Inter-American Development Bank

IDB WORKING PAPER SERIES Nº IDB-WP-1389

The Risk of External Financial Crisis

Eduardo A. Cavallo
Eduardo Fernández-Arias
Juan Martín Rinaldi

Inter-American Development Bank
Department of Research and Chief Economist

November 2022

The Risk of External Financial Crisis

Eduardo A. Cavallo*
Eduardo Fernández-Arias**
Juan Martín Rinaldi***

* Inter-American Development Bank
** Independent Consultant
*** University of British Columbia

November 2022

Cataloging-in-Publication data provided by the
Inter-American Development Bank
Felipe Herrera Library

Cavallo, Eduardo A.
The risk of external financial crisis / Eduardo A. Cavallo, Eduardo Fernández-Arias, Juan Martín Rinaldi.
p. cm. — (IDB Working Paper Series ; 1389)
Includes bibliographic references.
1. Financial crises-Econometric models. 2. Foreign exchange reserves. 3. Investments, Foreign. 4. Debts, External. I. Fernández-Arias, Eduardo. II. Rinaldi, Juan Martín. III. Inter-American Development Bank. Department of Research and Chief Economist. IV. Title. V. Series.
IDB-WP-1389

http://www.iadb.org

Abstract*

This paper explores the empirical determinants of external crises on a world panel dataset of 62 countries over the fifty-year period 1970-2019 and estimates their risk trade-offs with the aim of informing macrofinancial prudential policies. The determinants include countries' external balance sheets, macroeconomic imbalances, and structural and global factors. It finds that information on the composition of gross positions in countries' external financial portfolios is required to gauge the risk of external crisis: debt liabilities are the riskiest component, FDI liabilities are half as risky, and FDI assets are the most protective. Macroeconomic imbalances increase risk but are usually not the key drivers of crises. Adverse global shocks significantly leverage domestic risks. International reserves are powerful risk mitigants that provide high insurance value. The evidence shows that advanced economies are structurally more resilient to withstand exposure to weak external portfolios, macroeconomic imbalances, and global shocks. For the average country the risk of external crisis is on a declining trend mainly driven by improvements in the composition of external portfolio assets magnified by increasing financial integration as well as rising international reserves.

JEL classifications: F30, F34, G01, G15, H63

Keywords: External crisis, Financial crisis, External balance sheet; International reserves, Macroeconomic imbalances, External debt, Foreign Direct Investment, External assets and liabilities

* This paper draws insights from a previous paper written by Cavallo and Fernández-Arias with Matías Marzani, who was then a research assistant at the Inter-American Development Bank (Cavallo, Fernández-Arias and Marzani, 2017). While Marzani is not a co-author of this paper, because at the time of writing he was focused on finishing his PhD work, his contributions to the previous paper were key for this project. Santiago Gómez-Malagón provided superb research assistance. All remaining errors are the responsibility of the authors.

1. Introduction

External financial crises, understood as external credit events and/or the need for International Monetary Fund (IMF) emergency financing, have been historically an important threat in the world. Full-blown external crises lead to defaulting international financial obligations, lost access to private external financing and severe economic downturns. External financial crises have been often accompanied and followed by currency and banking crises as well as severe economic growth slowdowns. Even if the effects of external crises can be blunted by official financial emergency support, painful economic adjustments are still required to restore balance of payments equilibrium. Therefore, the assessment of the risk of external financial crisis is key to monitoring the economic health of countries, and the analysis of its sources is relevant to informing policies to prevent such crises.

This work is intended to assess risk factors of external crisis with the purpose of guiding prudential policy to ensure healthy external portfolios and domestic macroeconomic fundamentals. This objective requires identifying causal factors amenable to policy intervention in a timely fashion. This approach differs from an early warning analysis, in which the objective is to predict or forecast the likelihood of crisis to prepare for the event.[1] An early warning approach would be concerned with symptoms that help predict crises, such as the emergence of capital flight, rather than their underlying causal drivers. While symptoms are informative of root causes and a warning is policy-relevant information concerning the need for urgent policy action, a causal model is needed to provide reliable guidance on the substance of healthy policy regimes and the timing of appropriate policy measures.

As a policy question, it is important to separate exogenous factors driving the risk of external crisis, oftentimes in the form of financial contagion, from risk factors under the control of each country. In turn, among the latter, it is useful to distinguish the risks associated with the external financial portfolio of the country from macroeconomic factors. Catão and Milesi-Ferretti (2014) made a first cut of this issue by analyzing the effects of the stocks of net liabilities across types of financial instruments on the risk of external financial crisis. They studied these effects using a Probit model controlling for several factors, including domestic macroeconomic conditions. Cavallo, Fernández-Arias and Marzani (2017) extended that model by considering the

[1] For example, market indicators such as the sovereign risk spread may be a very useful component of an early warning model but would not be a policy-relevant risk factor.

gross positions of the external portfolio (putting to the test and rejecting the assumption that net stocks are the relevant risk factors). In this context, they looked in greater detail at the contributions of portfolio components to aggregate risk and analyzed the potential benefits that international financial integration could bring to developing countries by boosting the gross stocks supporting their net international investment position. However, their study focused on the external portfolio and had few additional controls.

This research builds on both papers to obtain a measure of the risk of country external financial crisis, analyze its drivers, and inform macro financial prudential policies. It embeds the kind of analysis of types of external portfolio assets and liabilities in Cavallo, Fernández-Arias and Marzani (2017) into a Probit model that also controls for several key domestic macroeconomic factors as in Catão and Milesi-Ferretti (2014). It expands on the role of exogenous factors, including structural country characteristics that may determine their resilience or propensity to external crises. It also refines the Probit estimations by controlling for reverse causation, or crisis-related effects on explanatory variables during the pre-crisis period in anticipation of an impending crisis. In this way, the risk of external crisis can be causally assessed and decomposed into the contributions of external financial portfolio factors, domestic macroeconomic conditions, and exogenous factors in a unified framework for a better understanding of the driving forces and policy options.

Section 2 describes the Probit model that will be utilized in the rest of the paper and reviews the sample. Section 3 discusses the model specification with an emphasis on the process followed to arrive at the baseline estimation. Section 4 presents the estimation results of the baseline specification and discusses the findings. Based on those results, Sections 5 and 6 analyze the overall evolution of the risk of external crises in the sample and decompose it by risk factors. Finally, Section 7 concludes with implications and possible extensions.

2. A Model to Explore Determinants of Crisis Onsets

This paper is concerned with external crises, known to be extremely disruptive. For consistency with prior studies, we do not discriminate among the ways in which crises unfold and use the "external crisis" indicator defined in Catão and Milesi-Ferretti (2014), so that there is a crisis when there is an external debt default or rescheduling event as well as events leading to large IMF support (IMF loans in excess of twice the country's quota).

The risk model to explain the onset of an external crisis is a Probit specification applied to a panel of countries, indexed by i, over yearly data, indexed by t. The main explanatory variables of interest are the stocks of external assets and liabilities accumulated through the financial account of the Balance of Payments (**Portfolio**). We control for several domestic explanatory variables (**Macrocontrols**), namely the stock of international reserves and a set of proxies for macroeconomic imbalances. Furthermore, in the starting specification, we control for the country's income per capita to capture domestic structural risk factors (**Structural Risk**) and global factors affecting global crisis propensity over time (**Global Risk)**.

Within **Portfolio***,* we consider a vector of six external portfolio variables according to Balance of Payments classification: *Foreign Debt (Assets and Liabilities), Foreign Portfolio Equity (Assets and Liabilities),* and *Foreign Direct Investment (Assets and Liabilities).* These six portfolio variables represent all international financial claims, private and public, except for the country's international reserves which are included with the controls. Portfolio stocks are measured as a share of trend GDP to eliminate temporary shocks to GDP and business cycle noise.[2]

To facilitate comparability, the controls are similar to the ones utilized by Catão and Milesi-Ferretti (2014). The **Macrocontrols** include *International Reserves* and a set of macroeconomic imbalances that may drive external crises: the *Current Account Deficit* (2-year average), the *Fiscal Deficit Gap* (the observed fiscal deficit relative to its previous 5-year average) and the *Real Exchange Rate Overvaluation* (the gap relative to its previous 5-year average).[3] All the nominal macro controls are also measured as a share of trend GDP. Finally, **Structural Risk** is captured by *Per-capita Income* I_{it} (relative to the US) and the **Global Risk** that a country faces is proxied by a variable G_{it} equal to the fraction of foreign countries that are in crisis in a given year.

The panel of observations is the largest for which the required information is available. Depending on the country, time series start in 1970 or at later date. The source of the external portfolio variables is Lane and Milesi-Ferretti (2018), updated through 2019. The fiscal deficit data are taken from Kaminsky, Reinhart and Végh (2004) and Mauro et al. (2013) and were

[2] The GDP in current USD time series comes from Lane and Milesi-Ferretti (2018) and its trend component is computed using a Hodrick-Prescott filter with a 6.25 smoothing parameter, consistent with the annual frequency of the data.

[3] We explored and discarded variations of the definitions of macrocontrols in which the three macroeconomic imbalances were measured uniformly, either as 2-year averages or as gaps (both relative to their previous 5-year average and to their historical average). The basic definitions performed better on statistical grounds. See Appendix C, Table C1.

updated through 2019. The source of the real effective exchange rate is Bruegel, based on the Darvas (2012) methodology, and that of relative per capita income is Feenstra, Inklaar and Timmer (2015).[4] The rest of the macroeconomic variables, including information to update them up to 2019, are taken from the World Economic Outlook (WEO) database. See Appendix A for details on data sources on external crisis and explanatory variables.

We vetted data regularity and excluded some atypical countries that could distort the estimation. Among them, we excluded international financial centers because their highly atypical external portfolios do not reflect the normal financial structure supporting a regular economy and may distort results.[5] Furthermore, we tested the influence of Hungary, Netherlands and South Africa, which are singled out in the metadata of Lane and Milesi-Ferretti (2018) as problematic due to atypical data, and decided to eliminate Hungary and South Africa from the sample because their inclusion would lead to a significant change in the estimated coefficient of at least one variable in the estimated model (see Appendix A for details on how data was tested and cleaned).

All in all, the resulting data set is an unbalanced panel of Advanced and Non-Advanced (or Emerging) economies with some missing information for specific country/year observations. It encompasses 62 countries over the 50-year period 1970-2019. See Appendix B for panel summary statistics, including country groupings and the incidence of crisis by country.

Figure 1 shows the evolution of the number of countries in crisis in the period, which amount to 289 crisis years out of 3,100 country years covered (62 countries x 50 years) or an overall crisis incidence of 9.3 percent. In the estimation of the model, the crises in years that immediately follow the year of a crisis onset in each country were eliminated from the sample (considered as missing values) because the Probit specification aimed at modeling the factors leading to crisis may not reflect the logic of a crisis regime. Figure 1 also shows for each year the number of countries falling into crisis, or crisis onsets (88 in total).

[4] https://www.bruegel.org/publications/datasets/real-effective-exchange-rates-for-178-countries-a-new-database/

[5] International financial centers are Panama, Singapore, Cyprus, Hong Kong, Malta and Switzerland.

Figure 1.

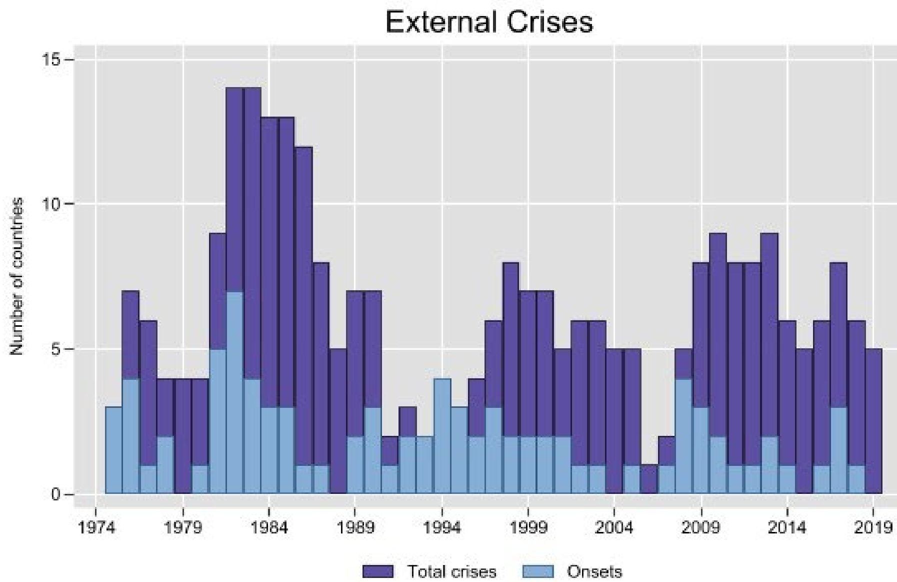


Figure 1 suggests that there are three periods in terms of crisis incidence. During the 1980s, there was a significant number of crisis onsets—especially at the beginning of the decade. The crises extended for several years, resulting in a large number of countries in crisis during the decade (labeled total crises). During the 1990s the crisis onsets were spread out throughout the decade: there was, for example, the Tequila crisis originating in Mexico in 1994, the Asian and Russian financial crises of 1997 and 1998, the Brazilian crisis of 1999, and then the Argentine crisis in 2001. Still, the total number of crises years during the decade was lower than in the 1980s because crises in the 1990s were of shorter duration. Finally, in the most recent period, there were crisis onsets concentrated around the global financial crisis of 2008/09, and then the Euro crisis starting in 2013. The total number of crisis years in the most recent period is somewhere in between the preceding decades.

3. Model Estimation

To simplify the analysis, we assume that structural and global risks, namely the stage of development and international crisis intensity, are exogenous to countries facing the prospect of falling into crisis. The starting probit model provisionally assumes, as is customary in this literature, that other explanatory variables lagged one year are also exogenous, not contaminated by unspecified factors that contribute to the subsequent onset of crisis. Otherwise, such reverse causation would bias the estimation of their causal effect on risk.

$$Prob\ (Crisis_{it} = 1) =$$

$$\Phi(Constant + \alpha I_{it} + \beta G_{it} + \gamma (Portfolio)_{it-1} + \delta (Macrocontrols)_{it-1}), \qquad (1)$$

In this specification, $Crisis_{it}$ is an indicator variable that takes the value of one at the onset of a crisis in country *i* in year *t*. It is expected that higher income makes countries less vulnerable to risk factors (negative α) and that international contagion increases the risk of crisis (positive β). Concerning the portfolio variables, the prior is that the corresponding parameters γ_1 to γ_6 are positive for (risky) liabilities and negative for (protective or risk-mitigating) assets. Similarly, it is expected that international reserves are protective (their δ is negative) and that macroeconomic imbalances, which are defined as risk factors, are risky (their δ parameters are positive).

Since the effect on the probability of crisis of the explanatory variables in the Probit linear term is mediated by the normal cumulative distribution Φ, their coefficient parameters do not measure their marginal effect on crisis probability. In fact, to obtain marginal effects the coefficients need to be scaled by the normal density distribution at the observed level of the explanatory variables (ϕ_{it}). This level is negative because crisis is a low-probability event (less than 50 percent), so this scaling factor increases with riskier fundamentals: the marginal effect of the risk factors is amplified when the probability of crisis is higher. In other words, risk factors are synergistic. One important corollary is that policy adjustments (or slippages) are more consequential in a high-risk context.

Nevertheless, even though marginal risk effects are not constant, the coefficient estimates from the Probit do contain key information about the marginal effects: the *relative* value of the coefficients between two variables x_k and x_j equals its (constant) *relative* marginal effect. It is easy to see that, if the coefficient parameters associated with these two variables are c_k and c_j, respectively, then:

$$\Phi'(x_k) = c_k\ \phi_{it} \qquad (2)$$
$$\Phi'(x_j) = c_j\ \phi_{it} \qquad (3)$$

where $\phi_{it} > 0$

$$\frac{\Phi'(x_k)}{\Phi'(x_j)} = \frac{c_k}{c_j} \tag{4}$$

First, the coefficient estimates from the Probit indicate the sign and statistical significance of the variable's marginal effect. Second, since all marginal effects are affected by the same scaling factor ϕ_{it}, the marginal effects of different variables can be compared, and the significance of their differences can be tested by looking at the coefficient estimates like in a linear model. Third, the relative marginal effects being constant, relative coefficient estimates also reflect the risk tradeoff between two variables at any scale as in a linear model, not only on the margin. Since in this study we will focus on these qualitative and relative features of risk factors, the coefficient estimates from the Probit contain all the relevant information.

In what follows we test this Probit specification in relation to several concerns and refine it to arrive at the preferred specification, based on which we obtain the baseline estimation of the coefficient estimates. We explore how many years after the crisis onset it is safe—from an estimation standpoint—to assume full recovery; we explore various ways to account for idiosyncratic effects; and we explore the issue of potential endogeneity of the regressors, in particular, the number of lags of explanatory variables necessary to reduce the risk of endogeneity bias in the estimation. Readers who are not interested in the econometric specification and estimation details can skip the reminder of this section and go to Section 4. In Sections 4 and 5, we utilize the baseline specification to derive conclusions about the role and contributions of factors considered to exacerbate and mitigate the risk of external crisis.

3.1 Recovery Years after Crisis Resolution

When the crisis indicator returns to zero (crisis resolution) after the onset of a crisis (and subsequent continuation crisis years that were eliminated as missing observations), the crisis is resolved, but it is not clear that full recovery has been achieved. It stands to reason that full recovery may entail a transition period after the crisis regime in which the risk of falling into crisis again is strongly influenced by special factors until the normal working of the economy is restored. The inclusion of early recovery years may lead to potential post-crisis bias, as termed by Bussière and Fratzscher (2006). To deal with this potential problem, we experimented with excluding observations right after crisis resolution as missing values.

Table 1 shows the estimation results using the starting specification applied to the entire sample as well as re-estimations in which the first one and two recovery years are excluded from the sample. All estimations are pooled Probit regressions with robust standard errors.

Table 1. Exploring Recovery Years

	(1) w/All Recovery Years	(2) w/o One Recovery Year	(3) w/o Two Recovery Years
Debt Assets	0.58	0.43	0.14
	(0.42)	(0.52)	(0.55)
Debt Liabilities	0.72*	1.01**	1.20**
	(0.40)	(0.49)	(0.55)
PE Assets	-2.89	-2.86	-1.81
	(5.13)	(6.07)	(5.16)
PE Liabilities	0.41	0.30	-0.02
	(1.24)	(1.42)	(1.46)
FDI Assets	-4.58**	-5.14*	-5.64*
	(2.27)	(2.76)	(2.89)
FDI Liabilities	0.24	0.26	0.36
	(0.43)	(0.50)	(0.56)
FX Reserves	-4.52***	-5.04***	-5.04***
	(0.95)	(1.07)	(1.11)
Current Account Deficit	6.03***	6.11***	6.14***
	(1.66)	(1.93)	(2.11)
Fiscal Deficit Gap	3.64*	3.22*	3.11*
	(1.86)	(1.84)	(1.80)
RER Overvaluation Gap	0.08*	0.48***	0.55***
	(0.05)	(0.19)	(0.18)
Per-Capita Income	-1.75***	-1.91***	-1.84***
	(0.46)	(0.54)	(0.52)
Constant	-1.47***	-1.47***	-1.50***
	(0.24)	(0.27)	(0.30)
N	1949	1880	1823
PseudoR2	0.24	0.28	0.29
Difference between βs (P-Value)	-	0.02	0.79

Standard errors in parenthesis

* $p<0.1$, ** $p<0.05$, *** $p<0.01$

A Wald test comparing the first and the second column indicates that the exclusion of the first recovery year significantly changes the coefficient estimates. However, the exclusion of the second year of recovery does not (the Wald test comparing the second and third column reported at the bottom of column 3 in Table 1 does not reject the hypothesis that the coefficient estimates of both columns are equal). Based on this evidence, we concluded that the first year of recovery is not a normal year and therefore we discarded those event observations as missing values. For this reason, the estimation sample shrunk from 1,949 to 1,880 observations. In summary, in our regression continuation crisis observations and the first non-crisis observation are disregarded as missing values.[6]

3.2 Idiosyncratic Crisis Propensity

The model differentiates the countries' crisis propensity based on their income per capita. This discrimination by income is intended to reflect structural differences across countries over the course of economic development, for which there is a long tradition in the literature. One interpretation of this model is that the true explanatory variables are the distance between the observed variables (both Portfolio and Macrocontrol variables) and corresponding tolerance thresholds that vary with income per capita. The specification above can be interpreted as expressing the change in tolerance thresholds as countries develop and become more resilient. For example, higher-income countries could have higher tolerance levels to risky factors (a higher safety threshold) and require lower levels of risk-mitigating factors (a lower threshold). This may reflect improvements in institutional quality, domestic financial deepening, and other factors identified in the theoretical literature (as in Broner and Ventura, 2016). The estimations in Table 1 showing that, ceteris paribus, the poorer the country the more prone to crisis are in line with this interpretation.

As a refinement, we consider the possibility that countries may have idiosyncratic structural characteristics that affect their propensity to fall into external crises but are not captured well by their income per capita. One way to control for these idiosyncratic factors would be to include country dummies in the specification. However, in the context of a binary model this is only feasible for countries with a mixed experience of crisis and non-crisis in the sample (because otherwise the country dummy would allow a perfect fit, in effect eliminating these countries from the sample in terms of their contribution to estimating panel parameters). In our case, the price to pay from including country fixed effects is that the information of the countries that never experienced crisis is thrown away (it would be implicitly attributed solely to extremely low crisis propensity), which in this case involves 34 countries.

[6] In their seminal work, Gourinchas and Obstfeld (2012) removed 4 years after a stress event. This is a refinement to tailor the interim period of crisis management to the observed crisis workout.

An alternative approach that would avoid losing the information of 34 countries is to proxy the idiosyncratic propensity to crisis with the country crisis ratio, defined as the number of crisis onsets as a proportion of the number of years observed in the sample for each country. In this way countries are partitioned in groups with the same idiosyncratic risk. Countries not experiencing crises would have a null crisis ratio. Still another possible approach consists of applying Mundlak's method (Mundlak, 1978) of adding the country means of all the explanatory variables as additional regressors, so that the estimated linear combination of these additional variables is the idiosyncratic factor for each country.

The results from these alternative approaches are reported in Appendix C, Table C2. Here, it suffices to say that all ways of modelling country idiosyncratic characteristics lead to the conclusion that there are idiosyncratic structural differences across countries (i.e., the idiosyncratic controls are statistically significant). However, formally incorporating these methods to estimate idiosyncratic factors into the baseline specification is problematic. First, crisis is a rare event, and the alternative Probit estimations using country dummies or the crisis ratio may be substantially biased under small-sample conditions. Second, while Mundlak's approach is not subject to the small sample bias concern, it poses a problem of interpretation of the estimated country effects, namely whether to accept that the average value of the variables of interest are reliable sample correlates of an underlying structural propensity to crisis.[7] Therefore, we decided to explore more robust alternatives to proxy idiosyncratic crisis propensity to arrive at a baseline specification.[8]

Table 2 (column 1) reproduces for reference the basic estimation tentatively selected in Table 1 along with estimations using alternative parsimonious specifications for structural proxies. Specifically, to overcome the small-sample issues associated with the use of country dummies while retaining its spirit, we explored the possibility of considering group dummies (where all countries belonging to the same group are assigned the same dummy). Column 2 discriminates among advanced economies and geographical groups of non-advanced economies. It shows that, generally, non-advanced dummies are significantly different from zero (non-advanced economies

[7] If countries are equally prudent, one would expect that a country with higher structural propensity to fall into crisis would attempt to have higher mean levels of protective variables (and lower levels of risky variables), thus inducing a positive association between propensity and risk-mitigating factors (and a negative association with risk factors). However, the estimated coefficient of the mean of international reserves is significantly negative, and more generally, the signs of Mundlak's additional variables in Table C2 do not conform to the expected pattern.

[8] A random effects Probit model would be an indirect way to model country-specific risk propensity, but it would lead to biased results unless untestable orthogonality conditions are assumed.

are more propense to fall into crisis than advanced economies), so that this specification improves the basic specification in column 1. At the same time, a Wald test does not reject the hypothesis that the idiosyncratic structural propensity to fall into crisis for the non-advanced groupings is equal across groups (p-value 0.37), suggesting that what is most relevant for structural crisis propensity is the split between advanced and non-advanced. Column 3 shows such dichotomic specification in which all non-advanced economies are lumped into one group, which makes very little difference to the estimations of the parameters of interest (as shown in the table, a Wald test would not reject that they are equal to the parameters in column 2).

Table 2. Country Group Dummies

	(1) Basic	(2) IMF Regions	(3) Non-Advanced Dummy	(4) Non-Advanced Dummy w/o Income Per Capita	(5) Non-Advanced Dummy w/Larger Sample
Debt Assets	0.43	0.41	0.62	0.64	0.12
	(0.53)	(0.53)	(0.52)	(0.56)	(0.49)
Debt Liabilities	1.01**	1.10**	1.11**	1.09***	1.46***
	(0.49)	(0.45)	(0.44)	(0.34)	(0.29)
PE Assets	-2.82	-2.32	-3.01	-2.87	-3.67
	(6.05)	(3.82)	(3.54)	(4.02)	(4.13)
PE Liabilities	0.37	1.27	0.71	0.65	0.89
	(1.46)	(0.99)	(1.31)	(1.83)	(1.54)
FDI Assets	-5.09*	-4.99**	-4.78*	-4.65*	-5.54**
	(2.70)	(2.44)	(2.44)	(2.57)	(2.34)
FDI Liabilities	0.26	0.00	0.20	0.19	0.71*
	(0.49)	(0.49)	(0.48)	(0.48)	(0.43)
FX Reserves	-4.97***	-4.79***	-5.56***	-5.49***	-5.57***
	(1.08)	(1.01)	(1.21)	(1.25)	(1.15)
Current Account Deficit	6.03***	6.58***	7.38***	7.34***	2.22***
	(1.95)	(2.24)	(2.32)	(1.93)	(0.78)
Fiscal Deficit Gap	3.08*	3.03	3.30	3.28	3.72**
	(1.86)	(1.97)	(2.03)	(2.04)	(1.78)
RER Overvaluation Gap	0.48***	0.43**	0.43**	0.44*	0.48**
	(0.19)	(0.19)	(0.19)	(0.24)	(0.23)
Per-Capita Income	-1.95***	-0.79	0.30		
	(0.54)	(0.90)	(0.81)		
Global risk	0.45	0.70	0.71	0.74	1.26
	(1.17)	(1.17)	(1.17)	(1.17)	(1.03)
LAC		1.01**			
		(0.50)			
EDE		0.83*			
		(0.48)			
EDA		0.66			
		(0.58)			
MECA		0.80			
		(0.52)			
Non advanced			1.67**	1.54***	1.02***
			(0.67)	(0.31)	(0.21)
Constant	-1.53***	-2.55***	-3.44***	-3.28***	-2.86***
	(0.36)	(0.60)	(0.74)	(0.38)	(0.27)
N	1880	1880	1880	1880	2066
Pseudo R^2	0.28	0.30	0.31	0.31	0.28
Wald Test Model			(3)vs(2)	(4)vs(3)	
Wald Test P-Value			0.99	0.02	

Standard errors in parenthesis

* p<0.1, ** p<0.05, *** p<0.01

We notice that in the specification with a binary non-advanced dummy in column 3 the income per capita control ceases to be useful (it changes sign, which is counterintuitive, and loses significance). Column 4 shows a more parsimonious specification where the income per capita control is dropped from the specification, whose validity cannot be rejected statistically.[9] We therefore eliminated the income per capita variable I_{it}, leaving only D_N, a group dummy taking the value 1 for non-advanced economies. In what follows we will use this binary structural classification to control for structural risk factors.

The usefulness of segmenting advanced and non-advanced economies in panel data to study issues in economic development has a long tradition which is also justified in our data concerning crisis risk. Using the group dummy instead of the relative income per capita has the additional advantage of making available 186 observations for which the relative income per capita data were missing for specific country / years, increasing the number of observations from 1,880 to 2,066 (estimation shown in column 5).[10]

3.3 Endogeneity of Explanatory Variables

Since this work is intended to identify and assess causal factors of external crisis to guide prudential policy rather than warning indicators to predict external crises, it is critical to ensure that the associations uncovered between explanatory variables and subsequent crisis are in fact causal and not induced by spurious correlation. While the use of lagged explanatory variables eliminates the problem of reverse causality originating in data collected throughout the year (e.g., explanatory variables partly reflecting effects after a crisis event in the middle of the year), there is still the potential problem that lagged explanatory variables may reflect in anticipation crisis risk factors that are not controlled by the model. This form of reverse causation would bias coefficient estimates and distort the policy implications of acting upon the model's explanatory variables. For example, increased political risk associated with a populist government that can be expected to

[9] A Wald test does not reject the equality of the parameters of interest under both specifications. In fact, the Akaike Information Criteria favor the more parsimonious specification of Column 4.

[10] To verify that the non-advanced country dummy adequately controls for structural differences between the two groups, we run the baseline regression separately over both subsamples and obtained qualitatively similar estimations for the slope coefficients while retaining a resilience advantage for advanced economies. (See Appendix C, Table C3). Controlling differences with a dummy variable appears to be a reasonable approximation that makes it possible to use the information of the whole sample to obtain more precise estimators. This contrasts with IMF (2020), where it is noted that in separate regressions some slope coefficient estimations are qualitatively different (but obtaining that advanced economies would be *less* resilient, as indicated by a smaller estimated constant).

underestimate the cost of crisis, or with other observables not controlled in this model, would go hand in hand with early capital flight, leading to the underestimation of the protective role that those foreign assets may have ceteris paribus. Macroeconomic policy and imbalances may also endogenously adjust to lagged extra-model risk factors and induce bias in the parameter estimations of their causal effects.

Consistent with much of the literature, our starting model assumed that Portfolio and Macrocontrols lagged by one year are exogenous, meaning that they are not correlated with risk factors included in the error term. However, this assumption should be scrutinized. To explore the issue, we followed the methodology used by Huertas and Meyer-Cirkel (2021) and regressed the annual change of each of the control variables in the Probit model at various lags against the crisis onset indicator, controlling for the initial level of the explanatory variables in the model. If the estimated correlation is positive, the evidence would be suggestive of anticipation due to reverse causation. Table 3 shows the results including both the sign of the coefficient estimates and the statistical significance in parenthesis. Each column corresponds to the row variable year-on-year changes between 1, 2 and 3 years before the crisis onset, respectively. The results in the first column correspond to the one-period lag in which we have been assuming that the explanatory variables are exogenous to risk factors in the error term.

We note that for some variables the crisis outcome was highly significantly associated with their changes over the two years prior to crisis onset. In particular, we note that debt stocks (both assets and liabilities) grow significantly in the pre-crisis period. This is suggestive of an endogeneity problem. This pattern weakens three years before the crisis, when the future crisis outcome has only a marginal significance. It also makes intuitive sense that a three-year lag should substantially dilute any potential reverse causation. Given this evidence, we conclude that variables lagged 3 years can be assumed to be exogenous with a degree of confidence that variables at a one-year lag cannot.

Table 3. Exploring Reverse Causality

Δ	Δ_{12}	Δ_{23}	Δ_{34}
Debt Assets	+ (**)	+ (***)	+
Debt Liabilities	+ (***)	+ (***)	+ (*)
PE Assets	+	+	-
PE Liabilities	-	-	-
FDI Assets	-	-	-
FDI Liabilities	-	-	-
FX Reserves	-	-	+
CA 2-Y MA	- (***)	- (***)	-
Fiscal gap(5YMA)	+	+ (*)	+ (**)
REER gap(5YMA)	+	+	+

Note: The table reports the sign of the coefficient estimates where the dependent variable is the change between lag 1 and lag 2 (second column), lag 2 and lag 3 (third column), and lag 3 and lag 4 (fourth column) respectively, for each of the variables, where the explanatory variable in each case is the future crisis onset indicator. In parenthesis below the signs is the statistical significance of the coefficient estimates where (***), (**), and (*) mean significant at the 1%, 5% and 10% levels, respectively. If there are no asterisks below the sign, the coefficient estimate is not statistically significant.

In what follows we assume that portfolio and macrocontrol variables lagged three years are exogenous. We then use the three-year lags as instruments of the corresponding variables in the model to test the endogeneity of one-year and two-year lagged variables. Lagging macrocontrol and portfolio variables three years reduces the number of observations from 2066 to 1949.

Table 4, column 1 shows the regular Probit estimation of the basic model of Table 2, column 1, alongside IV Probit estimations in which the portfolio and macrocontrol variables are instrumented using three-year lags (column 2). Columns 3 and 4 run the same exercise of regular and IV Probit estimation of a specification based on two-year lagged variables. The Wald endogeneity test of the instrumented variables based on the comparison of regular and IV Probit estimations rejects that the vector of one-year and two-year lagged variables is exogenous. It does so at a high confidence level (over 99%) in the first case and at a lower level (97%) in the second case. The implication is that the IV Probit estimations in columns 2 and 4, where all potentially endogenous variables are instrumented, correct for estimating biases in columns 1 and 3, which may be particularly severe in the specification based on the traditional one-year lag formulation.[11] These tests confirm the validity of the concerns prompted by Table 3 and call into question any causality claim based on the one-lag specifications that are standard in this literature.

Table 4. Probit and IV Probit Regressions with One and Two Lags

	(1) OneLag	(2) OneLag3LInst	(3) TwoLags	(4) TwoLags3LInst
Debt Assets	0.12	-0.35	-0.08	-0.30
	(0.44)	(0.37)	(0.47)	(0.55)
Debt Liabilities	1.46***	0.93**	1.49***	1.14***
	(0.37)	(0.46)	(0.42)	(0.34)
PE Assets	-3.67	-1.23	-1.59	-2.63
	(4.36)	(1.99)	(2.56)	(3.65)
PE Liabilities	0.89	0.90	1.21	1.71
	(1.03)	(1.35)	(1.01)	(1.82)
FDI Assets	-5.54***	-2.93	-5.98***	-6.04**
	(2.11)	(2.38)	(2.19)	(2.62)
FDI Liabilities	0.71**	0.38	0.67*	0.70
	(0.34)	(0.44)	(0.34)	(0.51)
FX Reserves	-5.57***	-2.68	-4.98***	-4.41***
	(1.00)	(2.14)	(1.00)	(1.33)
Current Account Deficit	2.22***	-0.45	1.63**	1.32
	(0.71)	(1.36)	(0.82)	(1.26)
Fiscal Deficit Gap	3.72**	24.01***	4.24**	5.32
	(1.69)	(4.94)	(2.11)	(3.66)
RER Overvaluation Gap	0.48***	-0.04	0.91***	0.80
	(0.17)	(0.90)	(0.29)	(0.49)
Non Advanced	1.02***	0.57	1.17***	1.05***
	(0.28)	(0.45)	(0.29)	(0.26)
Global Risk	1.26	-0.43	1.76*	0.77
	(0.91)	(0.86)	(0.97)	(1.22)
Constant	-2.86***	-1.41	-3.07***	-2.61***
	(0.33)	(1.01)	(0.36)	(0.40)
N	2066	1949	2005	1949
Wald P-Value		<0.001		0.03

Standard errors in parenthesis
* p<0.1, ** p<0.05, *** p<0.01

However, while under the assumptions an IV Probit procedure would correctly estimate the parameters of the basic specification, it may not be the most useful from a policy perspective. For example, the estimations in column 2 would indicate causal risk contributions of variables only one year in advance, in a near-crisis situation, and would therefore illuminate policy only in those extreme circumstances. For example, the analysis of how protective international reserves are and what is a reasonable level of reserves for prudential reasons illustrates this point. A country with an unhealthy economy destined to a largely inevitable external crisis can always delay it by spending international reserves to cover the shortfalls that would otherwise precipitate the crisis.

[11] We note that, as expected, the fit of the IV estimation in terms of the likelihood of the data is worse precisely because the association produced by reverse causation was removed. For this reason, the utilization of selection criteria based on predictive power, such as AUROC, would be misguided.

If the country engages in this unsustainable reserve decumulation, the external crisis will take place only when reserves are sufficiently depleted. In that case, reserves will be estimated to be exceptionally protective because crisis would only occur when they are low, but they would be so only in a one-year horizon. The policy question of what levels of reserves should a country have is related to the right stance in normal times to support a stable non-crisis regime, not to be able to delay crisis by one year. Reserves can be expected to diminish the probability of external crisis over a longer horizon because they can buffer shocks and deter panic attacks, but only if they are part of a sustainable policy framework.

The spirit of this paper is to analyze medium-term risk vulnerabilities and policies to maintain a healthy risk profile under normal circumstances. A robust estimation of risk contributions for the purpose of this research needs to look at the drivers of the probability of crisis down the road. We consider that a three-year lag is a good vantage point and timely enough for policy effectiveness. While shocks over the two interim years would tend to dilute somewhat the predictive power of the explanatory variables, we argue that the analysis of this risk indicator is more useful to reveal the underlying financial health of the country and guide policy to maintain it or correct course in a timely fashion.[12]

4. The Determinants of Crisis Onsets

Taking into account all the factors considered in the preceding subsections, in what follows the baseline specification will be:

$$Prob\ (Crisis_{it} = 1) =$$
$$\Phi(Constant + \alpha D_N + \beta G_{it} + \gamma(Portfolio)_{it-3} + \delta(Macrocontrols)_{it-3}), \qquad (5)$$

Table 5 shows the baseline Probit estimation of this model in which portfolio and macrocontrol variables are lagged three years under the maintained assumption that they are exogenous. In this Probit estimation, these variables explain the probability of crisis three years ahead.

[12] To ensure that the estimations reflect the risk of crisis three years down the road in a healthy country, in a normal scenario, we re-run the baseline regression restricted to crisis events (crisis onsets and non-crisis) that were preceded by three normal, non-crisis years (Appendix C, Table C4). The estimations were essentially unchanged and validate this interpretation of the results.

Table 5. Baseline Estimation

Category	Variable	Coefficient
Baseline	Constant	-2.88*** (0.33)
Structural and Global	Non-Advanced Dummy	1.08*** (0.26)
	Global Risk	1.65* (0.96)
Portfolio	Debt Assets	0.17 (0.46)
	Debt Liabilities	1.13*** (0.39)
	PE Assets	-2.23 (2.01)
	PE Liabilities	0.90 (1.10)
	FDI Assets	-4.98*** (1.72)
	FDI Liabilities	0.64* (0.35)
Macrocontrols	FX Reserves	-4.30*** (1.12)
	Current Account Deficit	1.22* (0.74)
	Fiscal Deficit Gap	2.76** (1.31)
	REER Overvaluation Gap	0.61** (0.27)
	Observations	1949
	AIC	475.2
	AUROC	0.85
	Pseudo R^2	0.21

Country clustered standard errors.
* $p<0.1$, ** $p<0.05$, *** $p<0.01$

This estimation has considerable predictive power as indicated by both the AUROC (the standard measure of successful binary classification) and the Pseudo R^2.[13]

The results are presented for three groups of variables: *structural* and *global factors*, *portfolio variables*, and *macrocontrols*.

4.1 Structural and Global Factors

Structural risk is proxied by a non-advanced country dummy. In this estimation, advanced economies are less prone to fall into crisis, which can be interpreted as having higher capacity to carry risks such as portfolio exposures and macroeconomic imbalances—ceteris paribus. One way

[13] An AUROC of 1 would mean perfect classification. An AUROC greater than 0.5 indicates that the model does better than random (no model) in differentiating outcomes, between crisis and no-crisis. The Pseudo R^2 is calculated using the McFadden method. A McFadden's Pseudo R^2 ranging from 0.2 to 0.4 indicates very good model fit (see Louvierm, Hensher and Swait, 2000)

to measure this lower vulnerability or higher resilience is to compare it with other risk factors. For example, ceteris paribus, advanced economies would be able to carry almost 100 points of GDP more of debt liabilities (a fraction of GDP equal to 1.08/1.13) than non-advanced economies. Similarly, one could consider the extra international reserves that a non-advanced country with the same risk factors would need to match the vulnerability level of an advanced economy. In our estimations, the offsetting factor would be equal to 1.08/4.30, so that the advanced country advantage corresponds to additional international reserves of about 25 points of GDP.

The estimation shows a significant effect of global risks on the probability of an external crisis. For any given level of country risk fundamentals, the risk of crisis onset is larger when more countries in the world are in a state of external crisis. This global risk factor is meant to capture well-documented special episodes or circumstances, whether due to worsened economic fundamentals in the rest of the world or pure international financial contagion.[14] To gain a sense of how important global risk is, one could ask how widespread crises around the world have to be to aggravate the risk of crisis of a particular country as much as 20 extra GDP points of debt liabilities do. The answer is 14 percent (=1.13x0.2/1.65). It follows that the occurrence of widespread crises of that order, which is common in episodes of global turmoil, is a substantial additional risk burden for any given country but pales in comparison to the structural burden of being non-advanced (which is five times as high).

4.2 Portfolio Variables

The second group of parameters of interest pertains to the external portfolio variables. The estimation of the parameter vector γ informs about the risk properties of the various items of the external financial portfolio of countries (given the controls). Specifically, it is relevant for assessing the relative risk of types of foreign liabilities and the relative risk mitigation provided by types of foreign assets. The estimation results are re-arranged in Table 6 for convenience:

[14] The baseline specification does not control for structural changes in the global framework of international financial relations, such as the emergence of financial cooperation facilities and mechanisms to prevent crises, that may also have an impact on the risk of external crisis. If so, associated structural changes in some of the explanatory variables over time would lead to biased estimations. One way to explore global structural change is to introduce a time trend as an additional explanatory variable. However, when added to the baseline specification its coefficient turns out to be indistinguishable from zero (p-value of 0.92), consequently making very little difference and confirming the validity of the stationary assumption of the baseline specification estimated in Table 5. See Appendix C, Table C4 for details.

Table 6. Coefficient Estimates of Portfolio Variables

Item	Debt	Portfolio Equity	FDI
Foreign Assets	$\gamma_1 : 0.17$ (0.46)	$\gamma_3 : -2.23$ (2.01)	$\gamma_5 : -4.98^{***}$ (1.72)
Foreign Liabilities	$\gamma_2 : 1.13^{***}$ (0.39)	$\gamma_4 : 0.90$ (1.10)	$\gamma_6 : 0.64^{*}$ (0.35)

Country clustered standard errors in parenthesis.
* p<0.1, ** p<0.05, *** p<0.01

While point estimates tend to be imprecise, the results in Table 6 generally conform to the prior that the coefficients of liabilities ($\gamma_{2,}\gamma_{4,}\gamma_{6,}$) are positive (risky) and those of assets ($\gamma_{1,}\gamma_{3,}\gamma_{5,}$) are negative (protective or risk mitigating). The exception is debt assets (whose coefficient has the wrong sign, albeit not significantly different from zero). Since all portfolio variables are measured with the same metric, these coefficients are comparable dollar for dollar. It appears that there are substantial disparities among financial types (debt, portfolio equity and direct equity) concerning their incidence on risk.

Table 7 formally puts to the test the hypothesis that types do not make a difference for risk ($\gamma_2 = \gamma_4 = \gamma_6$ and $\gamma_1 = \gamma_3 = \gamma_5$) and rejects it with high statistical confidence (over 99 percent); see Table 8 for a summary of this and other tests carried out in this subsection. The conclusion is that the risk implications of the financial portfolio depend on its composition. In other words, the baseline specification (copied for reference in column 1) is significantly different from a constrained specification that aggregates foreign assets and foreign liabilities across types (column 2). Such aggregate specification would omit relevant composition information. Nevertheless, it is worth mentioning that composition makes a significant difference only on the asset side. In effect, the equality hypothesis on the asset side $\gamma_1 = \gamma_3 = \gamma_5$ is rejected with great confidence (over 99 percent), but on the liability side $\gamma_2 = \gamma_4 = \gamma_6$ cannot be rejected at conventional confidence levels (p-value is 0.65). Therefore, there is clear evidence that the degree of risk mitigation of financial assets depends on their type, but there is less evidence that the risk of financial liabilities does.

Table 7. Alternative Specifications with Different Aggregations of Foreign Assets and Liabilities

	(1) Baseline	(2) Assets and Liabs	(3) Nets	(4) FI
Debt Assets	0.17			
	(0.46)			
Debt Liabilities	1.13***			
	(0.39)			
PE Assets	-2.23			
	(2.01)			
PE Liabilities	0.90			
	(1.10)			
FDI Assets	-4.98***			
	(1.72)			
FDI Liabilities	0.64*			
	(0.36)			
Foreign Assets		-0.80***		
		(0.29)		
Foreign Liabilities		0.79***		
		(0.27)		
Net Debt Liabilities			1.04**	0.48
			(0.42)	(0.40)
Net PE Liabilities			0.63	1.57
			(0.61)	(1.31)
Net FDI Liabilities			0.40	2.81***
			(0.30)	(0.98)
Financial Integration Debt				1.30***
				(0.29)
Financial Integration PE				-1.33
				(1.93)
Financial Integration FDI				-4.34***
				(1.51)
FX Reserves	-4.30***	-4.37***	-3.89***	-4.30***
	(1.12)	(1.13)	(1.21)	(1.12)
Current Account Deficit	1.22*	1.43**	1.36*	1.22*
	(0.74)	(0.73)	(0.77)	(0.74)
Fiscal Deficit Gap	2.76**	2.09	2.19	2.76**
	(1.31)	(1.45)	(1.43)	(1.31)
RER Overvaluation Gap	0.61**	0.48*	0.56**	0.61**
	(0.27)	(0.28)	(0.26)	(0.27)
Non Advanced	1.08***	1.20***	1.24***	1.08***
	(0.26)	(0.24)	(0.20)	(0.26)
Global Risk	1.65*	1.65	1.71*	1.65*
	(0.96)	(1.02)	(1.02)	(0.96)
Constant	-2.88***	-2.83***	-2.93***	-2.88***
	(0.33)	(0.31)	(0.32)	(0.33)
N	1949	1949	1949	1949

Standard errors in parenthesis

* $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 8 also shows that the risk contribution of a given type of private financial stock cannot be summarized by its net position in the portfolio. This is so because assets do not appear to offset the risk of the corresponding liabilities dollar for dollar. In fact, net financial positions would be sufficient to account for risk in the special case of perfect mitigation, that is $\gamma_1 + \gamma_2 = 0$, $\gamma_3 + \gamma_4 = 0$, and $\gamma_5 + \gamma_6 = 0$. This hypothesis is also rejected with high statistical confidence (over 99 percent), meaning that a specification based on net stocks by type as specified in Column 3 of Table 8 misses relevant risk information captured by the consideration of gross stocks by type.[15] In fact, when the full offset hypothesis is tested separately for each type, the need to consider gross stock positions to assess risk is validated with extreme confidence (at the 99 percent level) for both debt and FDI, albeit not for portfolio equity (p-value 0.49). Therefore, both gross positions and composition are important to gauge risk.[16] Table 8 summarizes the test results.

The last column of Table 7 (column 4) shows why specifying gross position is necessary by looking at how the constrained specification in column 3, based on net liabilities, would need to be expanded to span the space of the baseline specification (and therefore obtain an equivalent specification). (L-A) being a generic net liability variable in column 3, column 4 adds an index of observed financial integration defined as the sum of assets and liabilities for the corresponding variable (L+A). It is easy to show that this extension spans the same space as the gross portfolio variables in column 1 for any given type:

$$aA + lL \equiv \frac{(l-a)}{2}(L-A) + \frac{(l+a)}{2}(L+A), \tag{6}$$

The last term in this formulation shows the effect of financial integration for given net liabilities, that is an increase in gross stocks on both sides of the ledger keeping constant the net position. This additional effect is absent in specifications based on net liabilities. That effect exists when the risk effects of assets and liabilities of a given type do not completely offset each other ($l+a \neq 0$). The estimation of this offset and its statistical significance can be checked directly in column 4, and as discussed above it is highly significant for debt and FDI. Notice that the sign of $(l+a)$ determines whether higher international financial integration increases or reduces risk.

[15] This result differs from that in Catão and Milesi-Ferretti (2014), where the baseline specification is based on net stocks.

[16] This conclusion validates the results advanced by Cavallo, Fernández-Arias and Marzani (2017) in a model with fewer controls. In effect, portfolio point estimates are roughly similar. IMF (2020) confirmed this finding using a post-1990 sample, albeit in a model in which equity liabilities appear to be significantly risk *mitigating*.

Increased financial integration amplifies risk exposures when it applies to financing types that are net risk contributors, such as debt (i.e., positive coefficient estimate), but reduces risk when it applies to types whose risk mitigation is predominant, such as FDI (i.e., negative coefficient estimate).

Because the parameters γ_1 thru γ_6 reflect the risk implication of types of assets and liabilities dollar for dollar, the estimations can be used to compare the relative risk effects across portfolio items. For example, in comparing types of liabilities, γ_2/γ_6 measures how risky foreign debt is compared to FDI. Put differently, the decrease in the estimated crisis probability $\widehat{\Phi}$ (equation 5) involved in each unit of debt reduction would be offset by an increase of γ_2/γ_6 units of FDI. In this regard, we estimate that FDI is about half as risky as debt, which implies that traditional debt-to-GDP ratios sustainability indicators miss important information in countries with substantial FDI liabilities. It would be a mistake to gauge liability risk by looking at foreign debt alone. Our estimations suggest that there is risk of creeping or outright expropriation parallel to the risk of debt restructuring and provide support to those who point out that FDI is also footloose because it can be easily moved financially by using it as loan collateral (Fernández-Arias and Hausmann, 2001).

On the asset side, we find the surprising result that FDI assets are extremely protective, far exceeding the risk associated with FDI liabilities (our estimations show that $-\gamma_5$ exceeds γ_6 more than sevenfold). This evidence is consistent with the notion that potential impediments or retaliation against a country's FDI assets abroad may act as a deterrent to not honoring the country's liabilities. This novel finding suggests that FDI assets abroad may magnify the country's reputational cost of defaulting on external liabilities and in this way amount to an effective risk-mitigating factor.[17]

These estimations cast some doubts on the traditional pecking order between debt and direct equity investment, according to which FDI liabilities are less risky than debt liabilities because they are less fickle.[18] The hypothesis that these two liability types are equally risky cannot be rejected in favor of the pecking order conjecture $\gamma_2 > \gamma_6$ at conventional confidence levels (p-

[17] The notion that foreign assets provide important protection to foreign liabilities has a long tradition, at least starting with Kindleberger in reference to the United States. This statistically significant and substantial estimation of the mitigation power of FDI assets is robust to country sampling: a separate regression within non-advanced economies yields an almost identical point estimate (Appendix C, Table C3).

[18] See Levy-Yeyati and Zúñiga (2015).

value 0.18, see Table 8). For the same reasons, debt assets could be presumed to be more protective because they can be more easily liquidated and repatriated to provide financial support. Looking at the assets side, FDI appears to be substantially more *protective* than debt, the opposite of a pecking order conjecture that $\gamma_1 < \gamma_5$ (p-value 0.99, see Table 8).

Table 8. Hypothesis Tests

Hypothesis	P-Value
$\gamma_2 = \gamma_4 = \gamma_6$ and $\gamma_1 = \gamma_3 = \gamma_5$	0.00
$\gamma_1 = \gamma_3 = \gamma_5$	0.00
$\gamma_2 = \gamma_4 = \gamma_6$	0.65
$\gamma_1 + \gamma_2 = 0$ and $\gamma_3 + \gamma_4 = 0$ and $\gamma_5 + \gamma_6 = 0$	0.00
$\gamma_1 + \gamma_2 = 0$	0.00
$\gamma_3 + \gamma_4 = 0$	0.49
$\gamma_5 + \gamma_6 = 0$	0.00
$\gamma_1 = \gamma_3 = 0$ and $\gamma_2 = \gamma_4 = 0$	0.43
$\gamma_3 = \gamma_5 = 0$ and $\gamma_4 = \gamma_6 = 0$	0.58
Ho:$\gamma_2 = \gamma_6$ $Ha: \gamma_2 > \gamma_6$	0.18
Ho:$\gamma_1 = \gamma_5$ $Ha: \gamma_1 < \gamma_5$	0.99

Note: The table reports the p-value from a Wald test of the null hypothesis that a set of parameters is equal to some value as specified in each row. In the models being tested here, the null hypothesis is that two or more coefficients of interest are simultaneously equal to each other, and/or equal to zero. All tests are two-sided, except for the last two rows, where the alternative hypotheses are inequalities, as specified in the corresponding row, and therefore the tests are one-sided Wald tests.

4.3 Macrocontrols

The group of macro controls in Table 6 involves two different sets of variables: international reserves (negative estimated coefficient, meaning risk mitigating) and three macro imbalances: Current Account Deficit, Fiscal Deficit Gap, and Exchange Rate Overvaluation (positive estimated coefficients, meaning risk-creating). We study them separately.

Reserves are consistently estimated as highly protective at high levels of confidence across specifications. As shown in the previous risk comparisons, a point of international reserves goes a long way to offset deteriorations in many of the other risk factors. This contrasts with the negligible protection afforded by foreign debt assets. While debt assets could potentially play a similar role in mitigating risk, the use of international reserves can be driven by policy for maximum effect in a way that debt assets, especially private, cannot. The ability to repatriate private liquid assets held by risk-averse debt investors to back foreign liability obligations is not particularly helpful in practice. In contrast, a substantial level of reserves is an important ingredient to mitigate external risks and maintain a healthy risk profile.

The estimations of Table 6 provide an estimate of the risk mitigation value of international reserves as an insurance policy. According to these estimations, public sector foreign borrowing to increase international reserves would provide a net mitigating effect to the risk of external crisis (-4.30+1.13=-3.17<0). In other words, a dollar borrowed for this purpose would neutralize the risk created by more than three dollars in existing foreign debt. To determine the optimal level of reserves, it is necessary to put an economic value to this risk, which is beyond the scope of this paper, and compare it with the net financial cost of borrowing long to hold liquid assets.

The current account deficit, the fiscal deficit gap and the real exchange rate overvaluation are statistically significant risk factors. The proportions of their estimated coefficients indicate the tradeoffs between these policy-sensitive variables in crisis risk space (e.g., one unit of fiscal imbalance weighs more than twice as much as one unit of current account imbalance = 2.76/1.22). To have a quantitative sense of the relevance of macroeconomic imbalances one could estimate the amount of international reserves needed to offset their estimated risk effects. According to the coefficient estimates, one point of GDP in international reserves would offset the risk of about 3.5 points of current account imbalance (=4.30/1.22), 1.5 points of fiscal imbalance (=4.30/2.76), and a 7 percent overvaluation (=4.30/0.61). These macro imbalances combined would be offset by 3 points of additional reserves. Measured in terms of debt liabilities, the risk content of the combination of these imbalances would be equivalent to about 11 percent of foreign debt (= 3*(4.30/1.13)). Put differently, a macroeconomic adjustment of that size would have the same effects on risk as debt reduction of 11 percent of GDP.

5. The Evolution of Portfolio Risks: Composition and Financial Integration

The estimation of the parameter vector γ for the group of external portfolio variables can be used to construct a portfolio risk indicator at a 3-year horizon (PRI):

$$PRI_{it} = \gamma_1 DA_{it} + \gamma_2 DL_{it} + \gamma_3 PEA_{it} + \gamma_4 PEL_{it} + \gamma_5 FDIA_{it} + \gamma_6 FDIL_{it}, \qquad (7)$$

where:

DA: $Debt\ Assets$,

DL: $Debt\ Liabilities$,
PEA: $Portfolio\ Equity\ Assets$,
PEL: $Portfolio\ Equity\ Liabilities$,
$FDIA$: $FDI\ Assets$,
$FDIL$: $FDI\ Liabilities$.

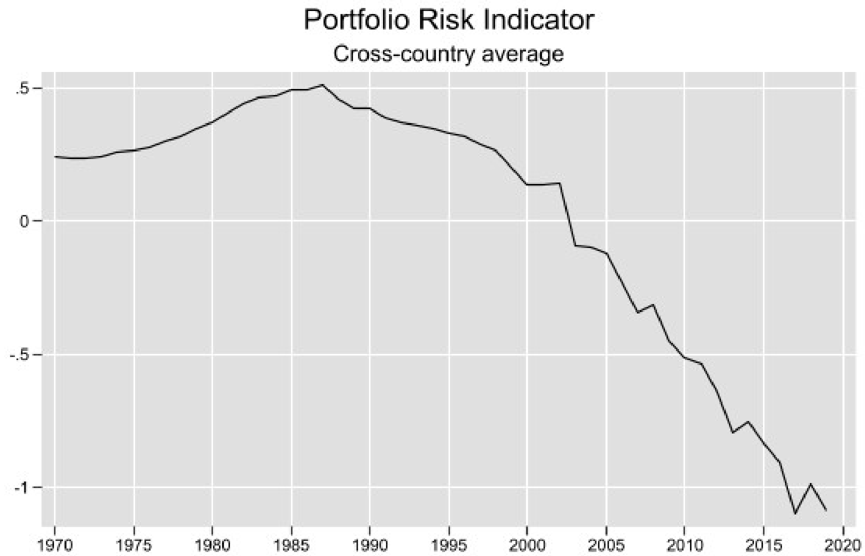
It is important to note that the PRI is a risk indicator, not a measure of risk. While the PRI is one factor relevant to the estimation of the probability of crisis in the Probit model (equation 5), its mapping into probability space is mediated by a non-linear function that also depends on the rest of the risk factors. Nevertheless, since this transformation in monotonic, it provides qualitative information about risk trends.

Notice that the PRI of a country under financial portfolio autarky (an external financial portfolio with no assets or liabilities) would be zero. Therefore, the estimated PRI is an indicator of the risk created by the external portfolio relative to no portfolio. If portfolio risks are balanced, the indicator is zero and the probability of external crisis would be the same as in financial autarky. A positive indicator implies that the external portfolio increases such probability of crisis, more so if the indicator is higher. The opposite is true for a negative indicator, in which case the external portfolio mitigates the risk that would obtain under financial portfolio autarky (created by other risk factors).

In this section we analyze the evolution of the PRI in the whole sample by computing the average PRI across countries. To avoid country compositional changes in the PRI time series we included the missing portfolio observations omitted from the estimation sample due to crisis continuation and recovery years after each crisis onset. The remaining missing values at the beginning of the sample period for countries whose data starts later were filled by extrapolating their first sample observation. In this way, we obtain a complete panel of portfolio observations of 62 countries from 1970 to 2019.

Figure 2 shows the evolution of the average PRI in our sample. We note that in our world sample the PRI has been trending downwards since the mid-1980s, becoming a source of risk mitigation in the 2000s (relative to a null portfolio).

Figure 2.



Panels A and B in Figure 3 explore the portfolio components that account for this evolution. Panel A decomposes the PRI into asset and liability gross positions, where each subcomponent indicates the change in risk relative to autarky, that is no assets and no liabilities, respectively, (subindexes dropped for convenience):

$$PRI = PRI_A + PRI_L, \tag{8}$$

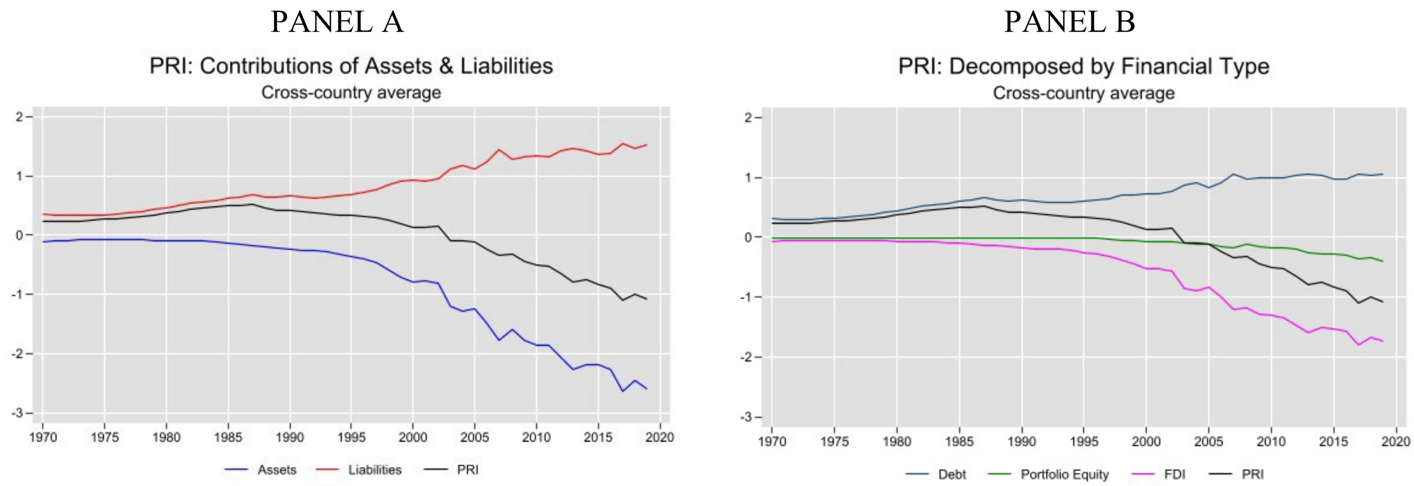
where:

$$PRI_A = \gamma_1 D_A + \gamma_3 PE_A + \gamma_5 FDI_A$$
$$PRI_L = \gamma_2 D_L + \gamma_4 PE_L + \gamma_6 FDI_L$$

Panel B decomposes the PRI in terms of the positions in each financial type (again relative to portfolios that do not include each one of the types):

$$PRI = (\gamma_1 D_A + \gamma_2 D_L) + (\gamma_3 PE_A + \gamma_4 PE_L) + (\gamma_5 FDI_A + \gamma_6 FDI_L) \tag{9}$$

Figure 3. Portfolio Risk Indicators by Component



Panel A shows that the risk indicator for foreign liabilities has been consistently growing decade after decade. Despite increasingly risky liabilities, the PRI had an overall downward trend over the past three decades because of the explosive increase in risk mitigation afforded by foreign assets.

Panel B reveals that the main driver of the declining PRI is the impact of FDI positions, while portfolio equity is a distant second, with only a marginal contribution. In contrast, debt positions have become increasingly risky and then stabilized over the last 15 years.

In order to analytically disentangle the drivers of these developments, we distinguish two main sources of changes in the PRI: changes in the composition of the portfolio (moving assets or liabilities from one type to another type leads to changes in the PRI because γ's are different across types) and changes in the aggregate level of assets and liabilities, an extensive margin that would affect risk for any given portfolio composition. To identify the portfolio composition effect, we consider a core portfolio normalized by the level of aggregate portfolio assets (A) and liabilities (L) in country *i* at time *t*:

$$(Asset\ Portfolio\ Item)'_{it} = \frac{(Asset\ Portfolio\ Item)_{it}}{A_{it}}, \tag{10}$$

$$(Liability\ Portfolio\ Item)'_{it} = \frac{(Liability\ Portfolio\ Item)_{it}}{L_{it}}, \tag{11}$$

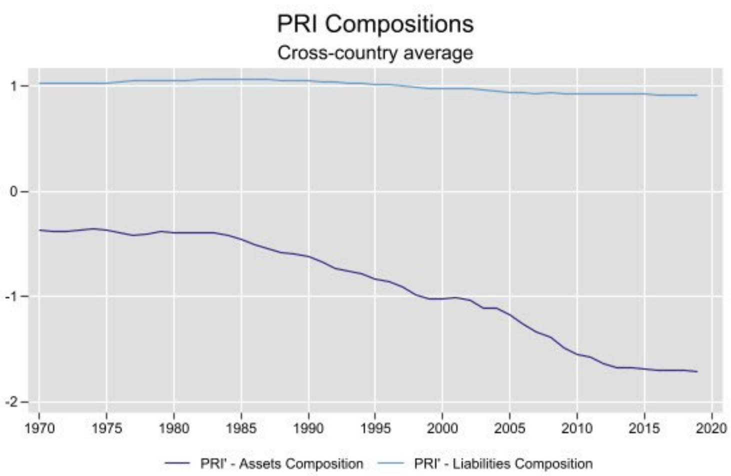
The normalized portfolio items are the shares of each financial type for both assets and liabilities. We capture the portfolio composition source by looking at the evolution of these normalized portfolios (PRI'), whose variations are not due to changes in aggregate assets or liabilities but to changes in composition (changes in the share allocation of assets and liabilities across types). This leads to the following decomposition:

$$PRI_{A,it} = \left(PRI'_{A_{it}} \right) A_{it}, \quad (12)$$
$$PRI_{L,it} = (PRI'_{L_{it}}) L_{it}, \quad (13)$$

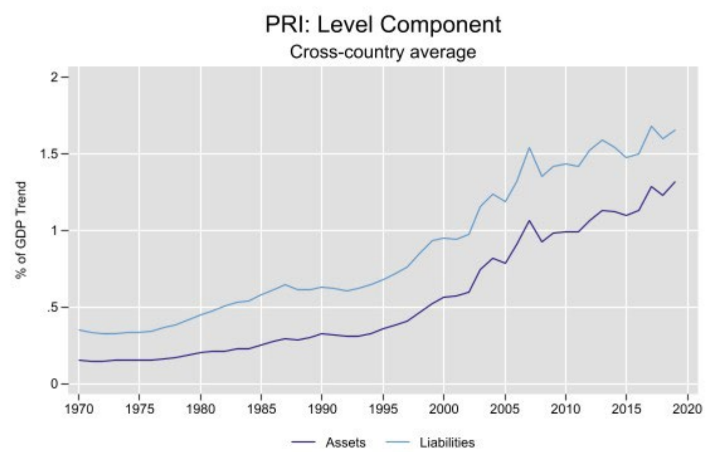
Figure 4 sheds light on the evolution of the assets and liabilities risk indicators shown in Figure 3 (PRI_A and PRI_L) by showing the evolution of two components: the risk associated with normalized portfolios over time (PRI'_A and PRI'_L) in panel A, and the evolution of the asset and liability levels (A and L) in panel B .

Figure 4. Asset and Liabilities Risk Indicators

PANEL A



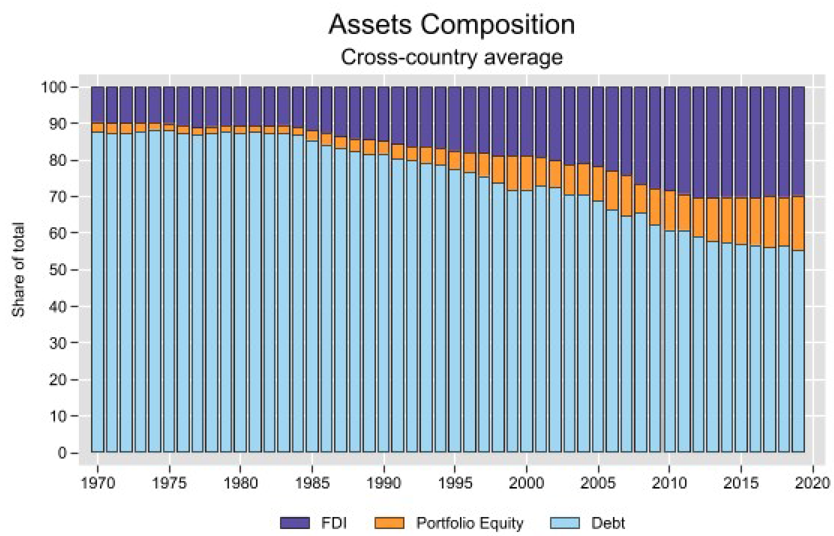
PANEL B

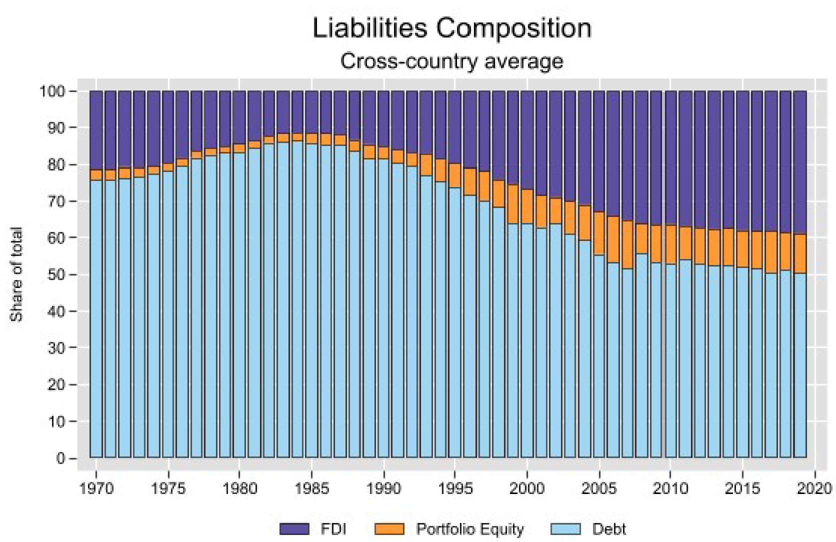


Panel A clearly shows that the risk associated with liability composition has been remarkably constant throughout the period. However, asset composition has become consistently more risk mitigating since the mid-1908s, fully offsetting the liability risk of the normalized portfolios by 2000. In other words, if aggregate assets and liabilities were equal and remained constant, the observed changes in their composition would have reduced and then turned around the overall portfolio risk. At the same time, Panel B shows a consistent upward trend of both gross assets and liabilities, which magnifies the qualitative risk implications of normalized portfolios. This implies that, on average, higher gross positions have amplified risks up to 2000 and risk mitigation afterwards.

The underlying changes in portfolio composition can be summarized in the more intensive use of equity instruments, which are somewhat less risky as liabilities and much more protective as assets compared to debt instruments. Figure 5 portrays the increase of the share of equity positions in overall foreign assets and liabilities starting around 1990, which appears to have stalled in recent years.

Figure 5.



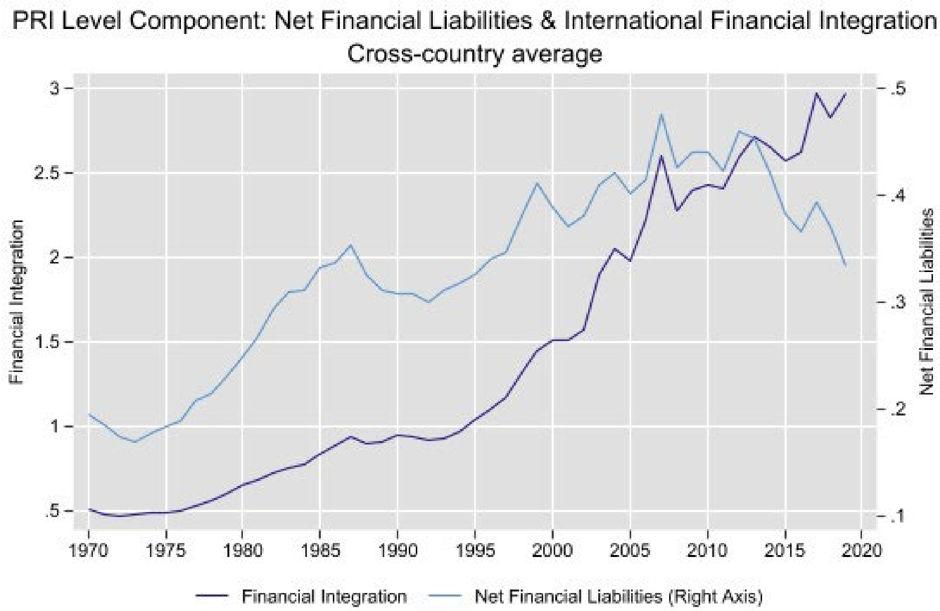


It is useful to link the evolution of gross assets and liabilities *(A* and *L)* shown in Panel B to international financial integration *(F=L+A)* and net financial exposure *(N=L-A),* where:

$$L = \frac{F + N}{2} \;\; and \;\; A = \frac{F - N}{2} \qquad (14)$$

Figure 6 shows that the increasing evolution of gross assets and liabilities can be traced to the explosive development of financial integration. The changes in the net financial position (its accumulated capital account), which consistently worsened until recent years, were dwarfed by those of financial integration, which dominated the action.[19] The changes in net financial liabilities, which would act asymmetrically on assets and liabilities, made very little difference to the overall trend of assets and liabilities.

Figure 6.



To disentangle the quantitative importance of each one of these factors, it is useful to decompose the changes of the assets and liabilities risk indicators in changes in their composition and level components as follows:

[19] Notice that average net positions in our sample would not add up to zero even if the sample encompassed the whole world and BOP statistics were consistent because assets and liabilities are not in levels but scaled by each country's GDP.

$$\Delta PRI_{A,it} = (\Delta PRI'_{A,it})\ \bar{A}_{it} + (\overline{PRI}'_{A,it})\ \Delta A_{it}, \tag{15}$$

$$\Delta PRI_{L,it} = (\Delta PRI'_{L,it})\ \bar{L}_{it} + (\overline{PRI}'_{L,it})\ \Delta L_{it}, \tag{16}$$

where the means are the simple average of the observations in t and t-1.

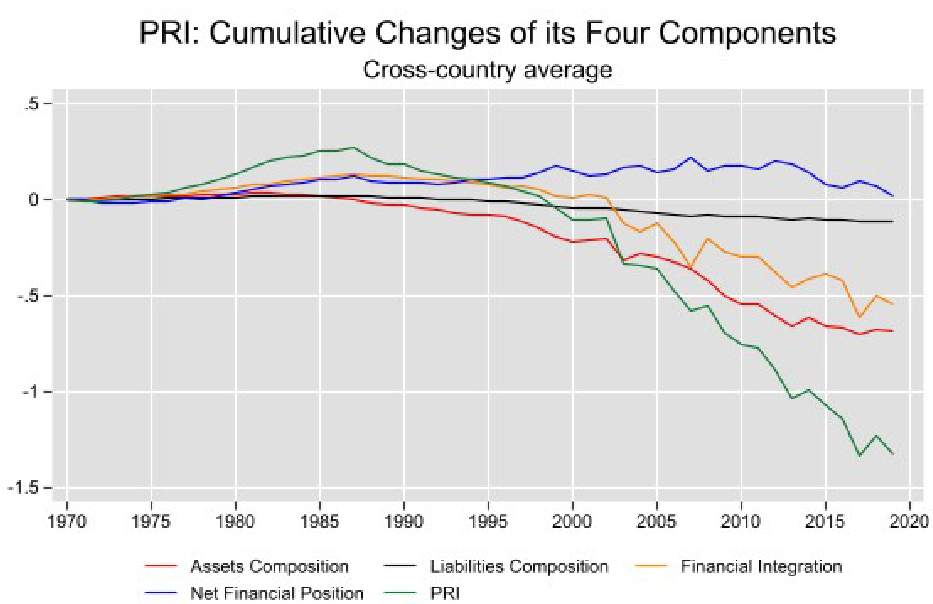
Figure 7 shows a full decomposition of the cumulative change of PRI to account for four sources of variation: the two composition sources identified in the first terms of equations 15 and 16, and two additional sources: net financial position and financial integration. To do this, the level effects in the second terms of these equations are interpreted as the combined effect of net financial positions and financial integration. It is easy to check that based on the previous decomposition of changes in risks in the assets and liabilities side, the change to the overall portfolio risk indicator can be decomposed into these four sources:

$$\Delta PRI_{it} = \Delta PRI_{A,it} + \Delta PRI_{L,it} = \tag{17}$$

$$(\Delta PRI'_{A,it})\ \bar{A}_{it} + (\Delta PRI'_{L,it})\ \bar{L}_{it} + n_{it}\Delta N_{it} + f_{it}\Delta F_{it},$$

where the weights n_{it} and f_{it} are, respectively, the difference and the sum of $(\overline{PRI}'_{A,it})$ and $(\overline{PRI}'_{L,it})$ divided by 2.

Figure 7.



The conclusion is that, for the average country in the sample, changes in portfolio asset composition have been responsible for driving most of the overall improvement in the risk indicator, which accounts for half of the overall reduction of the risk indicator. International financial integration has also been very important in leveraging the risk of the normalized portfolios, helping the decline in overall risk since the mid-1980s. On the other hand, the net financial position, which leverages the risk of normalized net liabilities, has not been strong enough to make a substantial difference both in the upswing and as it improved over the last decade. Its small cumulative contribution to increases in the risk indicator has been offset by marginal improvements in the composition of liabilities. In summary, the remarkable decline of portfolio risks as proxied by PRI was mainly due to changes in asset composition away from debt and the leveraging effect of the substantial increase in financial integration.

6. Assessing the Risk Drivers of External Crisis

In this section we analyze the risk and mitigation created by changes in variables other than the external portfolio in the baseline specification: i.e., Structural Risk, Global Risk and Macrocontrols. We also look at the relative contributions of these drivers to the estimated vulnerability to external crises.

In the model, the structural risk faced by the low resilience of a non-advanced country is captured in the country group dummy. As to the global risk that every country faces in turbulent times, it is captured by the proportion of other countries that are in crisis. Global risk captured in this way reflects global risk factors additional to the country fundamentals included in the model. The evolution of global risk would encompass changes in global fundamentals (e.g., a world recession or global financial turbulence not fully captured in countries' fundamentals) or crisis contagion (e.g., an increase in the risk assessment of all countries due to the onset of crisis in some of them without a change in fundamentals). As a risk indicator of external crisis three years ahead, the corresponding expected global risk needs to be estimated. For illustration, we use a perfect foresight assumption. Correspondingly, the structural risk indicator SRI_i and the global risk indicator GRI_{it} are:

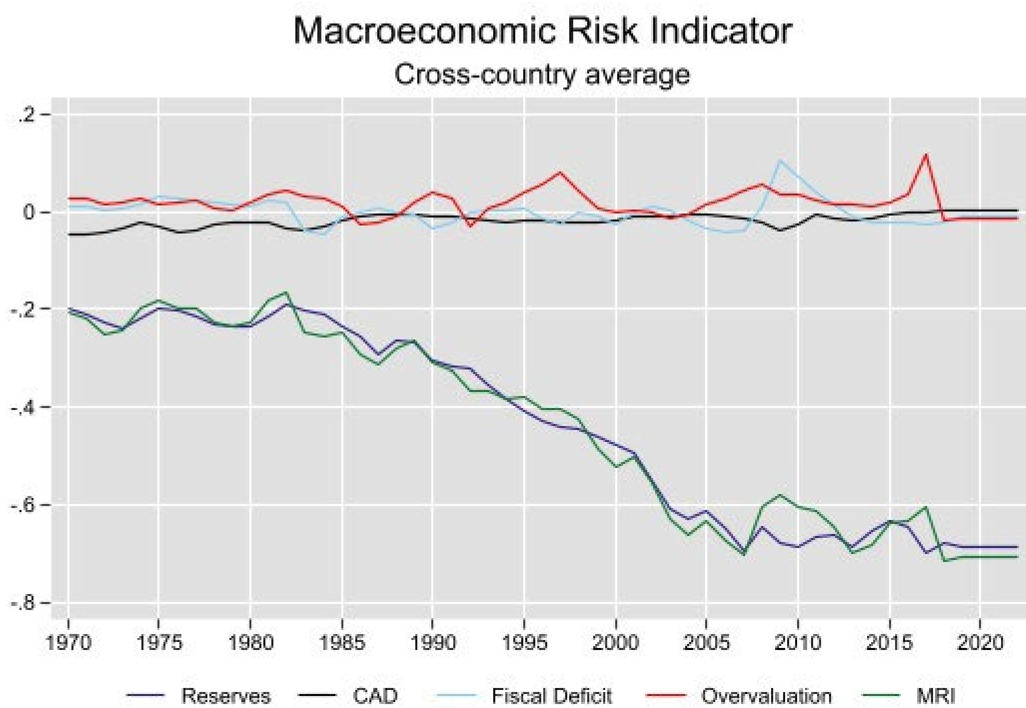
$$SRI_i = \alpha D_N \ and \ GRI_{it} = \beta G_{it+3} \quad (18)$$

The estimation of the parameter vector δ can be used to construct a macroeconomic risk indicator (MRI) similar to the PRI, which indicates the additional risk relative to a neutral situation of no overall macroeconomic risk:

$$MRI_{it} = \delta_1 Reserves_{it} + \delta_2 CAD_{it} + \delta_3 Fiscal\ Deficit_{it} + \delta_4 Overvaluation_{it}, \quad (19)$$

Figure 8 shows the evolution of the MRI for the average country in the world sample decomposed in its four components. International reserves are the main driving force behind MRI, both its level and its turning points.

Figure 8.

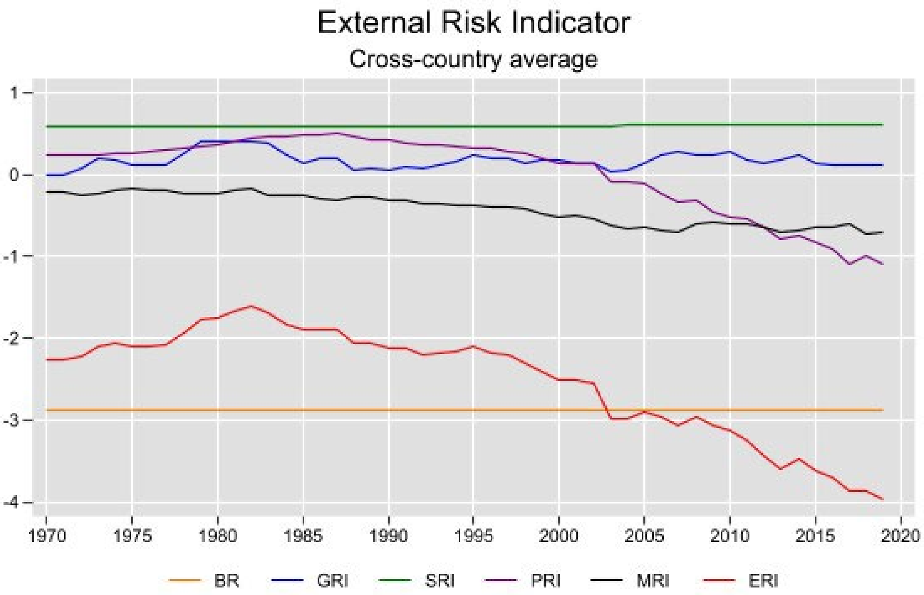


While the constant, estimated as -2.88, would not add any information as a risk indicator because it is invariant, we chose to incorporate it in the overall risk indicator for convenience. The sum of the four risk indicators on top of the estimated constant -2.88 would correspond to the overall External Risk Indicator (ERI):

$$ERI_{it} = -2.88 + SRI_i + GRI_{it} + PRI_{it} + MRI_{it} \quad (20)$$

Figure 9 accounts for the sources of the evolution of the ERI over the period:

Figure 9.



The figure demonstrates an important risk reduction in the average ERI. This overall risk reduction over time has been supported mainly by a remarkable reduction in external portfolio risk after the mid-1980s (PRI), followed by a substantial macroeconomic improvement (MRI) that appears to have stalled after the global recession. The global risk indicator (GRI) appears stable and has contributed only marginally to changes to the overall ERI over the period.

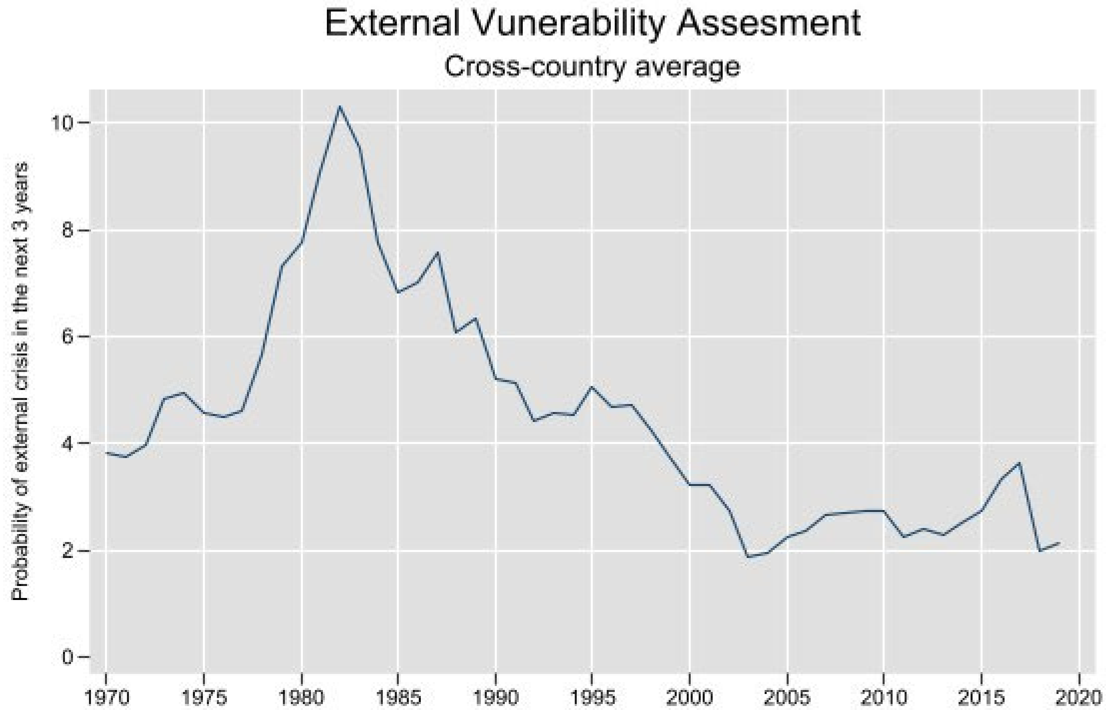
External Vulnerability Assessment (EVA)

Beyond risk indicators, our estimating equation of the probability of external crisis three years ahead is an assessment of external vulnerability in probability space, or EVA. This formulation makes the EVA a useful policy tool because it assesses overall risk in time to implement prudential policies on variables amenable to policy intervention, namely Macrocontrols and, to a smaller degree, Portfolio variables. The external vulnerability of country *i* at time *t* is:

$$EVA_{it} = \Phi(ERI_{it}) = \Phi(-2.88 + SRI_i + GRI_{it} + PRI_{it} + MRI_{it}) \qquad (21)$$

This assessment can be used to trace the level of vulnerability over time expressed as the probability of crisis as well as to compare vulnerability across countries. In this section we analyze the evolution of the average EVA across countries in the world sample. Figure 10 shows how the estimated average probability of external crisis three years ahead in the sample went down from about 10 percent in the early 1980s to about 2 percent in the most recent period.

Figure 10.



It is useful to think that countries face baseline risk, meaning the risk of falling into an external crisis in three years in a scenario in which all identified sources of risk exposure are shut off. For example, the probability of a crisis in an advanced economy (which has no structural propensity to fall in crisis), portfolio risks are neutral (PRI=0), the level of international reserves perfectly offsets the risks of macroeconomic imbalances, and there is no crisis onset in the world. Baseline risk (BR) is captured by the constant in Table 6 and is estimated as BR = $\Phi(-2.88)$ = 0.19%. With this definition, baseline risk is almost negligible. The identified risk factors would add or subtract risk relative to the baseline depending on the sign of their risk indicators in equation (21). Their risk contributions would fill the gap between the observed crisis probability and baseline risk.

How important are the contributions of the four risk factors to country vulnerability on top of baseline risk? To answer this question, we need to decompose the EVA. Since the estimating equation of the probability of crisis in this Probit formulation is not linear, risk-augmenting and risk-mitigating sources interact to produce substantial joint effects whose attribution is ambiguous. In this section we utilize the linear risk indicators SRI, GRI, PRI and MRI as building blocks. As noted, baseline risk is defined as the crisis risk when the four risk indicators are set to zero, so that:

$$\text{BR} = \Phi(-2.88) = 0.19\% \tag{22}$$

We express the EVA shown in equation (21) using the mean value theorem around the constant -2.88 for each (i,t):

$$EVA_{it} = \Phi(ERI_{it}) = \Phi(-2.88) + \lambda_{it}\,(ERI_{it} + 2.88) \tag{23}$$

$$= BR + \lambda_{it}\,(SRI_i + GRI_{it} + PRI_{it} + MRI_{it})$$

(where $\lambda_{it} > 0$ is the normal density ϕ evaluated at some point between -2.88 and ERI_{it}.) In what follows, equation (23) is used to obtain the risk contributions on top of baseline risk and decompose EVA into its five components:

$$EVA_{it} = 0.19 + SR_i + GR_{it} + PR_{it} + MR_{it} \tag{24}$$

where the contributions of the identified risk sources are given by

$$SR_{it} = \lambda_{it}\,SRI_i \tag{25}$$
$$GR_{it} = \lambda_{it}\,GRI_{it} \tag{26}$$
$$PR_{it} = \lambda_{it}\,PRI_{it} \tag{27}$$
$$MR_{it} = \lambda_{it}\,MRI_{it} \tag{28}$$

$$\lambda_{it} = \frac{EVA_{it} - 0.19}{SRI_i + GRI_{it} + PRI_{it} + MRI_{it}} \tag{29}$$

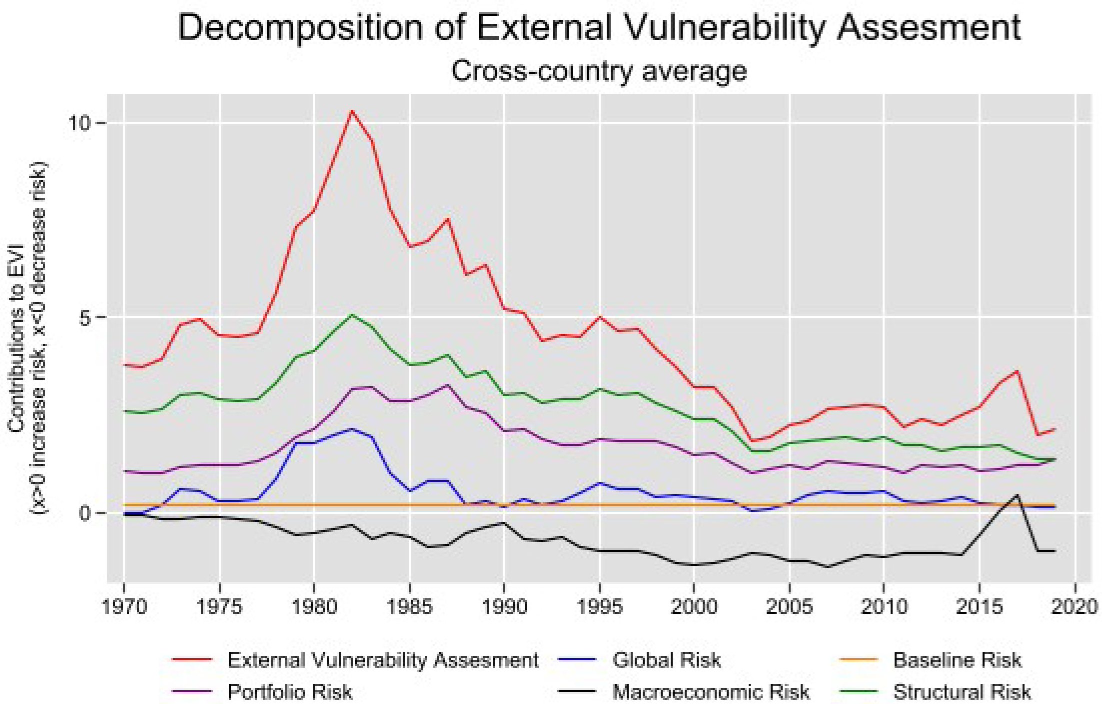
Note that this decomposition ensures not only that the signs of risk contributions and risk indicators coincide (because the scaling variable $\lambda_{it} > 0$), but it also preserves the shares of these four sources within ERI (because the scalar is λ_{it} is common across equations (25-28), and therefore the relative risk conclusions discussed previously using linear risk indicators.[20] This decomposition separates the effect of baseline risk as defined and then derives a decomposition of the risk effects of the explanatory variables to fill the remaining risk gap that is fully consistent with the previous relative risk analysis based on risk indicators.

The mapping between risk indicators and crisis probabilities is complicated because risk sources in this model are synergistic (the marginal risk contribution of any risk factor is higher if

[20] If $SRI_i + GRI_{it} + PRI_{it} + MRI_{it} = 0$, the decomposition would utilize the limiting value $\lambda_{it} = \phi(-2.88)$ to ensure continuity.

other risks factors are at a high level). For this reason, the multiplier λ_{it}, which reflects the circumstances in country i at time t, is not constant. An important corollary is that the average EVA across countries depicted in Figure 10 is not the EVA of the average country. Likewise, its decomposition into the four vulnerability sources (on top of baseline risk), depicted in Figure 11, cannot be derived from the risk indicators of the average country shown before.

Figure 11.



Average country vulnerability to external crisis, measured as the estimated probability of falling into external crisis three years down the road, started in the 1970s at a low level, dramatically increased in the 1980s, approaching a 10 percent crisis probability, and returned to initial levels in the last 15 years. To have a sense of magnitudes, a 10 percent probability of having a crisis in three years would translate into a 65 percent probability of falling into a crisis in a 10-year period if this level of risk remains. A 3 percent risk, which appears to be a stable level in recent years, would translate into a 26 percent probability over a 10-year period. Odds of one in four would be a significant threat for any given country.

Structural risk in non-advanced economies, that is the resiliency handicap relative to advanced economies, is clearly a substantial drag for them and appears to be on average the single most important risk factor component historically. It contributed by itself half of the crisis probability observed in the peak of the 1980s. Portfolio risk comes in second place, making a substantial contribution to crisis probability in the 1980s and remaining relevant nowadays after it stabilized around 1995. Global risk appears to have made a substantial contribution only during the 1980s. Of course, these findings apply on average, and they may certainly differ substantially across countries.

On the other hand, macroeconomic factors have been consistently risk mitigating throughout. However, the risk assessment of overall macroeconomic factors hides the offsetting effect of international reserves and macroeconomic imbalances. To unpack these two sources, Figure 12 decomposes the macroeconomic risk contribution following the same methodology, dividing equation (28) into two components according to the decomposition of the aggregate risk indicator MRI in equation (19):

$$\text{Risk Contribution of International Reserves} = \lambda_{it}\,(\delta_1 Reserves_{it}) \tag{30}$$

$$\text{Risk Contribution of Macroeconomic Imbalances} = \lambda_{it}\,(\delta_2 CAD_{it} + \delta_3 Fiscal\ Deficit_{it} + \delta_4 Overvaluation_{it}) \tag{31}$$

Figure 12.

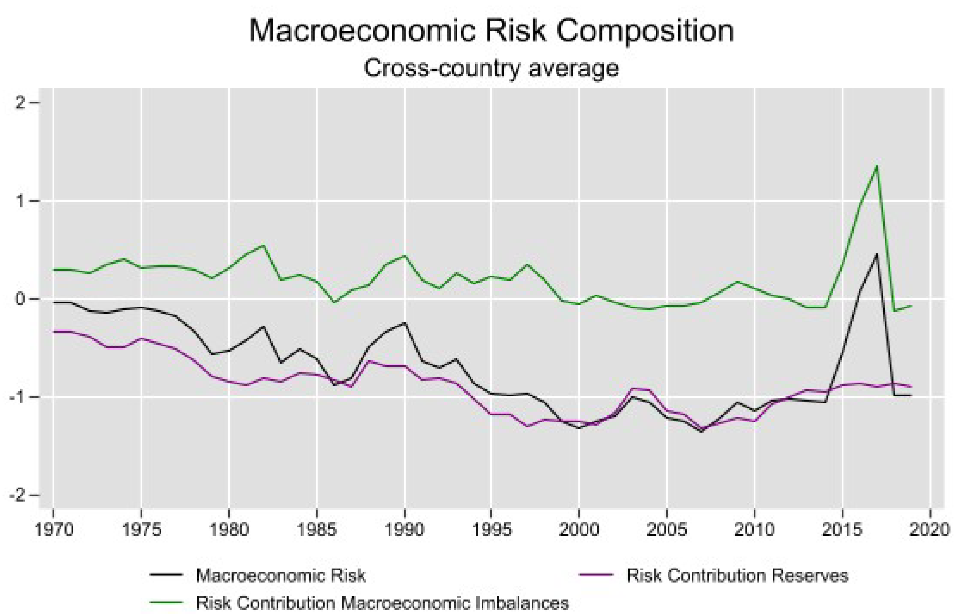


Figure 12 leads to two important findings concerning the average country. First, macroeconomic imbalances have not been a substantial risk contributor on average (barring a hiccup in 2017 due to extreme instability of the real exchange rate in Venezuela), not even in the 1980s. Second, international reserves have played an important mitigating role, becoming increasingly protective during the 1980s and mostly offsetting portfolio risk in recent years. One implication is that, for the average country, the crisis period of the 1980s was not prompted by macroeconomic imbalances or lower reserves, but rather unsafe accumulated portfolios and lack of resilience to control their risks.

7. Conclusions

This paper explored quantitatively the risk drivers of external crises in terms of countries' economic fundamentals and the intensity of global crises based on an extensive world panel. Economic fundamentals include external portfolio factors (positions of debt, portfolio equity, and FDI); macroeconomic factors (international reserves as well as fiscal, external and exchange rate imbalances); and structural factors. The estimations confirm that a) external portfolio liabilities and macroeconomic imbalances, as well as global financial shocks, are risk-augmenting factors; b) external portfolio assets and international reserves are risk-mitigating factors. In what follows we highlight some of the key quantitative findings.

Concerning the external portfolio, we found that to gauge its risk it is necessary to look at the composition of its gross positions: a) the evidence rejects the sufficiency of net liabilities by financial type because risk mitigation from assets does not offset liability risk, and b) the evidence rejects the aggregation of different financial types in assets and liabilities because composition matters. On the liability side, the evidence does not reject that all financial types are equally risky, so composition appears to be less critical. While our best estimate is that debt is the riskiest type, FDI is also significantly risky (about half as much in our estimation). Therefore, traditional debt-to-GDP ratios sustainability indicators miss important information in countries with substantial FDI liabilities, and it would certainly be a mistake to gauge risk by looking exclusively at indebtedness. On the asset side, however, composition is key. We found the surprising result that FDI (that is national direct investment abroad) reduces risk substantially. This novel finding suggests that potential impediments or retaliation against a country's FDI assets abroad may magnify the country's reputational cost of defaulting on external liabilities and act as a deterrent, and in this way amount to an effective risk-mitigating factor. In contrast, private debt assets are not protective: the potential ability to repatriate private liquid assets to shore up domestic financial stability is not helpful in practice. This finding supports the view that, as far as debt is concerned, what matters is (gross) liabilities.

As to macroeconomic factors, we found that international reserves are highly protective. In sharp contrast to private assets, holding international reserves is an important ingredient of mitigating external risks and maintaining a healthy risk profile. In our estimation, a dollar borrowed externally to accumulate reserves would neutralize the risk created by more than three dollars in existing foreign debt, so it may have a substantial insurance value (at the financial cost of borrowing long to hold liquid assets). Relative to the power of international reserves, the risk effects of macroeconomic imbalances appear small. For example, one point of GDP in international reserves would offset the risk of about 3.5 points of GDP of current account imbalance, 1.5 points of GDP of fiscal imbalance, or a 7 percent real overvaluation. In other words, limited reserve stocks of, say, 10 points of GDP can comfortably offset the risks generated by serious macroeconomic imbalances.

While the above findings on risk-augmenting and mitigating factors apply to all countries, the evidence shows that there is a substantial divide between advanced and non-advanced economies in terms of resilience: advanced economies are substantially better prepared to withstand exposure to weak external portfolios and macroeconomic imbalances. This resilience bonus would allow advanced economies to carry almost 100 GDP points in additional external debt liabilities. We also found that exogenous global risks significantly leverage domestic risks (but never exceeding the equivalent of some 20 GDP points of external debt liabilities, even at their highest in periods of widespread financial turmoil).

The estimations are useful to keep track of risk trends over time and explain them in terms of the underlying risk factors. For the average country, portfolio risks show a markedly declining trend, shifting from an overall risk factor to being a risk-mitigating factor over the past 20 years: currently, the average country is safer with its external portfolio than with no portfolio. This trend was driven by a beneficial shift in asset composition towards FDI. At the same time, increasing financial integration (the simultaneous increase in aggregate external assets and liabilities) magnified the risk implications of portfolio positions, substantially increasing the safety afforded by current portfolios. In contrast, the beneficial trend in liability composition and the increasing trend of overall net liabilities played a very marginal role and offset each other. As to macroeconomic risks, they also showed a declining trend, that stalled over the last 10 years, which was entirely driven by a substantial increase in international reserves.

All factors considered, we find that the current estimated average risk level across countries is as low as it has been for the past 50 years, about one fifth of its high-water mark in the 1980s. Its declining trend was mainly driven by improvements in the composition of external portfolio assets magnified by increasing financial integration as well as rising international reserves. Looking at the 1980s, when crisis events were the most intense, the main contributor to the estimated risk of crisis, about half of the overall risk at its peak, was the structural lack of resilience of non-advanced economies. Portfolio risk was second in importance and global risk third. By contrast, macroeconomic factors do not appear to have played a role: the risk associated with macroeconomic imbalances was negligible in comparison, and there is no evidence of an international reserves' shortfall. These average findings on risk trends and risk contributions may hide important differences across countries and groups of countries to be tackled in future research.

References

Beim, D.O., and C.W. Calomiris. 2001. *Emerging Financial Markets*. New York, United States: McGraw-Hill/Irwin.

Borensztein, E., and U. Panizza. 2008. "The Costs of Sovereign Default." IMF Working Paper WP/08/238. Washington, DC, United States: International Monetary Fund.

Bussière, M., and M. Fratzscher. 2006. "Towards a New Early Warning System of Financial Crises." *Journal of International Money and Finance* 25(6): 953–73.

Catão, L.A.V., and G.M. Milesi-Ferretti. 2014. "External Liabilities and Crises." *Journal of International Economics* 94(1): 18–32.

Cavallo, E., E. Fernández-Arias, and M. Marzani. 2017. "Making International Financial Integration Work for Low-Saving Countries." Working Paper IDB-WP-823. Washington, DC, United States: Inter-American Development Bank.

Darvas, Z. 2012. "Real Effective Exchange Rates for 178 Countries: A New Database." Working Paper 2021/15. Brussels, Belgium: Bruegel.

Feenstra, R.C., R. Inklaar, and M.P. Timmer. 2015. "The Next Generation of the Penn World Table." *American Economic Review* 105(10): 3150–82.

Fernández-Arias, E., and R. Hausmann. 2001. "Is Foreign Direct Investment a Safer Form of Financing?" *Emerging Markets Review* 2(1): 34–49.

Gourinchas, P-O., and M. Obstfeld. 2012. "Stories of the Twentieth Century for the Twenty-First." *American Economic Journal: Macroeconomics* 4(1): 226–265.

International Monetary Fund. 2020. World Economic Outlook (WEO) Database. October 2020

International Monetary Fund. 2020. External Stress and International Investment Position. 2020 External Sector Report - Chapter 2.

International Monetary Fund. 2020. International Financial Statistics.

Kaminsky, G.L., C.M. Reinhart and C.A. Végh. 2005. "When It Rains, It Pours: Procyclical Capital Flows and Macroeconomic Policies." In: M. Gertner and K. Rogoff, editors. *NBER Macroeconomics Annual 2004.* Cambridge, United States: MIT Press.

Kraay, A., and V. Nehru. 2006. "When is External Debt Sustainable?" *World Bank Economic Review* 20: 341–365.

Laeven, L., and F. Valencia. 2020. "Systemic Banking Crises Database II." *IMF Economic Review* 68(2): 307–61.

Lane, P.R., and G.M. Maria Milesi-Ferretti. 2018. "The External Wealth of Nations Revisited: International Financial Integration in the Aftermath of the Global Financial Crisis." *IMF Economic Review* 66(1): 189–222.

Levy Yeyati, E., and J. Zúñiga. 2015. "Varieties of Capital Flows: What Do We Know." Business School Working Paper. Buenos Aires, Argentina: Universidad Torcuato Di Tella.

Louvierm, J., D. Hensher and J. Swait. 2000. *Stated Choice Methods: Analysis and Applications*. Cambridge, United Kingdom: Cambridge University Press

Mauro, P. et al. 2013. "A Modern History of Fiscal Prudence and Profligacy." IMF Working Paper 2013/005. Washington, DC, United States: International Monetary Fund.

McFadden, D. et al. 1985. "Is There Life After Debt? An Econometric Analysis of the Creditworthiness of Developing Countries." In: G. Smith and J. Cuddington, editors. *International Debt and the Developing Countries*. Washington, DC, United States: World Bank.

Meyer-Cirkel, A., and G. Huertas. 2021. "Balance Sheets and Debt Crises—Empirical Regularities for Modern Cases of Sovereign Distress." IMF Working Paper 2021/125. Washington, DC, United States: International Monetary Fund.

Mundlak, Y. 1978. "On the Pooling of Time Series and Cross Section Data." *Econometrica* 46(1): 69–85.

Ravn, M.O., and H. Uhlig. 2002. "On Adjusting the Hodrick-Prescott Filter for the Frequency of Observations." *Review of Economics and Statistics* 84(2): 371-376.

S&P Global Ratings Research and S&P Global Market Intelligence's CreditPro®.

Varian, H.R. 2014. "Big Data: New Tricks for Econometrics." *Journal of Economic Perspectives* 28(2): 3-28.

Appendix A

Data Sources and Methods

External Crisis

The definition of external crisis follows Catão and Milesi-Ferretti (2014). There is a crisis when there is an external debt default or rescheduling event as well as events leading to large IMF support (IMF loans in excess of twice the country's quota). The debt default and rescheduling events are based on Beim and Calomiris (2001), S&P Global Ratings Research and S&P Global Market Intelligence's CreditPro® (ex-Standard and Poor's) and International Financial Statistics (2020). Data on IMF loans at least twice as large as the respective country's quota in the IMF comes from McFadden, Eckaus, Feder, Hajivassiliou, and O'Connell (1985) and Kraay and Nehru (2006). To account for the duration of each crisis episode, we use as a reference the episodes flagged as pertaining to a debt crisis or restructuring event in Laeven and Valencia (2020).

External Portfolio Variables

Lane and Maria Milesi-Ferretti (2018), updated to 2019 by Milesi-Ferretti (Brookings Website).

International Reserves

IMF: World Economic Outlook (WEO) Database, October 2020.

Fiscal Deficit

Raw data are from Kaminsky, Reinhart, and Végh (2004) and Mauro, Romeu, Binder, and Zaman (2013). Data are updated through 2019 using: IMF: World Economic Outlook (WEO) Database, October 2020.

Real Effective Exchange Rate (REER)

Darvas (2021).

Relative Per-Capita Income

Feenstra, Inklaar, and Timmer (2015). Data are updated through 2019 using IMF: World Economic Outlook (WEO) Database, October 2020.

Current Account Deficit

IMF: World Economic Outlook (WEO) Database, October 2020.

GDP

IMF: World Economic Outlook (WEO) Database, October 2020. We use an HP filter to extract the smooth trend from the GDP time series with a 6.25 smoothing parameter, in line with Ravn and Uhlig (2002).

Exclusions from the Sample

We excluded countries labeled as International Financial Centers (IFCs) in the metadata of Lane and Milesi-Ferretti (2018): Cyprus, Hong Kong, Malta, Panama, Singapore, and Switzerland. IFCs are countries with abnormally high gross stocks.

Furthermore, we tested the influence of Hungary, Netherlands, and South Africa which are singled out in the metadata of Lane and Milesi-Ferretti (2018) as problematic due to atypical data. These metadata show that these three countries exhibit breaks in their external portfolio components' time series. Figures A.1-A.3 show breaks in their FDI and portfolio equity components time series.

Lane and Milesi-Ferretti (2018) report that: i) the break takes place in Hungary after the inclusion of Special Purpose Entities (SPEs) in 2006, ii) a jump in FDI stocks in the Netherlands takes place in 2003, after the introduction of holdings of Special Financial Institutions (SFIs), and iii) there is difficulty in explaining the evolution of stocks based on flows for FDI and equity liabilities for South Africa. In the case of the Netherlands, SFIs transact mainly with nonresidents; typically, a large part of their financial balance sheets consists of cross-border claims and liabilities. The break reflects the effect of specific tax features that are attractive for SFIs on FDI stocks.

Given the potential problems created by jumps in the external portfolio data that may be in part due to biased accounting, we analyzed the influence of these countries in the regressions (details below) and decided to eliminate Hungary and South Africa from the sample because their inclusion would lead to a significant change in the estimated coefficient of at least one of the external portfolio variables in the estimated model (at the 10 percent level). Instead, the Netherlands was not excluded from the sample because its inclusion does not lead to sizeable changes in the estimated coefficients. In addition, following Catão and Milesi-Ferretti (2014), we also drop observations for Iceland after the year 2000 because foreign liabilities doubled in absolute value in 2007 and increased up to 6 times the level of GDP since 2000. These unexplained changes could significantly affect the coefficient estimates of the regressions.

Figure A.1.

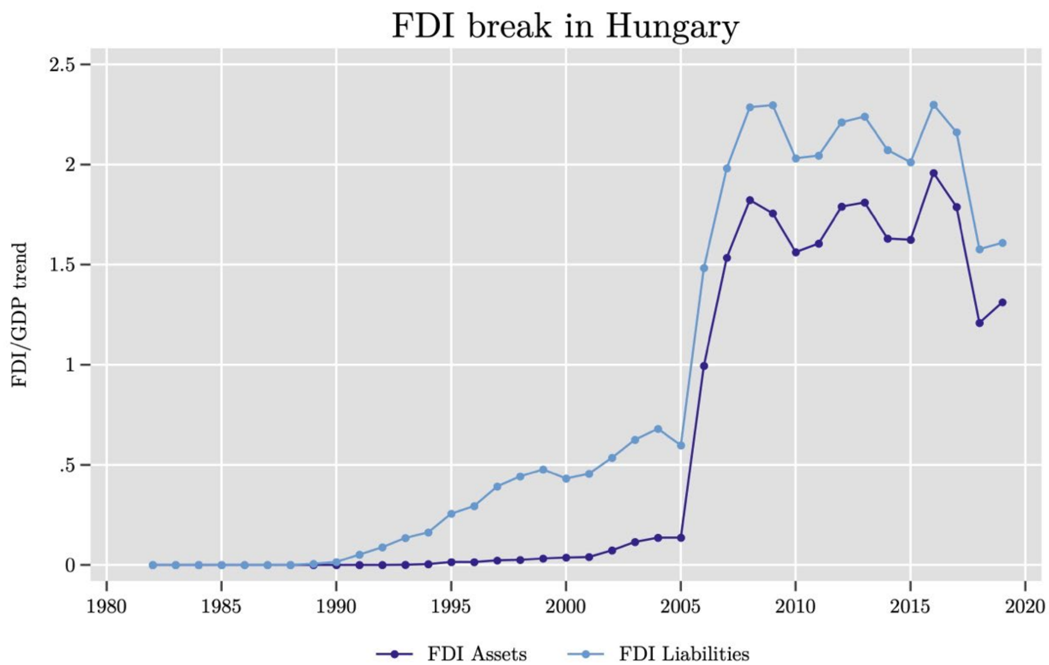


Figure A.2.

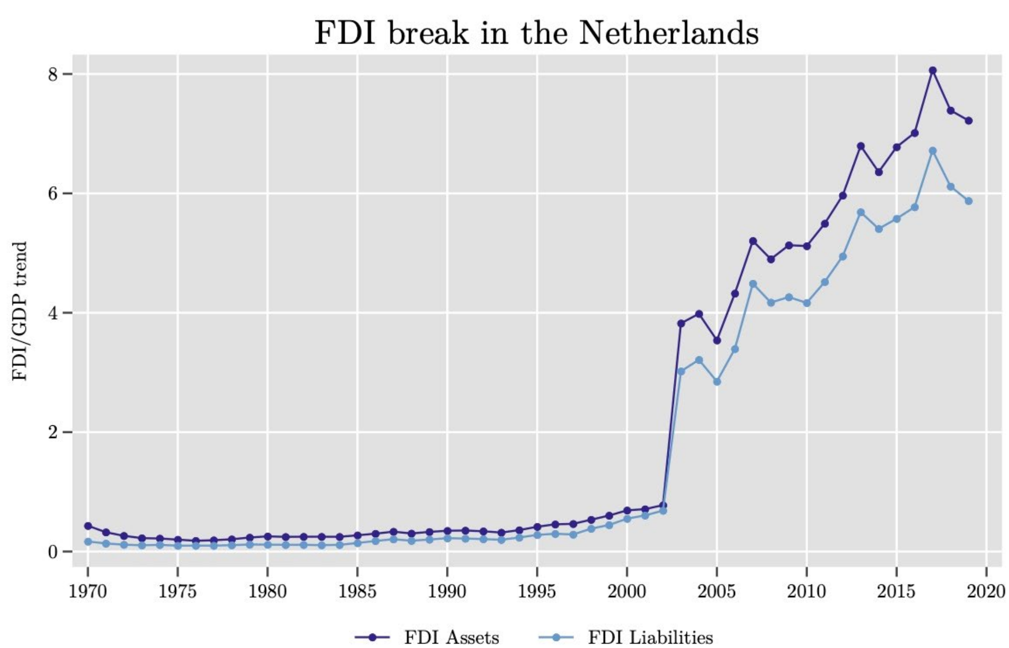
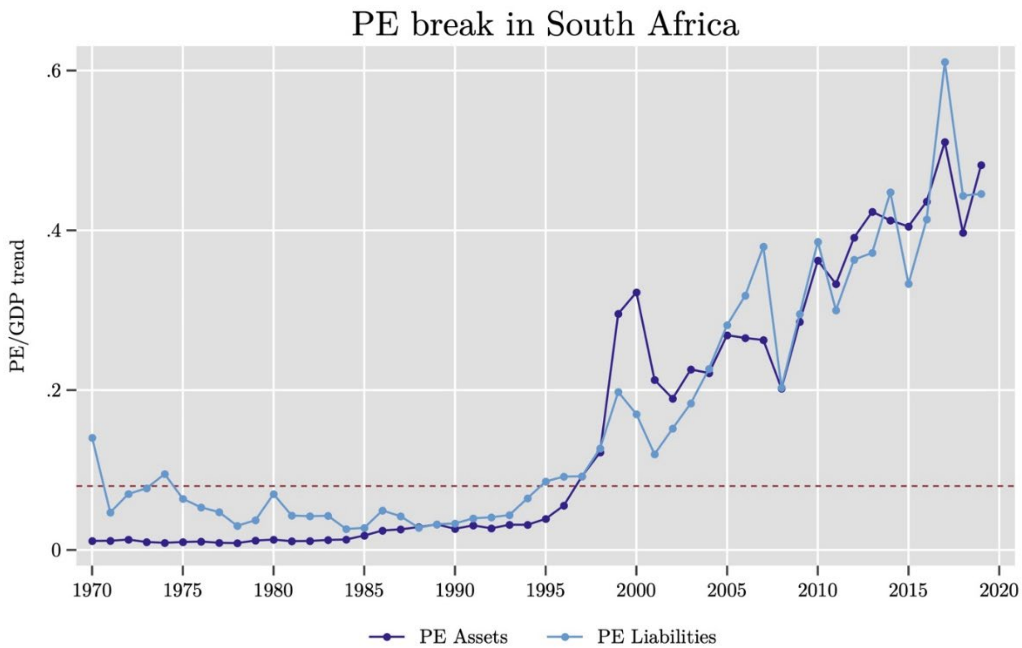


Figure A.3.



To determine whether to exclude specific countries from the sample, we conducted a sensitivity analysis to ensure that our estimation does not leverage too much information from any one country in a way that would significantly impact the pooled results. Methodologically, the exercise is in the spirit of *k-fold cross-validation,* as suggested in Varian (2014). The difference is that our exercise is not oriented to evaluate model performance but to detect influential clusters in our estimates. For each country, we create a training dataset that excludes all its observations to fit the models mentioned above and report the coefficient estimates with their 95 percent confidence intervals.

Figure A.4 depicts the portfolio variable coefficient estimates from the specification in column 1 of Table 2 for the entire country sample (the red line) and when each individual country is excluded from the sample. The sensitivity analysis performed confirmed that these breaks were extremely influential on key estimators and justified their exclusion (Hungary significantly dulls the point estimate for FDI Assets and South Africa that for PE assets).

Figure A.5 follows the same approach as a robustness check of the baseline estimation, showing that no individual country would lead to a significant change in point estimates if excluded. Finally, Figure A.6 extends the robustness check to macrocontrols to show that the estimates are stable.

Figure A.4.

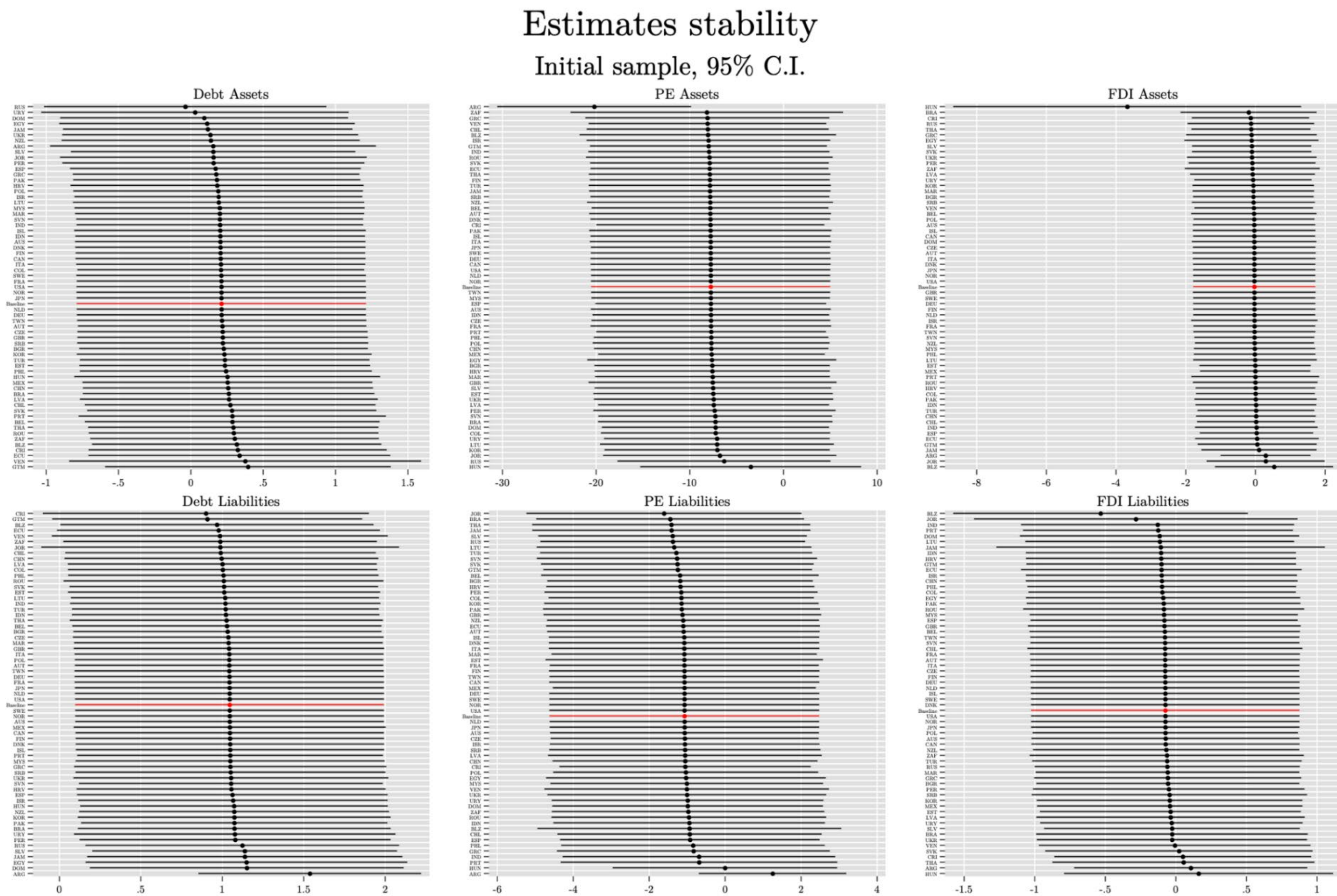

Estimates stability
Initial sample, 95% C.I.
Debt Assets
PE Assets
FDI Assets
Debt Liabilities
PE Liabilities
FDI Liabilities

Figure A.5.

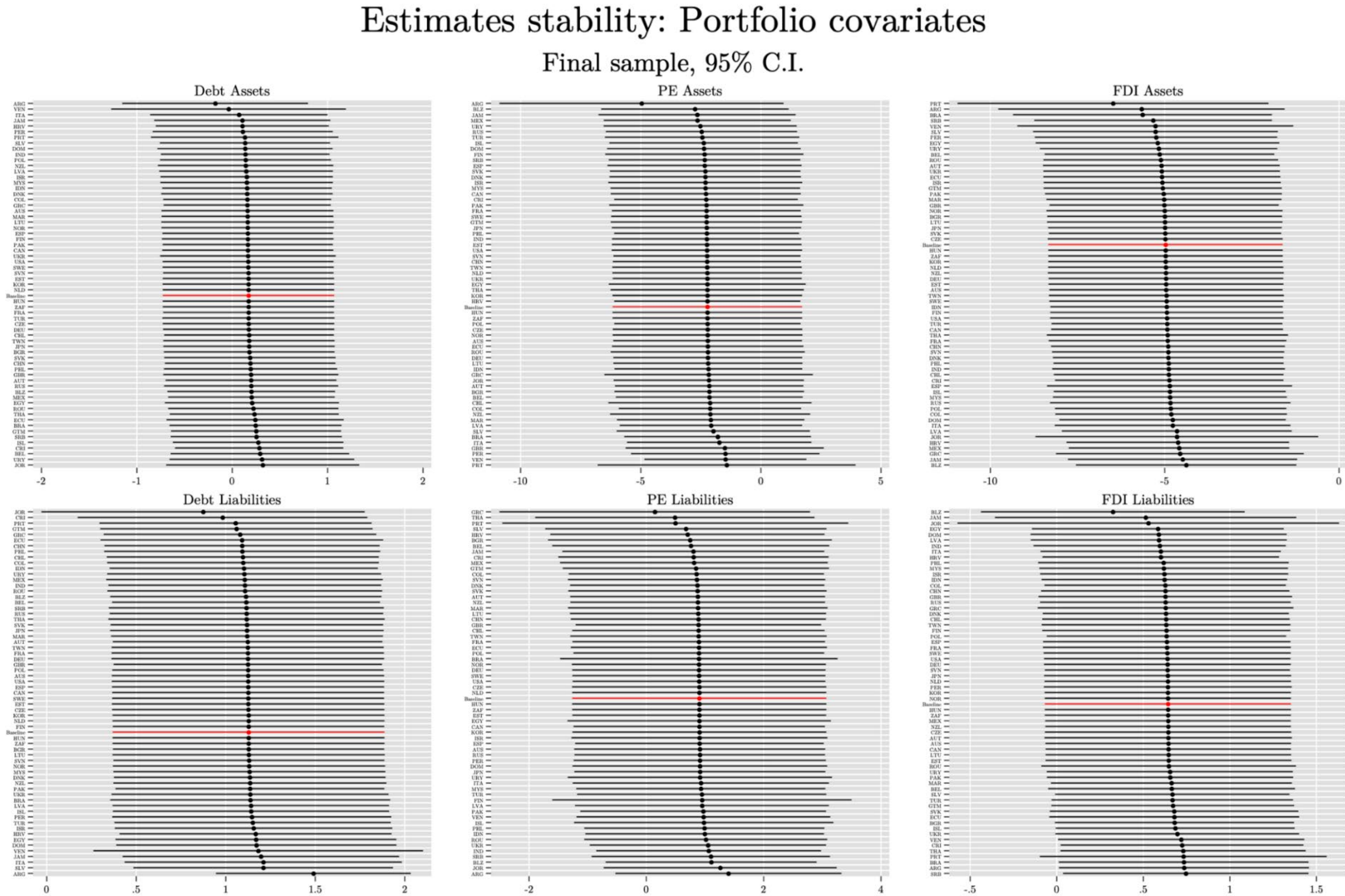
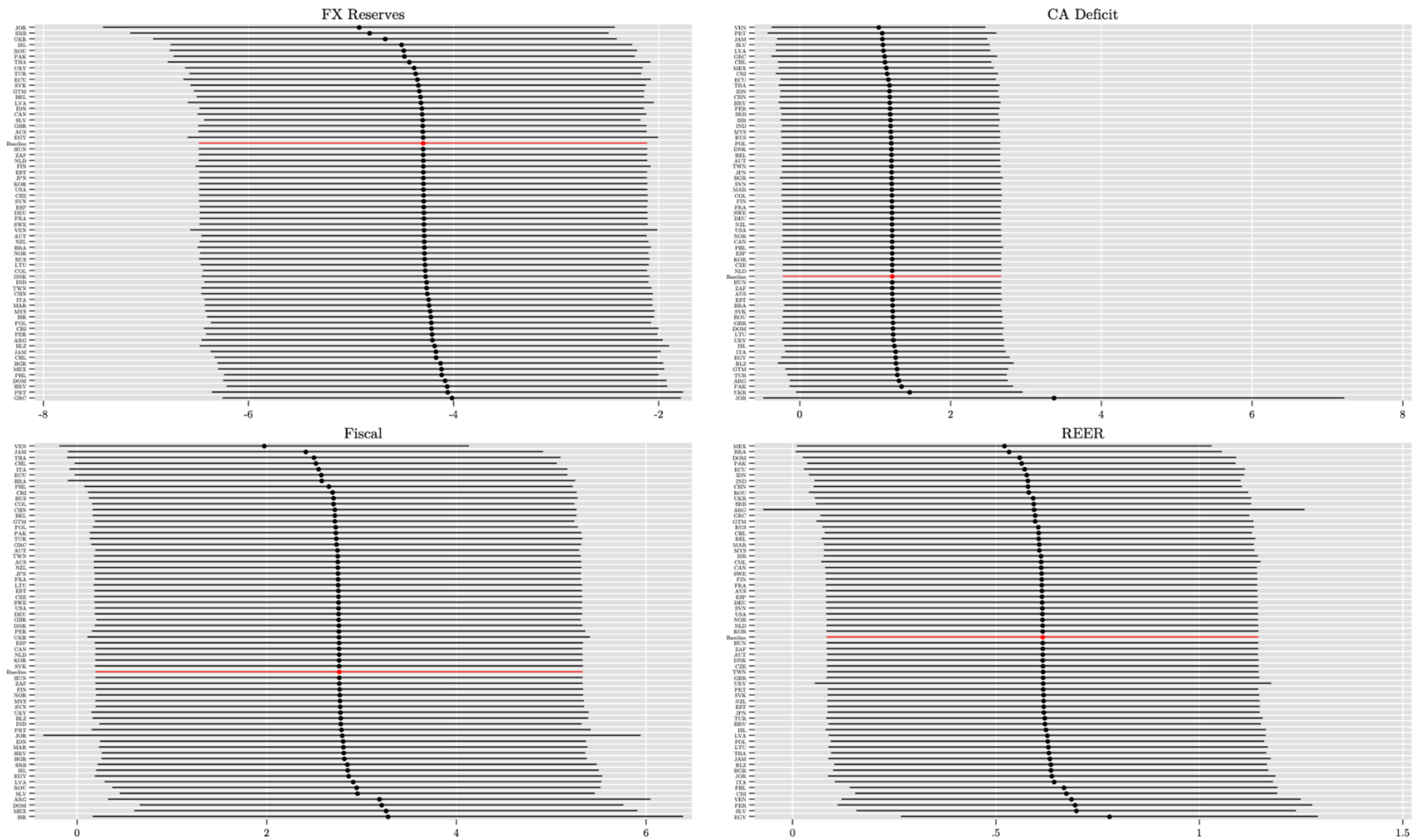

Estimates stability: Portfolio covariates
Final sample, 95% C.I.
Debt Assets
PE Assets
FDI Assets
Debt Liabilities
PE Liabilities
FDI Liabilities

Figure A.6.

Estimates stability: Macrocontrols

Final sample, 95% C.I.



Appendix B. Sample Characteristics

Table B.1. Summary Statistics

Variable	Description	Obs	Mean	Std. dev.	Min	Max
Debt Assets	Debt assets/GDP trend (%)	2,066	39.4	49.2	0.4	344.0
Debt Liabilities	Debt liabilities/GDP trend (%)	2,066	62.5	53.4	2.8	389.6
PE Assets	Portfolio equity assets/GDP trend (%)	2,066	9.5	19.5	0.0	234.0
PE Liabilities	Portfolio equity liabilities/GDP trend (%)	2,066	9.6	15.5	0.0	168.8
FDI Assets	FDI assets/GDP trend (%)	2,066	20.6	57.5	0.0	806.4
FDI Liabilities	FDI liabilities/GDP trend (%)	2,066	31.1	49.9	0.0	671.9
FX Reserves	Reserves/GDP trend (%)	2,066	11.4	11.7	0.1	85.4
Current Account Deficit	Two year moving average of CA deficit/GDP trend (%)	2,066	1.3	6.2	-18.1	111.0
Fiscal Deficit Gap	Observed fiscal deficit/GDP trend relative to its previous five-year average (%)	2,066	-0.01	3.7	-81.8	26.7
Overvaluation Gap	Real exchange rate overvaluation gap relative to its previous five-year average (%)	2,066	2.3	32.4	-63.6	1237.4
Global Risk	Fraction of foreign countries that are in crisis in a given year (%)	2,066	10.5	5.7	0.0	25.4
Income - Per Capita	Per-capita income relative to the US (%)	1,880	42.2	37.6	1.1	201.1

Table B.2. Country Groups

Country Group	Countries
Advanced	Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Netherlands, New Zealand, Norway, Portugal, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom, United States.
Non Advanced	Argentina, Belize, Brazil, Bulgaria, Chile, China, Colombia, Costa Rica, Croatia, Dominican Republic, Ecuador, Egypt, El Salvador, Guatemala, Jamaica, Jordan, India, Indonesia, Malaysia, Mexico, Morocco, Pakistan, Peru, Poland, Romania, Russia, Serbia, Taiwan, Thailand Turkey, Ukraine, Uruguay, Venezuela.

Table B.3. Crisis Incidence by Country

Country	Crisis Incidence	Crisis Onsets Years
Turkey	44.0%	1976,2000
Argentina	38.0%	1982,1986,1993,1995,2001,2014,2016,2018
Pakistan	34.0%	1981,2008
Jamaica	30.0%	1978,2010,2013
Korea	28.0%	1975,1980,1997
Mexico	28.0%	1982,1984,1995
Philippines	28.0%	1976,1989,1992
Ukraine	28.0%	1998,2008
Dominican Republic	26.0%	1982,1994,2003,2005,2009
Jordan	26.0%	1989,1993,1997,2013
Brazil	20.0%	1983,1994,1999,2001
Morocco	20.0%	1981
Thailand	20.0%	1981,1997
Chile	18.0%	1975,1983,1985
Ecuador	18.0%	1982,1985,1995,1999,2008
Greece	18.0%	2010
Indonesia	16.0%	1998
Portugal	16.0%	1977,2011
Romania	14.0%	1982,1987,2009
Peru	12.0%	1978,1982,1996
Uruguay	12.0%	1983,1991,2002
Venezuela, Rep. Bol.	12.0%	1982,1990,2017
Egypt	10.0%	1984,1992,2017
Belize	8.0%	2007,2012,2017
Costa Rica	8.0%	1981,1983,1985,1990
Latvia	8.0%	2008
Russia	8.0%	1996,2000
Serbia	8.0%	2009
Iceland	6.5%	1976
Bulgaria	4.0%	1990,1994
Israel	4.0%	1976
Italy	4.0%	1975
Poland	4.0%	1981,1994
India	2.0%	1984

Note: Table C shows only countries with crisis episodes. Crisis incidence: Years in crisis over total years in the sample for each country.

Appendix C. Additional Statistical Analysis

In Table C.1, we re-estimate the basic regression in Table 2, column (1) to explore variations of the definitions of macrocontrols in which the three macroeconomic imbalances were measured uniformly, either as 2-year averages (column 2), or as gaps (both relative to their previous 5-year average (column 3) and to their historical average (column 4). Basic results remain qualitatively unchanged. We note that according to the AIC, the definitions used in the paper (basic specification) is the best.

Table C1. Alternative Macroeconomic Imbalances Definitions

	(1) Basic	(2) Avg2Y	(3) Gaps5Y	(4) GapsHist
Debt Assets	0.43	0.68	-0.13	0.31
	(0.53)	(0.50)	(0.46)	(0.45)
Debt Liabilities	1.01**	0.84*	1.50***	1.28***
	(0.49)	(0.45)	(0.43)	(0.45)
PE Assets	-2.82	-4.16	-3.65	-4.48
	(6.05)	(6.23)	(5.78)	(6.98)
PE Liabilities	0.37	0.24	0.41	0.38
	(1.46)	(1.29)	(1.21)	(1.32)
FDI Assets	-5.09*	-4.21*	-4.79*	-5.10**
	(2.70)	(2.48)	(2.50)	(2.56)
FDI Liabilities	0.26	0.17	0.66	0.51
	(0.49)	(0.49)	(0.40)	(0.47)
FX Reserves	-4.97***	-4.51***	-5.20***	-4.81***
	(1.08)	(1.11)	(1.02)	(1.02)
Current Account Deficit	6.03***	6.76***	2.15	4.75***
	(1.95)	(2.00)	(2.20)	(1.71)
Fiscal Deficit Gap	3.08*	-1.08	3.08*	1.10
	(1.86)	(1.13)	(1.81)	(1.50)
RER Overvaluation Gap	0.48***	0.00**	0.50***	0.45***
	(0.19)	(0.00)	(0.19)	(0.17)
Per-Capita Income	-1.95***	-1.76***	-1.86***	-2.06***
	(0.54)	(0.50)	(0.48)	(0.51)
Global Risk	0.45	0.06	0.99	0.44
	(1.17)	(1.14)	(1.12)	(1.11)
Constant	-1.53***	-2.00***	-1.59***	-1.47***
	(0.36)	(0.37)	(0.35)	(0.37)
N	1880	1880	1880	1880
AIC	449.2	450.0	458.1	452.6

Standard errors in parenthesis
* $p<0.1$, ** $p<0.05$, *** $p<0.01$

In Table C.2, we re-estimate the basic regression in Table 2, column (1) to consider the possibility that countries may have idiosyncratic structural characteristics that affect their propensity to fall into external crises but are not captured well by their income per capita. We do so by estimating the model with country dummies (column 2), the crisis ratio of each country (column 3) and Mundlak's method (column 4), respectively. Basic results remain qualitatively unchanged.

Table C2. Exploring Idiosyncratic Factors

	(1) Basic	(2) CountryDummies	(3) CrisisRatio	(4) Mundlak
Debt Assets	0.43	1.32**	1.00	0.52
	(0.53)	(0.64)	(0.62)	(0.80)
Debt Liabilities	1.01**	2.37***	0.62	2.01***
	(0.49)	(0.55)	(0.52)	(0.43)
PE Assets	-2.82	-3.21	-1.95	-0.16
	(6.05)	(7.01)	(6.38)	(4.54)
PE Liabilities	0.37	-5.13**	-2.32	-1.78
	(1.46)	(2.26)	(2.10)	(1.49)
FDI Assets	-5.09*	-9.61**	-3.42	-8.07***
	(2.70)	(4.46)	(3.54)	(2.52)
FDI Liabilities	0.26	2.76***	0.18	1.15**
	(0.49)	(1.05)	(0.60)	(0.55)
FX Reserves	-4.97***	-4.62**	-3.99***	-3.46**
	(1.08)	(2.16)	(1.25)	(1.37)
Current Account Deficit	6.03***	12.99***	6.93***	7.38***
	(1.95)	(3.05)	(2.01)	(2.17)
Fiscal Deficit Gap	3.08*	4.43	2.57	2.75*
	(1.86)	(3.56)	(1.80)	(1.62)
RER Overvaluation Gap	0.48***	0.45*	0.43**	0.64***
	(0.19)	(0.26)	(0.19)	(0.22)
Per-Capita Income	-1.95***	-0.82	-1.93***	-1.69**
	(0.54)	(1.97)	(0.63)	(0.83)
Global Risk	0.45	1.05	1.43	0.66
	(1.17)	(2.19)	(1.23)	(1.26)
Crisis Ratio			66.70***	
			(16.62)	
Debt Assets(mean)				2.24
				(1.77)
Debt Liabilities(mean)				-3.63***
				(1.22)
PE Assets(mean)				-4.98
				(7.81)
PE Liabilities(mean)				8.21*
				(4.45)
FDI Assets(mean)				-1.15
				(3.87)
FDI Liabilities(mean)				0.43
				(1.58)
FX Reserves(mean)				-4.71*
				(2.66)
Current Account Deficit(mean)				0.72
				(4.17)
Fiscal Deficit Gap(mean)				-9.36
				(24.13)
RER Overvaluation Gap(mean)				-0.57
				(1.38)
Constant	-1.53***	-2.64***	-3.05***	-0.92*
	(0.36)	(0.75)	(0.37)	(0.55)
N	1880	733	1880	1880

Standard errors in parenthesis
* $p<0.1$, ** $p<0.05$, *** $p<0.01$

Turning to the baseline regression in Table 5, we run the regression separately over advanced (column 2) and non-advanced samples (column 3) and obtain similar estimations for the slope coefficients while retaining a resilience advantage for advanced economies. The Wald test in the bottom of the table indicates that we cannot reject the null hypothesis that the common coefficients in column (1) and (3) are equal, whereas we reject the same hypothesis when comparing (1) and (2).

Table C3. Robustness Check of Baseline Estimation: Split Sample, Advanced and Non-Advanced

	(1) Baseline	(2) Baseline_ADV	(3) Baseline_NADV
Debt Assets	0.17	0.56	0.17
	(0.46)	(1.10)	(0.66)
Debt Liabilities	1.13***	0.98	1.12***
	(0.39)	(0.81)	(0.38)
PE Assets	-2.23	-4.16	0.18
	(2.01)	(2.75)	(2.51)
PE Liabilities	0.90	2.36***	-0.66
	(1.10)	(0.68)	(1.54)
FDI Assets	-4.98***	-7.20**	-4.79*
	(1.72)	(2.81)	(2.87)
FDI Liabilities	0.64*	0.71	0.61
	(0.36)	(1.05)	(0.49)
FX Reserves	-4.30***	-7.26*	-3.85***
	(1.12)	(4.22)	(1.33)
Current Account Deficit	1.22*	11.12**	0.87
	(0.74)	(4.69)	(0.84)
Fiscal Deficit Gap	2.76**	0.70	2.97*
	(1.31)	(0.55)	(1.73)
RER Overvaluation	0.61**	-2.31*	0.63**
	(0.27)	(1.21)	(0.29)
Non Advanced	1.08***		
	(0.26)		
Global Risk	1.65*	-5.31**	2.50**
	(0.96)	(2.46)	(1.04)
Constant	-2.88***	-2.22***	-1.90***
	(0.33)	(0.62)	(0.25)
N	1949	977	972
Wald Test		(1)vs(2)	(1)vs(3)
Wald Test P-Value		0.002	0.573

Standard errors in parenthesis

* p<0.1, ** p<0.05, *** p<0.01

In Table C.4., we run the regression adding a time trend as an additional explanatory variable (column 2) and restricted to crisis events (crisis onsets and non-crisis) that were preceded by three normal, non-crisis years (column 3). The time trend coefficient is not significantly different from zero and its inclusion does not change the results. The Wald test in the bottom of the table indicates that we cannot reject the null hypothesis that the common coefficients in columns (1) and (3) are equal, confirming the baseline estimation.

Table C4. Robustness Check of Baseline Estimation: Controls over Time

	(1) Baseline	(2) TimeTrend	(3) Only Events After Three Normal Years
Debt Assets	0.17	0.19	0.11
	(0.46)	(0.44)	(0.52)
Debt Liabilities	1.13***	1.11***	1.55***
	(0.39)	(0.37)	(0.43)
PE Assets	-2.23	-2.19	-6.07*
	(2.01)	(1.98)	(3.24)
PE Liabilities	0.90	0.92	1.30
	(1.10)	(1.12)	(0.90)
FDI Assets	-4.98***	-4.92***	-5.31***
	(1.72)	(1.66)	(1.91)
FDI Liabilities	0.64*	0.71*	0.62
	(0.36)	(0.42)	(0.58)
FX Reserves	-4.30***	-4.24***	-4.15***
	(1.12)	(1.15)	(1.38)
Current Account Deficit	1.22*	1.16	0.70
	(0.74)	(0.78)	(0.84)
Fiscal Deficit Gap	2.76**	2.77**	2.38
	(1.31)	(1.31)	(1.57)
RER Overvaluation	0.61**	0.63**	0.55**
	(0.27)	(0.27)	(0.27)
Non Advanced	1.08***	1.09***	0.99***
	(0.26)	(0.24)	(0.29)
Global risk	1.65*	1.60*	2.13*
	(0.96)	(0.96)	(1.24)
Time Trend		-0.00	
		(0.01)	
Constant	-2.88***	1.87	-3.05***
	(0.33)	(14.83)	(0.44)
n	1949	1949	1776
Wald Test			(1) vs (3)
Wald Test P-Value			0.53

Standard errors in parenthesis
* $p<0.1$, ** $p<0.05$, *** $p<0.01$