defaults are defined as a (sovereign) debtor's repudiation of loan contracts, while expropriations refer to real capital investments which aren't reversible in the short term and which are therefore exposed to sometimes unpredictable changes in the host countries' political, institutional and legal environment.

[2]Albuquerque (2003) analyzes the relative properties of loans and direct investments and shows that in a world of imperfect contract enforcement capital flows should predominantly take the form of direct investments as they are harder to expropriate.

[3]For a critique of the embargo-argument in the context of international borrowing and lending, see Bulow and Rogoff (1989).

expropriation. While our framework does not rely on an embargo threat to prevent expropriation – and thus avoids the question whether such a threat is actually credible – we adopt the notion that foreign investments must not be "too large", and that they are restricted by a *non-expropriation constraint*.[4]

As in Harms (2002), we show that, for a given volume of capital inflows, the risk of expropriation is more pronounced if the host country's initial income level is low. However, we assume that foreign investors coordinate on the feasible level of investment. Moreover, we analyze how this threshold evolves over time, and how it is affected by the population growth rate.

The essential innovation of our paper is to motivate the government's expropriation decision by explicitly modeling the – potentially conflicting – interests in the host-country population and to identify intergenerational heterogeneity as a potential source of distributional conflict. Using this model, we analyze how the relative size of different generations affects the government's incentives and thus determines the feasible volume of international investments. As we demonstrate, the role of demographic variables is multifaceted, with higher population growth affecting government behavior both through its influence on factor prices and incomes, but also through its impact on the relative strength of opposed interest groups.

The rest of the paper is structured as follows: in the next section we introduce a two-country OLG model to analyze the role of a country's demographic structure in attracting foreign capital. Section 3 introduces the possibility of expropriation, discusses the impact of expropriation on factor prices and the welfare levels of different generations, and thus describes the fundamental forces that affect the government's decision. Using these insights, we derive and interpret the feasible volume of international investment in different time periods and explore how this volume reacts to changes in the host country's population growth rate. Section 4 summarizes and concludes.

2 The Model

2.1 Model Structure and Assumptions

We consider an economy that is populated by three overlapping generations: children, young workers and old workers. The number of young workers born in period $t-1$ and active in period t is N_t, the number of children born in period t is N_{t+1}, and the number of old workers active in period t is N_{t-1}.

[4] Cole and English (1991) discuss the possibility that the risk of expropriation can be reduced by increasing FDI. In that case, larger capital imports make the long-run cost more likely to outweigh the short-run gain of seizing foreign capital.

Children are economically passive, but they influence their parents' behavior by affecting their utility functions. Specifically, in period t the *representative young worker* maximizes the following utility function:

$$U_t^y = (1 + n_{t+1}) \ln c_t^y + \beta \ln c_{t+1}^o \ . \tag{1}$$

In equation (1), c_t^y represents the agent's young-age consumption, and c_{t+1}^o represents his/her consumption at old age. Young-age utility is weighted by the number of descendants $1 + n_{t+1} \equiv N_{t+1}/N_t$ to account for the fact that parents care about their children's welfare. Throughout this paper, we assume that the population growth rate is constant, i.e. $n_t = n \ \forall t$.

Labor supply is assumed to be exogenous and normalized to one unit in both young and old age. The wage paid per unit of labor in period t is denoted by w_t. Hence, labor income at time t is given by w_t for both a representative young and old worker. At time t, a young worker chooses consumption c_t^y and savings s_t subject to the following constraint:

$$c_t^y + s_t = w_t \tag{2}$$

Note that this reflects the assumption that there is no rivalry in consumption between young workers and their descendants – i.e., for a given income having more children does not reduce a parent's consumption possibilities. We assume that there is no formal capital market. Hence, agents are unable to borrow at young age, and their savings cannot be negative, i.e.

$$s_t \geq 0. \tag{3}$$

If savings are strictly positive, they are transformed into physical capital to be used in production during the following period. Throughout this paper, we stick to the assumption that old workers earn a capital income. This income could stem from individual entrepreneurial activity. More general, it can be interpreted as a rent whose size depends both on past investments and – as we will show – on the labor supply of young workers.

Returns to capital in period $t + 1$ are denoted by r_{t+1} and the rate of depreciation is assumed to be one. By assumption, old workers do not care for their grandchildren and do not leave any bequests. Hence, their consumption is constrained by

$$c_{t+1}^o = r_{t+1} s_t + w_{t+1}. \tag{4}$$

The technology of a representative firm whose output we use as the numeraire is

$$Y_t = A_t K_t^\alpha L_t^{1-\alpha} \tag{5}$$

where labor input is given by

$$L_t = N_t + N_{t-1}.$$

The wage paid for each unit of labor on a competitive labor market in period t is

$$w_t = (1-\alpha) A_t k_t^\alpha \tag{6}$$

with k_t as the capital stock per worker, i.e. $k_t \equiv K_t/L_t$. The return to capital is given by the difference between a firm's revenue and its labor costs:

$$r_t = \alpha A_t k_t^{\alpha-1} \, . \tag{7}$$

Throughout the paper total factor productivity A_t is assumed to be country-specific and constant over time, i.e. $A_t = A$ for all t.

2.2 Consumption and Capital Accumulation in a Closed Economy

All agents are assumed to have *perfect foresight*. Given the objective function (1), the constraints ((2) and (4)), and a constant population growth rate n, a young worker in period t chooses the following time path of consumption:

$$c_t^y = \frac{1+n}{1+n+\beta}\left[w_t + \frac{w_{t+1}}{r_{t+1}}\right] \tag{8}$$

and

$$c_{t+1}^o = \frac{\beta}{1+n+\beta}\left[r_{t+1} w_t + w_{t+1}\right]. \tag{9}$$

Optimal savings can be derived residually as

$$s_t = \frac{1}{1+n+\beta}\left(\beta w_t - (1+n)\frac{w_{t+1}}{r_{t+1}}\right). \tag{10}$$

Throughout this paper we assume that the evolution of factor prices is such that s_t is *strictly* positive. Using the expression in (10) as well as the fact that $K_{t+1} = N_t s_t$, we can derive the evolution of the capital stock per unit of labor $k_t \equiv K_t/(N_t + N_{t-1})$:

$$k_{t+1} = \frac{1}{(1+n)+1}\left[\frac{1}{1+n+\beta}\left(\beta w_t - (1+n)\frac{w_{t+1}}{r_{t+1}}\right)\right]. \tag{11}$$

Using equations (6) and (7), it can be shown that the time path of k_t is characterized by the following stable difference equation:

$$k_{t+1} = \lambda(k_t)^{\alpha} \tag{12}$$

with

$$\lambda = \left[\frac{\alpha(1-\alpha)\beta A}{\alpha((1+n)+1)(1+n+\beta)+(1+n)(1-\alpha)}\right].$$

The steady state value of the capital intensity is thus given by

$$k^{SS} = (\lambda)^{\frac{1}{1-\alpha}}.$$

It is easy to show that λ (and thus k^{SS}) are decreasing in n. Hence, *ceteris paribus*, a country with a fast-growing population is characterized by low wages and higher returns to capital. This has two reasons: first - as in the neoclassical growth model by Solow (1956) and Swan (1956) - higher population growth lowers the steady-state capital intensity for a given savings rate. In addition, a higher number of children raises young workers' consumption and lowers their savings rate. Figure 2 is a phase diagram representation of equation (12) and illustrates the effect of raising the (constant) population growth rate n.

2.3 International Investment with secure property rights

We now consider the effects of removing barriers to international investment between two economies that are both characterized by the economic structure presented so far. However, they differ in terms of their (exogenous) population growth rates and their total factor productivities. Specifically, we assume that the home economy is a less-developed country (LDC) with a higher population growth rate and a lower total factor productivity than the foreign industrialized country (IC), i.e. $n > n^*$ and $A < A^*$ with asterisks $(*)$ denoting foreign variables.

At the time investment barriers are removed, both countries are in their respective steady states. Since there is no formal capital market linking the two economies, all capital flows take the form of foreign direct investments (FDI): foreign agents can transform a share of their savings into capital goods

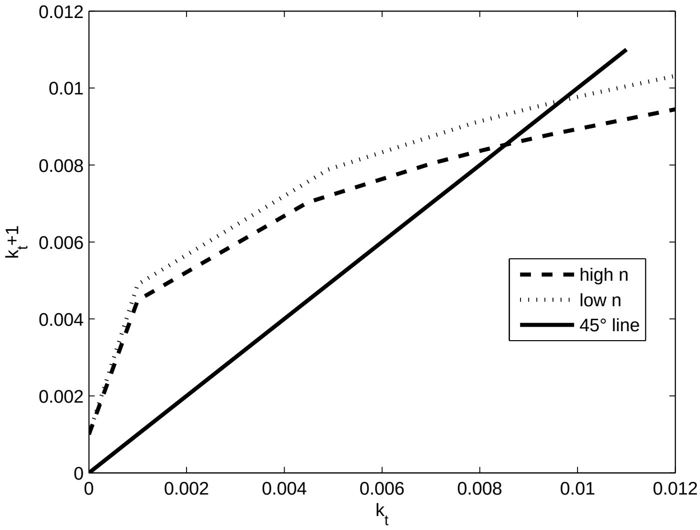


Figure 2: The effect of population growth on the steady-state capital intensity in a closed economy

and install them in the host economy. We make the important assumption that, together with their physical capital, foreign investors export their technological and managerial expertise. Hence, the total factor productivity (TFP) of foreign-owned firms is potentially higher than the TFP of domestic firms. This gives rise to a bi-sectoral structure in the host country which is characterized by the coexistence of 'advanced' foreign firms and 'backward' domestic firms. Yet, foreign firms' productivity is dragged down by the host country's less favorable business climate, a lower educational level of the work force etc. To capture this situation, we model foreign firms' TFP $\widetilde{A}$ as a linear combination of A and A^*:

$$\widetilde{A} = \theta A + (1 - \theta)A^*.$$

with $\theta \in [0, 1]$. Note that the lack of a capital market rules out intersectoral capital flows. Hence, investments of host country inhabitants always end up in the domestic sector, which is characterized by a lower TFP. Although we rule out *international* migration, domestic labor can nevertheless flow to the foreign sector until wages even out.

Given this structure, it is straightforward to derive the evolution of capital flows, factor prices and income levels after the elimination of investment barriers.

Foreign agents invest abroad as long as the return to capital exports exceeds the return on investing in the home economy. A foreign agent's capital return in his home ('industrialized') economy is given by

$$r^*_{t+1} = \alpha A^* (\frac{K^*_{t+1}}{L^*_{t+1}})^{\alpha-1} \tag{13}$$

By contrast, foreigners' return on investment in the host economy economy is

$$r^F_{t+1} = \alpha \widetilde{A} (\frac{B_{t+1}}{L^F_{t+1}})^{\alpha-1} \tag{14}$$

with F denoting foreign-sectoral variables and B_{t+1} representing the foreigners' capital stock in the host economy. The level of foreign capital at which $r^F_{t+1} = r^*_{t+1}$ holds will be denoted by $\widehat{B}_{t+1}$ and the restriction that $B_{t+1} \leq \widehat{B}_{t+1}$ will be called the *investment constraint*. It follows from (13) and (14) that

$$\widehat{B}_{t+1} = \frac{L^F_{t+1} K^*_{t+1}}{\left(\frac{\widetilde{A}}{A^*}\right)^{1/(\alpha-1)} L^*_{t+1} + L^F_{t+1}}. \tag{15}$$

Using (10), it is straightforward to derive the evolution of the capital stock in the domestic sector K^H_{t+1}, which is given by young workers' percapita savings s_t multiplied by the number of young workers N_t.

$$K^H_{t+1} = \frac{N_t}{1+n+\beta} \left[\beta w^H_t - (1+n)\frac{w^H_{t+1}}{r^H_{t+1}}\right]. \tag{16}$$

This can be rewritten as

$$K^H_{t+1} = \frac{\left[\frac{N_t}{1+n+\beta}\beta w^H_t\right] L^H_{t+1}}{L^H_{t+1} + \frac{N_t}{1+n+\beta}(1+n)\frac{1-\alpha}{\alpha}}. \tag{17}$$

Savings in the industrialized country are split between domestic investment and FDI, i.e.

$$B_{t+1} + K^*_{t+1} = \frac{N^*_t}{1+n^*+\beta} \left[\beta w^*_t - (1+n^*)\frac{w^*_{t+1}}{r^*_{t+1}}\right].$$

Subtracting B_{t+1} from both sides and dividing by L^*_{t+1}, we can derive the IC's capital stock in period $(t+1)$:

$$K^*_{t+1} = \frac{\left(\frac{N^*_t}{1+n^*+\beta}\beta w^*_t - B_{t+1}\right) L^*_{t+1}}{L^*_{t+1} + \frac{N^*_t}{1+n^*+\beta}(1+n^*)\frac{1-\alpha}{\alpha}}. \tag{18}$$

Intersectoral labor mobility implies that $w_{t+1}^H = w_{t+1}^F$. Using this condition, we can compute employment in the domestic sector as

$$L_{t+1}^H = \frac{L_{t+1} K_{t+1}^H}{K_{t+1}^H + \left(\frac{\widetilde{A}}{A}\right)^{1/\alpha} B_{t+1}}. \tag{19}$$

Note that L_{t+1}^H decreases in B_{t+1}: the presence of foreign firms reduces the labor supply available for domestic firms. This effect is stronger if the foreign firms' productivity advantage $\widetilde{A}/A$ is high.

After substituting L_{t+1}^F by $(L_{t+1} - L_{t+1}^H)$ in (14) and (15) we can solve the system of equations (15), (17), (18) and (19) for $\hat{B}_{t+1}$, K_{t+1}^*, K_{t+1}^H and L_{t+1}^H. In particular, the foreign-owned capital stock in period $t+1$ ist given by the following expression:

$$\widehat{B}_{t+1} = \frac{\left[\frac{1}{1+n^*+\beta}\beta w_t^* \left(\frac{\widetilde{A}}{A}\right)^{1/\alpha} \left(\frac{\widetilde{A}}{A^*}\right)^{1/(1-\alpha)}\right]\varphi - \left[\frac{1}{1+n+\beta}\beta w_t^H\right]\varphi^*}{\left[\left(\frac{\widetilde{A}}{A}\right)^{1/\alpha}\right]\frac{\varphi^*}{N_t} + \left[\left(\frac{\widetilde{A}}{A}\right)^{1/\alpha}\left(\frac{\widetilde{A}}{A^*}\right)^{1/(1-\alpha)}\right]\frac{\varphi}{N_t^*}} \tag{20}$$

with

$$\begin{aligned} \varphi &= \left[2 + n + \frac{1-\alpha}{\alpha}\frac{(1+n)}{1+n+\beta}\right] \\ \varphi^* &= \left[2 + n^* + \frac{1-\alpha}{\alpha}\frac{(1+n^*)}{1+n^*+\beta}\right]. \end{aligned}$$

The expression in (20) has a straightforward interpretation: foreigners' incentive to invest in the host economy is higher if the productivity disadvantage is not too strong – i.e. $\widetilde{A}/A^*$ is not too low – and if foreign firms can reckon on attracting a large foreign labor force. This is the case if foreign firms are much more productive than their domestic counterparte – i.e. if $\widetilde{A}/A$ is high – and if the domestic capital stock (K_{t+1}^H) is low. Since K_{t+1}^H depends on domestic wages of the preceding period (w_t^H), a lower wage level is associated with more FDI.

These results suggest the following time path of foreign investment.[5] Due to the low autarky capital-intensity, the host country's pre-liberalization wage is very low. Unless the discrepancy between A^* and $\tilde{A}$ is large, this creates a large incentive for foreign investments, and B_{t+1} is high in the immediate

[5]Note that, due to our assumption of a 100-percent rate of depreciation, the size of the foreign *capital stock* coincides with the volume of *foreign investment*.

post-liberalization period. In period $(t+1)$, host-country workers benefit from the higher wage and this has a positive effect on their savings. This raises the capital stock in the domestic sector, reduces the labor supply available to foreign firms, and might thus lead to a temporary decrease of FDI. In the long run, the higher population growth rate in the host economy as well as the lower productivity level in the domestic sector guarantee a constant supply of "cheap labor" for foreign firms and support a constant level of foreign investment per capita. Due to the large foreign capital inflows, but also due to the foreign firms' higher productivity, the domestic wage rate rises immediately after the elimination of investment barriers. The higher wage reduces capital returns in the domestic sector. Hence, in the short run, the move from financial autarky to financial integration raises wage incomes, but reduces capital incomes in the host economy.

Figure 3 depicts the evolution of B_{t+j} for the parameter values given in Table 1 and different population growth rates. Except for our assumption of a complete depreciation of the capital stock, most of the values presented in Table 1 are fairly standard.[6] A capital share of 0.3 can also be found in Prescott (1998), Klenow and Rodríguez-Clare (1997), Hall and Jones (1999) and Caselli (2005) among others. The value of β is derived from the calibration of the rate of time preference chosen by Börsch-Supan et al. (2002) in their overlapping generations model[7]. In their development-accounting exercise, Dreher et al. (2007) estimate total factor productivity for a wide range of countries assuming an aggregate Cobb-Douglas type neoclassical production function and using figures on the shadow economy in addition to official output. Their calculations yield an average total factor productivity of 0.765 relative to the United States if only official output is used and 0.918 if the shadow economy is also taken. Using these data, we can compute the average total factor productivity of developing countries relative to the U.S., which yields $A = 0.530$ if only official output is considered and $A^* = 0.836$ if the shadow economy is considered as well. Based on these findings, we chose a parameter value of 0.6 for A and set A^* equal to one. Population growth rates are taken from the United Nations World Population Prospects (United Nations Population Division (2006)). We compute the population growth factor from the number of children per woman divided by two. For the years $2000 - 2005$ the implied value of n for "less developed regions, excluding least developed countries" is 0.3. For n^* we chose a smaller but

[6] Note, however, that a 25-percent annual depreciation rate easily turns into 100 percent if the unit of time is 20 years.

[7] As a benchmark Börsch-Supan et al. (2002) choose 0.01 as the rate of time preference. With one period being something between 20 and 30 years we can calculate β as $1/1.01$ exponentiated by the number of years

positive value of 0.1, roughly reflecting the actual value in the United States.

The parameter value for which it is hardest to acquire reliable information is the spillover parameter θ which determines the productivity disadvantage of foreign firms operating in the host country relative to the source country. If $\Phi \equiv \widetilde{A}/A^*$ were readily available, we could easily compute $\theta = [1-\Phi]/[1-(A/A^*)]$. However, such data is out of reach, and we chose a value of 0.8 for θ. Given $A = 0.6$, this implies that foreign affiliates of international firms are roughly one third less productive in a developing country than they would be in their home country – a discrepancy that we do not consider excessive.

Parameter	Host Country	Source Country
Depreciation Rate δ	1	1
Capital Share α	0.3	0.3
Time Discount Factor β	0.8	0.8
Total Factor Productivity A	0.6	1
Population growth rate n	0.3	0.1
Knowledge Spillover Parameter θ	0.8	-

Table 1: Parameters underlying numerical simulations

Using these parameters figure 3 confirms our conjecture that the time path of foreign investment is non-monotonic. Moreover – and not surprisingly – a higher population growth rate raises B_{t+j} at every point in time: the labor supply becomes larger, which in turn is complemented with less capital as the population growth rate impacts the number of descendants of domestic investors, who react by substituting more savings for consumption. This dampens the domestic wage level and a larger fraction of labor flows to the foreign enterprises. This makes the host country more attractive for international investors. However, due to the productivity disadvantage of the developing country, wages and per-capita GDP levels never equalize between the two countries.

3 Modeling Expropriation Risk

3.1 The Costs of Expropriation

As stated in the introduction, the uncertainty of property rights is a major impediment to foreign investments in developing countries. We now introduce the possibility of outright expropriation into our model. Expropriation is discriminatory – i.e. it targets foreign investors but leaves domestically-owned capital untouched – and it is initiated by a government that seeks to

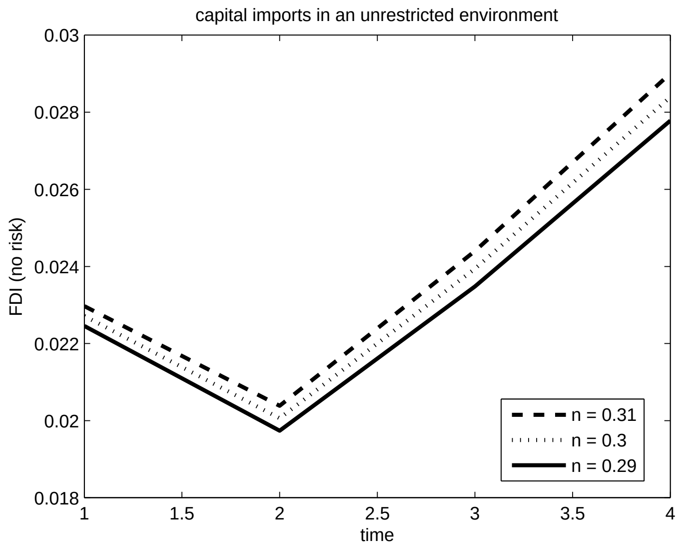


Figure 3: The evolution of $\widehat{B}$ for different population growth rates

maximize its political support among the domestic population. Moreover, we assume that expropriation is always total – i.e. we exclude the possibility of a *partial* expropriation – and that returns of foreign firms are evenly distributed among the host country population.[8]

Obviously, if there were not costs to expropriation, the government would be subject to the classical time-inconsistency / capital-levy problem:
a promise to stay away from foreign investments would not be credible since there would be a large temptation to expropriate foreign capital once it is installed. As a consequence, foreigners would refrain from investing in the host country. The literature has come up with various approaches to explain why international investments take place despite the obvious risks of expropriation: it has been argued that host country governments refrain from expropriation for fear of not attracting any further investments in the future (see Cole and English (1991)). In addition, it has been brought forward that 'direct sanctions' may reduce host country incomes or welfare and may thus amply reduce the net benefits of expropriation.

In this paper, we follow the approach of Eaton and Gersovitz (1984) and argue that, in case of expropriation, foreign investors withdraw their expertise. As a result, TFP in the 'foreign' sector drops from $\widetilde{A}$ to A. We argue that this is a highly plausible reaction since foreign investors do not benefit

[8]Note that, due to our assumption of a 100-percent rate of depreciation, there is no capital stock to be redistributed.

from further operating firms whose profits accrue to and are redistributed by the host-country government. Moreover, we do not have to worry about the credibility issues that come along with alternative 'punishments'. In particular, we do not have to claim that, after expropriation, foreign capital shuns the host country for a potentially infinite time period. Instead, we may allow for the possibility that international investors return in subsequent periods.

To identify the costs and benefits of expropriation for the host-country population, we have to be very precise on the sequence of events: we assume that foreign capital is completely installed *before* the expropriation decision takes place. Workers' decisions to work in the domestic or the foreign sector then takes place *after* the expropriation decision but – not surprisingly – *before* production and consumption takes place. The fact that the productivity level in the foreign sector is determined by the expropriation decision, i.e. *before* workers make their occupational choices has important consequences for the impact of expropriation on wages and capital returns: it directly follows from equation (19) that, if foreign-sector productivity decreases as a result of expropriation, economy-wide wages drop and – as workers are able to react due to the sequence of events – a higher portion of the labor force is available for the domestic sector. This, in turn, raises returns on investment in domestic firms.

We can thus decompose the benefits and costs of expropriation into three effects: most directly, all domestic citizens benefit from a strictly positive *transfer effect* since by the end of the period, capital returns in the foreign sector are evenly distributed among the two active generations currently alive. By contrast, old and young workers are hurt by a negative *wage effect* which is due to the lower productivity in the foreign sector and the resulting allocation of labor. Finally, capital-owners benefit from a positive *return effect*: the larger labor supply in the domestic sector lowers wage costs and boosts profits of domestic firms. The fact that only old workers possess capital while young workers exclusively rely on their labor income relates the resulting distributional interests to the host country's demographic structure.

3.2 The Government's Expropriation Decision

In this subsection, we model the government's expropriation decision in period $t+1$ as a choice of the variable ξ_{t+1} with

$$\xi_{t+1} = \begin{cases} 0 & \text{if no expropriation occurs in period } t+1 \\ 1 & \text{if expropriation occurs in period } t+1 \end{cases} \tag{21}$$

The government's goal is to maximize its political support among the host-country population. Political support in period $(t+1)$ is denoted by W_{t+1} and given by the sum of domestic residents' utilities, i.e.

$$W_{t+1}(\xi_{t+1}) = N_t \left[\ln c^o_{t+1}(\xi_{t+1})\right] + N_{t+1} U^y_{t+1}(\xi_{t+1}). \tag{22}$$

where U^y_{t+1} is defined by equation (1). Expropriation takes place in period $(t+1)$ if $W_{t+1}(1) > W_{t+1}(0)$. Whether this condition is satisfied depends on how expropriation affects old workers' consumption and young workers' lifetime utility. Denoting the per-capita transfer resulting from expropriation in period $(t+j)$ by Φ_{t+j} with $j = 1, 2, ...$ and domestic-sector wages and returns to capital by w^H_{t+j} and r^H_{t+j} respectively, we can use the results of the preceding sections to derive

$$c^o_{t+1} = \frac{\beta}{1+n+\beta} \left\{ r^H_{t+1} w^H_t + w^H_{t+1} + \xi_{t+1}\Phi_{t+1} \right\} \tag{23}$$

$$c^y_{t+1} = \frac{1+n}{1+n+\beta} \left\{ w^H_{t+1} + \xi_{t+1}\Phi_{t+1} + \frac{w^H_{t+2} + \xi_{t+2}\Phi_{t+2}}{r^H_{t+2}} \right\} \tag{24}$$

$$c^o_{t+2} = \frac{\beta}{1+n+\beta} \left\{ r^H_{t+2} \left[w^H_{t+1} + \xi_{t+1}\Phi_{t+1} \right] + w^H_{t+2} + \xi_{t+2}\Phi_{t+2} \right\}. \tag{25}$$

Note that wages and capital returns at time $(t+j)$ not only depend on the domestic capital stock K^H_{t+j} and the volume of foreign investment B_{t+j}, but also on the total factor productivity in the foreign sector $A^F(\xi_{t+j})$, with $A^F(1) = A$ and $A^F(0) = \widetilde{A}$. Finally, the per-capita transfer in period $t+j$ is given by

$$\Phi_{t+j} = \frac{B_{t+j} r^F_{t+j}}{N_{t+j-1} + N_{t+j}} \tag{26}$$

3.3 Foreign investment and the incentive to expropriate

As stated above, expropriation takes place if the difference $\Delta W_{t+j} \equiv W_{t+j}(1) - W_{t+j}(0)$ is strictly positive. In the following paragraphs, we will analyze how ΔW_{t+j} is affected by exogenously varying B_{t+j}, given that there has been no expropriation in period $t+j-1$ and that agents expect no expropriation in $t+j+1$.

To achieve this goal, we start by substituting the consumption levels given by equations (23) – (25) into (22). Wages, capital returns and transfers can be replaced using (6), (7) as well as (26). As we show in the Appendix, ΔW_{t+j} is given by

$$\begin{aligned}
&\frac{N_{t+j}}{1+n}\ln\left[\left(\frac{k^H_{t+j}}{k^{H,E}_{t+j}}\right)^{1-\alpha}\frac{\alpha(1-\alpha)A\left(k^H_{t+j-1}\right)^\alpha+(1-\alpha)\left(k^{H,E}_{t+j}\right)+\frac{B_{t+j}}{L_{t+j}}\alpha}{\alpha(1-\alpha)A\left(k^H_{t+j-1}\right)^\alpha+(1-\alpha)\left(k^H_{t+j}\right)}\right]\\
&+N_{t+j}\ln\left[\frac{(1-\alpha)A\left(k^{H,E}_{t+j}\right)^\alpha+\frac{B_{t+j}}{L_{t+j}}\alpha A\left(k^{H,E}_{t+j}\right)^{\alpha-1}+\frac{1-\alpha}{\alpha}k^H_{t+j+1}(1,0)}{(1-\alpha)A\left(k^H_{t+j}\right)^\alpha+\frac{1-\alpha}{\alpha}k^H_{t+j+1}}\right]\\
&+N_{t+j}\beta\ln\left[\kappa_{t+j+1}\frac{\alpha\left[(1-\alpha)A\left(k^{H,E}_{t+j}\right)^\alpha+\frac{B_{t+j}}{L_{t+j}}\alpha A\left(k^{H,E}_{t+j}\right)^{\alpha-1}\right]}{\alpha(1-\alpha)A\left(k^H_{t+j}\right)^\alpha+(1-\alpha)\left(k^H_{t+j+1}\right)}\right.\\
&\qquad\left.+\,\kappa_{t+j+1}\frac{(1-\alpha)\left(k^H_{t+j+1}(1,0)\right)}{\alpha(1-\alpha)A\left(k^H_{t+j}\right)^\alpha+(1-\alpha)\left(k^H_{t+j+1}\right)}\right]
\end{aligned} \tag{27}$$

with

$$\kappa_{t+j+1}=\left(\frac{k^H_{t+j+1}}{k^H_{t+j+1}(1,0)}\right)^{1-\alpha}.$$

The terms k^H_{t+j} and $k^{H,E}_{t+j}$ denote the capital-labor ratio in the domestic sector without and with expropriation in period $t+j$, respectively. Conversely, $k^H_{t+j+1}(\xi_{t+j},\xi_{t+j+1})$ represents the capital-labor ratio in the domestic sector, conditional on the expropriation decision in periods $t+j$ and $t+j+1$. In the appendix, we demonstrate that k^H_{t+j} is unambiguously larger than $k^{H,E}_{t+j}$. Intuitively, expropriation lowers total factor productivity in the foreign sector. This reduces labor's incentive to move out of the domestic sector and lowers $k^{H,E}_{t+j}$. Moreover, if domestic young agents in $t+j-1$ foresee expropriation in $t+j$ they reduce savings in anticipation of the transfer in $t+j$ which lowers $k^{H,E}_{t+j}$ additionally.

Expression (27) offers several insights: not surprisingly, $\Delta W_{t+j}=0$ for $B_{t+j}=0$: if there is no foreign capital, expropriation has neither costs nor benefits. Moreover (27) can be used to illustrate the three effects sketched above: the transfer effect, the return effect and the wage effect. The *transfer* is denoted by $\alpha A\left(k^{H,E}_{t+j}\right)^{\alpha-1}(B_{t+j}/L_{t+j})$ which is unambiguously increasing in B_{t+j}[9].

Regarding *wage effect* and *return effect* we can state that the derivative of the ratio

$$\frac{k_{t+j}^{H,E}}{k_{t+j}^{H}}$$

with respect to B_{t+j} is negative. The (positive) effect of B_{t+j} on k_{t+j}^{H} is stronger than the effect on $k_{t+j}^{H,E}$ since the intersectoral productivity differentials disappear in case of an expropriation.

Using this result, it is easy to show that the *return effect*, reflected by

$$\frac{\alpha A \left(k_{t+j}^{H,E}\right)^{\alpha-1}}{\alpha A \left(k_{t+j}^{H}\right)^{\alpha-1}}$$

is reinforced by additional capital inflows, thus confirming the above conjecture that, ceteris paribus, increasing B_{t+j} ceteris paribus raises capital owners' preference for expropriation.

On the contrary, the *wage effect*, given by

$$\frac{(1-\alpha) A \left(k_{t+j}^{H,E}\right)^{\alpha}}{(1-\alpha) A \left(k_{t+j}^{H}\right)^{\alpha}}$$

unambiguously declines in B_{t+j}. Hence, a higher capital stock in the foreign sector reinforces the income losses suffered by wage-earners in case of expropriation.

The term in (27) shows that old workers' preference for expropriation hinges on the strength of the (positive) transfer and return effects relative to the (negative) wage effect. By contrast, young workers' attitude depends on how the positive transfer effect and the negative wage effect influence lifetime utility. In addition, at time $t+j$, these individuals have to take into account the future returns on investment – represented by the terms $\alpha A \left(k_{t+j+1}^{H}(1,0)\right)^{\alpha-1}$ and $\alpha A \left(k_{t+j+1}^{H}\right)^{\alpha-1}$, respectively, as well as the future wage rate.

In the Appendix, we show that ΔW_{t+j} can be expressed as a function of k_{t+j-1}^{H}, B_{t+j} and B_{t+j+1} – i.e. it depends on the initial capital intensity in the domestic sector, on foreign investments in the current period, and on expected future foreign investments. Is there a value $\widetilde{B}_{t+j}$ such that

[9] This is not a trivial finding since a higher level of B_{t+j} reduces capital returns in the foreign sector. However, it can be shown that the overall effect of B_{t+j} on the transfer is positive.

$\Delta W_{t+j}(k^H_{t+j}, \widetilde{B}_{t+j}, B_{t+j+1}) = 0$ for given values of k^H_{t+j-1} and B_{t+j+1}? This would be a threshold at which the government would just be indifferent between expropriation and non-expropriation.

The nonlinear structure and the dynamic nature of our model does not allow for a generic answer to this question. However, we can explore whether such a threshold value exists for the parameter values given in Table 1. To accomplish this, we start by analyzing how varying B_{t+j} affects old workers' and young workers' preference for expropriation in an arbitrary period $t+j$ after the elimination of investment barriers, assuming that in all preceding periods $s < t+j$ B_s solved $\Delta W_s = 0$, that agents expect no expropriation in the following period and that they foresee the incentive-compatible levels $\widetilde{B}_{t+j+1}, \widetilde{B}_{t+j+2}, \ldots$ that follow in reaction to B_{t+j}. In a next step, we combine these results to derive the threshold value $\widetilde{B}_{t+j}$. In a later section, we will then show that the *non-expropriation constraint* is actually binding for these parameter values, i.e. that $\widetilde{B}_{t+j} \leq \widehat{B}_{t+j}$. Our reasoning suggests that these numerical results should hold for a wide range of parameter combinations.

Figure 4 shows the utility level of old workers as a function of B_{t+j}, using the parameter values introduced in the preceding section. For very low levels of foreign investment a negligible amount of proceeds from expropriation is distributed among domestic agents. Hence the transfer effect is hardly perceivable. Moreover the negative wage effect countervails the positive return effect for amounts of FDI being low enough. However, as stated above larger foreign capital inflows raise the transfer effect (compare the dotted lines in figure 4) but wage and return effect as well. Due to our calibration of α being less then 0.5 the negative effect of B_{t+j} on $\frac{k^{H,E}_{t+j}}{k^H_{t+j}}$ has a larger impact on the return effect than on the wage effect. Hence for larger levels of FDI old agents prefer to expropriate even regardless of the transfer accruing to individuals in case of expropriation.

Figure 5(a) depicts welfare levels for young workers (U^y_{t+j}) using the parameters of Table 1 and separating wage and transfer effects. Not surprisingly, their welfare is lower in case of expropriation if the transfer effect is neglected. If the transfer is taken into account, young agents derive a higher utility from expropriation which is the same in both figures 5(a) and 5(b) as the intersectoral productivity gap disappears no matter the levels of A and A^*.

However, as Figure 5(b) shows, the shape of utility in case of no expropriation changes if we arbitrarily raise total factor productivity in the domestic sector (A) from 0.5 to 0.8[10]. In contrast to expropriation a larger

[10]all other parameters are still taken from Table 1

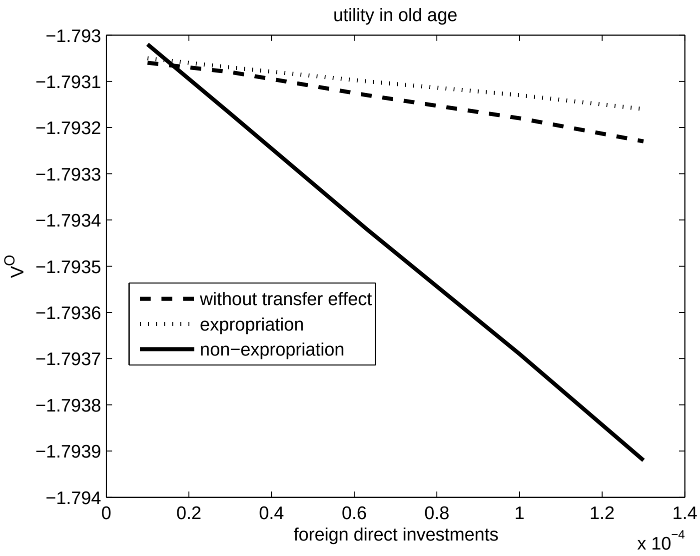
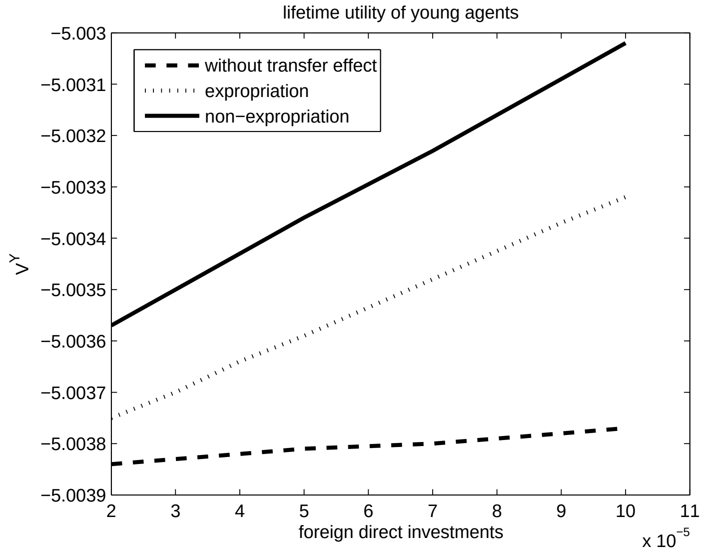


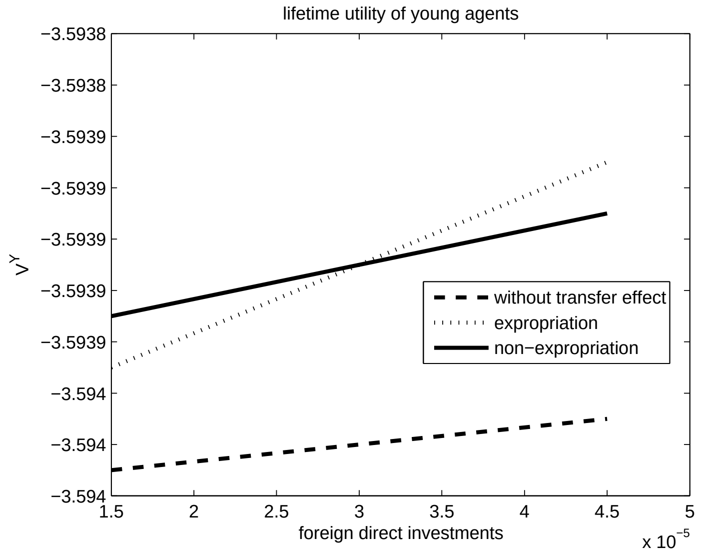
Figure 4: Old agent utility

A fills the productivity gap, leading to less intersectoral labor migration in response to additional FDI. Hence the slope of the solid line in figure 5(b) is smaller than the solid line in figure 5(a). Hence, if we raise total factor productivity in the domestic sector (A) from 0.5 to 0.8, the transfer effect dominates the wage effect at high levels of foreign investment: the higher the host country productivity level the smaller is the foreign sector productivity breakdown associated with expropriation and the less intense the decline in wages. Moreover, the transfer is eventually higher with a higher domestic-sector productivity as the return on seized capital benefits from the larger A, although it suffers from the massive re-allocation of labor.

Figure 6 combines young workers' and old workers' preferences and depicts the relationship between B_{t+j} and the government's political support – both in case of expropriation and in case of no expropriation. Given the above discussion, it is not surprising that expropriation reduces political support for low levels of B_{t+j} while the difference in support-levels becomes positive as B_{t+j} increases. The intersection of the solid and the dashed lines in Figure 6 yields the critical level of foreign investment $\widetilde{B}_{t+j}$ at which $\Delta W_{t+j} = 0$.



(a) Low Domestic TFP ($A = 0.5$)



(b) High Domestic TFP ($A = 0.8$)

Figure 5: Young agent utility

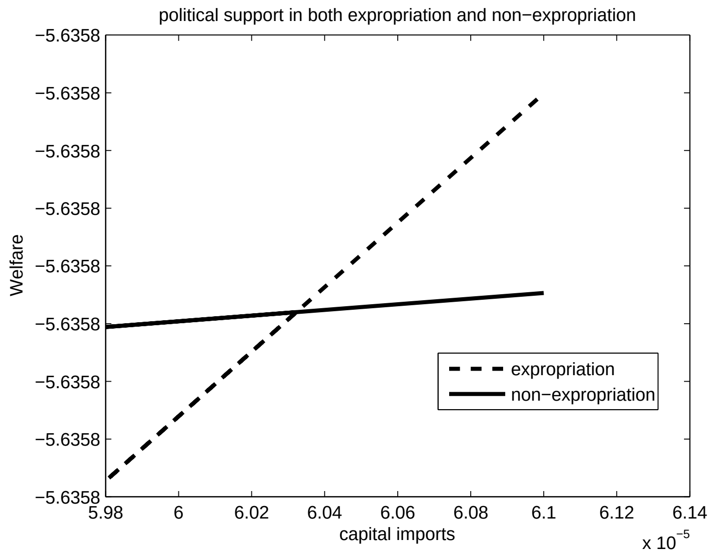


Figure 6: Political supports for different levels of FDI

3.4 The Evolution of Foreign Investment with the Risk of Expropriation

In the preceding section we have investigated how varying the level of foreign capital at any point in time (B_{t+j}) affects old workers' and young workers' welfare levels and thus the government's incentive to expropriate foreign investors. We have shown that, for the parameters presented in Table 1, this incentive increases in (B_{t+j}), and that there is a threshold value ($\widetilde{B}_{t+j}$) that must not be exceeded to keep the host-country government indifferent between non-expropriation and expropriation at any given point in time. We assume that at every point in time, foreign investors coordinate on not trespassing this critical level - e.g. because their savings are administered by a mutual fund which internalizes the impact of an additional unit of capital on the host government's expropriation decision. In this section, we explore how this *feasible* level of foreign investment evolves over time.

To do this, we compute $\widetilde{B}_{t+j}$ for $j = 0, 1, 2, ...$ – i.e. starting in the period immediately after the elimination of investment barriers. As in the preceding section, we use the parameter values from Table 1. And as before, $\widetilde{B}_{t+j}$ is computed to keep the government indifferent between expropriation and non-expropriation given that *no* expropriation has happened in the past and *no* expropriation is expected for the future. As shown above, $\widetilde{B}_{t+j}$ depends on the (pre-determined) initial capital stock in the domestic sector. It also hinges on the future volume of foreign investment, since the latter determines future returns and wages. Our analysis is substantially facilitated by the following observation: foreign capital inflows increase domestic wages and thus savings of young workers. In the next period, these higher savings transform into a higher capital stock in the domestic sector. Again, this raises (declines) the domestic wage level (capital return) for a given level of capital imports. This, in turn, strengthens the weight of wage losses but lowers the weight of capital return gains. The increased wage effect as well as the declined return effect reduce the attractiveness of expropriation for a given level of foreign investment and relax the *non-expropriation constraint*, inducing additional foreign capital inflows. Hence, expropriation risk becomes less and less pronounced, and $\widetilde{B}_{t+j}$ approaches the – unconstrained level – $\widehat{B}_{t+j}$.

Figures 7 and 8 present the evolution of the foreign capital stock and of the foreign capital stock relative to the host-country work force starting from the first post-liberalization period $t+1$. Due to the host country's low pre-liberalization income, expropriation would be triggered at already moderate levels of foreign investment. However, in subsequent periods, domestic incomes pick up and allow for an increasing presence of foreign firms. Due to the diminishing marginal product of labor and capital, foreign investments per work force are constant in the long run. Hence, $\widetilde{B}_{t+j}$ grows at a constant rate which is determined by the host country's population growth.

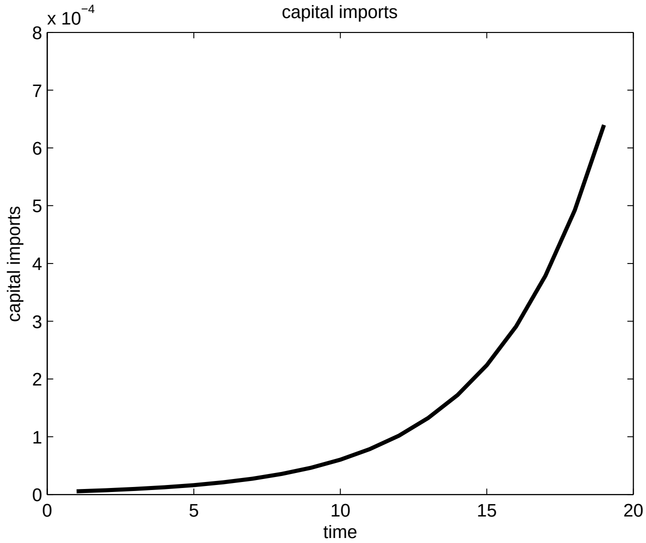


Figure 7: Evolution of capital imports

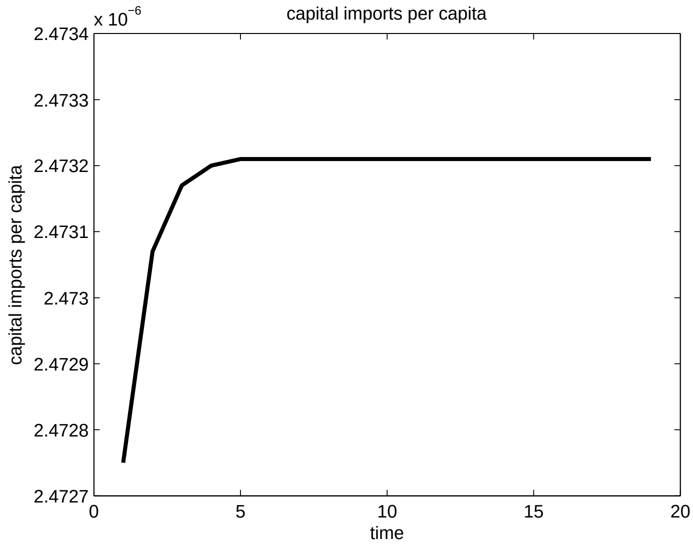


Figure 8: Evolution of capital imports per host country worker

3.5 Demography Matters: Population Growth and the Risk of Expropriation

In the preceding sections we identified the "feasible" level of foreign investment $\widetilde{B}_{t+j}$ as the foreign capital stock that keeps the host-country government indifferent between expropriation and non-expropriation. We have computed how this threshold value evolves over time and demonstrated that, while the risk of expropriation depresses foreign investment in early periods after de-jure financial liberalization, this constraint becomes less and less severe as the host country grows richer.

How does a demographic variable like the host country's population growth rate influence $\widetilde{B}_{t+j}$. We have shown that a higher value of n spurs foreign capital inflows if we abstract from expropriation risk since high population growth both reduces the host country's initial capital-labor ratio and raises the future supply of labor. Once we explicitly account for the possibility of redistributive expropriation, the role of n becomes more complex: we still have to consider the influence of the population growth rate on factor prices as well as income and utility levels. In addition, we have to take into account that raising n increases the weight of the young generation in the government's objective function.

Our analysis refers to the initial period of time after capital is allowed to flow internationally, which we name $t + 1$. Hence we start from the autarkic steady state situation in t. Furthermore we normalize the number of old agents in $t+1$ to one. From section 2.2 we know that the autarkic steady state wage level is given by

$$w^{SS} = (1-\alpha)A_t(\lambda)^{\frac{\alpha}{1-\alpha}}.$$

with λ given by (12). From $\frac{\partial \lambda}{\partial n} < 0$ it follows that w^{SS} declines in the population growth rate n. Hence, for a given amount of FDI a larger n leads to a smaller capital stock in the domestic sector in the period following the removal of investment barriers $(t+1)$. This, in turn, reinforces the transfer effect of expropriation: due to the low capital stock in the domestic sector, more labor flows to the foreign sector leading to higher capital returns that are redistributed in case of expropriation. Conversely, a lower domestic capital stock implies a lower wage level, which dampens the negative wage effect of expropriation. While both mechanisms result from the negative impact of high population growth on the pre-liberalization wage, they are reinforced by the fact that a higher value of n implies a higher labor supply in period t. Through both channels, higher population growth increases the importance of the transfer effect and reduces the importance of the wage effect. This, in turn, results in a greater risk of expropriation and consequently reduces foreign investments. Summing up, a larger population growth rate leads to a smaller domestic capital stock but a larger labor supply. Both effects rise the host country's preference for expropriation and foreign investors react by reducing FDI due to the larger political risk.

However the effect of n changes in the long run. If the domestic population grows faster, the transferred yields from a given stock of FDI has to be spread over a larger number of agents. Moreover, foreign capital inflows – albeit limited – contribute to a growing income and thus growing savings. Hence, the relative importance of the transfer and the return effect diminishes over time, while the drop in wage income associated with expropriation plays an increasingly large role. Combining these insights with the fact that the wage effect has the strongest impact on young workers' lifetime incomes explains why raising n – and thus giving additional weight to the young generation – lowers the risk of expropriation and allows for higher foreign investments in the long run

Summing up, a higher population growth rate depresses foreign investments in the short run. In the long run, however, population growth dilutes the per capita gain from the expropriation transfer and emphasizes the wage effect by an enhanced population share of young workers. Hence, a higher value of n eventually enhances capital imports. These results are illustrated by Figure 9 which depicts the evolution of $\widetilde{B}_{t+j}$ for the parameter values from Table 1 and different population growth rates.

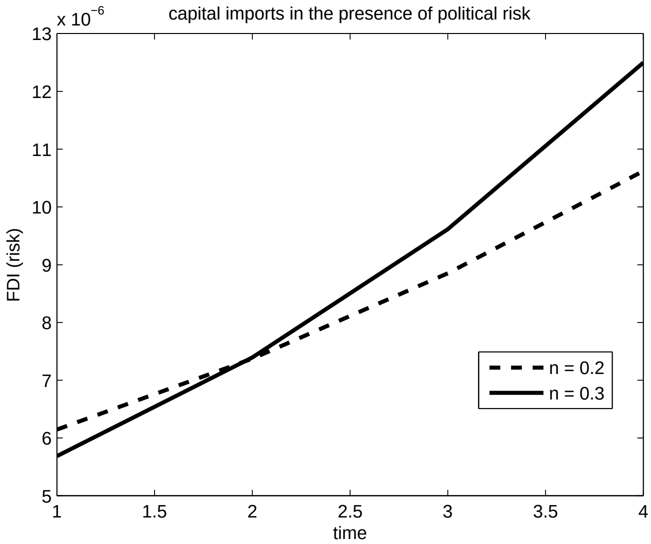


Figure 9: The evolution of $\widetilde{B}$ for different population growth rates

We can define the "extent of political risk" by a variable μ_{t+j}, which depends on $\widetilde{B}_{t+j}$ – i.e. the constrained volume of foreign investment – and $\widehat{B}_{t+j}$, which is the volume of foreign investment that would materialize if there were no risk of expropriation:

$$\mu_{t+j} = 1 - \frac{\widetilde{B}_{t+j}}{\widehat{B}_{t+j}} \tag{28}$$

Apparently, μ_{t+j} is between zero and one. Moreover, it increases in the ratio $\widetilde{B}/\widehat{B}$. Comparing Figures 3 and 9 we see that, in the short run, μ increases in the host country's population growth rate, while it decreases in the long run with n: as countries with high population growth catch up economically, the costs of expropriation grow faster than the benefits. In addition $\widetilde{B}$ is indeed approaching the unconstrained level $\widehat{B}$ as time goes by, i.e. $\widetilde{B}/\widehat{B}$ becomes larger and therefore μ_{t+j} becomes smaller in time (see figure 10).

4 Conclusions

There is a wide-spread presumption that sending capital to countries with high population growth rates might contribute to preventing an "asset-price meltdown" in fast-aging industrialized countries. At the same time, those

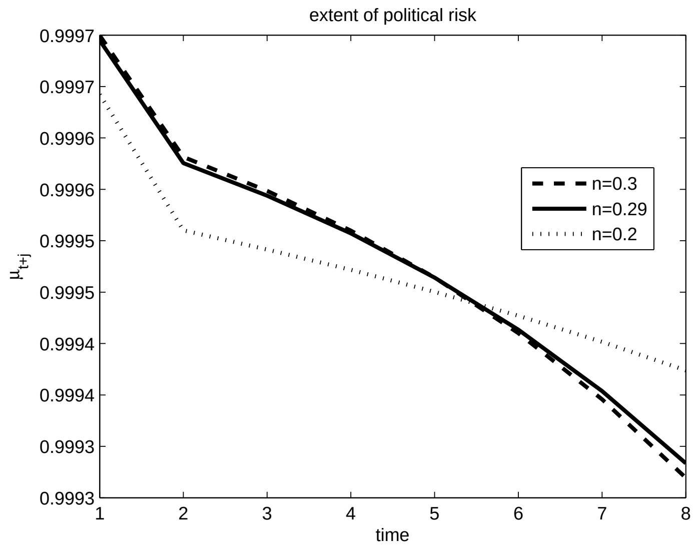


Figure 10: The extent of political risk for different population growth rates

countries that seem to offer the highest scope for "demographic diversification" threaten foreign investors with bad institutions and insecure property rights. The goal of this paper was to augment a standard two-country with a support-maximizing government's incentive to expropriate foreign investors and to use this framework to analyze the impact of demographic variables on international investment.

We have shown that, in a world with secure property rights, higher population growth in developing countries should, indeed, foster international investment. However, if we allow for the possibility of expropriation, foreign capital inflows are constrained by a threshold level that must not be exceeded to keep the host-country government indifferent between expropriation and non-expropriation. We have discussed how various effects – a *transfer* effect, a *return* effect and a *wage* effect – influence this threshold, and how it evolves over time. Most importantly, we have demonstrated that increasing the host country's population growth rate *increases* expropriation risk in the short run, but *reduces* it in the long run. This finding has important implications: while it is compatible with the notion that developing countries with high population growth rates are characterized by a insecure property rights and numerous institutional deficiencies, it suggests that population growth might contribute to reducing these problems over time. By identifying the mechanisms that are driving this result – namely, the diminishing importance of transfers and returns relative to wages and the importance of population growth for the relative weight of different generations – we are able to derive some normative conclusions. In particular, our framework highlights the notion that the gradual disappearance of investment constraints could be much accelerated by an institutional framework that appropriately protects foreign investors' property rights. Such a framework would be particularly important immediately after the elimination of investment barriers. Over time, as host-country incomes pick up, large foreign investments would become sustainable, and the necessity of explicit institutions would gradually vanish.

Of course, these conclusions have to be augmented with several caveats: by assuming that the host country is characterized by the absence of formal capital markets – thus restricting all foreign investments to be greenfield FDI – and that expropriation is discriminatory – i.e. not hurting domestic investors – are of crucial importance in defining the different generations' distributional interests. Moreover, the assumption of constant population growth rates in both regions certainly simplifies our analysis, but is not very realistic in the long run. Modifying and relaxing these assumptions goes beyond the scope of this paper, but offers ample opportunities for future research.

Appendix

In this appendix we derive the difference $\Delta W_{t+j} \equiv W_{t+j}(1) - W_{t+j}(0)$ presented in section 3.3 as a function of the predetermined variable k^H_{t+j-1} and both B_{t+j} and B_{t+j+1} (see section A.1).

Furthermore, in section A.2 we proof that k^H_{t+j} is unambiguously larger than $k^{H,E}_{t+j}$.

A Towards foreign investment and the incentive to expropriate

A.1 Deriving the political support difference ΔW_{t+j}

Analogously to equation (16) the evolution of the domestic capital stock in an arbitrary period $t+j$ is given by

$$K^H_{t+j} = \frac{N_{t+j-1}}{1+n+\beta}\left[\beta\left(w^H_{t+j-1} + \xi_{t+j-1}\Phi_{t+j-1}\right) - (1+n)r^H_{t+j}(w^H_{t+j} + \xi_{t+j}\Phi_{t+j})\right]$$

Apparently, K^H_{t+j} depends on the expropriation decision in periods $t+j-1$ and $t+j$:

$$K_{t+j}^{H} = \frac{N_{t+j-1}}{1+n+\beta}\left[\frac{\beta(1-\alpha)A\left(k_{t+j-1}^{H}\right)^{\alpha} - (1+n)\frac{1-\alpha}{\alpha}\frac{\Omega B_{t+j}}{L_{t+j}}}{1+\frac{1}{1+n+\beta}\frac{1-\alpha}{\alpha}\frac{1+n}{2+n}}\right]$$

$$K_{t+j}^{H}(1,0) = \frac{N_{t+j-1}}{1+n+\beta}\left[\frac{\beta\left((1-\alpha)A\left(k_{t+j-1}^{H,E}\right)^{\alpha} + \frac{B_{t+j-1}}{L_{t+j-1}}\alpha A\left(k_{t+j-1}^{H,E}\right)^{\alpha-1}\right)}{1+\frac{1}{1+n+\beta}\frac{1-\alpha}{\alpha}\frac{1+n}{2+n}}\right] - \frac{N_{t+j-1}}{1+n+\beta}\left[\frac{(1+n)\frac{1-\alpha}{\alpha}\frac{\Omega B_{t+j}}{L_{t+j}}}{1+\frac{1}{1+n+\beta}\frac{1-\alpha}{\alpha}\frac{1+n}{2+n}}\right] \quad (29)$$

$$K_{t+j}^{H,E} = \frac{N_{t+j-1}}{1+n+\beta}\left[\frac{\beta(1-\alpha)A\left(k_{t+j-1}^{H}\right)^{\alpha} - (1+n)\frac{1}{\alpha}\frac{B_{t+j}}{L_{t+j}}}{1+\frac{1}{1+n+\beta}\frac{1-\alpha}{\alpha}\frac{1+n}{2+n}}\right]$$

with

$$\begin{aligned} K_{t+j}^{H} &= K_{t+j}^{H}(\xi_{t+j-1}=0, \xi_{t+j}=0) \\ K_{t+j}^{H}(1,0) &= K_{t+j}^{H}(\xi_{t+j-1}=1, \xi_{t+j}=0) \\ K_{t+j}^{H,E} &= K_{t+j}^{H}(\xi_{t+j-1}=0, \xi_{t+j}=1) \end{aligned}$$

and

$$\Omega \equiv (\widetilde{A}/A)^{1/\alpha}.$$

The terms k_{t+j-1}^{H} and $k_{t+j-1}^{H,E}$ denote the capital-labor ratio in the domestic sector without and with expropriation in period $t+j-1$, respectively:

$$k_{t+j-1}^{H} = \left(\frac{K_{t+j-1}^{H} + \Omega B_{t+j-1}}{L_{t+j-1}}\right) \quad (30)$$

$$k_{t+j-1}^{H,E} = \left(\frac{K_{t+j-1}^{H}(\xi_{t+j-2}=0, \xi_{t+j-1}=1) + B_{t+j-1}}{L_{t+j-1}}\right). \quad (31)$$

Computing labor allocation by (19) we are left to ΔW_{t+j} as a function of k_{t+j-1}^{H} – a variable which is predetermined at the beginning of period $t+j-1$ – as well as B_{t+j+1} – which will be realized in the next period $t+j+1$ – and of B_{t+j}, i.e.

$$\Delta W_{t+j} = \Delta W_{t+j}(k_{t+j-1}^{H}, B_{t+j}, B_{t+j+1}).$$

Specifically, we get ΔW_{t+j} as

$$\frac{N_{t+j}}{1+n}\ln\left[\frac{\alpha A\left(k_{t+j}^{H,E}\right)^{\alpha-1}(1-\alpha)A\left(k_{t+j-1}^{H}\right)^{\alpha}}{\alpha A\left(k_{t+j}^{H}\right)^{\alpha-1}(1-\alpha)A\left(k_{t+j-1}^{H}\right)^{\alpha}+(1-\alpha)A\left(k_{t+j}^{H}\right)^{\alpha}}\right.$$

$$\left.+\frac{(1-\alpha)A\left(k_{t+j}^{H,E}\right)^{\alpha}+\frac{B_{t+j}}{L_{t+j}}\alpha A\left(k_{t+j}^{H,E}\right)^{\alpha-1}}{\alpha A\left(k_{t+j}^{H}\right)^{\alpha-1}(1-\alpha)A\left(k_{t+j-1}^{H}\right)^{\alpha}+(1-\alpha)A\left(k_{t+j}^{H}\right)^{\alpha}}\right]$$

$$+N_{t+j}\ln\left[\frac{(1-\alpha)A\left(k_{t+j}^{H,E}\right)^{\alpha}+\frac{B_{t+j}}{L_{t+j}}\alpha A\left(k_{t+j}^{H,E}\right)^{\alpha-1}+\frac{1-\alpha}{\alpha}k_{t+j+1}^{H}(1,0)}{(1-\alpha)A\left(k_{t+j}^{H}\right)^{\alpha}+\frac{1-\alpha}{\alpha}k_{t+j+1}^{H}}\right]$$

$$+N_{t+j}\beta\ln\left[\frac{\alpha A\left(k_{t+j+1}^{H}(1,0)\right)^{\alpha-1}\left[(1-\alpha)A\left(k_{t+j}^{H,E}\right)^{\alpha}+\frac{B_{t+j}}{L_{t+j}}\alpha A\left(k_{t+j}^{H,E}\right)^{\alpha-1}\right]}{\alpha A\left(k_{t+j+1}^{H}\right)^{\alpha-1}(1-\alpha)A\left(k_{t+j}^{H}\right)^{\alpha}+(1-\alpha)A\left(k_{t+j+1}^{H}\right)^{\alpha}}\right.$$

$$\left.+\frac{(1-\alpha)A\left(k_{t+j+1}^{H}(1,0)\right)^{\alpha}}{\alpha A\left(k_{t+j+1}^{H}\right)^{\alpha-1}(1-\alpha)A\left(k_{t+j}^{H}\right)^{\alpha}+(1-\alpha)A\left(k_{t+j+1}^{H}\right)^{\alpha}}\right]$$

with

$$\begin{aligned} k_{t+j+1}^{H}(1,0) &= k_{t+j+1}^{H}(\xi_{t+j}=1,\xi_{t+j+1}=0) \\ &= \left[\frac{K_{t+j+1}^{H}(\xi_{t+j}=1,\xi_{t+j+1}=0)+\Omega B_{t+j-1}}{L_{t+j-1}}\right]. \end{aligned}$$

A.2 The impact of expropriation on the domestic-sectoral capital intensity

In this subsection we will prove that other things being equal the domestic-sectoral capital intensity declines if expropriation occurs, i.e. $k_{t+j}^{H}-k_{t+j}^{H,E}>0$ for all post-liberalization periods $t+j$.

Using the first and third equation of (29) in (30) and (31), after some transformations it follows that $k_{t+j}^{H}-k_{t+j}^{H,E}>0$ reduces to

$$\Omega B_{t+j}>\left(1-\frac{1+n}{(2+n)(1+n+\beta)}\right)B_{t+j}. \tag{32}$$

Using $\Omega\geq 1$ (32) holds if we reasonably assume β to be not negative and $n>-1$.

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