Rethinking the Effects of Financial Liberalization

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VERY PRELIMINARY AND INCOMPLETE

Abstract

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During the last few decades, many countries have lifted restrictions on cross-border financial transactions. The incidence of domestic banking and financial crises has grown alongside. The correlation between financial openness and the incidence of financial crises is illustrated in Figure 1 for the case of banking crises. In this paper we argue that the increased instability of domestic financial markets can be partly explained by a change in government behavior resulting from financial globalization.

The first step to develop this argument is to note that the probability of a financial crisis depends on the nature of financial regulations and the judicial system’s resolve to enforce contracts. Governments can take actions that lower this probability, but this usually entails a cost. This might be a fiscal cost such as, for instance, raising funds to insure deposits or bailout financial institutions. Or this cost might be foregoing good but risky investment opportunities to enhance the safety of the financial sector.

The second step to our argument is that governments cannot fully discriminate between domestic and foreign asset trade when regulating and/or enforcing debt contracts. In the case of bonds and stocks, discriminating against foreigners is difficult because they can resell these assets to domestic residents in secondary markets.\footnote{Even when trade is intermediated by banks and other financial institutions, discrimination is difficult since it is not possible to know the nationality of the clients of these intermediaries or how default losses would be distributed among them. Finally, courts often abide by equal-treatment rules that limit the possibility of discrimination based on nationality.}

The third step of our argument is that globalization changes the mix of creditors, raising the number of foreign holders of domestic debts. Since governments typically care less about the losses that financial crises create to foreign creditors, globalization leads to unsafe financial regulations and weakens the incentives to develop a strong judicial system to enforce contracts.

This paper shows the implications of this view for the theory of financial integration.\footnote{To do this, we develop a tractable analytical framework that extends the popular Solow model to allow for imperfect debt enforcement. Despite its simplicity, this framework is a rich source of testable hypotheses linking the success or failure of financial liberalization to observable country characteristics such as initial income, savings, the level of productivity, the quality of enforcement institutions and luck. The model can account for a number of observed effects of financial liberalization that conventional models have had a hard time explaining.}

Capital flows to emerging markets have often been quite small and sometimes even negative.

\footnote{There are a few recent papers that also assume that debt enforcement is non-discriminatory. Broner and Ventura (2011) explore the effects of financial liberalization on the degree to which individuals can share risks within and between countries. Bruttì (2011) and Gennaioli, Martin, and Rossi (2014) explore the effects on sovereign debt and tax policy.}
Conventional models recognize that foreign sources of financing can be risky, as the temptation for opportunistic default combined with low-quality institutions can generate recurrent foreign debt crisis. But they also assume that domestic savings stay at home, and that new foreign sources of financing would constitute a net addition to overall development financing. If debt enforcement is not discriminatory however, defaults will not only affect foreign debts but also domestic ones. If defaults happen anyway, domestic savers will find it optimal to send part or all of their savings abroad. This detrimental “capital flight” effect was not anticipated by conventional models. But it means that financial liberalization not only adds new foreign sources of financing that are cheap but risky, but also subtracts domestic sources of financing that were expensive but safe. This tends to raise gross capital flows but has an ambiguous effect on net capital flows and overall development financing.

Financial liberalization has led to substantial capital flows to some emerging markets that were already somewhat rich. Conventional models predict that these countries should benefit from financial liberalization, but probably less so than poorer countries. The reason, of course, is that these countries already had a substantial amount of domestic savings and their needs for foreign financing were less acute. If debt enforcement is not discriminatory however, enforcing domestic debts implies also enforcing foreign ones. If domestic markets are deep enough, the desire to enforce domestic debts reduces or eliminates the temptation for opportunistic default on foreigners. This beneficial “financial depth” effect, which was not anticipated by conventional models, lowers the risk of foreign borrowing and raises capital flows.

Financial liberalization has led to capital flows that are volatile and procyclical and has raised the instability of domestic financial markets. The two effects discussed above suggest that two equilibria are possible depending on investor sentiment. If domestic savers are pessimistic and think that the probability of default is high, they will prefer to send most of their savings abroad. In this case, default affects mostly foreign debts and countries will prefer to default ex post, confirming the pessimistic beliefs. This equilibrium with small or negative capital inflows always exists. If instead domestic savers are optimistic and think that the probability of default is small, they will keep their savings at home. In this case, default would affect mostly domestic debts and countries will prefer not to default ex post, confirming the optimistic beliefs. This equilibrium with substantial capital inflows exists only if domestic savings are high relative to foreign borrowing. We describe these equilibria and show how changes in investor sentiment can generate macroeconomic volatility and procyclical capital flows.

Our theory provides an example of how globalization strains existing institutions. We start from a situation in which, despite imperfect enforcement institutions, domestic debts are enforced.
After financial liberalization, and despite no institutional change, domestic debts might no longer be enforced. The basic point is that globalization affects policy incentives, sometimes accentuating the shortcomings of imperfect institutions. This simple observation, which is key to understand why the conventional view failed, is a main theme in this paper.

The paper is organized in four sections. Section 1 develops the basic analytical framework used throughout the paper. This is a standard growth model of a country that is not always willing to enforce debts. Section 2 solves the model in autarky and shows that enforcement problems do not arise when all debts are domestic. Section 3 solves the model after financial liberalization. Section 4 analyzes the model for the particular case in which there is a representative agent and/or enforcement is discriminatory and shows that in these cases the model delivers “conventional” results. Section 5 analyzes the general case with asset trade between domestic residents and imperfect discrimination. It explores the interactions between domestic and international asset trade and explores a range of novel results. Section 6 discusses our main results and their relation to the literature. Section 7 concludes with some speculative remarks on the potential role of economic policy. Before all of this, we offer a short discussion of the most relevant empirical and theoretical literatures.

Empirical literature:

There is a vast empirical literature on the effects of financial liberalization. However, this literature is subject to important data limitations. In particular, there is a small number of episodes, financial liberalizations are accompanied by other policy reforms, and countries probably take into account the potential effects of liberalization when deciding whether to liberalize or not. As a result of these data limitations, there is no strong consensus regarding the effects of financial liberalization.

Regarding level effects, there are many cross-country studies that have shown that financial liberalization in developing countries has not led to an increase in investment, growth, or even net capital inflows. See for example Rodrik (1998), Arteta, Eichengreen, and Wyplosz (2001), Edwards (2001), and Bonfiglioli (2008). Henry (2007) argues that liberalizations do increase investment and growth, but that the effects are temporary. Bekaert, Harvey, and Lundblad (2005) argue that stock market liberalizations do increase growth. And Levchenko, Ranciere, and Thoenig (2009) also find positive growth effects when analyzing industry level data.\(^3\) One robust result

\(^3\)Another important issue is whether, as suggested by Lucas (1990), the return to capital in developing countries is not higher than in advanced countries due to productivity differences. Caselli and Feyrer (2007) present evidence consistent with this interpretation. However, their methodology is based on the assumption that domestic financial markets work perfectly, which is inconsistent with Banerjee and Duflo’s (2005) findings of very large differences in the return to capital within developing countries. Also, during the first wave of financial globalization in the late 19th century, when developing countries were effectively colonies and sovereign risk was less of a problem, capital flows to developing countries were extremely high (see Obstfeld and Taylor, 2004).
in the literature is that the effects of financial liberalization depend on country characteristics. In particular, Arteta, Eichengreen, and Wyplosz (2001), Edwards (2001), Bekaert, Harvey, and Lundblad (2005), Alfaro, Kalemli-Ozcan, and Volosovskyh (2008), and Papaioannou (2009) show that liberalization in developing countries leads to larger capital inflows, and higher investment and growth in countries with stronger institutions, more developed domestic financial markets, and higher initial income.

Regarding volatility effects, there is some evidence that financial liberalization increases macroeconomic volatility. This was argued for the case of Latin America by Díaz-Alejandro (1985), and in cross-country evidence by Kaminsky and Reinhart (1999) and Kose, Prasad, and Terrones (2003). However, Bekaert, Harvey, and Lundblad (2006) argue that stock market liberalizations lower consumption volatility. As in the case of level effects, there is robust evidence that the effects of liberalization depend on country characteristics. In particular, Bekaert, Harvey, and Lundblad (2006) and Broner and Rigobon (2006) show that both consumption volatility and the volatility of capital flows is higher in countries with weak institutions and underdeveloped domestic financial markets. Also, Reinhart and Rogoff (2009) use long-run historical data to show that the frequency of crises is a persistent characteristic of countries, although Ranciere, Tornell, and Westermann (2008) provide evidence that countries that are subject to crises grow on average faster than countries that follow a more cautious development strategy. For a thorough review of the effects of financial liberalizations, see the surveys by Prasad, Rajan, and Subramanian (2007), Kose, Prasad, Rogoff, and Wei (2009), and Obstfeld (2009).

There are a number of papers that provide evidence regarding the interactions of domestic and international financial markets emphasized in this paper. In particular, Kaminsky and Reinhart (1999), Borensztein and Panizza (2008), Gennaioli, Martin, and Rossi (2014), and Reinhart and Rogoff (2009) show that domestic financial crises are more frequent during periods of international financial integration, and that defaults on foreign debts are associated with domestic financial crises.

Theoretical literature:

The theoretical underpinnings of the conventional view were laid out by the maximizing models that took over the field of international economics in the early 1980s. These models were designed to study the pattern of capital flows and their macroeconomic consequences, and sprang from two sources: (i) the so-called intertemporal approach (IA) to the current account studied the case in which the costs of international risk sharing are prohibitive; and (ii) the open-economy versions of the Real Business Cycle (RBC) model went to the other extreme and studied the case in which these costs are negligible. See Obstfeld and Rogoff (1996) for a textbook treatment of these models.
In the case of industrial countries, Ventura (2003) shows that the IA models perform quite well empirically. Instead, RBC models predict much more international risk sharing than observed in the data. This is why a lot of the recent research in the field has focused on explaining why risk sharing is so low among industrial countries. See the surveys by Lewis (1999), Karolyi and Stultz (2003) and Sercu and Vanpée (2007).

In the case of emerging markets, it was recognized early on that neither the IA nor the RBC models would prove appropriate. Recall that these models were being developed against the background of the worst sovereign debt crisis since the 1930s. Consequently, a new class of models was developed emphasizing the role of strategic default on foreign debts (also called sovereign risk). See the seminal papers by Eaton and Gersovitz (1981), Grossman and van Huyck (1988), Bulow and Rogoff (1989a and 1989b) and Atkeson (1991), and the excellent survey by Eaton and Fernández (1995). It is widely believed that the predictions of these models for financial liberalization are essentially the same as those of the IA models. Strategic default reduces the size of the effects, but it does not change their nature. This is the view that we label “conventional” and that we challenge here. Taking as starting point a prototype model of strategic default, we show that this view hinges on the unrealistic assumption that domestic debts are unaffected by default on foreign debts. Once this assumption is removed, the effects of financial liberalization can be quite different from those predicted by the IA models. Our work shows that there is much more to the models of strategic default than what it has been uncovered so far, and that the classic research strategy of extending the IA models to include strategic default has not been exhausted yet.

This is not to say that this is the only useful research strategy, of course. A number of papers have challenged the conventional view by shifting the focus away from macroeconomic or sovereign risk and towards microeconomic frictions in financial markets. In a seminal paper, Gertler and Rogoff (1990) showed that, if wealth plays a role as collateral when borrowing (as it is often the case when various microeconomic frictions are present), autarky interest rates might be lower in capital-scarce countries than in capital-abundant ones, even if the marginal product of capital is higher. This might reverse the predictions of the IA models regarding the pattern of capital flows. Boyd and Smith (1997) and Matsuyama (2004 and 2008) used this insight in related dynamic models to show that financial liberalization can reduce investment and growth in capital-scarce countries. These models have the ability to explain why capital flows towards countries that are

\[ \text{\footnotesize\textsuperscript{4}} \text{See Aguiar and Gopinath (2007) for a recent contrarian view.} \]

\[ \text{\footnotesize\textsuperscript{5}} \text{Further research after this survey includes Cole and Kehoe (1997), Kletzer and Wright (2000), Wright (2002), Aguiar and Gopinath (2006), Amador (2008), Arellano (2008), Aguiar, Amador, and Gopinath (2009), Bai and Zhang (2010), and Aguiar and Amador (2011).} \]

\[ \text{\footnotesize\textsuperscript{6}} \text{It might however explain the composition of capital flows. See Kraay, Loayza Servén and Ventura (2005).} \]
already somewhat rich and have developed financial markets.\textsuperscript{7,8}

Of course, sovereign risk and microeconomic frictions are both important features of real economies. Caballero and Krishnamurthy (2001) and Tirole (2003) analyze the problem of sovereign risk in the presence of frictions that affect private transactions, and explore various externalities. While Caballero and Krishnamurthy emphasize excessive private risk taking, Tirole focuses on the problems that arise when individuals do not internalize how their actions affect government policy. In three recent papers, Brutti (2011), Gennaioli, Martin and Rossi (2014), and Basu (2010) have proposed models in which non-discriminatory defaults on sovereign debt reduce the net worth of investors and thus create turmoil in domestic financial markets. These papers uncover crucial interactions between international and domestic public debt and private financial transactions that are highly complementary to the analysis in this paper.

1 A simple model of credit, investment and growth

Consider a small country inhabited by an infinite sequence of two-period overlapping generations indexed by \( t \in (-\infty, \infty) \). All generations contain a continuum of individuals of size one that maximize the following utility function:

\[
U_{t,t}^i = \ln (c_{t,t}^i + \rho) + \beta \cdot E_t \ln (c_{t,t+1}^i + \rho) \tag{1}
\]

where \( \beta > 0 \) and \( c_{t,t}^i \) and \( c_{t,t+1}^i \) be the consumptions of individual \( i \) of generation \( t \) in periods \( t \) and \( t+1 \). We assume \( \rho > 0 \) to ensure that preferences are well defined even if consumption is zero, but we focus on the limiting case \( \rho \to 0 \).

The output of the country is given by a Cobb-Douglas production function: \( f(k_t) = k_t^\alpha \cdot l_t^{1-\alpha} \) with \( \alpha \in (0,1) \); where \( k_t \) and \( l_t \) are the country’s capital stock and labor force. The young supply one unit of labor inelastically, so that \( l_t = 1 \) for all \( t \). The capital is supplied by the old and fully depreciates during production. To produce one unit of capital, \( 1/A \) units of output must be invested one period earlier. Only a fraction \( \varepsilon \) of members of each generation, the “entrepreneurs”, know how to produce capital. We refer to the remaining patient members of the generation as

\textsuperscript{7}Focusing on the macroeconomic effects of microeconomic frictions when studying international capital flows has become quite popular recently. See Shleifer and Wolfenzon (2002), Aoki, Benigno, and Kiyotaki (2006), Caballero, Farhi, and Gourinchas (2008), Antràs and Caballero (2009), Mendoza, Quadrini, and Rios-Rull (2009) and Martin and Taddei (2013), among others.

\textsuperscript{8}A third, and quite interesting, line of research is that followed by Acemoglu and Zilibotti (1997) who develop a model in which investments are indivisible and show that this is enough to overturn some of the conclusions of the conventional view. In their framework, financial liberalization reduces investment and growth in capital-scarce countries if the world is poor enough, but this trend reverses as the world grows richer. Martin and Rey (2006) have shown that in this framework changes in investor sentiment can also generate macroeconomic volatility and procyclical capital flows.
the “savers.” Let \( I_t \) be the set of all members of generation \( t \), and \( I_t^E \) and \( I_t^S \) be the subsets of entrepreneurs and savers.

Factor markets are competitive and factors of production are paid their marginal products:

\[
    w_t = (1 - \alpha) \cdot k_t^n \quad \text{and} \quad r_t = \alpha \cdot k_t^{n-1}
\]

where \( w_t \) and \( r_t \) are the wage and the rental rate. Equation (2) shows how output is split between the young generation who owns the labor and the old generation who owns the capital stock.

The focus of our analysis is the credit market. Before financial liberalization, only domestic residents participate in this market. Financial liberalization allows residents from other, unspecified, countries whose combined size is much larger than that of our country to participate in this market. These “foreigners” are willing to buy or sell debt contracts offering an expected gross return of one. We refer to debt contracts issued and held by domestic residents as \textit{domestic debts}. We refer to debt contracts issued by domestic residents and held by foreigners as \textit{foreign debts}. Finally, we refer to debt contracts issued by foreigners and held by domestic residents as \textit{foreign assets}.

Foreign assets are always enforced. But domestic and foreign debts might not. In particular, we assume that the country’s enforcement institutions are imperfect and succeed only with probability \( \pi \in [0, 1] \). When institutions succeed, all outstanding debts are enforced. When institutions fail, the old generation chooses whether to enforce outstanding debts. The parameter \( \pi \) measures the quality of the country’s institutions.

We do not model explicitly how generations make collective decisions when institutions fail. Instead, we assume that these decisions are consistent with two principles: (i) an increase in the consumption of any member of the generation is good; and (ii) a redistribution that reduces consumption inequality within the generation is also good. Define \( c_{t+1} \) as the average old-age consumption of the members of generation \( t \), i.e. \( c_{t+1} = \frac{1}{I_t} \sum_{i \in I_t} c_{i,t+1} \). Then, we assume that generation \( t \) chooses enforcement in period \( t + 1 \) to maximize

\[
    W_{t,t+1} = c_{t,t+1} - \frac{\omega}{2} \cdot \int_{c_{t,t+1}} |c_{t,t+1} - c_{t,t+1}| \quad (3)
\]

where \( \omega \in (0, 1) \) so that an increase in the consumption of any individual is desirable even if this raises inequality.\(^9\)

We introduce two restrictions on enforcement decisions. The first one is that it is not possible to discriminate among debts of the same type. Thus, there are three relevant enforcement states,

\(^9\)We choose this particular welfare function for analytical convenience. All our results would go through with any welfare function satisfying the two principles mentioned. We shall return to this point in a later footnote.
If \( z_{t+1} = E \), all debts are enforced. If \( z_{t+1} = D \), domestic debts are enforced but foreign debts are not. If \( z_{t+1} = N \), neither domestic nor foreign debts are enforced. Let \( p_t^E \), \( p_t^D \) and \( p_t^N \) the probability in period \( t \) that \( z_{t+1} \) takes the corresponding value. \(^{10}\) The second restriction is that it is sometimes not possible to discriminate between domestic and foreign debts. If generations enforce domestic debts, attempts to default on foreign ones succeed only with probability \( \delta \in [0, 1] \).

Thus, when institutions fail, generations choose among \( z_{t+1} = E \), \( z_{t+1} = N \) and a “discrimination lottery” that delivers \( z_{t+1} = D \) with probability \( \delta \) and \( z_{t+1} = E \) with probability \( 1 - \delta \). The parameter \( \delta \) measures how easy it is to discriminate against foreigners.

We define a competitive equilibrium as a sequence of prices and quantities such that individuals choose their capital and debtholdings so as to maximize their utility in Equation (1), generations choose enforcement so as to maximize their welfare in Equation (3), factor prices are given by Equations (2) and the credit market clears. The goal of the next few sections is to study how financial liberalization affects the workings of the credit market and the shape of competitive equilibria.

2 Equilibrium dynamics before financial liberalization

Before financial liberalization, only domestic residents participate in the credit market. Thus, enforcement states \( D \) and \( E \) are identical and there is no loss of generality in assuming that \( p_t^D = 0 \). Let \( R_{t+1} \) be the contractual interest rate on domestic debts, and let \( d^i_{t+1} \) and \( k^i_{t+1} \) be the domestic debts issued (or held if negative) and the capital stock of individual \( i \). Then, his/her budget constraints are given by:

\[
c^i_{t,t+1} \leq w_t + \frac{d^i_{t+1}}{R_{t+1}}
\]

\[
c^i_{t,t+1} = \begin{cases} 
    r_{t+1} \cdot k^i_{t+1} - d^i_{t+1} & \text{if } z_{t+1} = E \\
    r_{t+1} \cdot k^i_{t+1} & \text{if } z_{t+1} = N
\end{cases}
\]

for all \( i \in I_t \). In addition, we have that \( k^i_{t+1} = 0 \) for all \( i \in I_t^S \). Both entrepreneurs and savers receive a wage when young and consume. The only difference is that savers can only hold debts, while entrepreneurs have the additional option of producing capital. As usual, we refer to aggregate variables by omitting the individual superscript. For instance, \( k_{t+1} = \int_{i \in I_t} k^i_{t+1} \).

The following proposition describes the equilibrium dynamics of our country in autarky:

**Proposition 1.** In autarky, there is a unique equilibrium such that \( p_t^E = 1 \) and \( p_t^D = p_t^N = 0 \). The

\(^{10}\)As it will become clear soon, a generation would never choose to enforce foreign debts and not domestic ones. Thus, we disregard this possibility.
interest rate and the capital stock are:

\[ R_{t+1} = A \cdot \alpha \cdot k_t^{\alpha - 1} \]
\[ k_{t+1} = A \cdot s \cdot k_t^\alpha \]

where \( s \equiv \frac{\beta}{1 + \beta} \cdot (1 - \alpha) \) is the savings rate of the economy.

Proposition 1 says that there is no enforcement risk in autarky. Savers lend their savings to entrepreneurs, and the latter invest both these and their own savings. Old generations consume the economy’s capital income. Enforcing domestic debts ensures that this capital income is equally shared by entrepreneurs and savers, while defaulting on these debts allows entrepreneurs to keep all the capital income for themselves. Thus, enforcing debts reduces consumption inequality without affecting average consumption and it is therefore preferred. Despite weak enforcement institutions, the credit market works well. Entrepreneurs compete for the savings of savers until the interest rate equals the return to investment.

Figure 2 shows the law of motion of the capital stock in autarky. The dynamics of the capital stock are those of the standard neoclassical model. From any initial condition, the economy converges to a steady state with the following capital stock:

\[ k_\infty = (A \cdot s)^{\frac{1}{1 - \alpha}} \]

We assume that the steady state interest rate in autarky is above one, i.e. \( \frac{\alpha}{s} > 1 \); so that the country is capital poor and a natural borrower.\(^{11}\) This streamlines the discussion by ruling out a number of straightforward but tedious cases.

### 3 Equilibrium dynamics after financial liberalization

Financial liberalization allows foreigners to participate in the credit market. Let \( R_{t+1}^f \) be the contractual interest rate on foreign debts, and let \( d_{t+1}^i \) and \( a_{t+1}^i \) be the foreign debts issued and the foreign assets held by individual \( i \). Naturally, \( d_{t+1}^i \geq 0 \) and \( a_{t+1}^i \geq 0 \). Then, his/her budget constraints after financial liberalization become:

\[ c_t^i + \frac{k_t^{i+1}}{A} + a_{t+1}^i \leq w_t + \frac{d_t^i}{R_{t+1}} + \frac{d_{t+1}^i}{R_{t+1}^f} \]
\(^{11}\) It also implies that investment is dynamically efficient and we can ignore equilibria with bubbles. See Abel et al. (1989) and Martin and Ventura (2012) for a discussion of this criterion.
\[
c_{i,t+1}' = \begin{cases} 
  r_{t+1} \cdot k_{i,t+1}^i + a_{t+1}^{z_i} - d_{t+1}^i - d_{t+1}^{k_i} & \text{if } z_{t+1} = E \\
  r_{t+1} \cdot k_{t+1}^i + a_{t+1}^{z_i} - d_{t+1}^i & \text{if } z_{t+1} = D \\
  r_{t+1} \cdot k_{t+1}^i + a_{t+1}^{z_i} & \text{if } z_{t+1} = N
\end{cases}
\]  

for all \( i \in I_t \). In addition, we have that \( k_{t+1}^i = 0 \) for all \( i \in I_S^S \). Comparing Equations (8)-(9) and (4)-(5) shows that the main effect of financial liberalization is to allow domestic residents to hold foreign assets and issue foreign debts.\(^{12}\)

In autarky, there is no enforcement risk. After financial liberalization, this need not be the case. Enforcing domestic debts reduces consumption inequality and this generations like, but enforcing foreign debts reduces their average consumption and this they dislike. Thus, generations would like to enforce domestic debts and default on foreign ones. But their inability to perfectly discriminate between domestic and foreign debts creates the trade-off that lies at the heart of all our results. Some generations might choose to enforce foreign debts to enforce domestic ones. But others might instead choose not to enforce domestic debts to avoid enforcing foreign ones. We examine each of these cases in turn.

### 3.1 Enforcing domestic debts leads to enforcement of foreign debts

We start the analysis of the enforcement trade-off by constructing an equilibrium in which generations choose the discrimination lottery. We conjecture that market participants expect the discrimination lottery when institutions fail and then check whether the resulting trade is consistent with generations preferring the discrimination lottery if institutions fail. We refer to this equilibrium as optimistic since domestic debts are always enforced and default on foreign debts is minimized.

The following proposition describes the equilibrium dynamics of our country after financial liberalization when market participants are optimistic:

**Proposition 2.** After financial liberalization, there may exist an optimistic equilibrium with \( p_{t}^F = \pi + (1 - \pi) \cdot (1 - \delta) \), \( p_{t}^D = (1 - \pi) \cdot \delta \) and \( p_{t}^N = 0 \). The interest rates and the return to investment

\(^{12}\)We allow domestic and foreign debt contracts to offer different contractual interest rates. Whether this is a good assumption or not depends on the context. It seems appropriate here since borrowing by entrepreneurs is often intermediated by banks and other financial institutions that can price discriminate among their clients. This assumption would not be appropriate, for instance, if we focused on borrowing by sovereigns since sovereign debt can easily be retraded in secondary markets. This is why we assumed instead that price discrimination is not possible in Broner et al. (2014). In any case, we have worked out this alternative case as well in the present context. Although the algebra is more cumbersome, all the results still go through.
are:

\[ R_{t+1} = A \cdot \alpha \cdot k_{t+1}^{\alpha-1} \quad \text{and} \quad R^*_t = \frac{1}{\pi + (1 - \pi) \cdot (1 - \delta)} k_{t+1} + A \cdot s \cdot k_t^\alpha \]

\[ A \cdot \alpha \cdot k_{t+1}^{\alpha-1} = \begin{cases} 
1 + \frac{(1 - \pi) \cdot \delta}{\pi + (1 - \pi) \cdot (1 - \delta)} \cdot \frac{k_{t+1} - A \cdot s \cdot k_t^\alpha}{k_{t+1}} & \text{if } k_t < \kappa \\
1 & \text{if } k_t \geq \kappa
\end{cases} \]

(10)

(11)

The optimistic equilibrium exists if and only if:

\[ k_t \geq \tilde{k} = \begin{cases} 
0 & \text{if } \frac{\omega \cdot (1 - \varepsilon)}{1 - \delta} \geq 1 \\
\left[ 1 - \frac{\omega \cdot (1 - \varepsilon)}{1 - \delta} \right]^{\frac{1}{\alpha}} \cdot \left[ 1 - (1 - \pi) \cdot \delta \cdot \frac{\omega \cdot (1 - \varepsilon)}{1 - \delta} \right]^{\frac{1}{\alpha}} \cdot \kappa & \text{if } \frac{\omega \cdot (1 - \varepsilon)}{1 - \delta} < 1
\end{cases} \]

(12)

where \( \kappa \equiv (A \cdot \alpha)^{\frac{1}{1-\alpha}} \cdot (A \cdot s)^{\frac{1}{\alpha}} \).

In the optimistic equilibrium, domestic debts are enforced with probability one, while foreign debts are enforced only with probability \( \pi + (1 - \pi) \cdot (1 - \delta) \). Thus, Proposition 2 says that the interest rates on domestic and foreign debts differ. Competition among entrepreneurs ensures that the contractual interest rate on domestic debts equals the return to investment. Foreigners require an expected return of one and this is why the contractual interest rate on foreign debts is \( \frac{1}{p_t^E} \).

Proposition 2 also describes the relationship between the return to investment and the expected return on foreign debts. To understand this relationship, note that the foreign borrowing and lending of the country is given by:

\[ \frac{d_{t+1}^*}{R_{t+1}^*} = \max \left\{ 0, \frac{k_{t+1}}{A} - s \cdot k_t^\alpha \right\} \]

\[ a_{t+1}^* = \max \left\{ 0, s \cdot k_t^\alpha - \frac{k_{t+1}}{A} \right\} \]

Also, note that \( \kappa \) is the value of the capital stock such that the country neither borrows nor lends: \( A \cdot s \cdot \kappa^\alpha \equiv (A \cdot \alpha)^{\frac{1}{1-\alpha}} \). If \( k_t \geq \kappa \), the country invests up to the point in which the return to investment equals one and it lends the rest of its savings abroad: \( d_{t+1}^* = 0, a_{t+1}^* \geq 0 \) and \( A \cdot \alpha \cdot k_t^{\alpha-1} = 1 \). If \( k_t < \kappa \), the country borrows and invests up to the point in which the return to investment equals one plus a risk premium that compensates for the fact that investment financed by foreign borrowing is risky: \( d_{t+1}^* > 0, a_{t+1}^* = 0 \) and \( A \cdot \alpha \cdot k_t^{\alpha-1} = 1 + (1 - \pi) \cdot \delta \cdot \frac{d_{t+1}^*}{k_{t+1}/A} \). This risk premium increases with enforcement risk, i.e. \( (1 - \pi) \cdot \delta \); and leverage or exposure to this risk, i.e. \( \frac{d_{t+1}^*}{k_{t+1}/A} \).

In the optimistic equilibrium, the credit market works relatively well. With some probability, the country defaults on its foreign debts. But domestic debts are always enforced. Since the
domestic interest rate equals the return to investment, savers and entrepreneurs effectively have the same budget sets and make the same choices. Before financial liberalization, savers lend their savings to entrepreneurs, and the latter invest these savings for them. After financial liberalization, savers and entrepreneurs borrow from abroad the same amount. Then, savers lend to entrepreneurs not only their own savings but also their foreign borrowing. Entrepreneurs invest their own savings and foreign borrowing, plus the savings and foreign borrowing of the savers. This pattern of trade allows savers and entrepreneurs to share default risk. This is why the risk premium depends on the foreign borrowing of the country and not on the foreign borrowing of entrepreneurs.

Proposition 2 also states that the optimistic equilibrium exists if and only if the country has a threshold level of capital $\tilde{\kappa}$. This reflects the enforcement trade-off faced by generations when institutions fail. On the one hand, the discrimination lottery leads to foreign payments that reduce the average consumption of the generation. On the other hand, the discrimination lottery leads to domestic payments that reduce inequality within the generation. The higher the capital stock, the higher the fraction of investment financed with domestic savings. This lowers foreign payments and raises domestic ones, increasing the incentives to enforce. Thus, there exists a threshold level for the capital stock such that the discrimination lottery is preferred for all capital stocks above that threshold and not preferred for all capital stocks below it.

This threshold depends on how easy it is to discriminate against foreigners and on the distaste for the inequality that would be created by not enforcing domestic debts. This is why the threshold level of capital depends on $\delta$, $\varepsilon$ and $\omega$. If discrimination is very likely, i.e. $\delta \to 1$, the threshold drops to zero, i.e. $\tilde{\kappa} = 0$. If default leads to extreme inequality, i.e. $\varepsilon \to 0$; and this inequality is perceived as a very serious problem, i.e. $\omega \to 1$; then the threshold also drops to zero, i.e. $\tilde{\kappa} = 0$.

Figure 3 shows the laws of motion of the capital stock before (dashed line) and after (solid line) financial liberalization if market participants are optimistic, that is, Equations (7) and (11) respectively. The two panels are drawn for different values of $\varepsilon$. Since savings is unaffected by financial liberalization, for each level of capital, the difference between these two lines equals the net foreign asset position of the country. If the country is capital poor, i.e. $k_t < \kappa$, the law of motion after financial liberalization is above that of autarky, indicating that the country imports capital. If the country is instead capital rich, i.e. $k_t > \kappa$, the law of motion after financial liberalization is below that of autarky, indicating that the country exports capital. From any initial value above the

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13If a generation chooses not to enforce debts when market participants expected the discrimination lottery, savers have zero consumption. This is because their only source of income when old are domestic debts. With any welfare function that penalizes infinitely zero consumption (e.g. average utility) generations would always choose the discrimination lottery and the threshold would be zero. This is not a robust result however if individuals have other sources of income. For example, individuals might receive wages or pension payments when old. Also, they might want to hold foreign assets if there are sources of risk other than enforcement risk.
threshold, the capital stock monotonically converges to a steady state with the following capital stock:

\[ k_{\infty}^O = \left( \left( (\pi + (1 - \pi) \cdot (1 - \delta)) \cdot \alpha + (1 - \pi) \cdot \delta \cdot s \right) \cdot A \right)^{1/\alpha} \]

if \( k_{\infty}^O \geq \bar{k} \), as in the left panel of Figure 3. Our assumption that \( s \leq \alpha \) implies that this new steady state is higher than that of autarky and it is such that the country imports capital. If \( k_{\infty}^O < \bar{k} \), as in the right panel of Figure 3, from any initial value above the threshold, the capital stock monotonically declines. Once the threshold has been crossed, the optimistic equilibrium no longer exists.

### 3.2 Defaulting on foreign debts leads to default on domestic debts

We continue our analysis of the enforcement trade-off by constructing an equilibrium in which all debts are enforced with probability \( \pi \). We conjecture that market participants believe that debts will not be enforced when institutions fail and, once again, then check whether the resulting trade is consistent with generations choosing not to enforce debts when institutions fail. We refer to this equilibrium as pessimistic.

The following proposition describes the equilibrium dynamics of our country after financial liberalization when market participants are pessimistic:

**Proposition 3.** After financial liberalization, there is a pessimistic equilibrium with \( p_t^E = \pi \), \( p_t^D = 0 \) and \( p_t^N = 1 - \pi \). The dynamics of the interest rate and the return to investment are:

\[ R_{t+1} = R_{t+1}^* = \frac{1}{\pi} \]

\[ A \cdot \alpha \cdot k_{t+1}^{\alpha-1} = \begin{cases} 1 + \frac{1 - \pi}{\pi} \cdot \frac{k_{t+1} - A \cdot \frac{s}{\kappa} \cdot k_t^O}{k_{t+1}} & \text{if } k_t < \frac{1}{\pi} \cdot \kappa \\ 1 & \text{if } k_t \geq \frac{1}{\pi} \cdot \kappa \end{cases} \]

The pessimistic equilibrium always exists.

In the pessimistic equilibrium both domestic and foreign debts are enforced with probability \( \pi \). Thus, Proposition 3 says that these contracts must offer the same interest rate and this rate must be such that their expected gross return is one. At this interest rate, savers prefer to purchase safe foreign assets rather than risky domestic debts. As a result, only entrepreneurs issue foreign debts
and the foreign borrowing and lending of the country is given by:

\[
\frac{d_{t+1}}{R_{t+1}} = \max \left\{ 0, \frac{k_{t+1}}{A} - \varepsilon \cdot s \cdot k_t^\alpha \right\}
\]

\[
a_{t+1} = (1 - \varepsilon) \cdot s \cdot k_t^\alpha + \max \left\{ 0, \varepsilon \cdot s \cdot k_t^\alpha - \frac{k_{t+1}}{A} \right\}
\]

Note now that \(\varepsilon^{-\frac{1}{\alpha}} \cdot \kappa\) is the value of the capital stock such that entrepreneurs neither borrow nor lend: \(A \cdot \varepsilon \cdot s \cdot \kappa^\alpha \equiv (A \cdot \alpha)^{\frac{1}{1-\alpha}}\). If \(k_t \geq \varepsilon^{-\frac{1}{\alpha}} \cdot \kappa\), entrepreneurs invest up to the point in which the return to investment equals one and they lend the rest of their savings abroad: \(d_{t+1}^* = 0\), \(a_{t+1}^* \geq (1 - \varepsilon) \cdot s \cdot k_t^\alpha\) and \(A \cdot \alpha \cdot k_{t+1}^{\alpha-1} = 1\). If \(k_t < \varepsilon^{-\frac{1}{\alpha}} \cdot \kappa\), entrepreneurs borrow and invest up to the point in which the return to investment equals one plus a risk premium: \(d_{t+1}^* > 0\), \(a_{t+1}^* = (1 - \varepsilon) \cdot s \cdot k_t^\alpha\) and \(A \cdot \alpha \cdot k_{t+1}^{\alpha-1} = 1 + (1 - \pi) \cdot \delta \cdot \frac{d_{t+1}^*}{k_{t+1}/A}\). Now the risk premium depends on the foreign borrowing of entrepreneurs and not that of the whole country.

In the optimistic equilibrium, savers purchase riskless debts from entrepreneurs. Thus, the total amount of “riskless” funding available for investment consists of the country’s total savings, i.e. \(s \cdot k_t^\alpha\). In the pessimistic equilibrium, savers purchase foreign assets. Thus, the total amount of “riskless” funding available for investment consists only of the entrepreneurs’ own savings, i.e. \(\varepsilon \cdot s \cdot k_t^\alpha\). This raises the risk premium and lowers investment and the capital stock.

Proposition 3 also says that the pessimistic equilibrium exists for all levels of capital. The intuition is clear: in the pessimistic equilibrium all debts are foreign. Thus, default on all debts is always preferred to the discrimination lottery.

Figure 4 shows the laws of motion of the capital stock before (dashed line) and after (solid line) financial liberalization if market participants are pessimistic, that is, Equations (7) and (14) respectively. The two panels are drawn for different values of \(\varepsilon\). For low levels of capital, financial liberalization shifts the law of motion upwards, indicating that the country imports capital. For higher levels of capital, financial liberalization shifts the law of motion downwards, indicating that the country exports capital. Interestingly, there is always a set of capital stocks lower than \(\kappa\) for which the country exports capital even though it is capital scarce. From any initial value, the capital stock monotonically converges to a steady state with the following capital stock:

\[
k_{P}^P = \left( [\pi \cdot \alpha + (1 - \pi) \cdot \varepsilon \cdot s] \cdot A \right)^{\frac{1}{1-\alpha}}
\]

As shown in the left panel of Figure 4, the steady state after liberalization is above that of autarky if \(\varepsilon\) is large. This is not surprising. More surprising perhaps is the right panel where \(\varepsilon\) is small and the steady state after liberalization is below that of autarky. To understand how this might
happen, consider the limiting case in which \( \pi \to 0 \). After financial liberalization, entrepreneurs cannot borrow from foreigners. Even worse, now they can no longer borrow from savers since these prefer to purchase foreign assets. The capital stock and welfare shrink.

3.3 Multiple equilibria and sunspots

The economy can have multiple equilibria. As usual, we assume that there is a “sunspot” that determines which equilibrium is played. The variable \( x_t \) denotes the equilibrium played at \( t \), where \( x_t = P \) or \( x_t = O \) if the equilibrium is pessimistic or optimistic respectively.\(^{14}\) Let \( q_t \) be the transition probability, i.e. \( q_t = \Pr \{ x_t \neq x_{t-1} \} \). If \( k_t < \bar{\kappa} \), we have that \( q_t = 0 \) if \( x_{t-1} = P \) and \( q_t = 1 \) if \( x_{t-1} = O \). If only the pessimistic equilibrium exists, market participants must be pessimistic.

If \( k_t \geq \bar{\kappa} \), the theory does not impose any restriction on \( q_t \). However, we assume from now on that in this case \( q_t \in (0,1) \). This rules out artificial absorbing states and it seems quite natural in this context. If both equilibria exist, market participants can always experience a change in expectations.

Figure 5 shows the laws of motion of the capital stock before (dashed line) and after (solid line) financial liberalization in these sunspot equilibria. The top panels show cases in which \( k_P^\infty \geq \bar{\kappa} \), while the bottom panels show cases in which \( k_P^\infty < \bar{\kappa} \). The left panels show cases in which \( k_O^\infty \geq k_A^\infty \), while the right panels show cases in which \( k_O^\infty < k_A^\infty \). These panels show all the relevant (or generic) cases that apply in the most general version of our model.

The steady state of the economy can have two shapes. If \( k_P^\infty \geq \bar{\kappa} \), the capital stock converges to the steady state interval \([k_P^\infty, k_O^\infty]\). Once this interval is reached, the capital stock fluctuates forever within it. From any initial capital stock, convergence to the steady state interval is monotonic.

If \( k_P^\infty \geq k_A^\infty \), the capital stock and welfare grow as a result of financial liberalization. If instead \( k_P^\infty < k_A^\infty \), whether the capital stock and welfare grow or shrink depends on the time the country spends in the optimistic and pessimistic states. And this depends on the stochastic process that we choose for the transition probability.

If \( k_P^\infty < \bar{\kappa} \), the capital stock converges to \( k_P^\infty \). If the initial capital is stock is below the threshold this convergence is monotonic. If the initial capital stock is above the threshold, it is possible for fluctuations in investor sentiment to generate fluctuations in the capital stock until a long enough

\(^{14}\)The optimistic and pessimistic equilibria are both equilibria in pure strategies. In the optimistic equilibrium generations strictly prefer ex post the discrimination lottery and in the pessimistic equilibrium they strictly prefer ex post to default on all debts. In addition, it can be shown that when both optimistic and pessimistic equilibria exist there is an additional, mixed-strategy, equilibrium in which market participants expect generations to choose the discrimination lottery with probability \( m_t \) and to default on all debts with probability \( 1 - m_t \). The probability \( m_t \) is such that it induces savers to hold enough domestic debts to make generations indifferent ex post between the discrimination lottery and defaulting on all debts. We disregard this equilibrium from now on.
sequence of pessimism eventually takes the economy below the threshold. After this, optimism is no longer possible and the capital stock monotonically converges to $k^P_\infty$. Whether the capital stock and welfare finally grow or shrink as the country settles in the new steady state depends on whether $k^P_\infty$ is above or below $k^A_\infty$.

4 A classic benchmark: representative agent

It is commonplace to use representative-agent models to study the effects of financial liberalization. In our framework, this is akin to focusing on the limiting case $\varepsilon \to 1$. In this limit, all debts are foreign and this has two important implications. The first one is that the optimistic equilibrium vanishes when the country is capital poor, i.e. $\bar{k} \to \kappa$. This is intuitive since, in the absence of domestic debts, defaulting on all debts is always preferred over the discrimination lottery. The second implication of ignoring domestic debts is that the law of motion of the pessimistic equilibrium (Equation (14)) is always above that of autarky (Equation (7)) when the country is capital poor. This is also intuitive since all the country’s savings are owned by entrepreneurs who invest rather than purchase foreign assets.

Figure 6 shows the laws of motion of the capital stock before (dashed line) and after (solid line) financial liberalization in the representative-agent benchmark for different values of $\pi$. After financial liberalization, the capital stock and the return to investment monotonically converge to a steady state with a higher capital stock and welfare. Weak enforcement institutions reduce the effects of financial liberalization on the steady state capital stock. Weak enforcement institutions also slow down the transition towards the new steady state. The latter can be seen by comparing the different panels of Figure 5. If $\pi = 1$, as in the top panel, the growth effect is maximized and the whole transition takes place in a single generation. If $\pi = 0$, as in the bottom panel, the growth effect vanishes and the economy remains in the autarkic steady state. If $\pi$ is between zero and one, as in the middle panel, there is some growth and the transition takes a few generations.

Figure 7 shows a simulation of financial liberalization for an intermediate value of $\pi$. In this simulation we start the economy at a level of capital below the autarky steady state and assume that financial liberalization takes place in period 2. The different panels of Figure 7 show the evolution of some key variables for 20 periods.\footnote{Panel A shows the capital stock: $k_t$. Panel B shows the gross and net foreign asset positions of the country, $a^*_t$, $-d^*_t$, and $a^*_t - d^*_t$. Panel C shows domestic asset trade $d_t$. Note that these variables reflect decisions made at $t - 1$.}

The young generation in period 2 borrows up to the point in which the return to capital equals the world interest rate plus the appropriate risk premium. Initially savings are low and so gross and net international borrowing are high. This leads to a high risk premium so capital is below its new
steady in the adjustment process. As the capital stock grows, so does the savings of subsequent
generations, reducing the risk premium and increasing further the capital stock. In the steady
state, the country permanently enjoys a higher capital stock. The country remains an international
borrower permanently.

Financial liberalization raises the country’s income (output net of depreciation and foreign debt
payments) permanently. It also brings standard distributional effects. The welfare of the young
generation in period 2 falls as the return to its savings declines. The welfare of future generations
grows as the increase in their wages more than compensates for the decline in the return to their
savings. As usual, it would be possible to achieve a Pareto improvement by complementing financial
liberalization with a set of intergenerational transfers that compensate the initial generation and
still leave future generations better off.

Many researchers working with representative-agent models (including us!) would object to a
literal interpretation of their models as assuming that there is no domestic trade. Instead, they
interpret their models more loosely as assuming that domestic and foreign debts are somehow
insulated and their interactions can be neglected. There is another limiting case of our model
that makes this loose interpretation “almost” literal. This is the case of perfect discrimination in
which $\delta \to 1$. It seems intuitively right that, in this limiting case, domestic debts are enforced
independently of the size of foreign debts and foreign debts are defaulted upon independently of
the size of domestic debts.

Indeed, with perfect discrimination the laws of motion in Figure 6 also apply. But the limit is
reached through a different route. As $\delta \to 1$ the optimistic equilibrium always exists, i.e. $\bar{\kappa} \to 0$.
Even if domestic debts are arbitrarily small, it is always preferred to enforce them and reduce
inequality if default on foreign debts is guaranteed. Note then that, as $\delta \to 1$, the law of motion
of the optimistic equilibrium converges to that of the representative-agent benchmark in Figure 6.
As $\varepsilon \to 1$, we reach this law of motion as the best possible pessimistic equilibrium. As $\delta \to 1$, we
reach the same law of motion as the worst possible optimistic equilibrium.

The perfect discrimination limit would exactly take us to the representative-agent benchmark
if, in this limit, the pessimistic equilibrium did not exist. But it still does. We think however that
this is a case in which it is justified to disregard the pessimistic equilibrium and focus exclusively
on the optimistic one. Choosing to default on all debts when there is the option of defaulting only
on foreign debts is a knife-edge result. It would not survive, for instance, simple extensions that
generate a small amount of domestic trade.

Whether we interpret the representative-agent benchmark literally ($\varepsilon \to 1$) or as the case
of perfect discrimination ($\delta \to 1$), the message that arises from this benchmark is clear: financial
liberalization facilitates capital imports that raise investment and lead to a steady state with higher capital stock and welfare. A key aspect of this message is that the country can take advantage of financial liberalization only if it has good enough enforcement institutions. But the representative-agent benchmark ignores the interaction between domestic and foreign debts. And this can be quite misleading.

5 A new benchmark: interacting domestic and foreign debts

As we move away from the representative-agent benchmark, we find two key interactions between domestic and foreign debts. The first one is that domestic debts support foreign debts. This “financial-depth” effect, which makes the optimistic equilibrium possible, allows our country to sustain more foreign borrowing than in the representative-agent benchmark and more domestic borrowing than in autarky. The second interaction is that foreign debts destroy domestic debts. This “capital-flight” effect, which makes the pessimistic equilibrium possible, means that our country can sustain less domestic borrowing than in autarky, less foreign borrowing than in the representative-agent benchmark, and possibly negative net foreign borrowing. The financial-depth and capital-flight effects combine in complex and interesting ways to deliver a much richer view of the effects of financial liberalization.

Recall the laws of motion of the capital stock illustrated in Figure 5. The effects of financial liberalization on total borrowing by entrepreneurs and, thus, investment and growth, depend on whether the equilibrium is optimistic or pessimistic. In the optimistic equilibrium, the financial-depth effect implies that total borrowing by entrepreneurs is not only higher than in autarky but also higher than in the representative-agent benchmark. In the pessimistic equilibrium the net effect on total borrowing by entrepreneurs depends on the balance of two forces. The positive one is that foreigners are now present in the credit market offering a new source of financing that is cheap but risky. The negative force is that savers are no longer present in the credit market and this eliminates an existing source of financing that was expensive but safe. The first force dominates if the initial stock of capital is sufficiently low since in this case domestic savings are low and the first effect dominates. On the other hand, the pessimistic equilibrium always displays a range of intermediate capital stocks in which the second effect dominates and there are net capital outflows even though the return to investment is higher than the international interest rate.
5.1 The role of nondiscrimination

Figure 8 shows how the laws of motion depend on the degree of discrimination. Discrimination affects both the position of the optimistic law of motion and the range of capital stocks for which the optimistic equilibrium exists. As discussed in Section 4, when discriminatory enforcement is likely, i.e. high δ, the optimistic law of motion is close to the one with a representative agent. This is because domestic debts are always enforced and foreign debts are enforced with probability close to π. Also, since there is a low risk of having to enforce foreign payments if the discrimination lottery is chosen, and in any case those payments are not very large, the discrimination lottery is very attractive and the threshold \( \tilde{\kappa} \) is low. This case is illustrated in the top panel of Figure 8. When enforcement is likely to be non-discriminatory, i.e. low δ, the optimistic law of motion is far above the one with a representative agent. This is because foreign debts are enforced with high probability, reducing borrowing risk and increasing investment. But this comes at a cost. Choosing the discrimination lottery implies making large foreign payments with a high probability. As a result, the optimistic equilibrium only exists when the country is rich enough so that domestic debts are so high that is worthwhile making foreign payments to preserve domestic ones. So \( \tilde{\kappa} \) is high. This case is illustrated in the middle panel. An interesting limiting case is the one in which δ = 0. In this case the optimistic equilibrium takes a particularly simple form:

**Lemma 1.** After financial liberalization, if δ = 0 there may exist an optimistic equilibrium with \( p_t^E = 1 \) and \( p_t^D = p_t^N = 0 \). The interest rates and the return to investment are

\[
R_{t+1} = R^*_t = A \cdot \alpha \cdot k_{t+1}^{\alpha^{-1}} = 1. \tag{15}
\]

The optimistic equilibrium exists if and only if

\[
k_t \geq \tilde{\kappa} = \left[ 1 - \omega \cdot (1 - \varepsilon) \right]^{\frac{1}{\alpha}} \cdot \kappa, \tag{16}
\]

where \( \kappa \equiv (A \cdot \alpha)^{\frac{\alpha^{-1}}{(1-\alpha)^{-\alpha}}} \cdot (A \cdot s)^{-\frac{1}{\alpha}} \).

In this case the optimistic equilibrium takes a particularly simple form. Since for foreign and domestic debts are enforced with probability 1, there is no borrowing risk and investment is so high that the return to investment equals the international interest rate in one generation. The optimistic equilibrium is more likely to exist if \( \varepsilon \) is low because in this case there is more domestic borrowing. It is also more likely to exist if \( \omega \) is high since in this case generations value more the redistribution that results from domestic enforcement. This case is illustrated in the bottom panel of Figure 8.
5.2 Financial liberalization and economic fundamentals

Figure 9 shows a simulation of financial liberalization in the new benchmark. We choose parameters so that a variety of effects can be observed. In particular, if we let $\bar{k}$ be the capital stock at which the pessimistic law of motion intersects the autarky law of motion, Figure 9 is drawn for a case in which $k_0 < \bar{k} < \bar{k} < k_\infty^P$. Financial liberalization takes place in period 2 and Figure 9 shows the evolution of some key variables for 20 periods. The effects of financial liberalization take place along three “phases.” At the time of liberalization only the pessimistic equilibrium exists. In the first phase, even though there is capital flight, domestic savings are so low that gross capital inflows more than compensate for gross capital outflows and investment and growth increase. Eventually, the second phase begins in which $\bar{k} < k_t < \bar{k}$. In this phase domestic savings are so high that gross outflows are greater than gross inflows. The net foreign asset position of the country is positive even though it is capital scarce, and investment and growth are lower than they would be if the economy were closed. Since we assumed $\bar{k} < k_\infty^P$, growth remains positive in this second phase until $\bar{k} < k_t$ and the optimistic equilibrium becomes possible. From then on the third phase takes place in which the economy transitions between periods of optimism, with net capital inflows and high investment and growth, and periods of pessimism, with net capital outflows and low investment and growth. In this phase income might be on average higher or lower than that in autarky depending on the fraction of time the economy spends in the optimistic equilibrium. Volatility is unambiguously higher than in autarky.

How do these effects depend on fundamentals?

1. (Initial level of development) Figure 9 shows the case of a country that liberalizes at a low level of development and goes through three different phases. During the initial phase, the country imports capital and growth accelerates. If financial liberalization takes place at an intermediate level of development, i.e. if $\bar{k} < k_0 < \bar{k}$, the country skips this phase and enters directly into the second phase. Thus, financial liberalization leads to net capital outflows and slows down growth. If financial liberalization takes place instead at high levels of development, i.e. $\bar{k} < k_0$, the country skips the first two phases and moves directly to the third phase in which both the pessimistic and optimistic equilibria exist. In this case, financial liberalization leads to capital imports and higher growth if beliefs are optimistic, but to capital exports and lower growth if beliefs are pessimistic. In any case, financial liberalization creates a recurrent cycle of high- and low-growth periods.

16Panel A shows the capital stock: $k_t$. Panel B shows the gross and net foreign asset positions of the country, $a_t^*, -d_t^*$, and $a_t^* - d_t^*$. Panel C shows domestic asset trade $d_t$. Panel D shows the equilibrium played $x_t$. Note that $k_t$, $a_t^*$, $d_t^*$ and $d_t$ reflect decisions made at $t-1$. 

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2. **(Productivity)** In this model, $A$ scales up all laws of motion by the same factor and therefore does not fundamentally affect the results. As is common in growth theory, we could have expressed the capital stock adjusted by productivity, i.e. $\dot{k}_t = A^{-\frac{1}{1-\alpha}} \cdot k_t$. All the results derived in the previous point for the initial capital stock would apply to this quantity. That is, what matters for the dynamics of the economy is the productivity-adjusted capital stock, and not the capital stock by itself.

3. **(Savings)** As $s$ increases, the law of motion under pessimism becomes closer to that under optimism and, as a result, the average capital stock increases and its volatility decreases. As $s$ decreases relative to the case in Figure 9, the opposite occurs. If $s$ falls enough, eventually we find that $\dot{\kappa} < k^*_SS < \dot{\kappa}$ or even $k^*_SS < \dot{\kappa} < \kappa$. That is, the country reaches the new steady state and stops growing before leaving the second or even the first phase.

4. **(Quality of enforcement institutions)** An increase in $\pi$ has a similar effect as an increase in $s$. It raises the pessimistic law of motion, making it more likely than the steady state is in phase III, and within this phase it increases average income and decreases volatility.

5. **(Probability of discrimination)** As discussed in Section 5.1, a reduction in $\delta$ raises the optimistic law of motion but increases the threshold $\kappa$. Thus, as long as development at the time of liberalization is high and expectations remain optimistic a reduction in $\delta$ increases the benefits of liberalization. However, this comes at the cost of higher volatility and a higher likelihood that the economy gets stuck in a steady state in phases I or II.

As this discussion shows, it is not in general the case that financial liberalization in a capital scarce country raises the steady state capital stock and consumption and speeds up the convergence process towards this steady state. The effects of financial liberalization on the growth process are much richer than this and depend in a subtle but quite clear way on the specific characteristics of the country that is liberalizing.

6 **Rethinking the effects of financial liberalization**

The most distinguishing aspect of the theory developed here is that the effects of financial liberalization should vary across capital-scarce countries, depending on a variety of well-identified country characteristics. In particular, we should consider two groups of countries based on whether they are below or above a threshold (which itself depends on country-specific characteristics). On the one hand, we have the set of “poor” countries for which $k_t < \kappa$ and optimism is not a possibility.
On the other hand, we have the set of “middle-income” countries for which $k_t \geq \bar{k}$ and optimism is indeed possible. The effects of financial liberalization should vary between and also within these groups.

Consider first the case of “poor” countries. The representative-agent model recognizes that foreign sources of financing are risky, as the temptation for opportunistic default combined with low-quality enforcement institutions are likely to generate recurrent foreign debt crisis. But even then, since any domestic trade is insulated from these crises, domestic savings stay at home and foreign borrowing constitutes a net addition to overall development financing. The result is higher investment and growth.

What the representative-agent model does not recognize is that it is quite difficult to insulate domestic debts from opportunistic defaults on foreign debts. Discriminating against foreigners is not possible when foreign finance takes the form of bonds and stocks, since foreigners can resell these assets to domestic residents in secondary markets in anticipation of default. Even when financing is intermediated by banks and other financial institutions, discrimination is difficult because governments might not know the identity of their clients or how these intermediaries distribute gains/losses among them. Once domestic savers understand that defaults not only affect foreign debts but also domestic ones, they find it optimal to send part or all of their savings abroad. This detrimental capital-flight effect is not present in the representative-agent model.

Financial liberalization has then unclear effects on the overall amount of financing that is available for investment and growth. It adds new foreign sources of financing that are cheap but risky, but it also subtracts domestic sources of financing that were expensive but safe. In very poor countries with little domestic savings to start with, this capital-flight effect is not likely to be quantitatively important and, as a result, financial liberalization is likely to add to development financing. The opposite might happen in not so poor countries with a reasonable amount of domestic savings. In these countries, the capital-flight effect might be so severe that financial liberalization does in fact subtract from development financing even if the country is capital-scarce.

Consider next the case of “middle-income”countries. The representative-agent model predicts that these countries benefit from financial liberalization, but less than the first group of poor countries. The reason, of course, is that these countries already have a substantial amount of domestic savings and their needs for foreign financing are less acute.

What the representative-agent model does not recognize is that, in this group of countries, the effects of financial liberalization depend on self-fulfilling expectations. Some countries might be lucky to coordinate to the optimistic equilibrium and be able to import capital well beyond what the representative-agent model predicts. The reason is due to a second effect that is not
present in this model: optimism keeps domestic savings at home, and the unwillingness to default on domestic debts reduces or eliminates the temptation for opportunistic default on foreign debts. This beneficial financial-depth effect lowers the risk of foreign borrowing, further raising capital imports, investment and growth.

Alongside these examples of successful financial liberalization, there might be other middle-income emerging markets for which financial liberalization does not work at all. Ex ante, this second group of countries look similar to those that succeed. The difference however is that they are unlucky to coordinate to the pessimistic equilibrium. As a result, the beneficial financial-depth effect no longer applies. Even worse, since these countries initially had a substantial amount of domestic savings the detrimental capital-flight effect is specially powerful. Thus, these countries end up exporting capital and experiencing a slowdown in investment and growth.

Self-fulfilling expectations can explain not only cross-sectional variation in the data, but also time-series variation when country characteristics seem relatively stable. In successful countries, negative shifts in investor sentiment can lead to sudden stops of capital imports and large capital flight. In unsuccessful countries, positive shifts in investor sentiment can reverse capital flight and lead to large surges in capital imports. Unlike the case of poor countries, financial liberalization is likely to raise macroeconomic volatility in middle-income countries.

Although this discussion is tentative, it illustrates the potential of the theory in explaining the findings of the empirical literature discussed in the introduction. In particular, it shows why financial liberalizations are sometimes successful and sometimes not, and how country characteristics and luck combine to determine this. A full analysis of welfare and the policy implications of the theory is possible and indeed quite interesting. But this would make the paper too long so we must leave it for future research. We cannot resist however the temptation to conclude the paper with a few speculative remarks on how to manage financial liberalization.

7 On how to manage financial liberalization

The representative-agent model suggests that a policy package that combines financial liberalization with structural reforms to raise productivity and improve institutions would put capital-scarce countries in a fast-track path to development. The theory developed here qualifies this policy recommendation in a fundamental way by shifting the emphasis towards the importance of domestic trade. Whether financial liberalization is successful or unsuccessful hinges on keeping this trade and this in turn depends on country characteristics and luck.

Obviously, structural reforms that improve these country characteristics can help making finan-
cial liberalization successful. Moreover, liberalization increases the incentives to carry out these reforms. For instance, in our model the quality of enforcement institutions does not matter in autarky but becomes crucial after financial liberalization. It would be interesting to formally model how institutions evolve and develop further results. But we leave this task for future research. Instead, we focus next on various policies that are less ambitious.

Even if other policy instruments are not available, countries must still decide when to implement a financial liberalization. Thus, the first and most rudimentary policy choice we consider is the timing of financial liberalization. The representative-agent model has a clear implication regarding this choice: the earlier the better! After all, this model predicts all financial liberalizations to be successful. Is there an equally simple and clearcut prediction coming from the theory developed here? At the risk of oversimplification, we would argue that this is indeed the case and that our theory says: unless the country is very poor, wait until it is ready! With pessimism, financial liberalization destroys domestic trade and creates capital flight. If the country is very poor, this does not matter much because this trade was small to start with. Thus, financial liberalization still leads to capital imports and raises investment and growth in very poor countries. If the country is not very poor, capital flight is sizeable and leads to capital exports that lower investment and growth. In this case, a country should wait to liberalize until optimism is possible. Even then, the theory warns us that financial liberalization might be unsuccessful if investor sentiment turns out to be pessimistic. Being ready is a necessary but not sufficient condition for success.

Waiting until the country has reached a sufficiently high level of development to liberalize might not be too useful a policy advice for countries that are eager to raise the living standards of their populations now and not later. Thus, a first question we must ask is: Is there any policy that can be used to sustain optimism and give financial liberalization a chance to succeed when fundamentals suggest that the country should wait? We know that, even if the country is ready, financial liberalization might be unsuccessful if investor sentiment turns out to be pessimistic. Thus, a second question that we must ask is: Is there any policy that can be used to rule out pessimism and ensure that financial liberalization is successful? These two questions, of course, ask whether there exist policies that make the optimistic equilibrium possible and rule out the pessimistic one.

The answers to these questions are positive under certain conditions. In the model there exist two externalities associated with financial transactions. First, entrepreneurs borrow too much from foreigners, which increases the incentives to default. That is why the optimistic equilibrium does not always exist. It is easy to show that, by imposing controls on capital inflows, the country can always make the optimistic equilibrium possible. In particular, regardless of how low domestic savings are, foreign borrowing can be reduced to a low enough level so that, if domestic savings
stay at home, enforcement is preferred ex-post.\textsuperscript{17} Second, savers do not lend enough domestically, which also increases the incentives to default. That is why they sometimes send their savings abroad leading to the pessimistic equilibrium. It is obvious that, by imposing controls on capital outflows, the country can always rule out the pessimistic equilibrium.\textsuperscript{18} Thus, a careful combination of controls on capital inflows and outflows would ensure that liberalization leads to capital inflows and higher investment and growth without increasing volatility as a result of multiple equilibria.

Have we then found the policy solution to the problem of financial liberalization? The answer is unclear, capital controls can only be imposed if countries can discriminate between foreign and domestic agents ex-ante, at the time of borrowing. But this might be difficult for the same reasons that ex-post discrimination, at the time of enforcement, is also difficult.\textsuperscript{19}

In the absence of ex-ante discriminatory policies, we are left only with policies that do not directly address the externalities mentioned above. As a result, these policies tend to introduce additional distortions. Policies of this kind include limits on borrowing, limits on investment, and forced savings. A full analysis of these policies is worthwhile but would require a richer model.\textsuperscript{20}

Finally, it is worth commenting on policies that affect the degree of discrimination. During the 1970s and early 1980s, in emerging markets most foreign borrowing was done by governments through foreign banks using syndicated loans, while the private sector was largely shut out from international financial markets. This facilitated discrimination, as countries could choose not to pay to foreign banks without interfering with domestic trade. This institutional setup changed in the 1990s and 2000s. In particular, emerging markets lifted restrictions on the access of the private sector to international markets and encouraged the development of secondary markets where domestic assets can be traded. This has made discrimination much more difficult. This shows that, to some extent, countries can design their financial systems so as to achieve a certain degree of discrimination.

The theory proposed in this paper has clear implications regarding the degree of discrimina-

\textsuperscript{17}Even if feasible, such policy might be counterproductive in countries with very low savings. The reason is that in these countries net capital inflows in such constrained optimistic equilibrium are in fact lower than in the unconstrained pessimistic equilibrium.

\textsuperscript{18}When the optimistic equilibrium exists, either because \( k_t \geq k \) or because other policies have made it possible even if \( k_t < k \), forbidding capital outflows ensures that the optimistic equilibrium is played and \( p_t^E = 1 \). When the optimistic equilibrium does not exist, forbidding outflows leads to a mixed strategy equilibrium with \( p_t^E < 1 \), in which net capital inflows are either zero or positive.

\textsuperscript{19}Capital controls seem feasible only if countries implement sweeping controls on all foreign financial transactions. But, in a world in which there is also a scope for international trade in goods, this would introduce additional distortions. See Broner, Martin, and Ventura (2010) and Broner and Ventura (2011) for a discussion of the effects of capital controls and trade policy in such an environment.

\textsuperscript{20}Note that in this model borrowing limits would have the same effect as controls on capital inflows. But this is only because the marginal lender is foreign. In general, borrowing limits affect both foreign and domestic borrowing, so their effect on enforcement is ambiguous. See Broner and Ventura (2011). Note also that borrowing limits are in general superior to borrowing taxes, since taxes generate distortions in the pessimistic equilibrium.
tion that makes financial liberalization more likely to succeed. At an early stage of development, countries should adopt financial systems that facilitate discrimination, since this leads to higher capital inflows, investment, and growth. The reason is that with discrimination domestic financial markets remain isolated from enforcement problems affecting foreign debts and the capital-flight effect is avoided. At later stages of development, countries should adopt financial systems that make discrimination difficult as this leads on average to higher capital inflows, investment, and growth.\footnote{Broner, Martin, and Ventura (2010) show that there are conditions under which the ability to retrade assets in secondary markets has even stronger effects than making discrimination among creditors difficult. In particular, by allowing assets to be retraded before enforcement decisions are made, secondary markets have the potential to redistribute assets in a way that maximizes the incentives to enforce. This suggests that by encouraging even further the development of liquid secondary markets, enforcement problems might be ameliorated at all stages of development, thereby increasing growth and lowering volatility.} In this case, the “financial-depth” effect dominates and the country can leverage on its domestic financial markets to take better advantage of its access to international financial markets. Interestingly, this is a possible explanation for the change in the institutional setup for emerging market borrowing observed in the early 1990s, which has been taken largely as exogenous by the previous literature.

References


Figure 1: Capital Mobility and Incidence of Banking Crises. Sources: Reinhart and Rogoff (2009), who combine own data with Kaminsky and Reinhart (1999), Bordo et al. (2001), Obstfeld and Taylor (2004), and Caprio et al. (2005). The index of capital mobility is the subjective index from Obstfeld and Taylor (2004).
Figure 2: The Autarkic Economy. The above figure shows the law of motion of capital for a closed economy with parameters $\alpha = 0.3$, $\beta = 0.9$, $\rho = 0.1$, $\omega = 0.2$, $A = 1$, $\delta = 0.6$, $\varepsilon = 0.8$ and $\pi = 0.7$. All figures in the paper are based on variations of $\{\delta, \varepsilon, \pi\}$, while sharing the same values of $\{\alpha, \beta, \rho, \omega, A\}$.
Figure 3: *Financial Liberalization - Optimistic Equilibria*. The dotted-line refers to the law of motion of capital in an autarkic economy while the solid-line refers to equilibria when market participants are ‘optimistic’ in an economy with financial liberalization. The left panel is based on parameters $\delta = 0.6$, $\varepsilon = 0.8$ and $\pi = 0.7$, while the right panel is based on parameters $\delta = 0.6$, $\varepsilon = 0.4$ and $\pi = 0.7$. Under high-levels of $\varepsilon$, the threshold value for the existence of the ‘optimistic’ equilibria is higher.

Figure 4: *Financial Liberalization - Pessimistic Equilibria*. The dashed-line refers to the law of motion of capital in an autarkic economy while the solid-line refers to equilibria when market participants are ‘pessimistic’ in an economy with financial liberalization. The left panel is based on parameters $\delta = 0.6$, $\varepsilon = 0.8$ and $\pi = 0.7$, while the right panel is based on parameters $\delta = 0.6$, $\varepsilon = 0.4$ and $\pi = 0.7$. There is greater foreign borrowing in an economy with a higher level of $\varepsilon$; the ‘pessimistic’ equilibria steady state is also higher than the autarkic steady state under higher levels of $\varepsilon$. 
Figure 5: *Types of sunspot equilibria under different parameter specifications.* The above figure shows the capital stock before (dashed-line) and after (solid-line) financial liberalization. The capital stock in an economy where market participants are 'optimistic' is higher than the stock where they are 'pessimistic'. The top-left panel is based on paramters \( \delta = 0.8, \varepsilon = 0.8, \pi = 0.8 \), top-right panel is based on paramters \( \delta = 0.8, \varepsilon = 0.8, \pi = 0.3 \), bottom-left panel is based on paramters \( \delta = 0.5, \varepsilon = 0.8, \pi = 0.8 \), bottom-right panel is based on paramters \( \delta = 0.5, \varepsilon = 0.6, \pi = 0.3 \).
Figure 6: Representative agent economy under different levels of financial development. The above figure shows the law of motion of capital for economies with \( \varepsilon = 1, \delta = 0.6 \) and different levels of \( \pi \). When \( \varepsilon \to 1, \kappa \to \kappa \) and the 'optimistic' equilibria is only possible for values of capital greater than \( \kappa \). In such an economy, an increase in \( \pi \) leads to greater capital inflow and faster capital accumulation at all levels of capital stock under the 'pessimistic' equilibria.
Figure 7: Simulated financial liberalization in an economy with $\varepsilon = 1$. We simulate financial liberalization at $t = 2$ in the representative-agent benchmark economy with parameters $\{\delta = 0.6, \varepsilon = 1, \pi = 0.5\}$ and starting value of capital $k_0$. The economy corresponds to the one represented in the middle panel of figure 6. Under the 'pessimistic' equilibria shown above, the economy uses foreign borrowing to reach a level of capital higher than the autarky steady state. This representative-agent benchmark is the best possible pessimistic equilibrium (refer figure 4).
Figure 8: Effect of ‘discrimination’ under financial liberalization. The above figure shows the law of motion of capital for economies with different levels of \( \delta \), \( \varepsilon = 0.2 \) and \( \pi = 0.5 \). As \( \delta \) increases, the ‘optimistic’ equilibria is possible even for low levels of capital stock. As \( \delta \to 1 \), the ‘optimistic’ equilibria is possible for all levels of capital and approximates the best-possible ‘pessimistic’ equilibria as \( \varepsilon \to 1 \).
Figure 9: Simulated financial liberalization in an economy with $k_0 < \bar{k} < \hat{k} < k^*_\infty$. We simulate financial liberalization at $t = 2$ in an economy with parameters $\{\delta = 0.8, \varepsilon = 0.8, \pi = 0.3\}$ and starting value of capital $k_0$. The economy corresponds to the one represented in the top-right panel of figure 5. Initially the economy grows by investing domestic savings. Upon financial liberalization, at low levels of capital, the economy continues to grow since the gross capital inflows compensate for the gross capital outflows. Once the threshold $\hat{k}$ is crossed, the economy fluctuates between the ‘optimistic’ and ‘pessimistic’ steady state levels of capital stock.