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Rethinking the Effects of Financial Liberalization

Fernando A. Broner and Jaime Ventura

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Fernando A. Broner* Jaume Ventura†

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Abstract

During the last few decades, emerging markets have lifted most restrictions on international asset trade. The conventional view was that (i) capital would flow into these countries raising investment and growth; (ii) these countries would use international capital markets to smooth productivity, terms-of-trade, and other shocks and achieve less volatile consumption; and (iii) financial integration would encourage the development of domestic financial markets, leading to a more efficient domestic allocation of capital and better sharing of individual risks.

But in those emerging markets that liberalized their financial markets, average net capital flows have been small and even negative, volatile and procyclical. As a result, (i) investment and growth have not only not increased but even declined in some cases; (ii) consumption has become more volatile; and (iii) domestic financial markets have become unstable and prone to crises.

In this paper, we present a simple model of financial liberalization that can account for these observations. The key friction in the model is sovereign risk. What makes this model different from previous models of sovereign risk is the existence of gains from domestic asset trade and that governments cannot discriminate between domestic and foreign creditors when enforcing debt payments. This makes the theory more realistic both in terms of assumptions and results.

Keywords: financial liberalization, sovereign risk, enforcement, capital flows.

JEL Classification: F34, F36, G15.

*CREI and Universitat Pompeu Fabra (www.crei.cat/people/broner).

†CREI and Universitat Pompeu Fabra (www.crei.cat/people/jventura).

During the last few decades, emerging markets have lifted most restrictions on international trade, in both goods and assets. As a result, these countries have become much more integrated into the world economy. There is broad consensus that integration in goods markets has been positive for emerging markets. There is no such consensus about the effects of integration in capital markets.

The conventional view was that once emerging markets liberalized their financial markets (i) capital would flow into these countries raising investment and growth; (ii) these countries would use international capital markets to smooth productivity, terms-of-trade, and other shocks and achieve less volatile consumption; and (iii) financial integration would encourage the development of domestic financial markets, leading to a more efficient domestic allocation of capital and better sharing of individual risks.

However, the evidence suggests that this conventional view was wrong. In particular, in emerging markets that liberalized their financial markets average net capital flows have been small and even negative, volatile and procyclical. As a result, (i) investment and growth have not only not increased but even declined in some cases; (ii) consumption has become more volatile; and (iii) domestic financial markets have become unstable and prone to crises.¹

In this paper, we present a simple model of financial liberalization that can account for these observations. As in much of the existing literature, we assume that governments might not always be willing ex-post to enforce or make asset payments to foreigners and, as a result, there is sovereign risk. Unlike the existing literature though, we also assume that enforcement is non-discriminatory. In particular, we assume that governments must choose either to enforce all payments to both domestic and foreign creditors, or to enforce none.^{2,3} Non-discriminatory enforcement creates interactions between domestic and international asset trade that do not arise when discrimination is possible. As a result of these interactions, the effects of financial liberalization in our model are

¹Although this big picture is clear, there is still debate about the details. A necessarily incomplete list of contributions to this debate includes Díaz-Alejandro (1985), Lucas (1990), Calvo, Leiderman, and Reinhart (1996), Bhagwati (1998), Kaminsky and Reinhart (1999), Stiglitz (2000), Fischer (2003), Obstfeld and Taylor (2003), Bekaert, Harvey, and Lundblad (2006), Gourinchas and Jeanne (2006), Kose, Prasad, Rogoff, and Wei (2006), Mishkin (2006), Prasad, Rajan, and Subramanian (2006), Kose, Prasad, and Terrones (2007), Henry (2007), Schularick and Steger (2007), Reinhart and Rogoff (2008), and Rodrik and Subramanian (2008).

²This assumption is justified by the current institutional setup of emerging market borrowing, as we explain in Section 3.

³There is an extensive literature on sovereign risk that developed in response to the debt crises of the early 1980's in emerging markets. See Eaton and Gersovitz (1981), Grossman and van Huyck (1988), Bulow and Rogoff (1989a and 1989b), Fernández and Rosenthal (1990), Atkeson (1991), Cole, Dow, and English (1995), Cole and Kehoe (1997), Kletzer and Wright (2000), Kehoe and Perri (2002), Wright (2002), and Amador (2003). See Eaton and Fernández (1995) for an excellent survey. All these papers implicitly assume that enforcement/repayment is discriminatory (by assuming that each region contains a representative agent). This assumption was justified since in this period governments borrowed abroad almost exclusively from foreign banks using syndicated loans, while the private sector was largely shut out from international financial markets. This institutional setup clearly facilitates ex-post discrimination, as governments can choose not to pay foreign banks without interfering with domestic asset trade.

qualitatively very different from, and we think more realistic than, those in traditional models.⁴

In our model, each individual in the country is born with an endowment and a project in which he can invest. Individuals differ in the productivity of their projects. In autarky, individuals with bad projects lend their endowment to individuals with good projects. Financial markets work well, as the government is willing to enforce payments when projects mature. Capital is scarce in autarky and interest rates are higher than in the rest of the world. Financial liberalization allows individuals to borrow not only from other domestic residents but also from foreigners. This creates a temptation for the government to not enforce payments since, unlike in autarky, some of the creditors are foreigners. Since enforcement is non-discriminatory, if the government does not enforce payments to foreigners, it also does not enforce payments to domestic creditors. We characterize this enforcement trade off. When the trade off favors enforcement, liberalization has the usual positive effects.⁵ However, when the trade off favors non-enforcement, both foreign and domestic borrowing become constrained. We show that this can lead to capital outflows, lower investment and growth, higher consumption volatility, and lower welfare.

There are two ingredients in our model that account for the result that liberalization may lead to capital outflows: heterogeneity among domestic residents and domestic financial frictions that prevent domestic savers from lending to potential domestic borrowers. These ingredients are also present in Boyd and Smith (1997), Matsuyama (2004 and 2007), Kiyotaki, Aoki, and Benigno (2006), and Caballero, Farhi, and Gourinchas (2007). Unlike in these papers, in our model domestic financial frictions arise endogenously as a result of financial liberalization itself, since the only source of financial frictions is sovereign risk. Thus, our model can also account for higher financial instability as a result of liberalization. This has crucial implications for the welfare effects in our model. In addition, our model has novel policy implications regarding the optimal institutional setup for emerging market borrowing.

The paper is organized in four sections. Section 1 presents the basic setup and describes conventional views of the effects of financial liberalization in the presence of sovereign risk. These views are based on the notion that governments can discriminate between domestic and foreign residents when enforcing asset payments. Section 2 shows that removing this assumption fundamentally changes the predictions of the model and make them closer to reality. Section 3 studies the equilibrium amount of discrimination. Finally, section 4 concludes.

⁴In Broner and Ventura (2007), we explore the effects of these interactions on the degree to which individuals can share risks within and between countries.

⁵Actually, the benefits are higher than in traditional models since in this case foreign borrowing becomes unconstrained.

1 Conventional view of financial liberalization

We first present a stylized model that captures the most conventional view of the effects of financial integration. We explain the issues that arise in standard analyses of this problem. There is sovereign risk, which makes the effects of financial liberalization smaller than those in a world with complete markets. However, this model fails to account for some central features of the data. We show this and we argue that the standard model of sovereign risk needs serious rethinking.

1.1 Basic Setup

Consider a world with two periods, Today and Tomorrow, indexed by $t = 0, 1$. This world contains a country with a representative agent and a government. The goal of the representative agent is to maximize the expected utility of his/her consumption Tomorrow, $u(c)$, with standard assumptions.

The representative agent receives an endowment $y \leq 1$ Today and has access to a continuum of investment projects, indexed by $i \in [0, 1]$. Investment i costs one unit of output Today and delivers $A(i)$ units of output Tomorrow.⁶ Without loss of generality, we give lower indices to those projects with higher return so that $A(i)$ is a downward-sloping function of i . For simplicity, we also assume that $A(i)$ is continuous. Figure 1 illustrates.

The representative agent can borrow and lend. If he borrows Today, he only repays Tomorrow if the government forces him to do so. The objective of the government is to maximize the average utility of domestic residents. The government announces Today an enforcement policy for Tomorrow. With probability $1 - \pi$ the government honors its promises. With probability π it decides its enforcement policy Tomorrow, i.e. it behaves opportunistically. There is sovereign risk as long as $\pi > 0$, and $1 - \pi$ is a measure of the strength of institutions. Since all individuals are identical, in autarky there is neither lending nor borrowing in equilibrium and sovereign risk plays no role.

Since it is better to finance a high-return project than a low-return one, there exists a cutoff value \bar{i} such that all projects with $i \leq \bar{i}$ are financed, while those with $i > \bar{i}$ are not. Since all projects cost one, \bar{i} is the investment of the country and $A(\bar{i})$ is the required return or hurdle rate for projects. We want to study how financial liberalization affects both of these variables.

All production Tomorrow is consumed, so the representative agents consumes

$$c = \int_0^{\bar{i}} A(i) \cdot di. \tag{1}$$

Since there is no consumption Today, the endowment is fully saved and, thus, invested. Investment

⁶In other words, if the representative agent invests in projects $P \subseteq [0, 1]$, then the cost of investment Today is $\int_0^1 I[i \in P] \cdot di$ and production Tomorrow is $\int_0^1 I[i \in P] \cdot A(i) \cdot di$, where $I[\cdot]$ is the indicator function.

is then

$$\bar{i} = y. \quad (2)$$

The autarky equilibrium is illustrated by the dashed lines in the three panels of Figure 2. The hurdle rate for projects equal to $A(y)$, which is also the gross interest rate in this economy.⁷ We analyze next how financial liberalization affects investment and consumption.

1.2 The effects of financial liberalization

There is an international financial market (IFM) that can lend to and borrow from the country. The IFM acts competitively, is risk neutral, does not discount the future, has deep pockets, can commit to make payments Tomorrow, and is therefore willing and able to buy or sell any asset offering zero expected return.

Given the objective of the government, it is always in its interest to promise Today that it will enforce payments Tomorrow. This allows the representative agent to borrow Today. However, the government will renege on this promise Tomorrow if it may do so. This is because enforcing payments to foreigners lowers the average utility of the representative agent Tomorrow. Thus, the representative agent pays back its debts Tomorrow with probability $1 - \pi$.⁸

The IFM offers different contractual rates for borrowing and lending,

$$R = \frac{1}{1 - \pi} \quad \text{and} \quad R^* = 1, \quad (3)$$

where R is the contractual gross interest rate on bonds issued by the country and sold to the IFM and R^* is the contractual gross interest rate on bonds issued by the IFM. The expected return on both bonds is the same, $R \cdot (1 - \pi) = R^* = 1$, since the difference in contractual rates reflects only the default premium.

What are the effects of financial liberalization under these assumptions? Consumption of the representative agent depends on whether the government enforces payments. Let c_E and c_N denote, respectively, consumption in case of enforcement and in case of no enforcement. Expected utility is then given by $(1 - \pi) \cdot u(c_E) + \pi \cdot u(c_N)$. Consumptions are given by

$$c_E = \int_0^{\bar{i}} A(i) \cdot di + b + b^* \quad \text{and} \quad c_N = \int_0^{\bar{i}} A(i) \cdot di + b^*, \quad (4)$$

⁷Let b be bond holdings of the representative agent and R the gross interest rate. The budget constraint of the representative agent is $\bar{i} + b/R = y$. Since the marginal return of investment is $A(\bar{i})$ and market clearing implies $b = 0$, it follows that $R = A(y)$.

⁸At this point, this could also be interpreted as borrowing limit with contingent assets. However, in the remaining sections of the paper this interpretation could lead to slightly different results. So we will assume throughout that assets are noncontingent and there is default in equilibrium.

where b denotes holdings of bonds issued by the country and sold to the IFM, and b^* denotes holdings of bonds issued by the IFM and bought by the country. Obviously, $b \leq 0$ and $b^* \geq 0$. The budget constraint of the representative agent is

$$\bar{i} + \frac{b}{R} + \frac{b^*}{R^*} = y. \quad (5)$$

Equation (5) states that the representative agent can use its endowment to invest, purchase domestic bonds at price $1/R$, or purchase foreign bonds at price $1/R^*$.

It is clear that financial liberalization can only improve welfare. This follows from the fact that the representative agent is free to choose not to trade in assets after liberalization, i.e. $b = b^* = 0$, which would ensure the same allocation as in autarky.

Maximization by the representative agent implies the following first order conditions:

$$[(1 - \pi) \cdot u'(c_E) + \pi \cdot u'(c_N)] \cdot A(\bar{i}) = \lambda, \quad (6)$$

$$(1 - \pi) \cdot u'(c_E) \cdot R \leq \lambda \quad \text{and} \quad b \leq 0, \quad (7)$$

$$[(1 - \pi) \cdot u'(c_E) + \pi \cdot u'(c_N)] \cdot R^* \geq \lambda \quad \text{and} \quad b^* \geq 0. \quad (8)$$

The three conditions correspond, respectively, to maximization with respect to investment, holdings of domestic bonds, and holdings of foreign bonds. The second and third conditions take into account that, while payments of domestic bonds are only enforced if the government has commitment, payments of foreign bonds are always enforced.

Note first that the representative agent never borrows and lends simultaneously. To show this, note that if $b^* > 0$ and $b < 0$, FOCs (7) and (8), together with Equation (3), imply $c_E = c_N$. But Equation (4) shows that this cannot be true if $b < 0$, unless $\pi = 0$ (i.e. there is no sovereign risk). As a result, gross positions are the same as net positions.

There are two cases. If $A(y) \leq 1$, the autarky gross interest rate is lower than the one offered by the IFM. This happens when the country is relatively rich and/or relatively unproductive. In this case, the country lends to the IFM. Consumption, investment, and production are characterized by

$$c_E = c_N = \int_0^{\bar{i}} A(i) \cdot di - \bar{i} + y, \quad (9)$$

$$A(\bar{i}) = 1. \quad (10)$$

The equilibrium is illustrated by the solid line in the first panel of Figure 2. Since the IFM offers a

riskless means of saving, the representative agent consumes the same amount regardless of whether its government can renege on its promises on enforcement. The effects of financial liberalization can be assessed by comparing Equations (1) and (2) to Equations (9) and (10). Investment decreases, consumption increases, volatility remains low, and welfare increases.

If $A(y) > 1$, the autarky gross interest rate is higher than the one offered by the IFM. This happens when the country is relatively poor and/or relatively productive. In this case, the country borrows from the IFM. Combining Equations (4) and (5), we find that consumption equals

$$c_E = \int_0^{\bar{i}} A(i) \cdot di - \frac{\bar{i} - y}{1 - \pi} \quad \text{and} \quad c_N = \int_0^{\bar{i}} A(i) \cdot di. \quad (11)$$

When the country borrows, consumption is higher when the government behaves opportunistically and defaults than when the country pays back its debts. As a result, although the cost of borrowing is “actuarially fair,” borrowing is risky. Combining FOCs (6) and (7), we find \bar{i} implicitly

$$A(\bar{i}) = \frac{u'(c_E)}{(1 - \pi) \cdot u'(c_E) + \pi \cdot u'(c_N)}. \quad (12)$$

It is easy to see that

$$A(y) > A(\bar{i}) \geq 1,$$

where the second inequality follows from the fact that $c_E \leq c_N$. If $\pi > 0$ (i.e. there is sovereign risk), this inequality is strict. This is because borrowing is risky, so the country borrows and invests less than it would in the absence of sovereign risk. The equilibrium is illustrated by the solid line in the second panel of Figure 2. As a reference, the dotted line illustrates the equilibrium when there is no sovereign risk.

The effects of financial liberalization can be assessed by comparing Equations (1) and (2) to Equations (12) and (11). Investment increases, consumption increases, volatility increases, and welfare increases. Apart from the increase in volatility, sovereign risk only makes the effects of liberalization smaller. The direction of capital flows and their effect on investment, growth, and welfare are qualitatively the same as in the absence of sovereign risk.

1.3 The representative agent assumption

Up to now we have followed the literature in assuming the existence of a representative agent. Although it is clear that there exists heterogeneity within every country, it is usually believed that modeling such heterogeneity would not affect the results in the literature qualitatively. In this Section we show that this relies on a crucial implicit assumption; namely, that domestic financial

markets always work perfectly.

Instead of there being a representative agent, we assume now that there is a continuum of mass one of heterogeneous individuals. Individuals are heterogeneous in that they have access to projects of different productivity. In particular, each project $i \in [0, 1]$ is assigned to one and only one individual. From now on, we use i to denote both an individual and the project he can invest in. All individuals receive the same endowment y Today.⁹ The government maximizes the average utility of domestic residents.

Assumption 1. DISCRIMINATION: *The government chooses whether to enforce payments between domestic residents independently of its choice of whether to enforce payments to foreigners.*

As in the previous Section, the government never chooses Tomorrow to enforce payments to foreigners if it has the option of not doing so. This would lower average utility of domestic residents. In addition, the government does choose to enforce domestic payments since this increases average utility. The reason is that borrowers consume more than lenders, so enforcing domestic payments increases average utility. Thus, the IFM offers these contractual rates for borrowing and lending,

$$R^F = \frac{1}{1 - \pi} \quad \text{and} \quad R^* = 1, \quad (13)$$

where now R^F is the contractual gross interest rate on bonds issued by the country and sold to the IFM and R^* is the contractual gross interest rate on bonds issued by the IFM. The contractual gross interest rate on bonds issued by the country and sold to domestic residents is denoted R^D . Although there is never default on these bonds, in general $R^D \neq R^*$. The reason is that these bonds are purchased by domestic residents, who may value them differently than the IFM.

What are the effects of financial liberalization under these assumptions? As in the previous Section, consumption of individual i depends on whether the government enforces payments. Let $c_E(i)$ and $c_N(i)$ denote, respectively, consumption in case of enforcement and in case of no enforcement. Expected utility is then given by $(1 - \pi) \cdot u(c_E(i)) + \pi \cdot u(c_N(i))$. Consumptions are given by

$$c_E(i) = A(i) \cdot k(i) + b^D(i) + b^F(i) + b^*(i) \quad \text{and} \quad c_N(i) = A(i) \cdot k(i) + b^D(i) + b^*(i), \quad (14)$$

where $k(i) \in \{0, 1\}$ denotes investment by individual i , $b^F(i)$ denotes i 's holdings of bonds issued by the country and sold to the IFM, $b^D(i)$ i 's holdings of bonds issued by the country and bought by other domestic residents, and $b^*(i)$ i 's holdings of bonds issued by the IFM and bought by the

⁹For this Section, we also assume that utility is CRRA.

country. Obviously, $b^F(i) \leq 0$ and $b^*(i) \geq 0$. The budget constraint of the representative agent is

$$k(i) + \frac{b^D(i)}{R^D} + \frac{b^F(i)}{R^F} + \frac{b^*(i)}{R^*} = y. \quad (15)$$

Equation (5) states that the representative agent can use its endowment to invest, purchase domestic bonds from domestic residents at price $1/R^D$, purchase domestic bonds from foreigners at price $1/R^F$, or purchase foreign bonds at price $1/R^*$.

Maximization by individual i implies the following conditions:

$$k(i) = \begin{cases} 1 & \text{if } A(i) \geq R^D, \\ 0 & \text{if } A(i) < R^D, \end{cases} \quad (16)$$

$$[(1 - \pi) \cdot u'(c_E(i)) + \pi \cdot u'(c_N(i))] \cdot R^D = \lambda, \quad (17)$$

$$(1 - \pi) \cdot u'(c_E(i)) \cdot R^F \leq \lambda \quad \text{and} \quad b^F(i) \leq 0, \quad (18)$$

$$[(1 - \pi) \cdot u'(c_E(i)) + \pi \cdot u'(c_N(i))] \cdot R^* \geq \lambda \quad \text{and} \quad b^*(i) \geq 0. \quad (19)$$

The four conditions correspond, respectively, to maximization with respect to investment, holdings of domestic bonds sold to other domestic residents, holdings of domestic bonds sold to foreigners, and holdings of foreign bonds. The third condition takes into account that payments of domestic bonds held by foreigners are enforced if the government has commitment. In addition, the market for domestic bonds held by domestic residents must clear, $\int_0^1 b^D(i) \cdot di = 0$.

Note first that the country cannot be borrowing to and lending from the IFM at the same time; namely, either $\int_0^1 b^*(i) = 0$ or $\int_0^1 b^F(i) = 0$. To see this assume otherwise. Then there is some i' for which $b^*(i') > 0$ which, using FOCs (17) and (19), implies $R^D = R^*$. Also, there is some i'' for which $b^F(i'') < 0$ which, using FOCs (17) and (18), implies $c_E(i'') = c_N(i'')$ unless $\pi = 0$. But, from Equation (14), this contradicts $b^F(i'') < 0$. As a result, gross positions are the same as net positions.

Second, since utility is CRRA, we can aggregate the three FOCs (17), (18), and (19) and replace average for individual consumption. Let us denote average consumption by $c_E = \int_0^1 c_E(i) \cdot di$ and $c_N = \int_0^1 c_N(i) \cdot di$.

As in the previous Section, there are two cases. If $A(y) \leq 1$, the country lends to the IFM. The domestic interest rate, consumption, investment, and production are characterized by

$$c_E = c_N = \int_0^{\bar{i}} A(i) \cdot di - \bar{i} + y, \quad (20)$$

$$A(\bar{i}) = R^D = 1. \quad (21)$$

If $A(y) > 1$, the country borrows from the IFM. The domestic interest rate, consumption, investment, and production are characterized by

$$c_E = \int_0^{\bar{i}} A(i) \cdot di - \frac{\bar{i} - y}{1 - \pi} \quad \text{and} \quad c_N = \int_0^{\bar{i}} A(i) \cdot di, \quad (22)$$

$$A(\bar{i}) = R^D = \frac{u'(c_E)}{(1 - \pi) \cdot u'(c_E) + \pi \cdot u'(c_N)} \geq 1. \quad (23)$$

Average consumption and average investment are exactly as they were in the economy with a representative agent. The effects of financial liberalization then are also the same. The reason for this is that when there is discrimination domestic financial markets always work well. This, together with CRRA preferences, implies that the average economy behaves in the same way regardless of the presence of heterogeneity. This is a possible justification for emphasizing representative agent models. However, it relies crucially on the government's ability to perfectly discriminate between domestic and foreign creditors when enforcing payments. We show this next.

2 Rethinking the effects of financial liberalization

The conventional model described above cannot account for a number of observed effects of financial liberalization. According to this model, capital should always flow from rich capital-abundant countries to poor capital-scarce ones. In poor countries this should lead to higher investment and growth. Domestic financial markets should not be affected by liberalization. Welfare should increase everywhere. In reality, however, financial liberalizations have had very different effects. Capital often seems to flow in the wrong direction.¹⁰ There is no clear effect of financial liberalizations on either investment or growth.¹¹ Financial liberalizations are often associated with higher volatility and disruptions in domestic financial markets.¹² The evidence also points to the existence of threshold effects. Specifically, the qualitative effects of financial liberalizations depend on whether the liberalizing country is rich or poor, on whether it has developed or underdeveloped financial markets, and on whether it has high- or low-quality institutions.¹³ When governments can discriminate between domestic and foreign creditors domestic markets work well and, as a result,

¹⁰See Lucas (1990), Prasad, Rajan, and Subramanian (2006), and Gourinchas and Jeanne (2006).

¹¹See Arteta, Eichengreen, and Wyplosz (2001), Kose, Prasad, Rogoff, and Wei (2006), and Bonfiglioli (2007).

¹²See Díaz-Alejandro (1985), Kaminsky and Reinhart (1999), Demirgüç-Kunt and Detragiache (2001), Glick and Hutchison (2001), International Monetary Fund (2002), Kose, Prasad, Terrones (2003 and 2007), and Reinhart and Rogoff (2008).

¹³See Arteta, Eichengreen, and Wyplosz (2001), Demirgüç-Kunt and Detragiache (2001), Bekaert, Harvey, and Lundblad (2006), Broner and Rigobon (2006), and Kose, Prasad, Rogoff, and Wei (2006).

the effects of liberalization go in the same direction as in a neoclassical world. This is at the root of the inability of such models to explain the observed effects of liberalizations.

In this section we consider once again the model of Section 1.3. But we now assume that enforcement is non-discriminatory:

Assumption 2. NON-DISCRIMINATION: *The government chooses whether to enforce payments to both domestic and foreign residents or not to enforce any payments.*

When enforcement is discriminatory, the government does not enforce payments to foreigners if it has that option. This is not the case when enforcement is non-discriminatory. The reason is that not enforcing payments to foreigners also implies not enforcing payments to domestic creditors. This leads to an enforcement trade off.

In autarky, the equilibrium is clearly the same as when there is discrimination. After financial liberalization, there are two possible cases. In the first, there is full enforcement of payments, to both domestic and foreign residents. This case is possible only if it is optimal ex-post for the government to enforce all payments. In the second case, there is enforcement only when the government is not able to behave opportunistically. We analyze both cases next.

2.1 The enforcement trade off

In this section we first solve the model assuming there is full enforcement. We then analyze the conditions under which the government does in fact prefer ex-post to enforce all payments.

Let R denote the contractual gross interest rate on domestic bonds. In the absence of discrimination, it is not necessary to distinguish between the interest rate on bonds held by domestic and foreign creditors. If the government always enforces payments, domestic and foreign bonds are perfect substitutes and, thus,

$$R = R^* = 1. \tag{24}$$

The consumption of individuals is given by

$$c(i) = A(i) \cdot k(i) + b(i) + b^*(i), \tag{25}$$

where $k(i) \in \{0, 1\}$ denotes investment by individual i , $b(i)$ denotes i 's holdings of bonds issued by the country, and $b^*(i)$ i 's holdings of bonds issued by the IFM and bought by the country. Obviously, $b^*(i) \geq 0$. The budget constraint of the representative agent is

$$k(i) + \frac{b(i)}{R} + \frac{b^*(i)}{R^*} = y. \tag{26}$$

Equation (5) states that the representative agent can use its endowment to invest, purchase domestic bonds at price $1/R$, or purchase foreign bonds at price $1/R^*$.

Maximization by individual i implies the following conditions:

$$k(i) = \begin{cases} 1 & \text{if } A(i) \geq R, \\ 0 & \text{if } A(i) < R, \end{cases} \quad (27)$$

$$u'(c(i)) \cdot R = \lambda, \quad (28)$$

$$u'(c(i)) \cdot R^* \geq \lambda \text{ and } b^*(i) \geq 0. \quad (29)$$

The three conditions correspond, respectively, to maximization with respect to investment, holdings of domestic bonds, and holdings of foreign bonds.

Since domestic and foreign bonds are perfect substitutes, individuals are indifferent between trading in one or the other. However, as we explain below, the enforcing condition is more likely to hold when gross trade is minimized, i.e. when domestic savers lend only to domestic borrowers, who in turn also borrow from foreigners. We assume that if there exists an allocation of bonds that is consistent with individual maximization and with enforcement by the government, then there is enforcement. This amounts to assuming that if two equilibria are possible, the best one is played. As a result, without loss of generality, from now on we assume that gross positions are minimized.

It is easy to show that consumption and investment are given by

$$c(i) = \begin{cases} A(i) - (1 - y) & \text{if } i \leq \bar{i} \\ y & \text{if } i > \bar{i} \end{cases}, \quad (30)$$

$$c = \int_0^{\bar{i}} A(i) \cdot di - \bar{i} + y, \quad (31)$$

$$A(\bar{i}) = R^D = 1. \quad (32)$$

At this point, we need to check whether the government prefers to enforce payments. There are two cases. If $A(y) \leq 1$, the country is a net lender to the IFM. As a result, since gross positions are minimized, there are no payments to foreign residents to enforce. And since domestic payments are from individuals with low marginal utility to individuals with high marginal utility, enforcement is ensured. The equilibrium is illustrated by the solid line in the first panel of Figure 2.

If $A(y) > 1$, the country is a net borrower from the IFM. To decide whether to enforce, the government compares the distribution of consumption in Equation (30) with the distribution of

consumption in case of no enforcement, which is given by

$$c^{NE}(i) = \begin{cases} A(i) & \text{if } i \leq \bar{i} \\ 0 & \text{if } i > \bar{i} \end{cases}. \quad (33)$$

This equation follows from the fact that domestic savers only lend to domestic borrowers, so they consume zero in case of no enforcement, while domestic borrowers get to consume their full production. The government enforces payments if

$$(1 - \bar{i}) \cdot [u(y) - u(0)] \geq \int_0^{\bar{i}} [u(A(i)) - u(A(i) - (1 - y))] \cdot di. \quad (34)$$

The LHS is the gain from enforcement to domestic savers. The RHS is the loss from enforcement to domestic borrowers. Even though enforcement lowers average consumption, the government might still have incentives to enforce since enforcement improves its distribution.¹⁴

What determines whether enforcement is possible? The main determinant is the initial endowment y . An increase in y makes enforcement more likely because it increases the size of domestic payments and decreases the size of foreign payments. This increases the benefit of enforcement for domestic savers and reduces the cost of enforcement for domestic borrowers. In addition, an increase in the variance of domestic productivities also makes enforcement more likely by increasing the size of domestic payments relative to foreign ones. In particular, if all projects had the same productivity, there would be no domestic trade and enforcement would not be possible. Finally, a higher level of risk aversion makes enforcement more likely by increasing the value of redistribution. In particular, if the $u(0) = -\infty$ there would always be enforcement.¹⁵

When the Enforcement Condition (34) holds, the effects of liberalization are exactly as in a neoclassical world ($\pi = 0$). The equilibrium is illustrated by dotted line in the third panel of Figure 2. However, the effects are qualitatively very different when the condition does not hold, as we show next.

2.2 Enforcement failure

In this section we analyze the equilibrium when the country is poor/capital-scarce, i.e. $A(y) > 1$, and Enforcement Condition (34) does not hold. Once again, let R denote the contractual gross interest rate on domestic bonds. Since with probability π there is no enforcement, the IFM now

¹⁴To see that average consumption is lower with enforcement, simply note that $(1 - \bar{i}) \cdot (y - 0) \leq \bar{i} \cdot (1 - y) \Leftrightarrow y \leq \bar{i} \Leftrightarrow A(y) \leq 1$, which we assumed.

¹⁵Of course, the last point would not be true if individuals also received an endowment Tomorrow.

offers these contractual rates for borrowing and lending,

$$R = \frac{1}{1 - \pi} \quad \text{and} \quad R^* = 1. \quad (35)$$

Consumptions are given by

$$c_E(i) = A(i) \cdot k(i) + b(i) + b^*(i) \quad \text{and} \quad c_N(i) = A(i) \cdot k(i) + b^*(i), \quad (36)$$

where $k(i) \in \{0, 1\}$ denotes investment by individual i , $b(i)$ denotes i 's holdings of bonds issued by the country, and $b^*(i)$ i 's holdings of bonds issued by the IFM. Obviously $b^*(i) \geq 0$. The budget constraint of the representative agent is

$$k(i) + \frac{b(i)}{R} + \frac{b^*(i)}{R^*} = y. \quad (37)$$

Equation (5) states that the representative agent can use its endowment to invest, purchase domestic bonds at price $1/R$, or purchase foreign bonds at price $1/R^*$.

Maximization by individual i implies the following conditions for asset holdings:

$$(1 - \pi) \cdot u'(c_E(i)) \cdot R = \lambda, \quad (38)$$

$$[(1 - \pi) \cdot u'(c_E(i)) + \pi \cdot u'(c_N(i))] \cdot R^* \geq \lambda \quad \text{and} \quad b^*(i) \geq 0. \quad (39)$$

Combining Conditions (38) and (39), it is easy to show that $c_N(i) \leq c_E(i)$, which implies $b(i) \leq 0$. In other words, only foreigners purchase domestic bonds. The reason is that these bonds are risky and their price is actuarially fair, so no domestic resident wants to buy them. This implies that gross positions are very large. While domestic savers save abroad in safe assets, domestic borrowers borrow from abroad without paying a risk premium. Maximization then implies the following condition for investment:

$$k(i) = \begin{cases} 1 & \text{if } (1 - \pi) \cdot u \left(A(i) - \frac{1 - y}{1 - \pi} \right) + \pi \cdot u(A(i)) \geq u(y), \\ 0 & \text{if } (1 - \pi) \cdot u \left(A(i) - \frac{1 - y}{1 - \pi} \right) + \pi \cdot u(A(i)) < u(y). \end{cases} \quad (40)$$

Consumption and investment are then characterized by

$$c_E(i) = \begin{cases} A(i) - \frac{1 - y}{1 - \pi} & \text{if } i \leq \bar{i} \\ y & \text{if } i > \bar{i} \end{cases} \quad \text{and} \quad c_N(i) = \begin{cases} A(i) & \text{if } i \leq \bar{i} \\ y & \text{if } i > \bar{i} \end{cases} \quad (41)$$

$$c_E = \int_0^{\bar{i}} A(i) \cdot di - \frac{\bar{i} - y}{1 - \pi} - \frac{\pi}{1 - \pi} \cdot (1 - \bar{i}) \cdot y \quad \text{and} \quad c_N = \int_0^{\bar{i}} A(i) \cdot di + (1 - \bar{i}) \cdot y, \quad (42)$$

$$(1 - \pi) \cdot u \left(A(\bar{i}) - \frac{1 - y}{1 - \pi} \right) + \pi \cdot u(A(\bar{i})) = u(y), \quad (43)$$

where the last equation determines investment implicitly. Although borrowing costs are actuarially fair, investment falls with π . This is because the fact that repayment only takes place with probability $1 - \pi$ makes borrowing risky, the more so the higher π is. Investment increases with y , because the higher y is the less borrowers need to borrow and the less they are exposed to the repayment risk. The equilibrium is illustrated by solid line in the third panel of Figure 2.

2.3 The effects of financial liberalization revisited

The effects of financial liberalization when enforcement is non-discriminatory are very different from those in traditional models. These effects depend crucially on whether liberalization affects enforcement. This, in turn, depends on how poor/capital scarce the country is and on the quality of its institutions. When the country is rich/capital-abundant or somewhat poor/capital-scarce (y not too low), enforcement is maintained. This is because the temptation of the government to default on foreigners is not strong enough to compensate for the cost of not enforcing domestic payments. As a result, liberalization has even more positive effects than in traditional models, since the constraints on foreign borrowing are relaxed.

When the country is very poor/capital-scarce (y low), the temptation to default on foreigners more than compensates for the cost of not enforcing domestic payments. Thus, enforcement is lost in states in which the government can act opportunistically. If institutions are very strong ($\pi \approx 0$), the fact that enforcement is lost with small probability does not have much of an effect. If institutions are not strong, then the effects of liberalization are very different from those in traditional models. In particular, when the country is poor/capital scarce and institutions are weak, we find that financial liberalization can have the following effects.

- Lower investment output growth: This is true despite the fact that the cost of borrowing drops in expected terms. It happens when π is sufficiently low. Correspondingly, liberalization can lead to capital outflows.
- Higher aggregate consumption volatility: This is also the case when there is discrimination, but it is even more so when there is no discrimination. This can be seen by comparing Equations (22) and (42). For a given level of investment \bar{i} , aggregate consumption volatility is higher with non-discrimination because the country receives net payments from foreigners

when domestic enforcement fails. Correspondingly, the country makes more net payments to foreigners when there is enforcement. In addition, investment and, thus, average consumption are lower with non-discrimination, so aggregate consumption is even more volatile in relative terms.

- Higher individual consumption volatility: This is also more so than when there is discrimination. This is because with discrimination borrowers can share the risk of enforcement with other domestic residents, as there is always enforcement of domestic payments. With non-discrimination, domestic risk sharing is destroyed.
- Instability in domestic financial markets: In fact, in the model domestic residents no longer trade with each other after liberalization since all trade is done with foreigners.
- Lower welfare: To see this, consider the case in which π is such that investment is the same in autarky and after liberalization, so that the sets of savers and borrowers are the same in both cases. Savers are worse off after liberalization, since they lend at a lower interest rate than they did in autarky. In addition, those borrowers that are close to indifferent between borrowing and lending are also worse off than in autarky, for a similar reason. The only residents that might be better off are those with a high enough productivity so that, if there is diminishing absolute risk aversion, they are not hurt much by the enforcement risk. These negative effects of liberalization become more important the lower π is.

The effects of financial liberalization on welfare are summarized in Figure 3. In the horizontal axis is the endowment y , which proxies for capital abundance. In the vertical axis is the change in welfare, which is measured as average expected utility. The first and second panels correspond, respectively, to the cases of strong and weak institutions. The solid line shows the change in welfare when enforcement is non-discriminatory. As a reference, the dashed line shows the change in welfare when enforcement is discriminatory.

Regardless of institutions, enforcement is maintained for high levels of y . As long as this is the case, the country can take full advantage of the opportunity to borrow from richer countries. Thus, the welfare gain is larger than in the case of discriminatory enforcement. Enforcement breaks down for low levels of y . When this happens, the quality of institutions matters. When institutions are strong, liberalization still raises welfare, although less so than when enforcement was maintained. In addition, the increase in welfare is smaller than with discriminatory enforcement. When institutions are weak, liberalization lowers welfare..

3 Equilibrium discrimination

The assumption of non-discrimination allows the model to account for the main empirical facts. Moreover, the assumption seems quite realistic. With few exceptions, episodes of default on government debts have affected all bondholders regardless of their nationality, and bond prices do not differ by the nationality of the holder. The same holds true in the case of debts issued by firms and/or banks.¹⁶

The current institutional setup for international borrowing actually makes discrimination quite difficult. Governments borrow from abroad mostly by selling bonds which are traded in deep secondary markets, while liberalized capital accounts permit the private sector to access international financial markets directly or through an increasing variety of financial intermediaries. In such an environment, governments' ability to discriminate between domestic and foreign creditors is seriously limited. For example, when borrowing takes place by selling bonds or stocks, even when foreigners cannot get repaid by the original borrowers they can still get repaid, albeit indirectly, by selling these assets to domestic residents in secondary markets.¹⁷ Even in those cases in which asset trade is intermediated, governments typically do not know the nationality of the clients of banks, mutual funds and other financial intermediaries that hold domestic debt. And even if governments had this information, they might still not be able to control how these intermediaries distribute the losses from not enforcing payments among their domestic and foreign clients. Finally, courts often abide by equal-treatment rules that limit the possibility of discrimination based on nationality.

In this section, we formally investigate these issues.

3.1 The role of secondary markets

This section will show how trading in secondary markets reduces the government's ability to discriminate against foreigners. Therefore, having well-functioning secondary markets might increase or lower welfare ex-ante. These markets increase welfare if non-discrimination leads to enforcement of foreign debts when discrimination would have led to default on foreigners. But secondary markets reduce welfare if non-discrimination leads to non-enforcement when discrimination would have led to enforcement of domestic debts.

¹⁶ A recent and very visible example is the case of the "pesificación" of bank deposits and loans in Argentina in 2001, which induced a generalized default that affected all depositors.

¹⁷ For a complete analysis of the role of secondary markets in the presence of sovereign risk see Broner, Martin, and Ventura (2007a and 2007b).

3.2 The choice of financial system

This section asks about the endogenous choice of financial systems. If non-discrimination is desirable and secondary markets would raise welfare, there is an incentive to adopt financial systems that make these markets possible. This is achieved, for instance, by developing standardized financial instruments such as stocks and bonds that can be easily retraded in anonymous markets.

If non-discrimination is undesirable and secondary markets would lower welfare, there is an incentive to adopt financial systems that impede the functioning of these markets. This is achieved, by instance, by developing financial systems based on banking and other types of financial intermediation that emphasize personal relationships and make financial contracts less tradable.

We first examine how the optimal choice of financial system depends on country characteristics. We also show that coordination failures can arise in which a country adopts the “wrong” financial system and there are no individual incentives to reverse the situation. In such a situation, the government might play a role in helping develop the “right” financial system.

4 Final remarks

This paper shows that, once we recognize that governments cannot discriminate easily between domestic and foreign creditors, it is straightforward to write down a model that, even though the only source of frictions in asset markets is sovereign risk, accounts for all the effects of financial liberalizations observed in reality.

The model also can be used to analyze the optimal institutional design for emerging market borrowing. The most immediate application seems to be whether emerging markets should borrow in a way that makes discrimination difficult, as they did in the 90s and do now, or in a way that makes discrimination easy, as they did in the 70s and 80s. From Figure 3, it is clear that the answer to this question depends on how poor/capital scarce the country is. Since emerging markets have grown faster than the developed world during the last few decades (at least some emerging markets), this seems like a potential explanation for the observed change in the institutional setup of emerging market borrowing.

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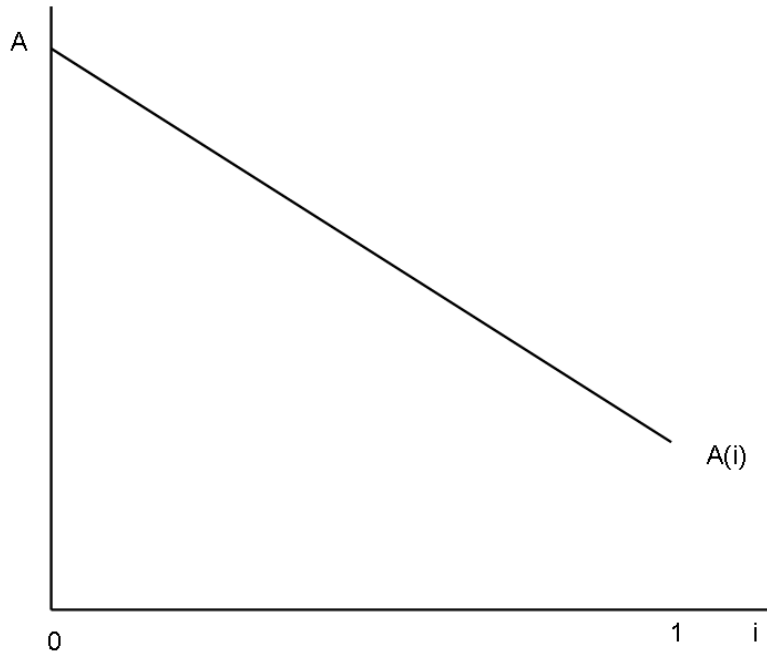


Figure 1:

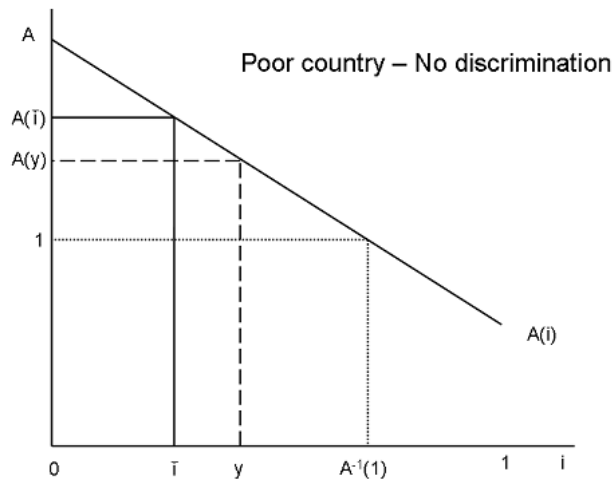
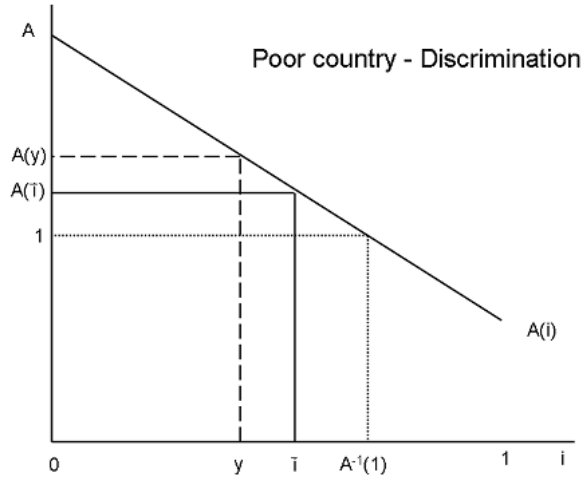
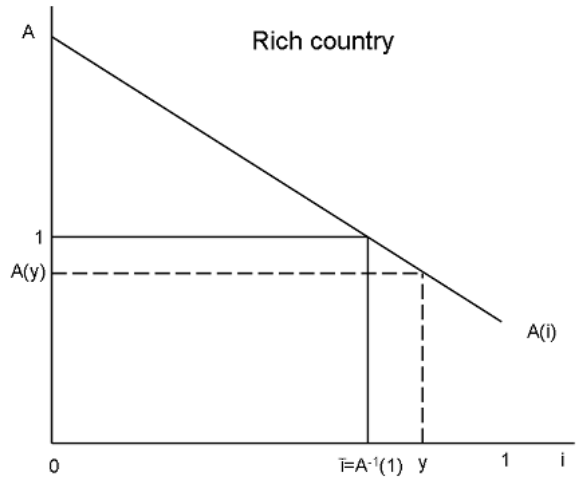


Figure 2:

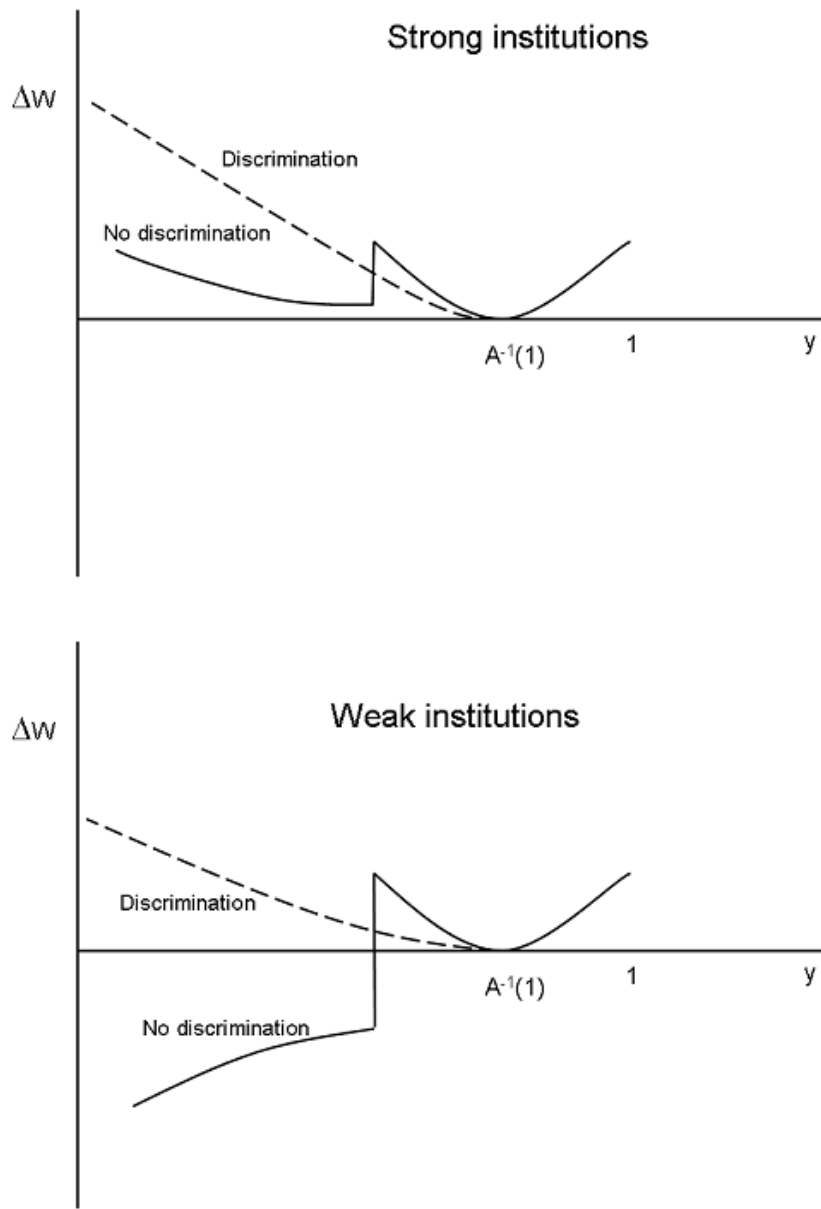


Figure 3: