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Abstract[1]

Deeper financial integration is expected to enable low-saving countries to increase domestic investment but also to increase crisis risks by facilitating the accumulation of risky foreign liabilities. This paper explores the connections between financial integration, investment and crisis risk to assess this tradeoff. It confirms expectations but also finds that the accumulation of safe foreign assets that financial integration brings is an important risk offset that in many cases even eliminates the risk factor from the tradeoff altogether. Furthermore, it shows that the risk features of assets and liabilities depend on their type. Ultimately, whether international financial integration is in fact a reliable remedy for individual countries critically depends on the portfolio composition of their foreign assets and liabilities.

JEL Codes: E44, F32, F34, G01, G15, H63
Keywords: Financial integration, Saving, External crisis, Foreign assets, Foreign liabilities

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1. Introduction

Low national saving rates can be a constraint to investment and growth. How binding the constraint is depends on the availability of alternative financing sources. To the extent that foreign financing is not forthcoming, the scarcity of national savings available to finance investment would be binding. Conversely, international financial integration facilitating low-saving countries' access to foreign financing could be the key to solving this problem. As international financial integration is on the rise, policymakers and others are faced with the question of whether it will it be an effective cure for low-saving countries with untapped investment opportunities.

At first pass the answer appears to be clearly positive. Successful financial integration lowers the financial costs of cross-border capital flows, reducing the cost of investment projects. Financial integration tends to eliminate interest rate differentials across countries and equalize their cost of capital in all forms of financing to the benefit of savings-constrained countries. At the limit, if national and foreign financing were financially equivalent under *perfect* integration, the source of funding would be irrelevant and only the aggregate financing supply would matter for investment. Financial integration would thus alleviate the low-saving constraint by facilitating access to foreign financing.

However, the concern with market and government failures leading to the misuse of foreign financing and the persistence of external crises as financial integration deepens suggests that, in practice, the answer is less certain. Foreign financing brought by financial integration may pose a tradeoff: on the one hand, it can help investment, but on the other hand it can exacerbate macroeconomic risks and may prompt costly crises. At the same time, financial integration also facilitates the accumulation of foreign assets, which may *reduce* the risks of external crisis because repatriated foreign assets can provide an alternative source of financing when external credit dries up. Therefore, a clear-cut case for financial integration needs to show how the various factors play out.

This paper documents the different channels through which financial integration can affect investment and macroeconomic risks. First, it shows that financial integration leads to higher absorption of foreign savings and higher investment in low-saving countries. It is well known after Feldstein and Horioka (1980) that investment is strongly dependent on national savings across countries. A strong rationale for pursuing deeper financial integration is that countries with low saving rates can potentially overcome the domestic financing shortage by importing savings from

the rest of the word, and in this way, delink investment from national savings. This paper assesses empirically the investment effects of financial integration by expanding the traditional Feldstein and Horioka (1980) framework to include proxies for financial integration in the estimating equation. It finds that financial integration helps to loosen the tight correlation between national saving and investment rates and that the positive investment effect of financial integration is higher when national saving rates are lower. It thus confirms that financial integration increases investment in low-saving countries.

Other channels concern the link between financial integration and crisis risk. Higher absorption of foreign savings—leading to the accumulation of foreign liabilities—may heighten macroeconomic risk. The view that foreign financing can be risky resonates with the literature on sudden stops in capital flows (Calvo, Izquierdo and Mejía, 2004; Cavallo and Frankel, 2008). This literature highlights the macroeconomic risks associated with the absorption of capital inflows and the damage infringed on recipient countries by sharp and unexpected reversals of capital flows. Moreover, capital inflows over time leads to the build-up of the *stock of foreign liabilities*, which would be subject to sovereign risk. Our paper confirms that financial integration effectively facilitates the accumulation of foreign liabilities in savings-constrained economies, thus representing a potential source of risk. It also reviews several reasons why markets may fail to modulate these macroeconomic risks appropriately. However, before concluding that financial integration necessarily poses a tradeoff between relaxing the low-saving constraint for investment and contributing to the build-up of macroeconomic external risks, it is important to recognize that it may also bring safety by facilitating the accumulation of foreign assets that can potentially be repatriated. Both liabilities and assets need to be examined.

This paper explores the potentially differential effects of *gross stocks* of foreign assets and liabilities on the crisis risk. It draws insights from a recent strand of the sudden stops literature that focuses on gross rather than net capital flows (Forbes and Warnock, 2012; Cowan et al., 2008). Cavallo et al. (2015) show that deeper financial integration across countries has led to a sharp rise in *gross* capital flows across countries. They show in turn that this process had implications for the assessment of risks of sudden stops in *net* capital flows. There are circumstances in which gross capital inflows and outflows may move in opposite directions (i.e., residents may repatriate assets when foreigners stop lending), thereby reducing the volatility of net capital inflows (i.e., gross inflows – gross outflows). In this way, by facilitating both inflows and outflows, financial

integration can change the balance of risks. In a similar fashion, this paper looks at the differential effect of *gross* foreign liabilities and assets on the risk of external crisis and uncovers a similar pattern. As financial integration deepened over the last decades, there has been a remarkable increase in the stocks of both liabilities (i.e., accumulated gross capital inflows) and of foreign assets (i.e., accumulated gross capital outflows). Given that foreign assets can potentially be repatriated, a larger stock of assets may offset some of the risks associated with the accumulated foreign liabilities. Thus, the net impact of financial integration on crisis risk would depend on the strength of the two opposing forces.

The main finding is that financial integration impacts risk through offsetting channels. On the one hand, the accumulation of foreign liabilities increases the crisis risk. On the other hand, the accumulation of foreign assets reduces the risks. This finding is in stark contrast to studies that neglect assets and take into account only gross liabilities as a risk factor. In particular, we find that, quantitatively, the risk-reducing channel of financial integration through assets is more powerful than the risk-augmenting channel. This last result is, to the best of our knowledge, novel and it goes against the established wisdom that gross capital outflows (oftentimes called "capital flight" in emerging and developing countries) are an indication of economic weakness.[2]

The preceding discussion highlights that the assessment of the risks from financial integration depends on the gross positions supporting *net* foreign liabilities. The problem is further complicated by the fact that not all foreign assets and liabilities carry the same risks. This paper shows that certain types of foreign liabilities (e.g., external debt) are riskier than others (e.g., FDI stocks). Moreover, certain types of assets (e.g., liquid assets like international reserves) are more protective than others (e.g., illiquid FDI). Ultimately, the power of financial integration to reduce risks, or to magnify them, depends on the composition of the portfolio of assets and liabilities.

2. Financial Integration Is on the Rise

The degree of international financial integration refers to the ease with which financial flows can move across national jurisdictions (i.e., the costs associated with such flows). While there are different proxies of financial integration,[3] in this paper, we focus on three measures trying to

[2] The term "capital flight" has a negative connotation. It suggests distrust in the national economy such that local capital flees the domestic economy.
[3] For a survey of the literature, see Quinn, Schindler and Toyoda (2011).

capture complementary elements: the Chinn and Ito (2008) KAOPEN index, the Lane and Milesi-Ferretti (2007) ratio based on observed stocks of foreign assets and liabilities, and a similar ratio based on capital *flows*.

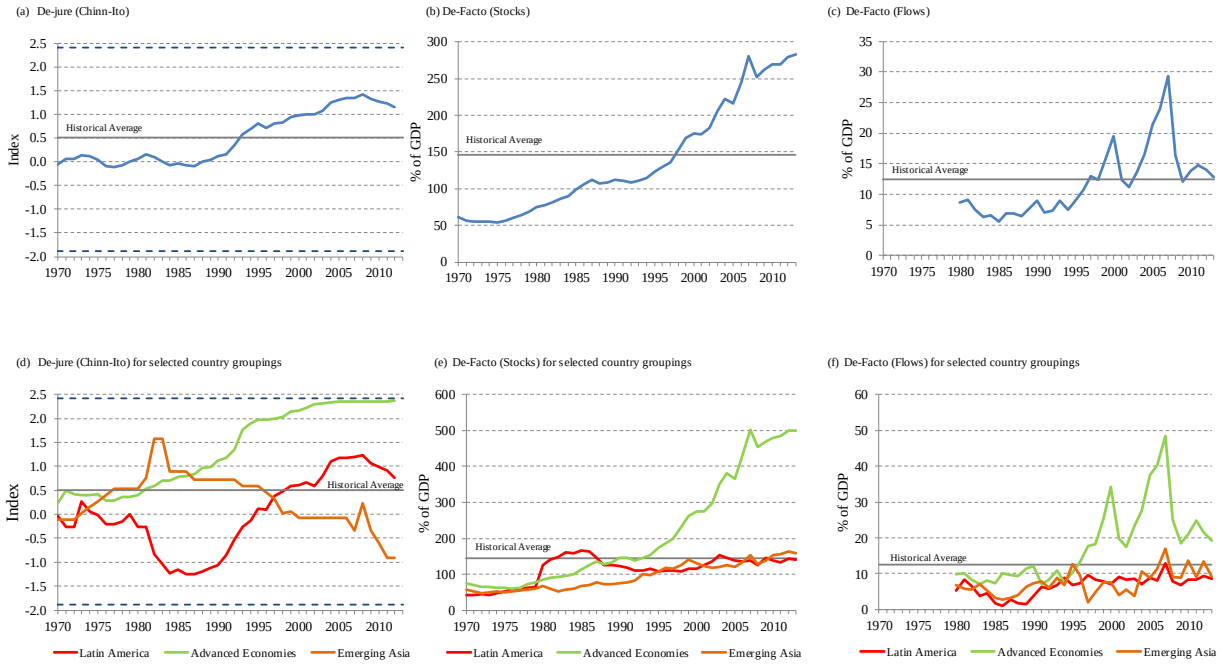
The Chinn and Ito (2008) index belongs to the family of so-called "de jure" indices. It measures the existence—or lack thereof—of capital controls in individual countries that regulate inbound and outbound financial transactions across countries. Chinn and Ito (2008) use a principal component analysis (PCA) on the following variables from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) table: restrictions on current or capital account transactions; existence of multiple exchange rates; and requirements of surrendering export proceeds. Higher values of the index imply *fewer* capital controls as well as better conditions for the free movement of exports and currencies. A shortcoming of "de jure" measures is that they do not reflect the extent to which actual financial conditions underlying capital flows evolve in response to changes in legal restrictions: they may not be able to capture subtle yet important differences among countries' capital control regimes.

"De facto" indices, in turn, are classified into quantity-based, price-based, and hybrids (see Quinn, Schindler and Toyoda 2011). Price-based indexes are theoretically sound but empirically unreliable. Among the quantity-based indices, the most widely used is Lane and Milesi-Ferretti (2007), which measures financial integration using data from countries' external balance sheets. The measure is computed as the sum of foreign assets and liabilities as a share of the country's GDP. To complement this index, we construct an analogous ratio using gross capital flows. This alternative measure is the sum of annual gross capital inflows and gross capital outflows as a share of the country's GDP.[4] One key disadvantage of "de facto" indices is that they do not reveal the conditions driving the accumulation of assets and liabilities; for example, whether an increase in the ratio followed cost reduction was associated with financial integration or was driven by other factors. As such, they are also imperfect proxies of financial integration. Importantly, in contrast to "de jure" measures, these ex post quantity-based indexes depend not only on national policies but are also influenced by the evolution of frictions in counterparty countries in the rest of the world that facilitate or impede cross-border flows.

[4] The data for gross capital flows are taken from the IMF's Balance of Payments and International Investment Position Statistics. The data necessary to compute this proxy are available for 58 of the 65 countries in the sample starting in 1980. Countries with missing flow data are Taiwan, China, Dominican Republic, Egypt, Jamaica, Jordan, Oman and Serbia.

Notwithstanding the diversity and limitations of existing proxies, Figure 1 illustrate that they uniformly show that financial integration was on the rise beginning in 1990s but has slowed down after the global financial crisis of 2008/09, particularly in regard to capital flows. At a regional level, an exception to the global trend is observed in Emerging Asia. Per the Chinn and Ito (2008) proxy, financial openness in Asia started to slow down in the aftermath of the Asian crisis of the late 1990s. Interestingly, despite the increase in capital controls (and the concomitant decline in the Chinn-Ito index), "de facto" financial integration continued to increase in Asia, the same as in all other regions. In advanced economies, the sharp fall in gross capital flows after 2008 suggests a return to normal levels prior to the pre-crisis boom. All in all, we note an increasing trend in financial integration albeit with (somewhat strong) fluctuations, especially around crisis periods. The overall picture is that there is a tide of deeper financial integration in the world that tends to push up inflows and outflows across countries.

Figure 1. Financial Integration around the World: De Jure and De Facto Indices
Simple average by country group



Source: Figure shows the simple average of Chinn-Ito's De Jure index and two De Facto indices: Stocks (the sum of foreign assets and liabilities as a share of the country's GDP) and Flows (the sum of gross capital inflows and outflows as a share of the country's GDP). Authors' calculations using data from Chinn and Ito (2008), Lane and Milesi-Ferretti (2007), World Economic Outlook, International financial Statistics and World Bank Open data. Data availability for De Facto (Flows) proxy starts in 1980. See appendix for the list of countries in each country group. Horizontal filled lines show the sample historical average. Horizontal dashed lines represent Chin-Ito's maximum and minimum sample values. In all cases, higher values imply deeper financial integration.

In the rest of the paper we explore the implications of the process of increased financial integration for investment and for countries' risk profiles with a focus on low-saving countries.

3. Financial Integration Brings Investment Gains to Low-Saving Countries

Financial integration is on the rise. What is the impact on investment in countries that are constrained by low saving rates? To fix ideas, we present a simple stylized model relating aggregate investment to national and foreign saving that we use as a workhorse.

3.1 A Simple Model of Saving, Investment and Financial Integration

The investment and savings behavior is modeled using the following equations:

$$\begin{cases} I = c_I - ir \\ S = c_s + sr \\ F = c_f + f(r - r^*) \end{cases}$$

where I, S and F are domestic investment, national savings and net foreign savings as a percentage of GDP, respectively; c_I , $c_s \geq 0$ are country-specific propensities to invest and save; and $i, s \geq 0$ are common parameters capturing the sensitivity of domestic investment and national savings, respectively, to the domestic real interest rate r. If $F \geq 0$, the country is a net importer of foreign savings, in part driven by a country-specific autonomous propensity to absorb foreign savings $c_f \geq 0$. r^* is the exogenous real interest rate available to foreign savers. It is assumed that that the real exchange rate is expected to remain constant in equilibrium so that currency value expectations do not distort the domestic return gap $r - r^*$. Finally, $f \geq 0$ is the financial integration indicator. It encompasses all the factors that may put a foreign financial investor at a disadvantage relative to a domestic one, including uncertainty with respect to future level of the real exchange rate. This parameter regulates how much foreign saving is absorbed (or exported) driven by the premium $(r - r^*)$. A larger f is tantamount to deeper financial integration.

The market-clearing condition is $I = S + F$. Therefore, in equilibrium, the domestic interest rate r is determined by:

$$r = \frac{c_I - c_s - c_f}{s + i + f} + \frac{fr^*}{s + i + f}$$

The equilibrium condition shows that, all else equal, the lower the propensity to save c_s, the higher the domestic interest rate $\left(\frac{\partial r}{\partial c_s} < 0\right)$ is. We define low-savings countries as those countries whose propensity to save is low enough to bring the domestic interest rate above the international interest rate $(r \geq r^*)$. From the equilibrium equation above, it follows that the low-saving country condition is:

$$c_s \leq \left(c_I - \ c_f\right) - r^*(s + i)$$

Proposition 1. All else equal, lower propensity to save c_s yields lower domestic savings, lower investment, and higher absorption of foreign savings.

Proof. Lower investment *I* and higher absorption *F* is an immediate consequence of the higher domestic rate *r* brought by lower propensity to save $\left(\frac{\partial r}{\partial c_s} < 0\right)$. Since S=I-F, it follows that domestic savings fall with lower propensity to save (despite the offsetting effect of higher domestic rates on savings).

Proposition 2. Deeper financial integration (i.e., higher f) tends to eliminate interest rate differentials across countries.

Proof. Compute $\frac{\partial r}{\partial f}$ using equilibrium condition.

$$\frac{\partial r}{\partial f} = -\frac{c_I - c_s - c_f}{(s + i + f)^2} + \frac{r^*}{s + i + f} - \frac{f r^*}{(s + i + f)^2}$$

$$\frac{\partial r}{\partial f} = \frac{1}{s + i + f}\left(r^* - \left(\frac{c_I - c_s - c_f}{s + i + f} + \frac{f r^*}{s + i + f}\right)\right)$$

$$\frac{\partial r}{\partial f} = \frac{1}{s + i + f}(r^* - r)$$

If $r \geq r^*$, then $\frac{\partial r}{\partial f} \leq 0$. If $r \leq r^*$, then $\frac{\partial r}{\partial f} \geq 0$. In both cases, in the limit as $f \to \infty$ then $\frac{\partial r}{\partial f} \to 0$, which implies that $r \to r^*$. End of proof.

In what follows we will focus on the case of low saving countries, where $r \geq r^*$.

Proposition 3. Deeper financial integration increases the absorption of net foreign saving and investment (despite decreased domestic savings) in low-saving countries.

Proof. In low-saving countries $r \geq r^*$, and therefore $\frac{\partial r}{\partial f} \leq 0$. It immediately follows that investment increases and domestic savings decreases. Since F=I-S, foreign savings increase. In fact, $\frac{\partial F}{\partial f} = -(i+s)\ \frac{\partial r}{\partial f}$, and therefore $\frac{\partial F}{\partial f} \geq 0$ when $r \geq r^*$.

There are three main takeaways from this simple macro model concerning low-saving countries: i) low-saving countries import foreign savings to finance investments; ii) deeper financial integration facilitates the absorption of additional foreign savings in low-saving countries; and iii) deeper financial integration helps low-saving countries to increase investment.

3.2 The Saving-Investment Nexus

Armed with the intuition of this simple model, we revisit the empirical evidence regarding the extent to which financial integration effectively helps to reduce the constraint on investment imposed by low national saving rates.[5] Consider a simple empirical model extending the basic Feldstein-Horioka (1980) framework that relates domestic investment (gross fixed capital formation) to national savings. The extended model includes how that relationship is affected by financial integration as measured by the index FI:

$$I_{i,t} = \alpha_i + \tau_t + \beta S_{i,t} + \gamma FI_{i,t} + \delta(S_{i,t} \times FI_{i,t}) + \varepsilon_{i,t} \qquad (1)$$

We estimate equation (1) relating investment rate *I* to national savings rate *S*, both measured as a proportion of trend GDP to avoid business cycle noise, and FI (using both de jure and de facto indices). In the model, *i* denotes a country and *t* the year, and $\varepsilon_{.}$ is the stochastic error term. α_i is the country-fixed effect, and τ_t is the time-fixed effect. The estimation is performed using fixed effects estimators for both years and countries. The sample includes all countries with available data in the World Economic Outlook (WEO) database and the other databases used to

[5] Of course, financial integration can have other benefits. For example, lower impediments to cross-border financing can widen the scope for risk diversification. Yet we abstract from a full assessment of all the possible benefits of financial integration to focus on just one that is particularly relevant for low-saving countries: the investment response.

compile the necessary data:[6] it includes 65 countries (of which 36 are emerging economies) for the period 1970-2013.[7] See the Appendix for data sources and summary statistics.

Feldstein and Horioka (1980) focused on estimating β, the so-called "saving retention coefficient." They found a positive and significant correlation coefficient (β) between national saving and domestic investment rates, which they interpreted to suggest that cross-border obstacles to financial integration were sufficiently large so that investment was crowded-in domestically whenever national saving increased. In the Appendix, we show that the original Feldstein-Horioka (1980) equation can be derived from the simple model in the previous section when financial integration is constant.

Equation (1) adds varying financial integration (FI) to the original empirical model to represent the equilibrium conditions of the saving-investment model of the previous section (see appendix). The model predicts that the dependence of investment on national saving decreases as financial integration is higher. It also shows that the investment-enhancing effect of financial integration is a decreasing function of the national saving rate, because countries with higher savings are less constrained.[8] This implies that δ is expected to have a negative sign. Because the effect of financial integration in low-saving countries is investment augmenting, it is expected that γ has a positive sign.

[6] We performed panel unit root tests finding no evidence that the series were non-stationary across the panels. Thus, we performed the estimation using fixed effects estimators, following the results of the F, Breuch-Pagan and Hausman tests, following the standard procedure.
[7] The panel is unbalanced with some missing information for specific country / year observations. We have excluded financial centers from the sample. See the Appendix for the list of countries and data availability.
[8] And high-saving countries are expected to export savings and to invest less.

Table 1. Extended Feldstein-Horioka Regressions

	Fixed Effects	De Jure (Chinn-Ito)	De Facto (Stocks)	De Facto (Flows)
Gross National Saving (GNS)	0.297***	0.301***	0.362***	0.279***
	(0.059)	(0.061)	(0.073)	(0.100)
FI Index		0.013**	0.007	0.205*
		(0.005)	(0.005)	(0.106)
FI and GNS Interaction		-0.048*	-0.058***	-0.689*
		(0.026)	(0.021)	(0.392)
Observations	2,335	2,199	2,331	1,549
Adjusted R2	0.594	0.606	0.611	0.615

Clustered Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Estimated using annual data (1970-2013) for a sample of 65 countries. Estimation method: Panel Fixed Effects. The lower number of observations in column (4) is due to the shorter time span of the capital flows data used to construct the proxy (i.e., data coverage starts in 1980) and to missing capital flows data in the IMF's Balance of Payments and International Investment Position Statistics for Taiwan, China, Dominican Republic, Egypt, Jamaica, Jordan, Oman and Serbia. Thus, the De Facto (flows) proxy is available for only 58 of the 65 countries in the sample over a time span beginning in 1980 (instead of 1970 as in the case of the De Jure measures the and De Facto stocks measures).

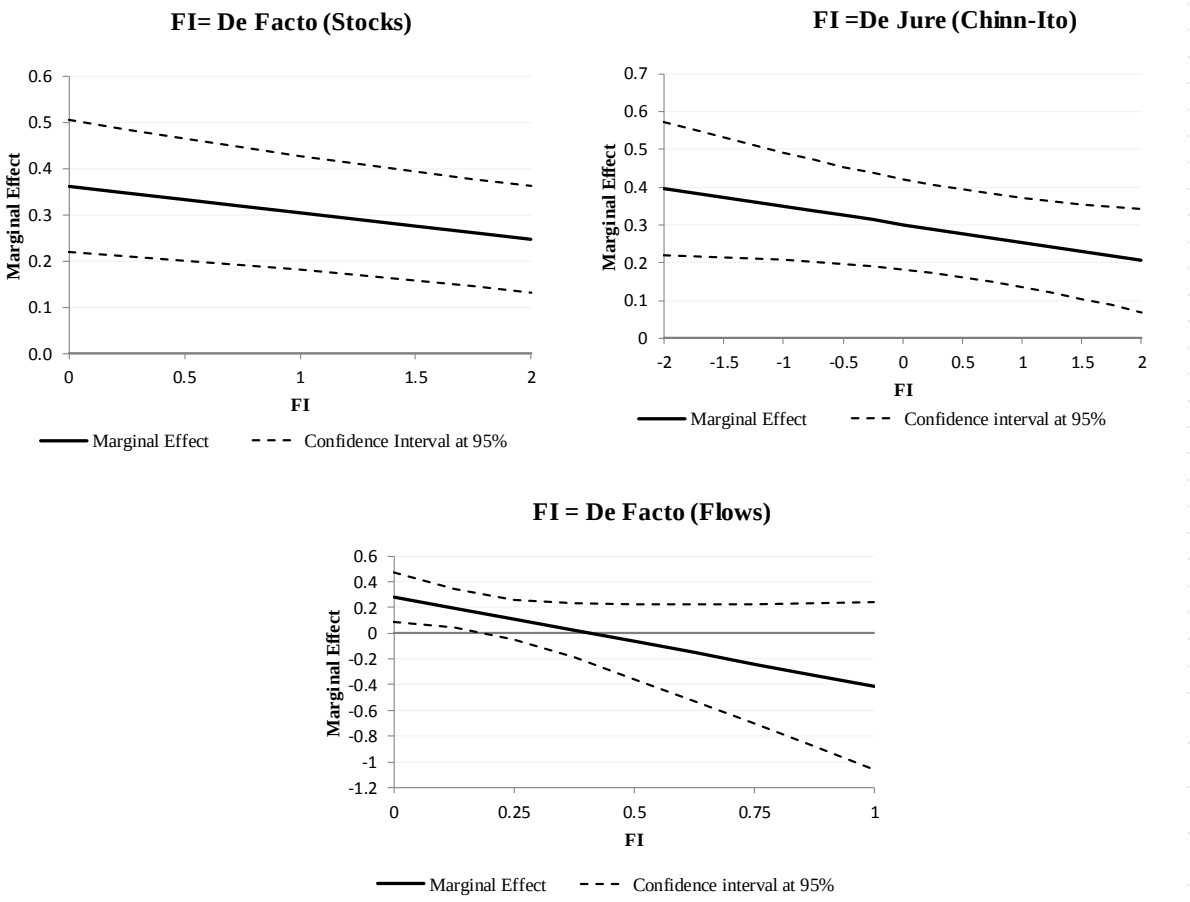
Results in Table 1 for the simpler model confirm the positive and significant coefficient estimate for β, Feldstein and Horioka's "saving retention coefficient." (column 1). The coefficient estimate suggests that for every 1 percentage point increase in national saving, domestic investment increases by approximately 0.30 percentage points.[9] Moreover, as expected, we find a negative and statistically significant coefficient estimate for the interaction term (δ) in columns 2-4. This implies that the overall saving retention coefficient $\boldsymbol{\beta + \delta(FI_{i,t})}$ shrinks as financial integration deepens.[10] Figure 2 plots this relationship to show how the overall saving retention

[9] This is in line with other recent estimates in the literature. See Cavallo and Pedemonte (2016) for a review.

[10] Some authors argue that Feldstein-Horioka estimations are biased so that the savings retention rate is overestimated. To the extent that financial integration does not affect such bias, this finding on the effect of financial integration remains valid.

coefficient declines with increasing levels of financial integration, eventually reaching the theoretical zero bound where national savings are irrelevant for investment under perfect financial integration.

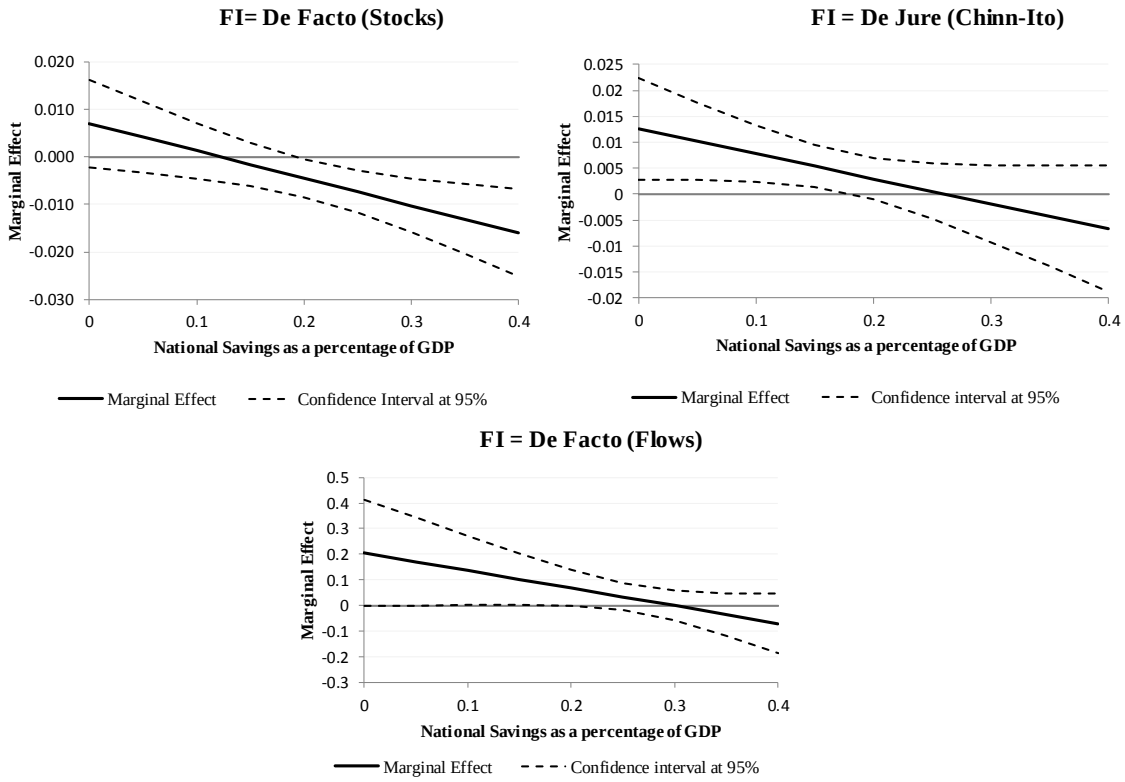
Figure 2. Expanded Saving Retention Coefficient: β + δFI



Source: Authors' calculations. *Estimation method:* Within Fixed Effects Model.
Note: Figure presents the estimated impact (marginal effect) of financial integration on investment (β + δFI from equation 1) with the corresponding confidence intervals. Estimated using annual data (1970-2013) for a sample of 65 countries.

Next, we compute the estimated impact of increasing financial integration on investment. We calculate: $\gamma + \delta S_{i,t}$ using the regression results.[11] Figure 3 shows the result.

Figure 3. Impact of Financial Integration on Investment: γ + δS



Source: Authors' calculations. *Estimation method:* Within Fixed Effects Model.
Note: Figure presents the estimated impact (marginal effect) of financial integration on investment (γ + δS from equation 1) with the corresponding confidence intervals. Estimated using annual data (1970-2013) for a sample of 65 countries.

The estimated marginal response of investment to financial integration is, as expected, a decreasing function of the national saving rate. This implies that, financial integration has a positive impact on investment in countries where national saving rates are low.

[11] This assumes that national savings remain constant as financial integration deepens. This no-crowding-out assumption may be optimistic to the extent that financial integration brings lower domestic interest rates in low saving countries.

4. Financial Integration May Be Risky

Deeper financial integration facilitates investment through increased foreign financing in countries with low national saving rates. However, there are reasons to suspect that the absorption of foreign savings can contribute to building up risks of macroeconomic crises. If so, deeper financial integration poses a tradeoff for low-saving countries.

First, foreign savings may be unreliable because its availability and financial terms depend on changing international circumstances outside the control of national authorities. Capital flows to emerging economies are influenced by external factors (the so-called "push factors").[12] Events such as the Federal Reserve Board of the United States raising interest rates can have significant impact on capital inflows to emerging markets.

Second, foreign financiers may be especially anxious because they rightly fear that, under economic stress, national policies may discriminate against foreign liabilities or even expropriate them as a quick way to favor national welfare, especially if foreign liabilities become too large relative to the size of the domestic economy. In those contexts, it is understandable that foreign investors may want to watch their exposure to the recipient country and, if they decide to run the risk, favor certain types of capital flows that are short-term, liquid and easier to repatriate. This behavior can lead to pro-cyclical capital flows during crisis periods, undermining macroeconomic stability.

Third, attracting foreign financing requires offering high returns in foreign currency, which cannot happen if the country is unable to generate foreign exchange. In most cases, external debt contracts are stipulated in foreign currency and need to be serviced correspondingly. The inability of issuing foreign debt in local currency at reasonable terms, the so-called "original sin" of emerging economies, is still a preponderant feature in many countries that hampers financial integration (see Levy-Yeyati and Zúñiga, 2015). But more generally, irrespective of the specifics of the foreign liability contract, in the end, foreigners care about the real value of their holdings in terms of their purchasing power in their own countries. For example, American holders of equity assets care about the dollar value of their shares. This means that foreign investors care about the potential conversion of domestic assets into foreign currency. In crisis situations, the ability of a country to generate foreign exchange may be quite limited. In fact, transforming domestic

[12] See Calvo, Leiderman and Reinhart (1996) for a summary of the discussion on the role of global factors versus domestic factors in driving capital flows to emerging markets.

resources into foreign exchange through increased net exports is a disruptive and costly process, especially if the adjustment needs to be effected quickly.

Unreliable foreign savings and difficult balance of payments adjustments make for an explosive mix, which is many times the cause of disequilibrium or a key transmission channel of macroeconomic crises. Therefore, it is important to recognize the financial risks that foreign savings carry and that detract from the benefit of increasing investment. Taking this into account, Rancière, Tornell and Westerman (2006) suggests that there is a potential tradeoff between crises and growth. Even if direct crisis costs do not materialize, macroeconomic risks brought by the excessive accumulation of foreign liabilities over time may raise the cost of capital and depress investment down the line.[13]

Can the market be trusted to self-regulate the absorption of foreign savings concerning macroeconomic risk to ensure that the tradeoff is resolved satisfactorily so that more financial integration is always a winning proposition? Possibly not. Individual market participants absorbing foreign financing cannot internalize the collective harm done by contributing to mounting aggregate foreign financing that may upset macroeconomic equilibrium. By raising macroeconomic risk, each operation adding to foreign liabilities would compromise the net returns of all domestic investment reflected in risk spreads without facing any disincentive to do so, which would lead to excessive macroeconomic risk.[14] In fact, the true measure of macroeconomic risk may actually exceed what is incorporated into financial market pricing (i.e., sovereign spreads, yields on credit-default swaps, etc.) and go under the radar because much of the cost of crises is often ultimately borne by workers and other third parties not involved in the financial transactions. Whether financial integration turns out well on balance is best studied as an empirical matter.

4.1 Assessing the Risks of Financial Integration: A First Cut

A first cut in assessing the contribution of financial integration to macroeconomic risks is based on two hypotheses. First, that deeper financial integration leads to the accumulation of *net foreign*

[13] For example, in Latin America and the Caribbean in the 1980s, the unyielding external debt overhang acted as an implicit tax on investment (the fruits of growth would increase countries' capacity to pay and then be captured by external creditors) and, possibly more importantly, created deep uncertainty as to how the burden of the ultimate costs would be distributed across different economic agents. See Cavallo, Fernández-Arias and Powell (2014).

[14] For example, in Jeanne and Korinek (2010) individual agents do not fully internalize how their individual capital inflow decisions impact overall volatility in the economy, which leads to excessive leverage unless regulated. In the same guise, Fernández-Arias and Lombardo (1998) showed that an unregulated economy absorbs foreign savings too quickly because it cannot properly ration its space to borrow abroad before reaching the country's credit ceiling.

liabilities in low-saving countries. Second, that higher net foreign liabilities increase the risk of external crises. Putting these together, one would conclude that financial integration is risky for low-saving countries.

The net foreign liabilities (NFL) position of a country is the sum of the accumulated absorption of foreign savings, appropriately priced and depreciated over time. Lane and Milesi-Ferretti (2007) document that different rates of absorption of foreign savings give rise to sizeable cross-country differences in NFL positions. As shown, low-saving countries in turn are more likely to import foreign savings (i.e., higher *F*) to finance their investment opportunities due to the shortage of domestic financing. It is thus to be expected, in line with the results from the comparative statics exercises presented before, that deeper financial integration (i.e., higher *F*) would lead to higher NFL in low-saving countries. To check whether this relationship holds in the data we consider the following linear model:

$$NFL_{it} = \alpha_i + \tau_t + \beta_1 FI_{it} + \beta_2 (FI_{it} \times \overline{S_i}) + \epsilon_{it} \quad (2)$$

where NFL_{it} are the Net Foreign Liabilities in country i on year t; $FI_{i,t}$ is the financial integration index; $\overline{S_i}$ is the average Gross National Saving Rate (as a percentage of trend GDP)—average taken for country *i* over the sample period; and ϵ_{it} is the error term. α_i is the country-fixed effect (which absorbs the term $\overline{S_i}$ in the regression), and τ_t is the time fixed-effect.

Deeper financial integration per se can lead to higher or lower NFL, depending on whether the country is a net debtor (low saving) or net creditor (high saving) vis-à-vis the rest of the world, so the overall effect is ambiguous. However, as financial integration deepens, high-saving countries would accumulate even more foreign assets than liabilities, and thus NFL would decline. The reverse would be true for low-saving countries. We thus expect $\beta_2 < 0$. Since the overall impact on low-saving countries would be positive, it is expected that $\beta_1 > 0$.

We estimate equation (2) using panel fixed effects to account for unobserved heterogeneity. The data on NFL positions are taken from Lane and Milesi-Ferretti (2007) and updated with data through 2013. Saving data are from the World Economic Outlook database (IMF). We use the three FI indices that were defined above. The sample is the same as before: it includes a maximum of 65 countries (of which 36 are emerging economies) for the period 1970-2013.[15]

[15] See the Appendix for the list of countries.

Table 2 shows the results for this exercise. There is no statistically significant correlation between the NFL and FI in the whole sample (columns 1-3), which appears to include low and high-saving countries in a balanced fashion. However, when we include the interaction with the average saving rate, the results change in line with the simple model of the previous section. In the case of the de facto openness indicators (columns 5 and 6), we find that the association between FI and NFL is decreasing as the saving rate is higher ($\beta_2 < 0$). As expected, $\beta_1 > 0$, so that deeper financial integration is associated with larger NFL in low-saving countries. The de jure index does not lead to statistically significant results, which may suggest that the reduction of financial frictions across the world may have been more important than national policies in bringing deeper financial integration underpinning the evolution of net financial liabilities in each country. Per the coefficients estimates, countries saving less than 25 percent or so of GDP tend to incur higher net foreign liabilities when financial integration deepens.[16]

Table 2. The Estimated Impact of Financial Integration on Net Foreign Liabilities (NFL)

	(1)	(2)	(3)	(4)	(5)	(6)
	De Jure (Chinn-Ito)	De Facto (Stock)	De Facto (Flows)	De Jure (Chinn-Ito)	De Facto (Stock)	De Facto (Flows)
FI Index	0.023	0.029	0.027	-0.008	0.407**	3.221***
	(0.018)	(0.022)	(0.232)	(0.093)	(0.200)	(1.102)
FI Index * Saving Average				0.149	-1.614**	-13.150***
				(0.439)	(0.762)	(4.447)
Observations	2,342	2,523	1,565	2,342	2,523	1,565

Clustered standard errors in parentheses. The country fixed effects absorb the saving term (*S*) when it is entered as a separate regressor in equation (2); therefore, in table the saving term appears only in the interaction term.
* p < 0.10, ** p < 0.05, *** p < 0.01

[16] The threshold is computed by taking the ratio of $-\beta_1/\beta_2$,

The second hypothesis is that higher NFL increases crisis risk. This hypothesis is confirmed by Catão and Milesi-Ferretti (2014). They show that a country's ratio of NFL to GDP is a significant predictor of external crises.[17] These crises, which encompass a variety of different types of events, usually entail output contraction and, more generally, are associated with large economic, social and political costs in the affected economies.

To probe deeper into this hypothesis, we extend the empirical analysis using a similar methodology. As a first step, we consider the following model:

$$P\{Crisis_{it} | \, NFL_{it-1}, Total\ Crisis_{it}\} = \Phi\left(\alpha + NFL_{it-1}\gamma_1 + Total\ Crisis_{it}\gamma_2\right) + \epsilon_{it} \quad (3)$$

where $Crisis_{it}$ is an indicator variable marking the onset of a crisis at time t in the country i, Φ is the normal cumulative distribution function, NFL_{it} are the Net Foreign Liabilities (as a share of trend dollar GDP to filter out business cycle fluctuations) and $Total\ Crisis_{it}$ stands for the total number of crises starting in the same year in the rest of the sample other than the observation *i* to control for global shocks. Given the nature of the left-hand side variable (i.e., dummy variable indicating the onset of a crisis), the model is estimated using the probit framework. In the baseline regressions, we use the "external crisis" indicator defined in Catão and Milesi-Ferretti (2014).[18] The definition of external crisis includes defaults and rescheduling events as well as events that require IMF support bigger than twice the respective country's IMF quota. In all the cases, as is common in the literature, we include only the initial year of each crisis to avoid second round effects affecting the results. The source of the data is Catão and Milesi-Ferretti (2014) and the sample is the same as in the previous regressions.

[17] The statistical analysis is conducted using a probit regression. The NFL ratio is statistically significant and substantial in economic terms. Crisis risk increases sharply as NFL exceeds 50 percent of GDP and whenever NFL/GDP ratio rises some 20 percentage points above the country-specific historical mean. The implication is that foreign liabilities are risky and should be kept under control.

[18] In other specifications, we use alternative crisis definitions: i) external crises paired with recessions; ii) real currency crises with and without recessions; iii) indicators of systemic banking, nominal currency and sovereign debt crises from Laeven and Valencia (2012); and iv) an indicator of sudden stops of capital flows following the taxonomy defined in Cavallo et al. (2015). In general, the economic studies that find a negative effect of a variety of macroeconomic crises on productivity and growth underscore their short-run destabilizing effects on macroeconomic variables and link these to the adverse effects that output volatility has on long-term growth. Crises reduce productivity and output, increase uncertainty, drive away investments and produce social tensions that hurt growth. See, for example, Ramey and Ramey (1995); Cerra and Saxena (2008); and Blyde, Daude and Fernández-Arias (2010). Results using alternative crisis indicators are available upon request.

The first column of Table 3 is like Catão and Milesi-Ferretti's main regression and confirms their result: higher NFL (as a share of GDP) increases the risk of external crisis.[19] Coupled with the result that in low-saving countries financial integration tends to increase NFL, this would indicate that deeper financial integration increases the risk of external crisis in low-saving countries. In the previous section, we showed that in this group of countries financial integration also increases investment. The conclusion would be that financial integration poses a tradeoff between growth and stability. Before reaching this conclusion, however, the next section takes a second look at the risk assessment of financial integration.

4.2 Revisiting the Tradeoff Between Growth and Stability

To take a closer look at the risk effects of financial integration, in columns (2) – (4) of Table 3 we expand the basic regression adding the financial integration proxies discussed before as separate explanatory variables. Interestingly, we find that the coefficient estimates for FI proxies are *negative*, and statistically significant in two out of three cases. This suggests that, in addition to the risk-enhancing channel documented by Catão and Milesi-Ferretti (2014), financial integration appears to have an independent *stabilizing* impact (i.e., reduces crisis risk).

Table 3. Probit Models for External Crises

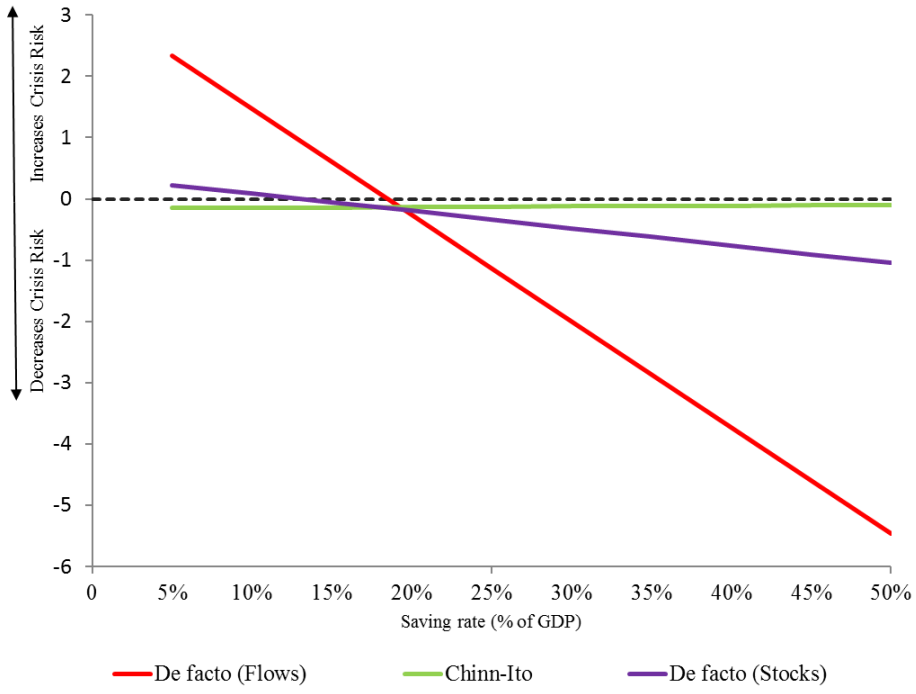
	(1)	(2)	(3)	(4)
	No FI term	De-Jure (Chinn-Ito)	De-Facto (Stocks)	De Facto (Flows)
Net Foreign Liabilities (NFL)	1.373***	1.404***	1.874***	1.339***
	(0.199)	(0.248)	(0.310)	(0.295)
FI Index		-0.166***	-0.344***	-1.035
		(0.046)	(0.133)	(0.983)
Total crisis	0.107***	0.112***	0.113***	0.093***
	(0.027)	(0.029)	(0.027)	(0.029)
Observations	2,040	1,944	2,040	1,236

Clustered standard errors in parentheses. *Notes:* Estimated using annual data (1970-2013) for a sample of 65 countries. * p < 0.10, ** p < 0.05, *** p < 0.01

[19] The results reported herein are based on the external crisis definition only but are validated using alternative crisis indicators.

In other words, these results suggest that financial integration has two different impacts on external crisis risk. There is a risk-increasing impact via the accumulation of NFL: i.e., deeper financial integration increases NFL in low-saving countries. There is also an offsetting impact: controlling for NFL, deeper financial integration reduces risk. Putting together both effects based on these estimates, that is the direct effect in Table 3 and the indirect risk effect resulting from increased NFL as estimated in Table 2 we obtain that the overall macroeconomic risk effect associated with financial integration may very well be negative unless savings are very low. Figure 4 plots the overall risk effect for the three FI proxies as a function of the savings rate and shows that for most low-saving countries (and all high-saving countries) financial integration tends to *reduce* macroeconomic risk.[20]

Figure 4. Marginal Contribution of Financial Integration to External Crisis Risk
(Index: >0 means FI increasing risk; <0 means FI lowers risk)



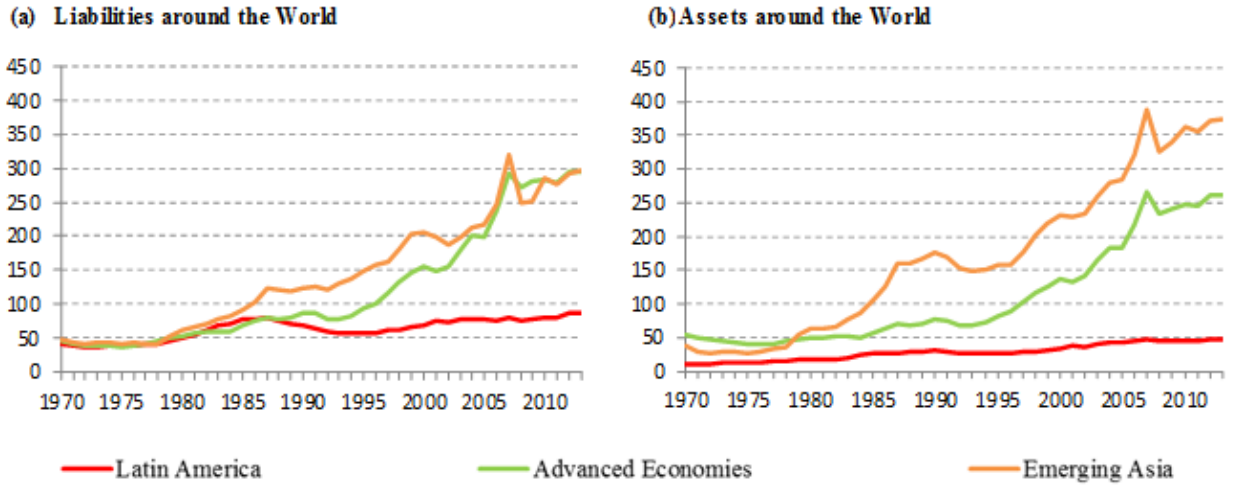
Source: Authors' calculations.
Note: The overall effect is obtained combining the fitted value of NFL from equation (2)—calculated for different values of S—with the coefficient estimates from the probit regression (3). A positive value of the index (plotted in the y-axis) means that, at the given saving rate (plotted in the x-axis), higher financial integration increases crisis risk. A negative value of the index means that, at the given saving rate, an increase in financial integration reduces crisis risk.

[20] All countries in our sample are below the cut-off between risk augmenting and risk diminishing using the De Jure (Chinn-Ito) FI measure. 5 out of 68 countries in the sample have saving rates below the cut-off between risk augmenting and risk diminishing using the De Facto (stocks) FI measure. 23 out of the 68 countries have saving rates below the cut-off between risk augmenting and risk diminishing using the De Facto (Flows) FI measure.

It is clear from the analysis that the risky part of deeper financial integration arises from facilitating the accumulation of NFL in low-saving countries. But where is the offsetting (stabilizing) impact coming from? A plausible hypothesis we will pursue is that financial integration facilitates two-way capital flows: i.e., financial integration may not just facilitate the accumulation of *risky* foreign liabilities, but it can also help low-saving countries accumulate a larger stock of *safe* foreign assets.

Over the last two decades, there has been a significant increase worldwide in both foreign liabilities and assets. The trend towards increased gross positions in the countries' balance sheets is remarkable in Advanced Countries and in Emerging Asia—where gross foreign assets and liabilities stand at approximately 300 percent of GDP. A similar trend is already observed in Latin America, although gross foreign assets and liabilities as share of GDP are still significantly below these regions (see Figure 5).

Figure 5. Gross Foreign Assets and Foreign Liabilities around the World
Simple average by country group (% of GDP)



Note: Figure shows the simple average of Gross foreign liabilities and assets (as percentage of trend GDP) for select country groupings. See Appendix for the list of countries in each country group. Smaller countries are the rest of the countries in the region not included in LAC-7.
Source: Authors' calculations based on External Wealth of Nations database (Lane and Milesi-Ferretti, 2007, updated in 2014).

These trends of increasing gross assets and liabilities are likely the result of deeper financial integration that facilitated the cross-border financial transactions allowing financial investors around the world to achieve greater portfolio diversification and international risk sharing.[21] The corollary of this process is that, in many countries, NFL positions are now underpinned by more substantial gross foreign liabilities *and* assets.

This is relevant for risk assessment because foreign assets can be a source of safety if they are repatriated. If so, financial integration can reduce macroeconomic risks because it permits domestic residents to accumulate safe foreign assets abroad. This can compensate part or all the risks of accumulating foreign liabilities. In the end, financial integration may pose no tradeoff between growth and stability.

5. Reassessing the Risks of Financial Integration: Looking at Assets and Liabilities

Table 3 shows that keeping track of NFL is not sufficient to assess the risk effects of financial integration. A plausible hypothesis is that financial integration has an independent stabilizing effect because it also facilitates that low saving countries accumulate foreign assets, which can be repatriated. To analyze the implications of *gross* positions on the risk of external crises, we examine the separate effect of foreign liabilities and assets using the same empirical model as before. Table 4 shows the results of the probit regressions replacing NFL with its gross components (i.e., total foreign liabilities, TFL, and total foreign assets, TFA, respectively, both as ratios of trend GDP).[22]

[21] See Committee on International Economic Policy and Reform (2012).
[22] The data on gross foreign assets and liabilities comes from the Lane and Milesi-Ferretti (2007) dataset (updated in 2014).

Table 4. Probit Models for External Crisis with Gross Foreign Liabilities and Assets
(Dependent variable = External Crisis)

	(1)	(2) No FI term	(3) De Jure (Chinn-Ito)	(4) De Facto (Flows)
Net Foreign Liabilities (NFL)	1.373***			
	(0.199)			
Total Foreign Assets (TFA)		-2.218***	-1.847***	-2.059***
		(0.406)	(0.395)	(0.440)
Total Foreign Liabilities (TFL)		1.530***	1.464***	1.305***
		(0.252)	(0.268)	(0.364)
FI Index			-0.121**	1.475
			(0.054)	(1.407)
Total crisis	0.107***	0.113***	0.114***	0.091***
	(0.027)	(0.027)	(0.028)	(0.029)
Observations	2,040	2,040	1,944	1,236

Clustered standard errors in parentheses. The FI measure using stocks of foreign assets and foreign liabilities (Lane and Milesi-Ferretti, 2007) is excluded because it is multicollinear with the other regressors. *Notes:* Estimated using annual data (1970-2013) for a sample of 65 countries.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The results are that, as expected, gross foreign liabilities increase the probability of crisis. At the same time, foreign assets instead appear to *reduce* the risk of crisis, suggesting that foreign assets possess insurance value (possibly due to potential capital repatriation). This finding goes against the view—which was very common in developing countries in the 1980s and 1990s—that capital outflows weaken economies.[23]

Therefore, it is important to gauge the extent to which the protection afforded by foreign assets mitigates or eliminates the risk of foreign liabilities altogether. Interestingly, the coefficient

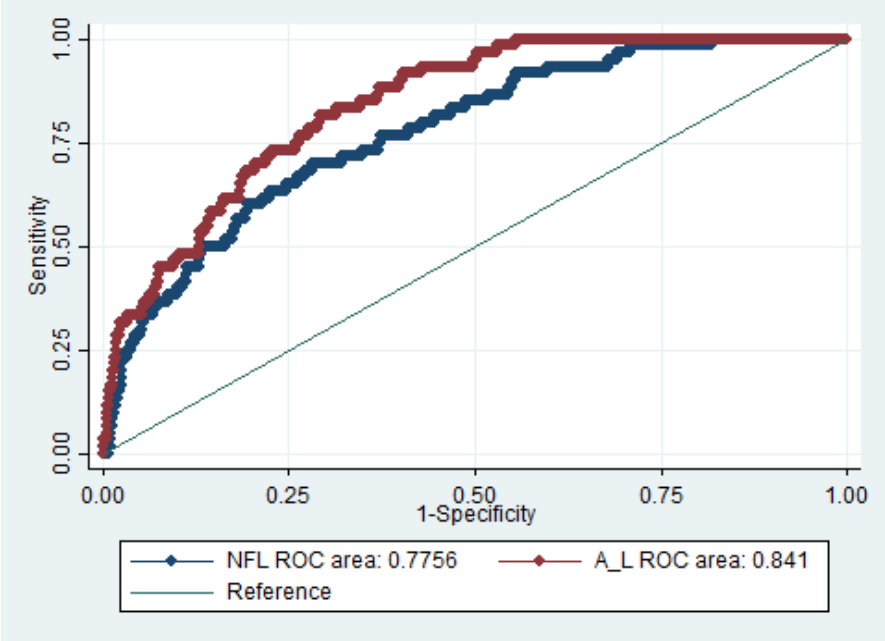
[23] At the same time, higher capital outflows (and consequently, larger accumulated foreign assets) can be expected to be associated with macrofinancial conditions calling for additional capital inflows (and consequently increasing accumulated foreign liabilities) to satisfy aggregate domestic investment demand. This is a natural consequence of better international financial integration leading to inflows and outflows growing in tandem.

estimates on foreign assets and liabilities, respectively, indicate that a dollar of foreign assets appears to *more than offset* the risk generated by a dollar of foreign liabilities. That is why in Table 3 a given net position is less risky if it is supported by deeper financial integration.

The previous findings hold for all versions of the model in columns 2 to 4. However, the parsimonious specification in column 2 appears to be a good baseline model. In fact, once gross positions are specified, the financial integration indexes become less important and both de facto indexes are statistically insignificant (note that the specification in column 2 leaves no additional explanatory power for the de facto stock index). If financial integration is proxied by its effect on gross stocks of assets and liabilities, then the baseline model in column 2 captures all effects of financial integration on risk.

At the same time, this specification in column 2 is substantially richer than its net position counterpart in column 1. The estimating equation based on gross positions (column 2) includes as a particular case the one based on the net position (column 1) when the coefficients of assets and liabilities are the same in absolute value, in which case NFL would be sufficient to capture all risk factors. This case, however, can be rejected statistically. We ran statistical (Wald) tests to gauge the extent of risk offsetting of foreign assets and rejected the hypothesis of full offset to favor more than full offset at the 5 percent confidence level. In fact, a Wald test of the goodness of fit of the two models rejects the model based on NFL at the 1 percent confidence level in favor of the model based on gross positions. Similarly, using the ratio of true positives to false positives as the criterion for model selection, as proposed by Catão and Milesi-Ferretti (2014), leads to the same conclusion. Figure 6 shows the ROC curves depicting the locus of that ratio for both models; a chi-squared statistic shows that the fuller model is statistically superior with 99 percent confidence. Per this evidence, the NFL is not sufficient to predict the risk of crises: a well-specified model needs to include the gross positions separately.

Figure 6. ROC Curves for NFL and Disaggregated Models



Source: Authors' calculations based on probit models computed in column 1 and 2 of Table 4.

6. Opening the Black Box: The Risk Profile of Foreign Assets and Liabilities

Before concluding that risk is reasonably well tracked by looking at gross foreign assets and liabilities, however, it is important to look deeper into the risk profile of the actual liabilities and assets involved in the financial transactions to better understand how they expose to and protect from macroeconomic risk. The conclusions obtained so far may be too broad because different types of financial flows may entail different risks to the domestic economy. If so, assessing macroeconomic risk by looking at aggregates, even if discriminating between gross foreign assets and foreign liabilities, would paint a misleading picture. Countries in which riskier types of foreign liabilities are more prevalent would underestimate the macroeconomic risk brought about by the absorption of foreign savings.

Concerning liabilities, many studies distinguish types of financing in relation to characteristics such as the international risk sharing they provide and how footloose they are. Some of them discuss the validity of a pecking order of foreign liabilities, where short-term debt in foreign currency would be the riskiest and FDI the safest.[24] The key point is that different types of

[24] Fernández-Arias and Hausmann (2001). For a recent survey, see Levy-Yeyati and Zúñiga (2015).

capital inflows may perform differently concerning how they impact country solvency (both the ability and the willingness to honor foreign claims) and the liquidity the country needs for macroeconomic stability. There is much less research on how different types of foreign assets may help prevent macroeconomic crises or cure their effects. It stands to reason that how easy it is to repatriate assets and how safely they can be channeled by the domestic financial system to address the sources of financial stress are key for their insurance value.

Distinguishing foreign assets and liabilities by type may be relevant for assessing both the risk potential of foreign liabilities and the safety value of foreign assets because portfolio composition varies widely across countries. To study the countries' risk profile in a more granular fashion, we disaggregate gross foreign liabilities and assets into their main instruments. For this purpose, total foreign liabilities are disaggregated into three subcomponents: debt, portfolio equity investments, and direct equity investments (FDI). In the case of total foreign assets, the disaggregation also includes foreign exchange reserves held by the public sector.

The results are reported in table 5, which shows the baseline regression in Table 4 (column 2), but disaggregating Total Foreign Liabilities and Total Foreign Assets (rows) into their subcomponents (columns).

Table 5. Probit Model of External Crisis with Gross Components of Foreign Assets and Foreign Liabilities
(Dependent variable = External Crisis)

	Debt	Portfolio Equity	FDI	Reserves
Foreign Assets	-1.1*	-20.1***	-0.5	-4.9***
	(0.6)	(7.3)	(1.0)	(1.1)
Foreign Liabilities	2.0***	1.6	1.1**	
	(0.3)	(1.5)	(0.5)	

Clustered standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01
The regression also includes the total number of crisis (total Crisis) as control (coefficient estimate -0.11, standard error 0.03). Number of observations: 2040.
Notes: Estimated using annual data (1970-2013) for a sample of 65 countries.

Table 5 shows the substantial disparity among types of foreign assets and types of liabilities concerning their contribution to risk. In other words, the risk implications of the stocks of liabilities or of assets depend on the composition of such stocks. This diversity is key to understand the

finding in Table 4 that the protection afforded by foreign assets appears to more than offsets the risk generated by foreign liabilities. The bottom line is that risk assessment requires us to look at the composition of foreign assets and liabilities.

On the liabilities side, we find that crisis risk rises as the composition of gross foreign liabilities is tilted towards debt. The evidence is consistent with equity liabilities (both portfolio and direct investment) being of lower risk. There is statistical evidence that foreign direct investment is less risky than debt in terms of the associated risk of external crisis.[25, 26]

Concerning foreign assets, we find that those that are more easily liquidated: i.e., portfolio equity assets, reserve assets, and to some extent debt assets, are the ones that reduce the risk of crises. By contrast, FDI, the least liquid of the four, has no such insurance value. This is consistent with the hypothesis that there is an insurance value for the type of assets whose value is more easily repatriated. We note that reserve assets, which are designed to protect external equilibrium, appear to be in fact useful to prevent crises.

A key implication of this analysis is that the risks associated with NFL vary with the portfolio characteristics of international financing, mainly the debt/equity divide of foreign liabilities and the degree of liquidity of foreign assets. Therefore, a full assessment of the risks entailed by the absorption of foreign savings requires considering the composition of the resulting portfolio of foreign assets and liabilities.

This result begs the question of the reasons why liquid foreign assets would be repatriated when required to offset a shortfall of foreign liabilities. While a full answer to this question is outside the scope of this paper, we offer three complementary hypotheses that rationalize the empirical finding. First, global circumstances such as a global crisis leading to frictions in international investment and a reversal of financial integration, would naturally lead to "home bias": foreign investors moving out and national investors coming back. In this scenario, asset repatriation is expected to accompany a liability shortfall; a simultaneous contraction of foreign assets and labilities across countries through the retrenchment of capital flows. A second

[25] We reject at the 1 percent confidence level the null hypothesis that the estimated coefficients for "Debt Liabilities" and "FDI Liabilities" are equal.

[26] This result is confirmed by Hansen and Wagner (2015). They show that FDI liabilities are a particularly safer form of capital inflows when they are substantially based on the retained-earnings of multinational corporations. It turns out that retained earnings used to finance domestic investment behave as national saving, both components of what the authors call "local savings." From the point of view of macroeconomic financial risks, it is as if these companies were in part owned by nationals.

hypothesis is also related to the nature of shocks; in this case a failure in the international financial system through which emerging markets capture foreign investment. Let's take as an example a global shock affecting institutional investors in advanced countries that triggers margin calls across emerging markets. In this scenario, it is to be expected that foreign investors (the owners of foreign liabilities) are more constrained to respond than the local investors (the owners of foreign assets). Thus, having a larger stock of foreign assets that can be liquidated means that the local investor base can take better advantage of fire-sales opportunities created by the forced retrenchment of foreign investors. If crisis can be avoided, repatriation is to be expected. Finally, even if the shock is domestic in nature, it can be expected that local investors can to some extent put to use their superior information or legal protection to selectively find good investments in the domestic economy and displace foreign investors whose only alternative is to run for the exits at any cost. However, the advantage can be realized only if local investors have foreign assets available to repatriate. In all three cases, the quantity and the composition of foreign assets and liabilities in the country's balance sheet determine the nature of the impact of shocks to financial integration on country risk.

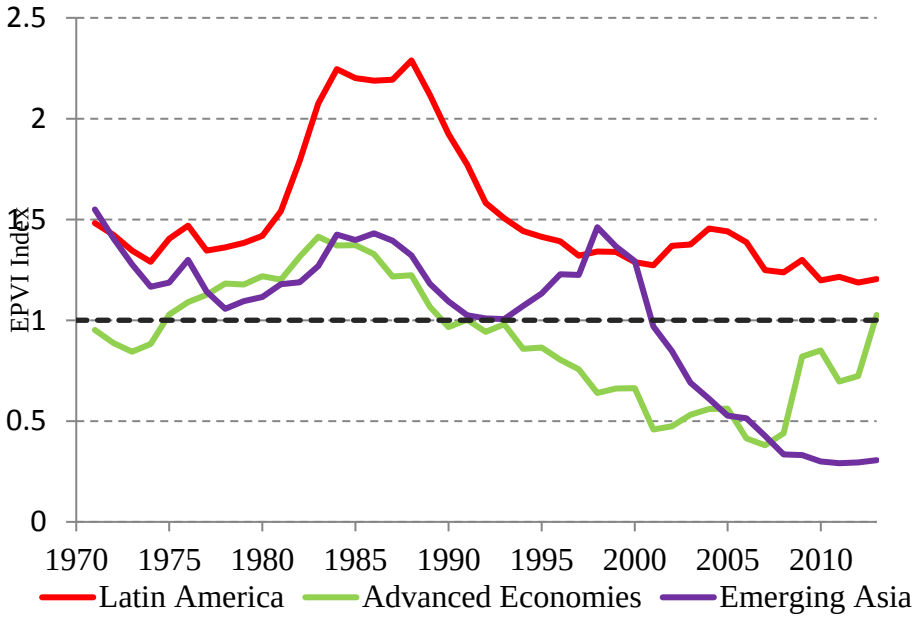
7. Quantifying Risks: The External Portfolio Vulnerability Index

The statistical model above yields a risk profile of foreign savings that depends on the portfolio composition of foreign assets and liabilities in a country's balance sheet. The contribution to the risk of external crisis of each country's portfolio can be summarized in the "External Portfolio Vulnerability Index" or EPVI. This index is based on the product of: i) the estimated coefficients in the regressions (i.e., the rows of Table 5) for each of the explanatory variables related to gross foreign assets (i.e., debt assets, portfolio equity assets, FDI assets and Reserve assets) and liabilities (debt liabilities, portfolio equality liabilities and FDI liabilities), respectively; and ii) the observed levels of each of those variables for countries in the sample. We compute the contribution to the risk of external crisis of each country's portfolio.[27] An EPVI value of 1 equals a neutral contribution to risk (i.e., the portfolio is such that the positive and negative risks associated with it balance out). Instead, values of the EPVI higher than 1 indicate that the balance of risks is such that the portfolio by itself *increases* the probability of an external crisis. Finally, values of EPVI

[27] By construction, the EPVI leaves out other factors relevant for risk, such as global factors, which may compound the external portfolio risks.

lower than 1 mean that the balance of risks is such that the portfolio reduces the probability of a crisis.[28] Figure 7 shows how the EPVI has evolved in select country groupings over time.[29]

Figure 7. External Portfolio Vulnerability Index (EPVI)
Simple average by country group



Source: Authors' calculations.
Note: The EPVI is the exponentiated linear combination of the observed values of the external portfolio (i.e., gross foreign assets and foreign liabilities) times the estimated coefficients in the probit regression (Table 5) acting as scalars. Values of the EPVI higher than 1 indicate that the balance of risks is such that the portfolio by itself increases the probability of an external crisis.
The figure presents the simple average by region. See the Appendix for the list of countries in each country group.

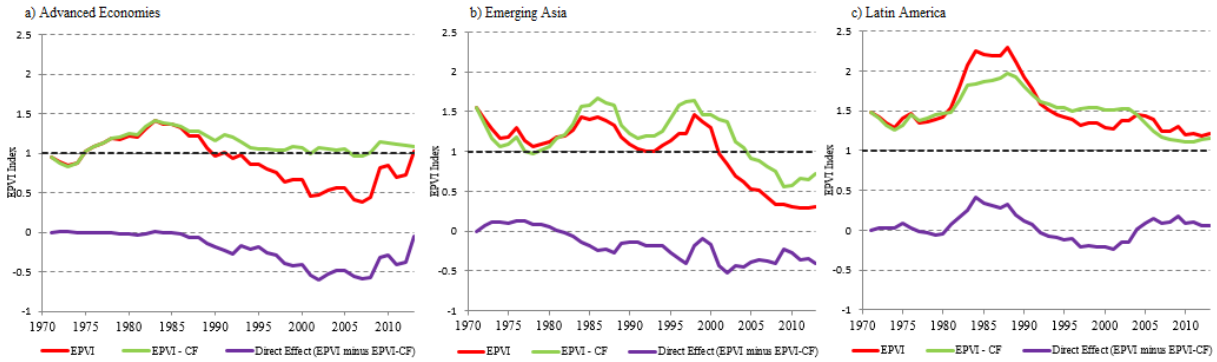
[28] Note that the EPVI only refers to the contribution of a country's external portfolio to overall risk. Overall risk also depends on the other factors included in the statistical exercise.

[29] Figure 7, and subsequent figures plotting EPVIs in this section, plots year by year the average EPVI estimates of individual countries for which there is data. Therefore, the time series variation of the average EPVIs may be affected by changes in country composition due to data availability. To check if this introduces a material bias in the average EPVI estimates we have recomputed the regional averages using the restricted sample of 35 countries that have data over the entire sample period 1970 – 2013. The changes in the results are negligible except in the case of emerging Asia, where the average EPVI shows a substantially bigger spike in the late 1990s compared to the series plotted in Figure 7. This is so because the three countries with complete data in that group (Indonesia, Malaysia and Thailand) were the most impacted by the Asian financial crisis of 1997 (leading to a higher EPVI); the other countries with incomplete information underlying Figure 7 (China, South Korea and Taiwan) were already in the sample by the time of the Asian financial crisis and were not hit as hardly. We believe that these additional countries did not introduce a compositional distortion because when they entered the sample their EPVI levels were similar to the average of the other countries in the group. We do not regard the average EPVI plotted in Figure 7 as downward biased but rather as more representative of the experience in the region.

In Latin America, the external portfolio in the 1980s contributed to very substantial risk of crises. From the final years of that decade to the mid-1990s, the index declined rapidly. However, since then the pace of decline moderated and by the end of the sample the EPVI for the typical country in the region was still above the neutral level. This means that, on average, the level and composition of the portfolio of foreign assets and liabilities in Latin American was still a risk-increasing factor for crisis. In Advanced Countries, the EPVI had been declining prior to the global financial crisis, but it has increased to neutral levels since then. In sharp contrast, in Emerging Asia the balance is such that countries' external portfolios contribute to *reducing* the risks of crisis.

Behind the evolution of the EPVI is the extensive margin of increased foreign assets and liabilities facilitated by financial integration that underpins the level of net foreign liabilities. What would have been the risk profile of countries if financial integration had remained constant throughout the period? In other words, how would the EPVI have evolved counterfactually if countries had accumulated the same level of net foreign liabilities over the period but without the concurrent increase in the gross stocks of foreign assets and liabilities? Figure 8 shows a counterfactual EPVI in which the observed level of NFL (measured as foreign liabilities minus foreign assets over GDP) is underpinned by the same level of financial integration (measured as foreign assets plus foreign liabilities over GDP) that countries had at the beginning of the period in 1970. The gap between factual (observed) and counterfactual EPVI is a measure of the "direct effect" of financial integration. Direct effects have been risk-reducing in Emerging Asia since the 1980s and in Advanced Economies up to the years following the global financial crisis (at the end of the sample period, the direct effect becomes neutral). Instead, the direct effect has fluctuated around zero in Latin America throughout the period.

Figure 8. Factual vs. Counterfactual EPVI: The Role of Gross Stocks (Direct Effects)
Simple average by country group



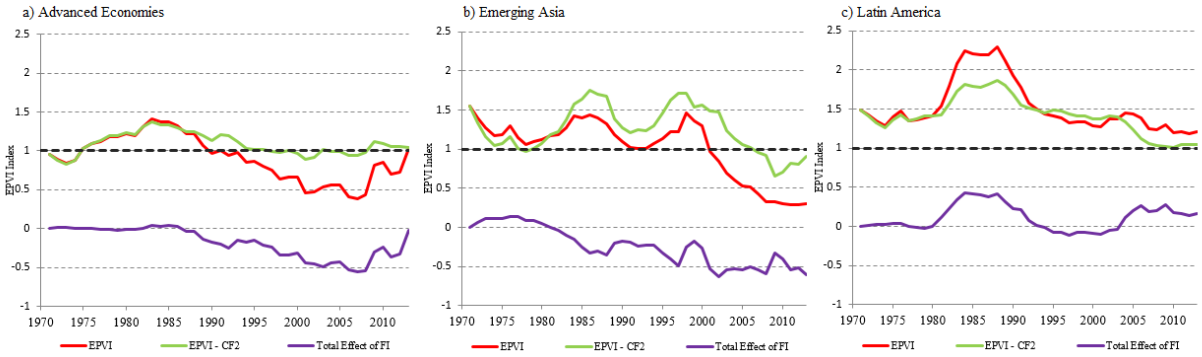
Source: Authors' calculations.
Note: The EPVI is the exponentiated linear combination of the observed values of the external portfolio (i.e., gross foreign assets and foreign liabilities) times the estimated coefficients in the probit regression (Table 5) acting as scalars. The counterfactual (EPVI-CF) is calculated by holding the 1970 level of financial integration (foreign assets + foreign liabilities over GDP) constant and computing the counterfactual level of foreign assets and liabilities that would be required to match the factual (observed) NFL (foreign liabilities *minus* foreign assets). The composition of foreign assets and foreign liabilities (between portfolio, FDI, etc.) is held equal to the factual throughout the sample period to isolate the effect of financial integration. The difference between EPVI and EPVI-CF is the estimated direct effect of financial integration on country risk.

At the same time, increasing financial integration has an "indirect" impact on country risk by enabling the accumulation of NFL in low-saving countries. To quantify this indirect effect, we first calculate the "total effect" of financial integration. The total effect is calculated through another counterfactual EPVI that is computed in two steps. First, the factual NFL series is replaced by a counterfactual NFL estimated through the model in equation (2): $NFL_{it} = \alpha_i + \tau_t + \beta_1 FI_{it} + \beta_2 (FI_{it} \times \overline{S_i}) + \epsilon_{it}$, assuming that the level of financial integration (measured as foreign assets + foreign liabilities over GDP) remains fixed at the 1970 level. Second, counterfactual foreign assets and liabilities are backed-out to match the counterfactual NFL (holding financial integration constant at the 1970 level). The counterfactual EPVI (EPVI-CF2) is then computed in the same way as the EPVI, replacing the factual levels of foreign liabilities and foreign assets with their counterfactuals. The composition shares of foreign assets and foreign liabilities (among portfolio, FDI, etc.) were held equal to the factual shares throughout the sample period to isolate the effect of financial integration.[30] The total effect of financial integration is the gap between EPVI and

[30] This assumes that deeper financial integration does not affect the composition of foreign assets and liabilities, which may not be the case. However, exploring this additional channel is beyond the scope of this paper.

EPVI-CF2. Figure 9 shows the results: the total effects have been beneficial (i.e., risk reducing) in all regions on average except for Latin America.

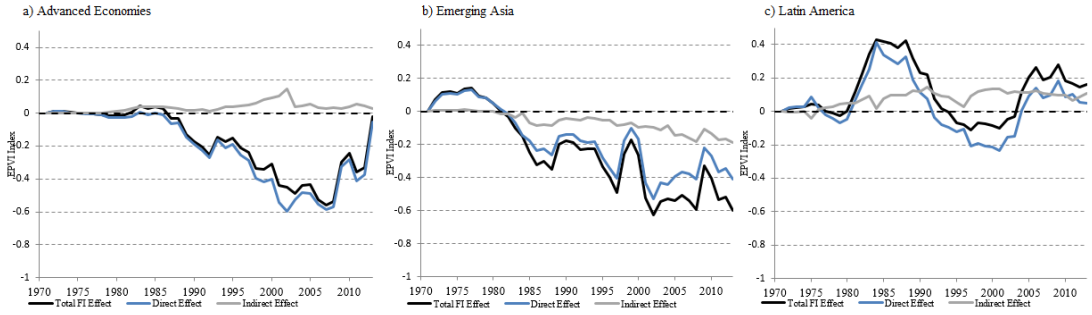
Figure 9. Factual vs. Counterfactual EPVI: The Role of Financial Integration
Simple average by country group



Source: Authors' calculations.
Note: The EPVI is the exponentiated linear combination of the observed values of the external portfolio (i.e., gross foreign assets and foreign liabilities) times the estimated coefficients in the probit regression (Table 5) acting as scalars. The counterfactual (EPVI-CF2) is calculated in two steps. First, the factual NFL series is replaced by a counterfactual NFL estimated through the model in equation (2): $NFL_{it} = \alpha_i + \tau_t + \beta_1 FI_{it} + \beta_2 (FI_{it} \times \overline{S_i}) + \epsilon_{it}$, assuming that the level of FI (measured as foreign assets + foreign liabilities over GDP) remains fixed at the 1970 level. Second, the counterfactual foreign assets and liabilities are backed-out to match the counterfactual NFL (holding financial integration constant at the 1970 level). The counterfactual EPVI is then computed in the same way as the EPVI, replacing the factual levels of foreign liabilities and foreign assets with their counterfactuals. The difference between EPVI and EPVI-CF2 is the estimated total effect of financial integration on country risk.

Finally, the total effect of financial integration (EPVI *minus* EPVI-CF2 in Figure 9) can be decomposed into the estimated direct effect (EPVI *minus* EPVI-CF1 in Figure 8) and the indirect effect through NFL obtained as a residual. Figure 10 plots the average results by region.

Figure 10. Direct and Indirect Effects of Financial Integration
Simple average by country group



Source: Authors' calculations.
Note: Direct effects = EPVI minus EPVI-CF. Total effects = EPVI minus EPVI-CF2. Indirect effects = total effects minus dir*ect effects.*

On average, the indirect effect (which captures the fact that financial integration enables low-saving countries to increase NFL) has contributed to increasing risks in Advanced Economies and especially, in Latin America. Instead in the high-saving Emerging Asia, the indirect effect contributed to reducing risk. Overall, in Emerging Asia, direct and indirect effects are both risk-reducing and therefore they reinforce each other. In Latin America in contrast, the total effect on average has shown to be risk enhancing throughout most of the sample period.

Regional averages in the preceding figures hide significant levels of intra-regional heterogeneity. In countries with lower national saving rates, it is expected that the indirect effects will yield higher risks. This is so because countries with low saving rates are the ones for which NFL increases more with financial integration. Similarly, in countries where the composition of foreign assets and liabilities is tilted towards riskier instruments, the risk-reducing direct effects of financial integration will be weaker.[31] A deeper analysis of the cross-country heterogeneity and the implications for risk profiles is left for future research.

8. Conclusions

The case for financial integration would be weak if it amounts to just broadly facilitating perilous foreign financing. This is because the macroeconomic risks it would bring via the build-up of foreign liabilities could easily offset the investment gains generated by expanding the supply of financing in the economy. However, financial integration also helps to reduce crisis risks by facilitating the accumulation of foreign assets. The paper finds that financial integration reduces risks on net in many cases because the safety granted by foreign assets generally outweighs the increased risk brought by foreign liabilities. Whether this materializes in individual cases depends on the specifics of the composition of the country's external balance sheet, i.e., on the composition of foreign liabilities and foreign assets. But if the composition of gross capital flows is not out of line, financial integration appears to be a reliable aid for low-saving countries with good investment opportunities. We leave for future research the possible impact of financial integration on the composition of assets and liabilities, which in this paper is taken as exogenous.

The bottom line is that financial integration need not pose a tradeoff between growth and stability in low saving countries. In fact, the evidence suggests that in most countries it can be

[31] This is if financial integration itself does not change the composition of foreign assets and liabilities. The intensive margin resulting from the possible change in the portfolio composition of foreign assets and liabilities is something that we have not tested formally in this paper.

expected that higher growth will come with enhanced stability, provided that the composition of foreign assets and liabilities is not unbalanced. It is important to notice, however, that an increase in domestic savings are likely to deliver a better growth/stability package than the one delivered by deeper financial integration. First, higher domestic savings never pose a tradeoff: it would achieve higher investment (as shown in the expanded Feldstein-Horioka model) with no risk. This is so because, in contrast to foreign liabilities, the accumulation of national liabilities on the part of domestic investors is not a macroeconomic risk factor (see, Cavallo, Fernández-Arias and Marzani 2016). Furthermore, the leakage of national savings not directed to domestic investment (one minus the saving retention rate in the Feldstein-Horioka equation) would bring a corresponding decrease in net foreign liabilities and, consequently, risk reduction. Financial integration, on the other hand, would bring an increase in net foreign liabilities. Therefore, its risk-reducing effect would need to be extremely strong, much more than simply risk offsetting, to come ahead of higher domestic saving in the risk comparison.[32] This comparison suggests that financial integration should be a complement to rather than a substitute for domestic savings policies.

[32] This informal comparison assumes that a change in the domestic saving rate does not change financial integration (the adjustments to foreign assets and liabilities balance out). A more detailed comparison would also consider the cross effects between financial integration and national savings.

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Appendix

Feldstein-Horioka (1980) and the Saving-Investment Nexus

The investment and savings relationships are modeled using the following equations:

$$\begin{cases} I = c_I - ir \\ S = c_s + sr \\ F = c_f + f(r - r^*) \end{cases}$$

where I, S and F are the investment, savings and net foreign savings, respectively. c_I, c_s and $c_f \geq 0$ are country specific; $i, s \geq 0$ are common parameters capturing the sensitivity of domestic investment and national savings, respectively, to the domestic interest rate; r and r^* are the domestic and international real interest rates, respectively.

Let $i' = \frac{i}{s+i+f}$; $s' = \frac{s}{s+i+f}$; $f' = \frac{f}{s+i+f}$ so $i' = 1 - (s' + f')$, then the reduced form is:

$$\begin{cases} I = (s' + f')c_I + \big(1 - (s' + f')\big)\big(c_s + c_f - fr^*\big) \\ S = (1 - s')c_s + s'\big(c_I - c_f + fr^*\big) \\ F = (1 - f')\big(c_f - fr^*\big) + f'(c_I - c_s) \end{cases}$$

Eliminating c_s combining (1) and (2):

$$\mathrm{c}_s = \frac{S - s'(c_I - c_F + \mathrm{f}r^*)}{1 - s'}$$

Plugging this value into (1):

$$\mathrm{I} = (\mathrm{s}' + \mathrm{f}')\mathrm{c}_\mathrm{I} + \big(1 - (\mathrm{s}' + \mathrm{f}')\big)\left(\frac{S - s'(c_I - c_F + \mathrm{f}r^*)}{1 - s'} + \mathrm{c}_F - \mathrm{f}r^*\right)$$

Using $\mathrm{i}' = 1 - (\mathrm{s}' + \mathrm{f}')$, we get:

$$\mathrm{I} = (1 - \mathrm{i}')\mathrm{c}_\mathrm{I} + \mathrm{i}'\left(\frac{S - s'(c_I - c_F + \mathrm{f}r^*)}{i' + f'} + \mathrm{c}_F - \mathrm{f}r^*\right)$$

$$\mathrm{I} = (1 - \mathrm{i}')\mathrm{c}_\mathrm{I} + \mathrm{i}'\left(\frac{S - \big(1 - (i' + f')\big)(c_I - c_F + \mathrm{f}r^*)}{i' + f'} + \mathrm{c}_F - \mathrm{f}r^*\right)$$

$$\mathrm{I} = \left(1 - \mathrm{i}' - \frac{\mathrm{i}'}{i' + f'}\left(1 - (i' + f')\right)\right)\mathrm{c_I} + \frac{\mathrm{i}'}{i' + f'}S - \frac{\mathrm{i}'}{i' + f'}\left(1 - (i' + f')\right)(\mathrm{fr}^* - c_F) + \mathrm{i}'c_F - i'\,\mathrm{fr}^*$$

$$\mathrm{I} = \left(\frac{f'}{i' + f'}\right)\mathrm{c_I} + \left(\frac{\mathrm{i}'}{i' + f'}\right)S + \left(\frac{\mathrm{i}'}{i' + f'}\left(1 - (i' + f')\right) + \mathrm{i}'\right)(c_F - \mathrm{fr}^*)$$

$$\mathrm{I} = \left(\frac{f'}{i' + f'}\right)\mathrm{c_I} + \frac{\mathrm{i}'}{i' + f'}S + \left(\frac{\mathrm{i}' - \mathrm{i}'(i' + f') + \mathrm{i}'(i' + f')}{i' + f'}\right)(c_F - \mathrm{fr}^*)$$

$$\mathrm{I} = \left(\frac{f'}{i' + f'}\right)\mathrm{c_I} + \frac{\mathrm{i}'}{i' + f'}S + \left(\frac{\mathrm{i}'}{i' + f'}\right)(c_F - \mathrm{fr}^*)$$

Define $\phi = \frac{f'}{i' + f'} = \frac{f}{i + f}$, where $0 \leq \phi \leq 1$. Therefore:

$$\mathrm{I} \cong \phi\mathrm{c_I} + (1 - \phi)S + (1 - \phi)c_F - (1 - \phi)\mathrm{fr}^*$$

Note that fr^* is the same across countries, therefore it can be represented with time dummies.

If ϕ is constant (f constant), we can rearrange the equation terms in the following fashion

$$\mathrm{I} \cong [\phi\mathrm{c_I} + (1 - \phi)c_F] + (1 - \phi)S - (1 - \phi)\mathrm{fr}^*$$

Define $d_i = [\phi\mathrm{c_I} + (1 - \phi)c_F]$ and $d_t = -(1 - \phi)\mathrm{fr}^*$ leads to the following Feldstein-Horioka model specification:

$$I \cong d_i + d_t + hS$$

where d_i are the country fixed-effects, d_t are the year fixed effects.

$\phi'(f) > 0$, $\phi(\infty) = 1$ (perfect financial integration), $\phi(0) = 0$ ("financial autarky"); then $0 \leq h \leq h$.

It is worth noticing that more financial integration means lower h. In a scenario of perfect financial integration ($f = \infty$), then $h = 0$. Under financial autarky ($f = 0$), $h = 1$.

Extended F-H Regression

Let instead $\phi^{'} = a + b\phi$ be a proxy of ϕ, $b > 0$. This is tantamount to assuming that financial integration is changing over time. Then

$$\mathrm{I} = \phi^{'}\,\mathrm{c_I} + (1 - \phi^{'})S + (1 - \phi^{'})c_F - (1 - \phi^{'})fr^{*}$$

$$\mathrm{I} = (a + b\phi)\mathrm{c_I} + (1 - a - b\phi)S + (1 - a - b\phi)c_F - (1 - a - b\phi)fr^{*}$$

$$\mathrm{I} = (a + b\phi)\mathrm{c_I} + (1 - a - b\phi)S + (1 - a - b\phi)c_F - (1 - a - b\phi)fr^{*}$$

Similarly, to the original F-H regression, define $d_i = [(a + b\phi)c_I + (1 - a + b\phi)c_F]$, and $d_t = -(1 - a - b\phi)fr^{*}$, we get $\mathrm{I} = d_i + d_t + (1 - a)S - b\phi S$. This can be approximated by:

$$I \cong d_i + d_t + a'S - b\phi'S \quad \text{(X)}$$

where we expect $\widehat{b} = -b\phi' > 0$. This is the extended Feldstein-Horioka equation we estimate in the text.

Country List

Advanced Economies		Emerging Market and Developing Economies	
Australia	Korea, Rep.	Argentina	Jordan
Austria	Latvia	Belize	Malaysia
Belgium	Lithuania	Brazil	Mexico
Canada	Netherlands	Bulgaria	Morocco
Czech Republic	New Zealand	Chile	Oman
Denmark	Norway	China	Pakistan
Estonia	Portugal	Colombia	Peru
Finland	Slovak Republic	Costa Rica	Philippines
France	Slovenia	Croatia	Poland
Germany	Spain	Dominican Republic	Romania
Greece	Sweden	Ecuador	Russian Federation
Iceland	Taiwan	Egypt	Serbia
Israel	United Kingdom	El Salvador	South Africa
Italy	United States	Guatemala	Thailand
Japan		Hungary	Turkey
		India	Ukraine
		Indonesia	Uruguay
		Jamaica	Venezuela, RB
		Jordan	

Summary Statistics

Variable	Source	Countries	Maximum time span	Mean	Std. Deviation
Net Foreign Liabilities	Lane & Milesi-Ferretti (2007)	65	1970 - 2013	0.242	0.36
Total Foreign Assets	Lane & Milesi-Ferretti (2007)	65	1970 - 2013	0.586	0.75
Total Foreign Liabilities	Lane & Milesi-Ferretti (2007)	65	1970 - 2013	0.828	0.74
Reserve Assets	Lane & Milesi-Ferretti (2007)	65	1970 - 2013	0.099	0.10
Portfolio Equity Assets	Lane & Milesi-Ferretti (2007)	65	1970 - 2013	0.052	0.12
Portfolio Equity Liabilities	Lane & Milesi-Ferretti (2007)	65	1970 - 2013	0.064	0.12
FDI Assets	Lane & Milesi-Ferretti (2007)	65	1970 - 2013	0.110	0.22
FDI Liabilities	Lane & Milesi-Ferretti (2007)	65	1970 - 2013	0.202	0.24
Debt Assets	Lane & Milesi-Ferretti (2007)	65	1970 - 2013	0.309	0.42
Debt Liabilities	Lane & Milesi-Ferretti (2007)	65	1970 - 2013	0.546	0.46
Domestic Investment (Gross Fixed Capital Formation) / GDP	World Development Indicators Database	65	1970 - 2013	0.227	0.05
Gross National Savings / GDP	World Development Indicators Database	65	1970 - 2013	0.226	0.07
De Jure FI (Chinn Ito)	Chinn & Ito (2008)	63	1970 - 2012	0.456	1.59
De Facto FI (Stocks)	Lane & Milesi-Ferretti (2007)	65	1970 - 2013	1.414	1.45
De Facto FI (Flows)	Balance of Payments Statistics Dataset	58	1980 - 2013	0.129	0.15
External Crisis	Catao & Milesi-Ferretti (2014)	65	1970 - 2011	0.028	0.16
Total Crises ($\sum_t External\ Crisis$)	Catao & Milesi-Ferretti (2014)	65	1970 - 2011	1.935	1.93
EPVI – Total	Authors Calculations'	65	1971 - 2013	1.196	0.99
EPVI - Counterfactual I	Authors Calculations'	65	1971 - 2013	1.590	1.19
EPVI - Counterfactual II	Authors Calculations'	65	1971 - 2013	1.361	0.88