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Throwing the Spanner in the Works: The Mixed Blessing of FDI

Jakob Schwab*

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Abstract

FDI is generally attributed to have positive impact for developing countries. In contrast, this paper shows that foreign capital inflows may cause an economy to be stuck in a middle-income trap. Introducing a simple capital market imperfection into a standard neoclassical (open-economy) model of growth, I show that FDI crowds out domestic investment when countries are still growing. If profitable investments are pursued by foreign capital owners, this does reduce chances for domestic entrepreneurs that they would have otherwise been able to take, by means of economy-wide savings. The long term losses due to the crowding-out effect occur despite the the short-term gains that sudden capital inflows entail, as in static models. At the same time, savings that are not invested leave the country in turn, generating reverse capital flows.

Keywords: FDI, financial market globalization, welfare effects, open-economy growth, middle income trap, two-way capital flows
JEL: F21, F43, F54, F62, O16

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1 Introduction

Financial globalization still falls short of universally promoting growth and welfare, especially in developing countries (see e.g. Prasad et al. (2007)). This stands in sharp contrast to the predictions of economic theory, according to which capital scarce countries should be the first to profit from increased inflows of productive capital. If ownership of capital is initially concentrated in richer countries, a more widespread and hence efficient allocation of it should be to the benefit of all. This view has been questioned by many non-economist critics of financial globalization. They argue that a world in which Northern owned firms produce in Souhern countries must be to the disadvantage of the latter. But this critique appears pointless since we not only seem to just not observe these North-South capital flows in aggregate - the well-known Lucas (1990)-Puzzle - they even appear to be reversed since the turn of the century. Nonetheless, the public and academic discussion is still largely concerned with the phenomena of offshoring and (mostly Northern-based) multinational enterprises, which entail capital investments of northern ownership in low-income countries. These facts hardly seem to reconcile.

This paper develops a stylized model of a world where investment is freely pursued around the globe. It then analyzes the growth structure of this world, where capital ownership is concentrated in initially rich countries but its use is not necessarily undertaken there. However, whereas international investment goes without frictions, the market for credit is imperfect. Then, wealth plays a role for the possibility to obtain credit for new investment and the individual accumulation of assets is crucial for the further development of the worldwide distribution of (profitable) investment ownership and hence incomes.

When credit eligibility does not only depend on pledgeable collateral, but also on the profitability of the prospective investment, then inflowing FDI has a direct impact on domestic entrepreneurial activity: By raising the wage rate and reducing the scarcity of capital, it decreases the marginal product of capital and hence of individual investments. Although the immediate raise in wage income also increases domestic pledgeability, eventual entrepreneurs in poorer countries still fall behind in a concurrent competion for credit and investment opportunities, due to their lower accumulated income. On a fully integrated capital market, domestic entrepreneurial activity in developing countries is thus hindered.

This contrasts to an autarkic growth process, where capital only builds up slowly by reinvested domestic savings, but therefore an entrepreneurial class can emerge and build up

wealth in pace with the decrease in returns to capital. Thereby, growth trickles down the economy. Integrating into international capital market interrupts this growth process. Income initially increases as capital rushes in but investment income is foregone in the long run. This argument relates the real world observation of countries being stuck in a so-called 'middle income trap' (e.g. Eichengreen et al. (2013)), i.e. growth slowdowns of emerging markets that experienced massive periods of growth prior to that, to their integration into world capital markets.

It also explains the accompanying structure of capital flows that is observed: Because the immediate rise in income and thus savings is contrasted by a falling demand for credit by domestic agents, financial capital flows out of poorer countries into richer ones. At the same time, this credit is used partly to in turn finance direct investment by Northern entrepreneurs in the South. This implies a two-way structure of capital flows between North and South that tends to net out gross flows. Table 1 illustrates this pattern in the actual data. The

	FDI	Financial Capital	Aggregate
High Income	357	-289	68
Low & Middle Income	-481	435	-46

Table 1: Net Capital Outflows in 2011, in Billion USD
Source: IMF BOP Statistics, country classifications according to World Bank

striking clarity of this pattern has long been largely overlooked by the literature. I show that the structure of global capital flows stands in direct connection to the permanent division of the world into poorer and richer countries. The mechanism is sparked by aggregate flows of FDI into developing countries[1], and the income distribution and reverse financial flows are a direct result from these. In the baseline model, countries only differ in their income levels due to a different progress in the growth process. Even though we will take the perspective of a developing contry throughout most of the analysis, the income effects in richer countries are just the mirror image: An outflow of capital initially harms domestic workers, but investment around the world and the access to credit for this increase national income in the long run.

The remainder of the paper is organized as follows: The next section discusses in more detail some related literature. Section 3 sets up the model and section 4 lays out how the growth

[1]We thus concentrate on neoclassical forces behind FDI, not the motive of monopolitic firms to access markets in other developed and possibly developing countries.

and trickle down process in this economy emerges in autarky. Section 5 shows how this process is interrupted by the opening up of the economy to world capital markets and section 6 discusses the resulting structure of capital flows. Some extensions are briefly presented in section 7: Section 7.1 lays out the two-country setting and 7.2 shows how the result is magnified when differences in total factor productivity between countries are accounted for. Section 8 concludes.

2 Related Literature

The growth effects of the globalization of the capital market in a dynamic neoclassical setting have first been thouroughly analyzed by Barro et al. (1995). They show that with perfect capital markets, capital market integration only accelarates the growth process by raising the capital stock immediately. Because there is then also no difference in returns between saving and investment, there are no income effects in the long run. I will show that with imperfect capital markets instead, when there is a wedge between the rate for lending and the return to physical investment, the initial distribution of capital ownership matters also in the long run.

There is an extensive literature that discusses how an imperfect market for credit may lead to reverse flows of financial capital, starting with the partial-equilibrium framework of Gertler and Rogoff (1990). Matsuyama (2004) shows in a general equilibrium framework that this may lead to endogenous inequality between countries when capital flows to where capital already is. He, however, excludes the possibility of FDI.[2]

In the same line and closely related to our paper are the works by Song et al. (2011) and Buera and Shin (2009). They look at how an economic transition will lead to outflows of financial capital when credit markets are imperfect. Whereas Buera and Shin (2009) concentrate on the supply side of credit as a driving force because entrepreneurs need to save in order to make investments, Song et al. (2011) show to regard the case of China that the reallocation from financing-intensive state owned enterprises to more restricted private firms affects the demand side for credit, leading to a current account surplus during the transition period. These papers also do not consider the effects of FDI.

The first work to explicitly account for the observations of table 1 is Ju and Wei (2010). To explain the structure of two-way capital flows, they provide a static model where capital

[2]In fact, allowing for FDI in Matsuyama (2004)'s model would make the entire mechanism break down.

flows are driven by differences in institutional quality between countries. The quality of financial institutions determines where financial capital goes and the level of property rights protection and the capital scarcity determine where FDI flows to. However, both types of capital flows are not directly linked in their model. I, in contrast, relate the inflow of FDI to financing opportunities for domestic entrepreneurs and consider the dynamic effects of FDI on domestic investment opportunities and income. [3] The bypass effect of financial globalization from their model is also present in my mechanism, but the income effects are quite different.[4]

The fact that FDI itself tends to crowd out domestic investment (and with it then the demand for credit) in developing countries is empirically verified by Agosin and Machado (2005). By theoretically underpinning this link, my paper is related to the works of Grossman (1984) and Reis (2001), who also comment on how FDI might slow down domestic entrepreneurial activity. Both results complement the argument made here, but stress different mechanisms. The former argues that possible entrepreneurs in developing countries prefer to leave the risk of investment to foreign investors and instead work in foreign companies for lower, but safe wage income. Risk sharing is no objective in my model, which implies that agents would prefer, but are hindered, to become entrepreneurs. The resulting welfare losses in the economy opening up are thus absent in Grossman (1984). Reis (2001) on the other hand shows in a model of endogenous growth that the exogenous technological advantage of foreign firms may crowd out domestic research activities in partial equilibrium, so that the profits that accrue to these activities and that escape the country by repatriation may mirror domestic welfare losses. However, in her model, the countries differ in their technological characteristics and the capital market is restricted to direct investment.

I show the effect of a reduction of domestic entrepreneurial activity in a general equilibrium model of complete - and same - market interaction that deliberately stays as close to neoclassical growth theory as possible. I thereby deliver a tractable way to identify why - in contrast to conventional arguments - it could be disadvantegeaous for developing countries to have substantial shares of GDP leave the country as foreign factor payments such that GNI is lower than the domestic value of production. This pattern holds true for almost all

[3] To be specific, The appendix of Ju and Wei (2010) extends their setting to a dynamic one. Still, feedback effects between investment and credit market interaction are cut. Consequently, short term effects are simply magnified in the long run.

[4] Also, because the analysis undertaken here takes into account the role of individual agents, I do not have to assume convex costs of investment to obtain an interior solution.

developing countries.
I do not consider other effects of FDI than the increase in the domestic capital stock which are often attributed to it, such as technological or competition-induced spillover effects (see e.g. de Mello (1997) for an overview). The reason is twofold: First, a metastudy by Harrison and Rodriguez-Clare (2009) concludes the empirical evidence on these two be negligable at best. Second, and more importantly, I want to highlight one specific effect of FDI, abstracting from everything else that may well be considered additionally. Even if positive effects may be present, the mechanism presented here should help answering the question why especially FDI still has a negative effect on welfare in developing countries. There is by nature not much conclusive evidence on this direct link, but the one that exists (Kose et al. (2009), Herzer (2012)) makes a strong point for a negative relationship in the long run. The fact that those countries, that have experienced high investment rates in advance, appear especially prone to be caught in a middle-income trap, supports this notion (Eichengreen et al. (2013)). Whereas that literature focuses on country-specific reasons, my model offers a systemic explanation for this.

3 The model

The model is based on the one of growth under imperfect capital markets from Matsuyama (2004), but alters the basic framework to analyse the effects of FDI in particular instead of only looking at the effect of competition for credit.[5]
Consider an economy that is made up by a homogeneous population of unit mass. Agents are infinitely lived. Individuals are indexed by $i \in [0,1]$ and each agent supplies one unit of labor inelastically. There is only one good produced, used for consumption and investment. Production follows standard neoclassical patterns: $Y_t = F(K_t, L_t)$, where K_t and L_t are aggregate supplies of capital and labor in period t. F is a constant returns to scale production function and $L = 1$ such that production equals per capita production and can be expressed as $y_t = f(k_t)$, lower case notation indicating per capita variables. Furthermore, $f'(k) > 0 > f''(k)$. Inada conditions hold. However, since we will have to make a statement about the characteristics of growth over history, suppose that $f(0) = \epsilon$, with ϵ small, but greater zero.

[5]The central results in the autarky case therefore resemble the one in Matsuyama (2004). The situation under open markets, however, looks fundamentally different here compared to the one in his setting.

The labor market is competetive and labor is paid its marginal product, $w_t(k_t) = \frac{\partial F(K_t,1)}{\partial L}$. Invested capital receives the residual of production, which is, per invested unit of capital, $\rho_t = \frac{f(k_t)-w_t(k_t)}{k_t} = f'(k_t)$. $f'(k) > 0 > f''(k)$ implies that a greater capital stock decreases per unit capital returns and increases wages.

For simplicity, capital depreciates fully after one period.[6] Agents save - in a Solow-type way - a constant fraction s of their income.[7] They can transfer their savings to the next period by either lending it on the competetive market for credit, earning the gross return of r_{t+1}, or by investing it: If investing, each agent can run exactly one investment project by investing exactly 1 unit of capital into the joint production process. This restricts in both directions: First of all, investment is indivisible, i.e. there is a threshold of funds that have to be brought into each single investment. This will lead to competition on the market for credit in the first place. Secondly, this is the most extreme, but also most tractable form of individually diminishing returns to investment. If they weren't, the richest individual would always be able to attract all credit, as we will see. Both, indivisibility and diminishing returns, are in their extreme form a simplification and only introduced as such for tractability, but both in general are essential for the mechanism to be at work.

If an individual i wants to invest, but her funds - which equal her savings - are not sufficient to ensure investment, she has to borrow the remaining share, $1 - sI_t^i$, on the credit market in order to invest one unit in physical capital in $t+1$. She then earns the return on her investment, has to repay her credit taken (if any), and also receives the wage payment on her labor supplied. An entrepreneur's income in period $t+1$ then reads:

$$^{E}I_{t+1}^i = f'(k_{t+1}) - r_{t+1}(1 - sI_t^i) + w(k_{t+1}) \tag{1}$$

If she instead lends her savings, she receives the credit market return on her savings and her wage and her income is given by:

$$^{L}I_{t+1}^i = r_{t+1}sI_t^i + w(k_{t+1}) \tag{2}$$

[6] This emphasizes the fact that direct investment is not just 'earlier' and thus crowds out domestic investment later on, but that investment chances are structurally reduced.

[7] This could easily be motivated by an OLG-Model with log-preferences and ẁarm-glow' bequests or simply as a dynasty-model as in Matsuyama (2011). Both would not change the results qualitatively.

(1) can be rearranged to:

$$^{E}I^i_{t+1} = f'(k_{t+1}) - r_{t+1} + r_{t+1}sI^i_t + w(k_{t+1}) = (f'(k_{t+1}) - r_{t+1}) +^{L} I^i_{t+1} \tag{3}$$

Thus, an individual will always be willing to invest if

$$f'(k_{t+1}) \geq r_{t+1} \tag{4}$$

Because this does not depend on individual characteristics, this is also the condition for any investment to take place. We refer to this as the Profitability Constraint (PC). All individuals additionally underlie a borowing constraint (BC), however. This takes the form:

$$\lambda f'(k_{t+1}) \geq r_{t+1}(1 - sI^i_t) \tag{5}$$

This capital market imperfection lies in the heart of our analysis. It sais that an individual with income I^i_t can only pledge a share $\lambda < 1$ of the prospective return to her investment (LHS) on her payback (RHS).[8] This has two implications: First, ceteris paribus, an individual with a lower income has less collateral to bring in the investment, thus has to raise more credit and consequently finds it harder to warrant for the high repayment by the return to investment, i.e. have the condition satisfied. Secondly, a higher aggregate capital stock decreases the prospective returns and thus the probability of everyone to be eligable for credit. λ is a measure of credit market imperfection.
If (4) holds with inequality, i.e. if physical investment is more profitable than lending, everyone would like to invest rather than lend on the credit market. As long as agents can do so, this investment decreases the left hand side of both, (4) and (5). Therefore, for any given r_{t+1}, either one will bind to 'stop' investment activity. The equilibrium interest rate r_{t+1} will be determined by supply and demand in the credit market, as spelled out below. The borrowing constraint will be binding as long as $\frac{1-sI^i_t}{\lambda} \geq 1$ for some individual i.[9]
We will restrict ourselves in what follows to the case that this holds, which is equivalent to saying that the borrowing constraint (5) is always binding for some agents and the prof-

[8] Matsuyama (2004), p.860f, argues that this form of borrowing constraint stands in line with most microfoundations of capital market imperfections that can be found in the literature.

[9] To be exact, it has to bind for the critical agent as defined below. This will in equilibrium be equal to the lowest income, making the two statements equivalent.

itability constraint (4) holds with inequality, i.e. investment is strictly profitable.[10] Those agents (we will introduce the reason for ex post income heterogeneity later) which have to borrow only so little that investment can guarantee repayment, will borrow on the credit market and invest their savings and credit in physical capital and become entrepreneurs. All others will lend their savings as credit. If an entrepreneur has so many own funds, that these suffice for investment alone, she will make the investment and lend the remaining savings on the credit market, which also results in an entrepreneur's income given by (3).[11]

Now, how is equilibrium in the credit market, r_{t+1}, determined? Incomes in period t are given by the current capital stock(s). Now, because s is exogenous, also savings are given. They can only be invested or lent in the credit market, to again be borrowed by other agents to be invested.

W.l.o.g., order the agents increasing in their income, such that I_t^i is increasing in i. Now, we define $\tilde{i}_t$ as the agent which can just pledge investment, i.e. for whom the borrowing constraint (5) is exactly binding for a given r_{t+1}. Denote her critical income $\tilde{I}_t$, which is the income that just suffices such that (5) holds with equality:

$$\tilde{I}_t = \frac{r_{t+1} - \lambda f'(k_{t+1})}{s r_{t+1}} \tag{6}$$

All agents $i < \tilde{i}$ cannot invest, all agents $i \geq \tilde{i}$ can. It means that agents with a lower income and hence less colteral lend their savings, all those who can self-finance a larger share of investment will be able to invest. The lenders' savings, however, make up the supply side on the credit market, whereas the investors' borrowing represents the demand for credit. The former is hence increasing, the latter decreasing in $\tilde{i}$. In equilibrium both have to equal, such that $\tilde{i}$ is implicitly determined by

$$\int_0^{\tilde{i}} I_t^i di = (1 - \tilde{i}) - \int_{\tilde{i}}^1 I_t^i di$$

This is illustrated by figure 1(a). Because $\frac{\partial \tilde{I}_t}{\partial r_{t+1}} > 0$, to this $\tilde{i}$, there corresponds exactly one r_{t+1}. With a lower r_{t+1}, more agents would demand credit (and less would supply), driving

[10] Note, that this is different to Matsuyama (2004)'s analysis where an interior solution can only exist if the Profitability Constraint is binding in the richer countries. By cutting intertemporal links in individual incomes, he does not account for ex post heterogeneity between agents within countries, which changes the interpretation.

[11] We will still refer to such an agent as 'entrepreneur' rather than 'lender'.

the interest rate up, and vice versa. An alternative way of representation is hence that all savings have to be invested, such that $k_{t+1} = 1 - \tilde{i}(r_{t+1})$. The richest individuals will invest and the interest rate adjusts accordingly. This is illustrated by figure 1(b).
As we will see in what follows, the income distribution may have flat parts. If this is the case at $\tilde{i}_t$, some agents of those of equal income are credit rationed.
The equilibrium interest rate is then given by

$$r^*_{t+1} = f'(k_{t+1})\frac{\lambda}{1 - s\tilde{I}_t} \tag{7}$$

From this, we see that the credit market imperfection implies that there is a wedge between the equilibrium interest rate and the return to physical investment, the latter being greater by $\frac{1-s\tilde{I}_t}{\lambda}$, as long as the borrowing constraint is binding.

4 Autarky

Dynamics

It follows from the above analysis that in autarky all domestic savings in period t are invested in physical capital, i.e. $sf(k_t) = k_{t+1}$ - either directly by the saver or via lending. The interest rate r_{t+1} will adjust such that all savings find an investor. Thus, for the aggregate economy, Solow-type growth emerges, irrespective of the capital market imperfection. Figure 2 illustrates the dynamics.
When k_{t+1} is given, so is $f'(k_{t+1})$. Since every agent can invest only one unit of capital, the share of entrepreneurs in period $t+1$ is also given by k_{t+1}.
From (3), the income of an agent who becomes an entrepreneur will exceed that of an agent of same period-before income by exactly the excess profits of physical investment on her invested one unit of capital. She earns the wedge on what she borrows and and receives the higher returns on her own savings. If she can fully self-finance her investment, one unit of her savings is paid off with the higher return and the remainder is lent on the credit market. Since only the highest income (and thus highest savings) individuals are able to borrow and invest, they must have had a higher income in the period before also and so on. Thus, as long as the aggregate capital stock is increasing - and thus the share of entrepreneurs - an agent who was an entrepreneur the period before will be an entrepreneur in all succeeding periods

as well.[12] (2) and (3) imply that the ordering of agents according to their income does not change, due to the deterministic path-dependence of incomes. However, an increasing capital stock implies that in each period additional agents must become entrepreneurs. These must then have been lenders the period before and all periods before that. Figure 3 illustrates the transition and the resulting income distribution.

The interest rate thus has to adjust such that some lenders can become entrepreneurs and that they can just pledge payback by their income. Having only received wage income and saved part of that throughout from the beginning of the growth process, by iterating (2), this income is given by:

$$ {}^{L}I_t^i = w(k_t) + \sum_{i=0}^{t-1} w(k_i) s^{t-i} \prod_{j=0}^{t-i-1} r_{t-j} = \tilde{I}_t \tag{8} $$

which corresponds to an equilibrium interest rate given by (7). In each period, the income of the next 'new' entrepreneur fixes the interest rate which in turn determines next period's incomes and so on. With an increasing capital stock, also the wage rate increases over time. Because the interest rate changes over time and part of a lender's income is also given by the return on her savings, the increasing wage income does technically not necessarily imply a rising overall income. We will, however, assume that this is always the case, which is in line with the empirical evidence.[13]

Assumption 1 $\frac{\partial {}^{L}I_t^i}{\partial t} > 0$. *For the necessary restrictions on the production function, see Appendix A.*

The intuition behind this is that the rental rate must not decrease so much, that this eats up the increase in the wage income, which is always the case for reasonable parameter values. The capital income of the individual investor on the other hand decreases over time, but they benefit from the increase in the wage rate as well. The result on their overall income is ambiguous. However, more and more agents become entrepreneurs, yielding the higher income compared to that of the lenders.

[12] Obviously, there is heterogeneity within the group of entrepreneurs, depending on the time that they have been investors and have received the respective income.

[13] See e.g. Chen and Ravallion (2010).

Aggregate GNI in autarky in period t is given by

$$GNI_t^a = k_t(f'(k_t) - r_t) + \sum_{i=1}^{t-1} k_{t-i}(f'(k_{t-i}) - r_{t-i})s^i \prod_{j=0}^{i-1} r_{t-j} \\ + w(k_t) + \sum_{i=0}^{t-1} w(k_i)s^{t-i} \prod_{j=1}^{t-i} r_{t-j+1}$$

This representation emphasizes the fact that in each period the share of entrepreneurs receives an additional income on their invested capital (the terms in the first line), and all agents get a wage income (second line). All either get return on their saved incomes or need to repay them less, which leads to that all income is discounted through with the respective interest rate of all relevant periods.
Aggregate GNI_t^a, in autarky, must however be equal to $GDP_t^a = f(k_t)$. This drives, as already seen, also the dynamics of the aggregate capital stock, described by $sf(k_t) = k_{t+1}$.

Steady State

The dynamics implicitly define the steady state to which the autarky economy converges to, as depicted in figure 2:

$$sf(k^*) = k^* \tag{9}$$

In the steady state, the share of entrepreneurs is exactly k^*. The respective incomes of each type of agent converge to:

$${}^E I^* = \frac{f'(k^*) - r^* + w^*}{1 - r^* s} \tag{10}$$

$${}^L I^* = \frac{w^*}{1 - r^* s} \tag{11}$$

Where again the steady state interest rate is determined by the 'newest' entrepreneur's income, which is just given by (11).[14] It will adjust such that all savings can be invested by someone who is able to do so. The steady state level of investment is also unaffected by the effectiveness of the credit market imperfection.

[14] An alternative way to look at it would be that 'in' the steady state, no new entrepreneur will emerge and $\tilde{I}_t$ is the income of the 'last' entrepreneur. Taking that we always only approach the steady state, marginal shares of the population will become new entrepreneurs and the critical income is given by the income of the lenders. I prefer looking at it the latter way, even though it makes no difference for the analysis undertaken here, the results would be even clearer otherwise.

Note, that in the steady state, the savings of entrepreneurs cannot alone suffice to afford investment, i.e. $s\frac{f'(k^*)-r^*+w^*}{1-r^*s} < 1$. If they wouldn't demand credit, savings would be invested by new entrepreneurs.
GNI in the steady state is again equal to GDP, $f(k^*)$, and can be expressed as

$$GNI^{a*} = k^*\frac{f'(k^*) - r^*}{1 - r^*s} + \frac{w^*}{1 - r^*s} = \frac{k^*(f'(k^*) - r^*) + w^*}{1 - r^*s} \tag{12}$$

5 Open Capital Markets

Now, consider a small open economy in the South, which is fully described by the above characteristics, opens up to the world market. To focus on the structural mechanism, assume that all other countries in the world (the North) are of the exactly same type. Especially, the level of capital market imperfection λ is equal in all countries, implying that differences in the competitiveness on the credit market arise from differences in incomes solely.[15] The difference is given only by that they are already more progressed, whereas the opening economy is behind in the process of development. This is the same as saying that a country in a lower autarky t opens to a world in a higher t. For convenience, we will assume that the world is already in its steady state. This is not crucial, the analysis holds for all cases where a less developed country opens up to a more progressed world. This is then mirrored by a difference in the relative capital endowment. Denote the given capital ratio in period T by k_T for the home country and that of the world $k_T^W = k^*$, with T being the period of opening up.
Opening up now implies two things: First, investors can freely invest in physical capital whereever they wish, investment becoming effective the respective next period. The only restriction is that each investor can only make one indivisible investment and needs to decide where to do so. Secondly, agents can freely lend and borrow at the world market for financial capital. Lenders receive the world market return r_{t+1} on their savings. Potential borrowers face this credit cost and face the borrowing constraint which is dependent on the prospective return in the destination of their planned investment decision as well as their individiual incomes.

[15] Loosening this assumption would magnify our results while making the weaker point that institutional differences account for differences in development. The abstraction made here shall distinguish a different feature of same market interaction.

In period T, all incomes are given by the capital installed and the history of incomes in the closed economy. Because $k_T < k_T^W$, capital returns in South are higher. Therefore, and because the good is freely shipped, northern investors will for the next period rather invest in the South until returns are equalized such that $k_{T+1} = k_{T+1}^W = k^*$. Returns depend neither on the individual pursuing the investment nor the destination country, be it home or foreign. Now consider what happens on the market for credit. The world market return to financial capital is given by r^*. Agent i is able to pledge investment in period $T+1$ iff

$$\lambda f'(k^*) \geq r^*(1 - sI_T^i) \quad \Leftrightarrow \quad I_T^i \geq \frac{r^* - \lambda f'(k^*)}{sr^*} \tag{13}$$

The world interest rate r^* is however determined exactly such that for a lender with steady state income, given by (11), condition (13) is satisfied with equality, i.e. $\tilde{I}_T = {}^L I^* = \frac{w^*}{1-r^*s}$. Thus, agents in South can just guarantuee repayment on their loan if their income exceeds that of a steady state lender. For those that are already entrepreneurs in the moment of opening up, it is not clear whether this holds, i.e. whether ${}^E I_T^i > \tilde{I}_T$. It may hold for all, for only some, or for none of those that had already invested.[16]

However, by Assumption 1, income of those that have been lenders until T is strictly lower than in the steady state, ${}^L I_T < {}^L I^* = \tilde{I}_T$. Thus, these agents cannot pledge investment for $T+1$ at world market conditions.

Now, denote the share of those in South that can in T pledge investment for the next period by $\tilde{k}_{T+1} \equiv \tilde{k}$. By the above argument, at most all past entrepreneurs in T can at world market conditions again become entrepreneurs. Their number was given by k_T, thus the share of entrepreneurs in the opening economy will be smaller than or equal to as it was just before opening up and

$$\tilde{k} \leq k_T \tag{14}$$

holds.[17]

What happens in the following periods? In period $T+1$, foreign investment becomes effective and the physical capital stock in the economy is given by k^*. The increase in the capital stock raises the wage rate in $T+1$ to w^*. This is an immediate gain for the entire population and increases the balance sheet for pledging investment for the subsequent periods. But, the

[16] Because returns and thus investors' incomes are higher the lower the capital stock, it is more likely that it holds for some or even all, the more backward the country is when opening up.

[17] It holds with equality if all past entrepreneurs can become entrpreneurs in the open economy. Note, that the timing of investment is not crucial for the result.

income of a lender from period T to period $T+1$ in South is given by:

$$^{LS}I^i_{T+1} = w^* + sr^* I^i_T < w^* + sr^* \frac{w^*}{1 - r^* s} = \tilde{I}_{T+1} \tag{15}$$

where the latter equality derives from the fact that the income just sufficient for pledging investment can be expressed as the wage income in steady state plus the savings on previos income. This is the same for a (new or historic) lender in South, only that her income the period before was lower, and thus are her savings. Consequently her current income in $T+1$ is still lower than that of a steady state lender. This on the other hand implies that she can still not pledge investment for period $T+2$ when facing world market returns to capital. This argument, then, holds for all following periods. Thus, who could not invest in period T will never be able to invest in future periods and the share of entrepreneurs will not expand over time, being fixed at $\tilde{k} \leq k_T < k^*$. The trickle-down mechanism is disrupted when the economy opens up to world capital markets. This is illustrated in figure 4 (for the case of all past entrepreneurs being able to borrow internationally).

Especially for low levels of development, the capital inflow and concurring increase in the wage rate implies an immediate gain in individual incomes. But what is happening at the same time is that, due to FDI, the prospective returns for capital decrease so much that the agents in South still cannot pledge investment despite their risen income.

GNI thus also initially increases due to the inflow of FDI. It now doesn't have to equal GDP, which immediately jumps to $GDP^o_t = f(k^*)$ for $t > T$.

GNI, in contrast, is given by

$$GNI^o_t = \tilde{k}(f'(k^*) - r^*) \sum_{i=0}^{t-T-1} (sr^*)^i$$
$$+ w(k^*) \sum_{i=0}^{t-T-1} (sr^*)^i + f(k_T)(sr^*)^{t-T}$$

which is the constant capital income of the constant share of investors plus the constant wage payments, each transferred at the same rate throughout time from period T on, plus the remaining savings on income in period T. Figure 5 illustrates the time dynamics of this and contrasts it to the situation in autarky. In autarky, capital would build up slowly, but the share of investors would expand, who would then reap the surplus profits on physical investment. When opening up, capital rushes into the country, but domestic agents will

never be able to become entrepreneurs and benefit from the gains of capital ownership. The steady state values for GNI in the respective situations read

$$GNI^{a*} = k^* \frac{f'(k^*) - r^*}{1 - r^* s} + \frac{w^*}{1 - r^* s}$$

$$GNI^{o*} = \tilde{k} \frac{f'(k^*) - r^*}{1 - r^* s} + \frac{w^*}{1 - r^* s}$$

Because $\tilde{k} \leq k_T < k^*$, steady state national income will always be lower when the country has opened up to international markets in the process of development. In the long run, labor income would have been the same. But, in autarky, capital ownership and the concurring profits would be in domestic hands, which they are not if a country integrates into international capital markets. The standard neoclassical result of initial gains due to capital inflows is bought at the expense of a disruption in the trickle-down process.

6 The Structure of Capital Flows

The resulting structure of capital flows in and out of the country is easily analyzed, concentrating on the steady state for exposition.[18] Since the share of domestic investors who each invest 1 unit of capital is lower than the overall capital stock, FDI into the country is positive and given by the difference of the two:

$$FDI^* = k^* - \tilde{k} > 0 \tag{16}$$

The outflow of financial capital is given by the difference in overall savings by domestic agents and what of savings is invested by domestic agents. The latter is just given by $\tilde{k} = k^* - (k^* - \tilde{k})$. Savings are the same as in autarky, where they would just constitute steady state capital stock, lowered by the not occuring savings on the missed out returns to physical capital, i.e. by $S^o = k^* - s(k^* - \tilde{k}) \frac{f'(k^*) - r^*}{1 - r^* s}$.

[18] I here talk about 'net' flows in the sense of net for each type of capital flow - financial and direct investment. In the absence of costs to international investment, all domestic investors could invest abroad and all domestic capital could be FDI. We simply assume that an investor first invests at home as long as this yields the same return.

Financial capital outflow as the difference of these two is thus given by

$$\begin{aligned} FC^* &= k^* - (k^* - \tilde{k})s\frac{f'(k^*) - r^*}{1 - r^*s} - [k^* - (k^* - \tilde{k})] \\ &= (k^* - \tilde{k})\left(1 - s\frac{f'(k^*) - r^*}{1 - r^*s}\right) > 0 \end{aligned} \tag{17}$$

where the last inequality derives from the fact that savings on capital income in the steady state must be smaller than 1, as shown above. Compared to the autarky steady state, the reduction in savings is not as high as the difference in investment by domestic agents that is crowded out by foreign investment. These excess savings flow out of the country via the credit market, to flow back as direct investment.
The aggregate financial account is given by the difference between the outflow of financial capital (17) and FDI-inflow (16)

$$FA^* = (k^* - \tilde{k})\left(-s\frac{f'(k^*) - r^*}{1 - r^*s}\right) < 0 \tag{18}$$

This is exactly the pattern that we see in table 1.
The inflow of capital is mirrored by the outflow of factor income that shows responsible for lost out welfare in the long run.

7 Extensions

The basic setting considered so far was a simple and tractable way to isolate the effect of how FDI crowds out domestic investment in developing countries. As that, the equilibrium described has some features that we would not expect to see in the world. That is for example, that with otherwise identical countries, the productive capital stock (although not owned) in the developing is the same as in more developed countries after opening up, and immediately so. As a result, in the steady state, income of lenders approaches the critical income, thus technically bringing them close to become entrepreneurs themselves when in a 'large' rest of the world, an infinite amount of investment projects is potentially realizable. Also, we will be interested how this structure of capital flows and ownership affects agents in the northern countries. Therefore, in the following, we will look at how the presented mechanism interacts with other differences that are observable in reality. The result is, that

the income diverging effect of FDI is even magnified by these differences.
We will first extend the analysis to a two-country-setting and then look at the interaction when the developing country does not only lag behind in capital endowment but also exhibits a lower total factor productivity. Both extensions should hold as a robustness check for the validity of the theory, as well as an elaboration of its predictions.

7.1 Two Country Setting

The two country setting follows straightfoward from the analysis in section 5. Consider, country 'South', as before in period T, integrates its capital markets with 'North', which is now of same size. Both countries have grown as in section 4, only that $k_T^N > k_T^S$. Free movement of investment equalizes capital stocks from period $T+1$ on. The capital stock in each country is given by half of aggregate world savings, i.e. $k_{T+1}^S = k_{T+1}^N = \frac{1}{2}s(f(k_T^N) + f(k_T^S)) \equiv \bar{k}_{T+1}$. The capital stock in North is smaller as compared to autarky when opening up, by exactly the amount that it is increased in South. The dynamics of national capital stocks then follow Solow-type growth for both countries parallelly: $\bar{k}_{t+1} = \frac{1}{2}s2f(\bar{k}_t) = sf(\bar{k}_t), \ \forall t > T$.
However, income dynamics are disparate between the countries after opening up. As before, the credit market imperfection defines the critical income as given in (6), being the same for agents in both countries. (15) now reads

$$ {}^L I_{t+1}^S = w(\bar{k}_{t+1}) + sr_{t+1} {}^L I_t^S < w(\bar{k}_{t+1}) + sr_{t+1} {}^L I_t^N = {}^L I_{t+1}^N \tag{19} $$

$\forall t \geq T$. Because ${}^L I_T^S < {}^L I_T^N$, all new capital will be invested by northern agents. Define the share of entrepreneurs in South who could pledge for borrowing in T as $\tilde{k}^S \in [0, k_T^S]$. This share will again not expand. In contrast, the share of entrepreneurs in North is given by $\tilde{k}_t^N = 2\bar{k}_t - \tilde{k}^S$, which is increasing as long as the world economy is growing. GNI in country j is analogously given by

$$ \begin{aligned} GNI_t^j = \tilde{k}_t^j(f'(\bar{k}_t) - r_t) + \sum_{i=1}^{t-T-1} \tilde{k}_{t-i}^j(f'(\bar{k}_{t-i}) - r_{t-i}) s^i \prod_{h=0}^{i-1} r_{t-h} \\ + w(\bar{k}_t) + \sum_{i=1}^{t-T-1} w(\bar{k}_i) s^i \prod_{h=0}^{i-1} r_{t-h} + f(k_t^j) s^{t-T} \prod_{h=0}^{t-T-1} r_{t-h} \end{aligned} $$

National income will increase for both countries with an increasing capital stock. However, South does not expand its share of entrepreneurs, whereas North does, by investing in both countries. South does - after an initial gain due to capital inflows - not only grow slower than North in terms of income, it does so also slower than it would have under autarky at that level.
Steady State national incomes are given by:

$$GNI^{j*} = \tilde{k}^j \frac{f'(k^*) - r^*}{1 - r^* s} + \frac{w^*}{1 - r^* s}$$

where $\tilde{k^N} = 2k_t^* - \tilde{k}^S$. National income in South is strictly lower than in North and, in the long run, again also lower than it would have been under autarky. South hence unambiguously loses by integrating its capital market with a more advanced country. North, in turn gains in the long run, even though pure workers initially lose due to the outflow of productive capital.[19]
The two-country equilibrium is even more stable than the small open economy case. Even though the income of a lender in South approaches that of a Northern lender and thus the critical income for investment in the steady state, this does not create investment chances in large scale. The reason is, that all entrepreneurs' income is still higher than that of lenders all over the world and the historical entrepreneurs will also in steady state re-take investment chances, not leaving much room for 'new' investment. The time dimension does enter here - not in that investment is taken, but in that incomes are distributed which determine borrowing, and thus investment possibilities.

7.2 TFP-Differences

It is widely argued that capital flows to South are reduced because human capital, infrastructure, etc. in developing countries are not comparable to those in developed economies. By affecting the incentives for FDI, this will obviously interact with the mechanism described here.

[19]The structure of capital flows is analogolous to the analysis in section 6. Capital inflows in South are now capital outflows in North and vice versa.

Consider South exhibits lower total factor productivity than North, such that

$$f^S(k) = \delta f(k) \qquad \delta < 1$$

Consequently, $f'^S(k) = \delta f'(k)$ and $w^S(k) = \delta w(k)$.
In autarky, South would converge to a steady state given by $s\delta f(k^{*S,a}) = k^{*S,a} \Leftrightarrow \frac{f(k^*)^{S,a}}{k^{*S,a}} = \frac{1}{s\delta}$. Because the LHS is decreasing in k, $k^{*S,a}$ is lower than in the autarky steady state with higher TFP and thus lower than that in North.
If the two countries integrate their capital markets in T, capital returns from T+1 are equalized. Suppose $f'^S(k_T^S) > f'(k_T^N)$, such that some FDI will still take place in South, as empirically relevant. From T+1, relative capital stocks are implicitly determined by $f'^S(k_t^S) = \delta f'(k_t^S) = f'(k_t^N) \equiv \bar{f}'_t$. Consequently, $k_t^N > k_t^S$ holds $\forall t > T$. The capital stock, and with it GDP, is increased in South, but still lower than in North after opening up.
Again, the critical income to just pledge investment is given by $\tilde{I}_t = \frac{r_{t+1} - \lambda \bar{f}'_t}{r_{t+1} s}$, which is equal for agents in both countries. Lenders' income in South is equivalently given by

$${}^L I_{t+1}^S = \delta w(k_{t+1}^S) + s r_{t+1} {}^L I_t^S < w(k_{t+1}^N) + s r_{t+1} {}^L I_t^N = {}^L I_{t+1}^N$$

It is thus again not sufficient to pledge borrowing in open markets for southern agents. Note, that the difference is even greater than with equal TFP, because a lower capital stock and lower overall productivity reduce wage income in comparison to lenders in North, in addition to the lower historical income. Consequently, as for identical countries, all investment after opening up will be pursued by northern agents, such that $\tilde{k}_t^S = \tilde{k}_{T+1} \leq k_T^S$.
Steady state amounts of capital stocks are equal to autarky steady state amounts, $k^{*S,o} = k^{*S,a}$ and $k^{*N,o} = k^*$.[20] GNI in either country j in the steady state read

$$GNI^{j*} = \tilde{k}^j \frac{f'(k^{*j}) - r^*}{1 - r^* s} + \frac{w^{*j}}{1 - r^* s}$$

where $\tilde{k}^N = k^* + k^{*S} - \tilde{k}^S > k^*$.
Because as before, $\tilde{k}_t^S < k^{*S}$ holds, income in South is reduced by missed out investment returns $(k^{*S} - \tilde{k}^S) \frac{f'(k^{*S}) - r^*}{1 - r^* s}$, and analogously increased in North as an outcome of global-

[20] This is a direct result from that world savings has to equal world investment - as in autarky - and Jensen's Inequality. Throughout the growth process, by the same argument, capital stocks installed evolve as in autarky from their values at period T+1 on.

ization in the long run. The result of diverging incomes (and disparate growth) induced by FDI still holds in this setting when countries are not identical and capital stocks installed do not equalize. It holds even stronger, because incomes are then diverging and chances on investment further reduced for Southern agents. The underlying mechanism is not driven by the simplifying assumptions made earlier.

8 Conclusion and Outlook

We have seen that introducing imperfect capital markets into a neoclassical model of growth draws the attention the individual income distribution in the growing economy(-ies). In a very stylized way, the difference between capital owners' and pure workers' incomes created by the capital market imperfection shows responsible for within-country inequality whereas differences in the amount of productive capital installed creates within-group-between-countries differences. The natural trickle-down process that autarky growth entails is disrupted when an economy opens up to international markets with more progressed countries. The reason is that FDI flows in, which raises the capital stock but at the same time reduces its marginal product and thus possibilities to invest. Because the poorer country's agents cannot compete on the market for credit given this new conditions, the share of entrepreneurs will not expand anymore, despite an initially risen income due to the capital inflow. In the long run, the missed out returns on investment lower national income in comparison to the autarky steady state.

Extending the model to a two-country analysis yields a pattern of parallel, but disparate growth. The story thus concurrently shows motives for richer countries to push poorer countries into integration to international markets even though this might be harmful for them: Obviously, the losses of the poor countries in the steady state are mirrored by gains for foreign investors (whereas the initial inflow is the well known win-win situation of a static analysis).

It shows that the structure of capital flows and incomes of countries are mutually interdependent. This is different from saying that each type of capital flows has different idiosyncratic reasons to flow in either direction. Instead, an inflow of FDI, outflow of financial capital and underdevelopment are different sides of the same story here.

To emphasize this basic mechanism, we have first abstracted from any other differences between countries other than the capital stock. This assumption is strong and hints at the

possibility, that countries that lag behind could have developed in the same way as developed countries if they wouldn't have integrated their capital markets and let FDI flow into the country. This perspective has not been widespread in formal theories of economic growth before.

However, the assumption can be relaxed without altering the model's qualitative predictions. A developing country will also lose from integration when its productivity is lower and hence the inflow of FDI, and with it the productive capital stock. In this case, the split is even clearer, because agents in this country would never be able to invest neither at home nor abroad in an international capital market. They would still have built up some capital with a closed financial account.

However, even when accounting for productivity differences, in the model, GDP is the same in the long run as it would be in autarky. It even jumps initially to that level. This is obviously simplifying. As Mankiw et al. (1992) have shown, the reason for lower productivity could well be differences in human capital of poorer countries' working force. In the spirit of Galor and Zeira (1993), this is even more probable if credit markets are imperfect, such that poorer agents cannot borrow to invest in schooling. Because FDI is unlikely to reduce returns to investment in human capital, an initial inflow of capital could on the contrary rather loosen these constraints and increase incentives to invest in schooling or public goods. Thus, the story could have two sides to it, depending on how the initial income gain is used. This might well be an explanation for the quite distinct experiences with capital market integration for developing economies.

Another reason for a reduced capital inflow could be that the final good is not freely traded. If it were costly to repatriate the profits from FDI, returns would have to be accordingly higher, thus invested capital (and GDP) lower. This has two effects: First, wage income is lower. Second, the return to investment of domestic agents is higher. Both work in opposite directions regarding chances on the market for credit. Depending on which effect dominates, trade costs might either safeguard poor countries against harmful FDI but jump-start growth, or might even worsen the effect of opening up by making producing for foreign countries even less profitable. If an equilibrium with two-way capital flows still emerges when trade is costly, then the world as a whole would lose due to the dislocation of production from consumption sites.

From a policy perspective, both possible further extensions - human capital and trade costs - interact with the time dimension of the model described in the way that it may contribute

to the decision about when to open best in the process of development.

The theory presented here is very stylized. By abstracting from many other mechanisms that are involved with international capital market integration, it does not claim that these are not at work. It is only to point out an additional aspect to be taken into consideration, both, from a theoretical point of view and from policy perspective. In the first place, it draws the attention to the fact that the observed structure of two-way capital flows may be both result of and reason for income disparities between countries. As hinted at, it may in many ways interact with well-known results regarding capital market integration. It thus does add a novel argument by introducing a new dimension to the discussion about the welfare effects of globalization.

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A Assumption 1

We want to show under which conditions the income of lenders, ${}^{L}I^{i}_{t+1} = r_{t+1}sI^{i}_{t} + w(k_{t+1})$, is increasing over time.
Dropping the individual index for readability, this condition is given by $w_t + r_t s I_{t-1} > I_{t-1} \forall t$. Inserting (7) and rearranging yields:

$$I^2_{t-1} - \frac{1 + sw_t - s\lambda f'(k_t)}{s} I_{t-1} + \frac{w_t}{s} > 0 \tag{20}$$

The LHS is an upward opened parabola. Solving for its zeros yields

$$I_{t-1;1,2} = \frac{1 + sw_t - s\lambda f'(k_t)}{2s} \pm \sqrt{\left(\frac{1 + sw_t - s\lambda f'(k_t)}{2s}\right)^2 - \frac{w_t}{s}} \tag{21}$$

Now, we have to make some case distinctions:
a) For $\left(\frac{1+sw_t-s\lambda f'(k_t)}{2s}\right)^2 < \frac{w_t}{s}$, this has no solutions. Therefore for all I_{t-1}, The LHS of (20) is positive and income is unambiguously increasing.
b) If, now $\left(\frac{1+sw_t-s\lambda f'(k_t)}{2s}\right)^2 > \frac{w_t}{s}$ holds, such that (21) has two solutions, two cases may occur:
i)$1 + sw_t - s\lambda f'(k_t) < 0$. This is the case if the marginal product of capital is high and the wage rate rather low, i.e. especially likely in the beginning of the growth process. Because $\frac{w_t}{s} > 0$, both are in the negative range of I_{t-1}. Therefore, for all positive values of I_{t-1}, condition (20) still holds, and income is further increasing (Note, that first period income is always positive). ii)If $1 + sw_t - s\lambda f'(k_t) > 0$, the zeros are in the positive range of I_{t-1}, such that for some incomes in between, we may have a decreasing income. Note, that this is the case only if the wage rate is sufficiently high compared to the return to physical capital, i.e. this would in any case only occur towards the end of the growth process.
We can see that, with the evolution of the return to capital throughout the growth process, the likelihood runs from case b)i) to case a) to case b)ii). Note also, that even in the last case, if income is already sufficiently high (i.e. greater than the solutions to (21), it will further increase anyway. However, to avoid taxoconomical exposition, we can easily assume that even in the steady state, where (20) is most likely not to hold, it will still hold, i.e. we assume:

If

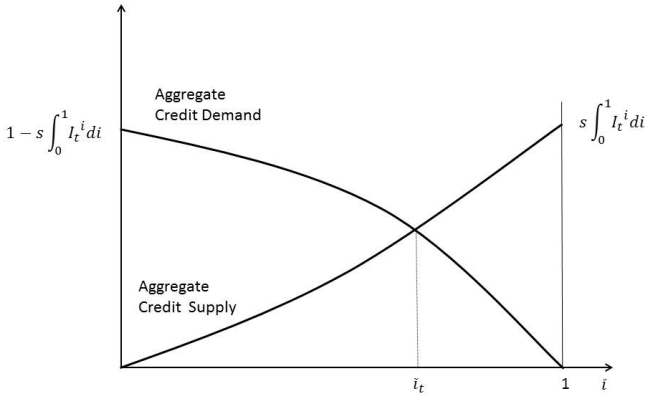
$$1 + sw^* - s\lambda f'(k^*) > 0$$

then

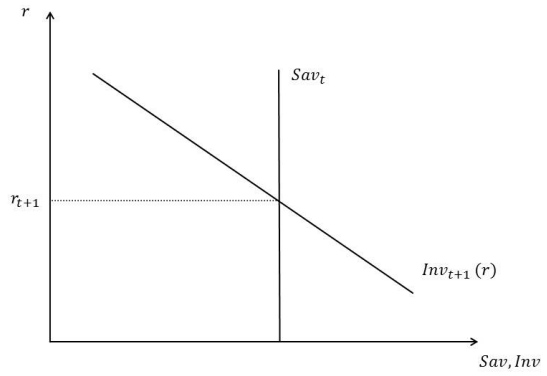
$$\left(\frac{1 + sw^* - s\lambda f'(k^*)}{2s}\right)^2 < \frac{w^*}{s}$$

In words, this is equivalent to assuming that the return to investment in physical capital is still sufficiently high throughout the growth process up to the steady state.

B Figures



(a)



(b)

Figure 1: Credit market equilibrium

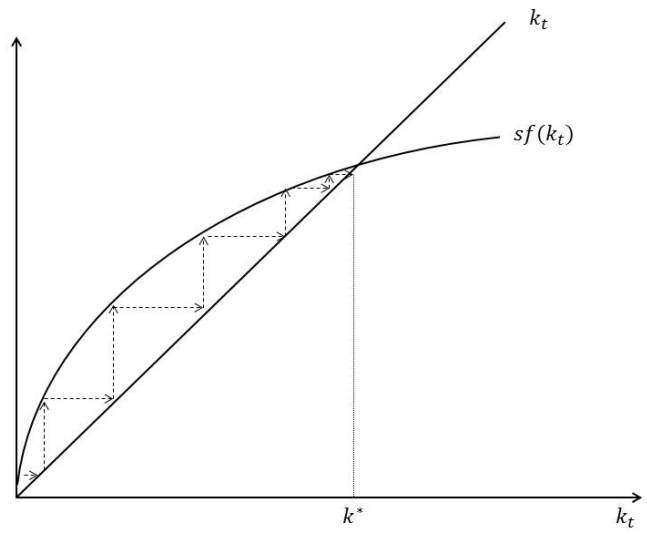


Figure 2: Autarky Dynamics

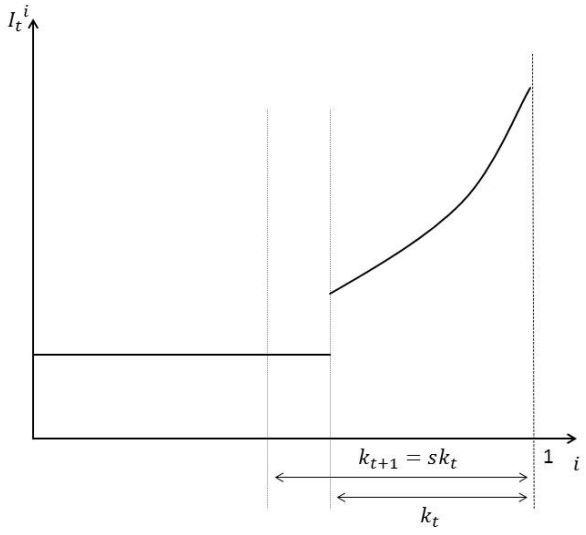


Figure 3: Autarky Transition

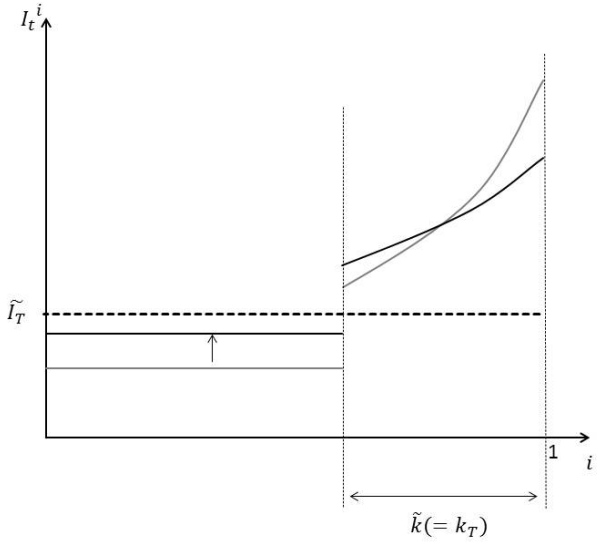


Figure 4: An Economy opening up

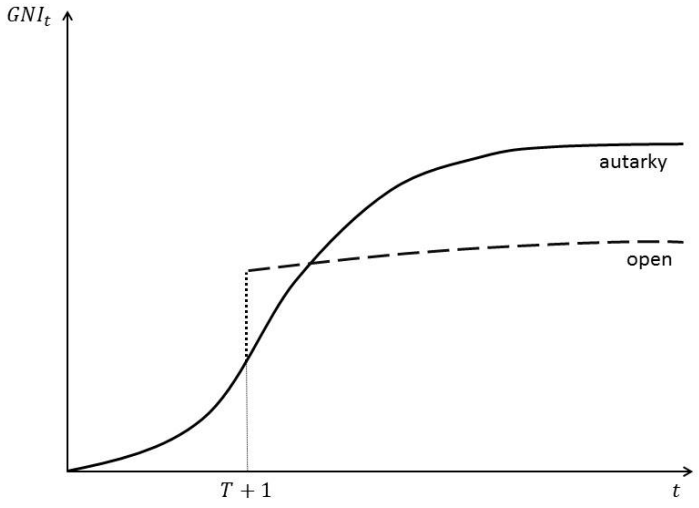


Figure 5: Timepath of GNI