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Fiscal Crises: The Role of the Public Debt Investor Base and Domestic Financial Markets as Aggravating and Mitigating Factors

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Prepared by: R. Bhattacharya, K. Johnson, M. Nkusu, and M. Wang*

Authorized for distribution by Carlo Sdralevich and Olaf Unteroberdoerster
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ABSTRACT: The paper evaluates the key drivers of fiscal crises in a sample of countries from all three income groups—advanced, emerging, and low-income countries, using fiscal crisis data recently developed by the IMF's Fiscal Affairs Department. The empirical study focuses on three questions: (1) How does the composition of debtholders (domestic vs. foreign, resident vs. non-resident, or official vs. non-official) affect the probability of a fiscal crisis, after controlling for the level of public debt and other relevant variables?; (2) How does the development and size of the domestic financial sector affect the probability of a fiscal crisis?; and (3) How do changes in the debt level affect the probability of a fiscal crisis, for given compositions of the sovereign debt investor base and different levels of development and size of domestic financial markets? Our findings confirm the benefits of financial development, the danger of heavy reliance on a non-resident investor base, and also that emerging market economies have a lower debt carrying capacity compared to the full sample.

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WORKING PAPERS

Fiscal Crises: The Role of the Public Debt Investor Base and Domestic Financial Markets as Aggravating and Mitigating Factors

Prepared by R. Bhattacharya, K. Johnson, M. Nkusu, and M. Wang[1]

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I. INTRODUCTION

The COVID-19 pandemic has stretched the financial resources available to the fiscal authorities in many countries, raising the specter of debt distress for some developing countries— emerging and frontier market economies, as well as low income countries (LICs) that have been severely affected.[1] Countries where the domestic investor base may not be deep enough to absorb additional supplies of government debt could face major fiscal (and external) financing challenges. This is why it is so important, at this juncture, to have a better understanding of the key factors that could drive an economy into a fiscal crisis: how could an economy's sovereign debtholder composition and underlying structural features (such as the size and development of its domestic financial sector) either amplify or mitigate the likelihood of the economy running into a fiscal crisis?

This study examines some key drivers of fiscal crisis across a wide range of countries, using the fiscal crisis data from the Fiscal Crisis Database developed by the Fiscal Affairs Department (FAD) of the International Monetary Fund (IMF). The empirical analysis focuses on addressing three key questions:

- How does the composition of the sovereign debt investor base (resident vs. non-resident, official vs. non-official) affect the probability of a fiscal crisis, after controlling for the level of public debt?
- How does the development and size of the domestic financial sector affect the probability of a fiscal crisis, after controlling for the level of public debt?; and
- How do changes in public indebtedness affect the probability of fiscal crisis for given compositions of the sovereign debt investor base, and for given sizes and levels of development of the domestic financial sector?

The composition of the sovereign debt investor base can affect an economy's probability of running into a fiscal crisis through several channels. First, a resident investor base provides a more stable and less volatile source of funding for the sovereign than a non-resident investor base. This partly reflects what is known as home bias, where domestic investors are willing to hold domestic bonds under conditions that would make foreign investors exit. It could also be due to a significant share of domestic public debt being held by domestic financial institutions, over which the government can exercise significant control though regulatory requirements or political pressure. The composition of the sovereign debt investor base in terms of official / non-official creditors is a bit more complex. On the one hand, non-official external holders of sovereign debt are likely to be more footloose and to withdraw funding if there are any concerns about the sustainability of public debt. On the other hand, as already mentioned, non-official domestic creditors – mostly domestic financial institutions – represent a captive domestic investor base in many economies due to the lack of viable investment alternatives.

The size and development of the domestic financial sector can also affect the probability of a fiscal crisis, after controlling for the level of public debt, but the impact is ambiguous. On one hand, a well-developed domestic financial market suggests that the government is less likely to rely on monetary financing or to issue more 'risky' debt (for example, foreign currency-denominated debt, or debt issued to non-residents). On the other hand, a large and well-developed domestic financial market is typically associated with high credit to the economy. High indebtedness in turn makes the economy more vulnerable to shocks which may require fiscal support, thus adversely affecting the government's balance sheet. Moreover, a deep and large domestic financial sector is also likely to mean that the costs of a potential crisis would be larger, as domestic banks

[1] As of end-March 2022, some 43 percent of LICs were assessed to be at high risk of experiencing debt distress with a further 13 percent in debt distress, up from 37 percent and 12 percent respectively at end-2019.

would likely be more exposed to the government through their holdings of government debt – the widely cited sovereign-banking sector nexus. Thus, the government will have a stronger incentive to pursue a prudent fiscal policy.

This study will contribute to a large body of the existing literature looking at the causes of different types of crises—banking crises, currency crises, sudden stops, and sovereign debt crises— in two key respects. First, our empirical study is one of only a few studies that use a relatively new and unique data source that identifies fiscal crises, namely FAD's fiscal crisis database. As far as we are aware, except for the 2017 IMF working paper in which the fiscal crisis database was first presented, the ensuing journal article published a year later, and a couple of studies by IMF staff, this data has, so far, not been used to study the drivers of a fiscal crisis. This dataset is also unique in that it covers countries from all income groups and the determination of whether a country has faced a fiscal crisis or not is based on a broad set of criteria as discussed in the data section. Second, to our knowledge, no research paper incorporates estimations from a sample covering countries from all income groups and combining the variables that we use to study the key drivers of fiscal crises.

Several studies have discussed how the composition of a country's sovereign debt holders, and/or the size / development of its domestic financial sector, can affect a country's economic growth, its debt carrying capacity, or the probability of the country running into a crisis (for example, Kumar and Woo, 2010; Reinhart and Rogoff, 2011a; Bruns and Poghosyan, 2018). However, none of these studies is based on the broad sample of countries and combination of explanatory variables that we use in this study. For these reasons we think that this empirical study will make an important contribution to the existing body of research on the key drivers of fiscal crises.

This paper is organized as follows. The next section provides a brief review of the existing literature on determinants of (banking, external, sovereign debt) crises. The following section discusses the data used for our empirical analysis. Section IV outlines the model that is the basis of our empirical study, and Section V presents the results from estimating the model. The final section concludes with some key takeaways for policy makers.

II. LITERATURE REVIEW

There is a large literature on sovereign debt, with several strands to which our analysis relates. While we focus on debt and fiscal crisis, there has been a large literature discussing the impact of debt on growth, both theoretically and empirically. Since growth and fiscal crisis are closely related, and since one of the main channels through which debt affects the likelihood of a fiscal crisis is through its impact on economic activity, we survey some of the literature on debt and growth here. Teles and Mussolini (2014) present a theoretical model of endogenous growth that suggests that the level of the public debt-to-gross domestic product (GDP) ratio should negatively impact the effect of fiscal policy on growth. Ostry, Ghosh and Espinoza (2015) discuss issues of debt overhang, including the questions of at what point and how should the debt burden be reduced. Kumar and Woo (2010) study the impact of public debt on rates of economic growth in cross-country regressions and find that there is an inverse relationship between initial debt and subsequent growth, controlling for other determinants of growth.

Eberhardt and Presbitero (2015) study the long-run relationship between public debt and growth in a large panel of countries and find some support for a negative relationship between public debt and long-run growth across countries. Our empirical work, which focuses not on debt and growth but rather on two key structural features of an economy that affect the probability of the economy running into a fiscal crisis—composition of

the sovereign debt investor base, and size and level of development of domestic financial markets—is closely related to three strands of the literature discussed in turn next.

The first strand of the literature relates to the composition of debt from various standpoints. Hausman and Panizza (2011) argue for instance that the relationship between public debt and the ability to conduct counter-cyclical policies is more likely to depend on the composition of public debt than on its level. Our study relies on a more recent dataset, with detailed information on the composition of the sovereign debt investor base for 89 countries, to derive the differentiated impact of debt components by investor base on the probability of a fiscal crisis. Along a similar vein Panizza and Taddei (2020) look at how the currency composition of sovereign debt affects overall debt sustainability in developing countries. The study concludes that, while foreign currency debt reduces the incentives for debt monetization, local currency debt improves public debt sustainability by providing a better hedge against external shocks.

The second strand of the literature relates to domestic financial markets' development and public debt distress. Gennaioli, Martin, and Rossi (2013) find that government defaults should be less likely where financial institutions are more developed, as the cost of default will be transmitted more directly to the real economy through financial intermediaries. Our paper provides empirical support for this hypothesis and examines this relationship more closely by constructing a dataset containing detailed components of financial markets (banks, stock market, pension fund, insurance fund, debt securities and shadow banking) and examining the key features of the relationship between domestic financial markets and the probability of an economy running into a fiscal crisis.

The third strand of the literature relates to studies that aim to model and predict fiscal crises. Medas et al (2018) show that both nonfiscal (external and internal imbalances) and fiscal variables help predict crises among both advanced and emerging economies. Bruns and Poghosyan (2018) find, using extreme bounds analysis, that both fiscal and non-fiscal leading indicators are robustly associated with fiscal distress. However, there is still no consensus on the relationship between public debt and the probability of a fiscal crisis. Savona and Vezzoli (2015) do not find evidence that public debt matters for predicting crises, particularly default, while illiquidity (a high short-term debt-to-reserves ratio) and default history, as well as real GDP growth and US interest rates, are the main determinants of default, both for emerging market economies and for the countries hit by the post-global financial crisis and the European sovereign debt crisis. Similar results on debt and crisis are reported in Bruns and Poghosyan (2018). On the other hand, Cerovic et al. (2018) find that both fiscal and non-fiscal variables help predict crises, but fiscal and debt indicators show a mixed picture around crises. Sumner and Berti (2017) confirm the importance of macro-financial variables in predicting fiscal distress and find some evidence that changes in public debt affect the probability of a fiscal crisis. Reinhart and Rogoff (2011a) also find that changes in public debt are a significant predictor of debt crises, although the result does not hold for all time periods. More recently, Badia et al. (2020) find that public debt is the most important predictor of fiscal crises and shows strong non-linearities. Instead of looking at a comprehensive model for predicting fiscal crises, our paper focuses on how a more restricted set of variables (namely the sovereign debt investor base, the size of the domestic financial market, and the level of development of the domestic financial sector) affects the likelihood of an economy running into a fiscal crisis.

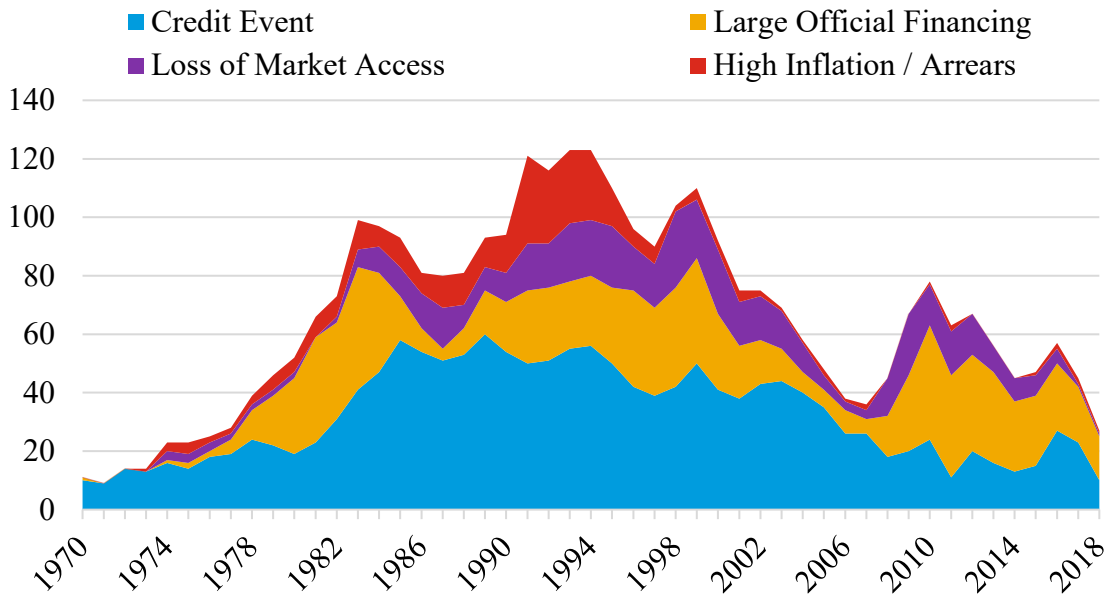
III. DATA

To understand how a country's sovereign debt investor base, financial market structure, and debt levels relate to the likelihood of a fiscal crisis, we construct a novel sample composed of data from recent studies as well as official sources. The sample's binary dependent variable, indicating whether a country had a fiscal crisis in a given year, originates from Medas et al. (2018) and takes a more nuanced and expansive approach for

classifying crises. The variable is more nuanced because, instead of identifying a fiscal crisis event solely as a credit default or restructuring event, it also identifies a crisis if a country experiences exceptionally large official financing from the IMF, extremely high inflation or a steep increase in arrears, or loss of market access.[2] Additionally, the outcome variable is expansive because it covers 188 countries from 1970 to 2018.

In total, there are 3,222 crisis years during 1970–2018 (Medas et al. (2018)). Credit events, defined as a default, restructuring, rescheduling or any other material investment loss on sovereign debt, account for nearly half of the total crisis years. The number of countries in crisis peaks in 1993 and 1994 with 123 total countries experiencing some form of crisis. The number of countries in crises related to high inflation or arrears peaked in 1991, remained high during 1993-94 and declined significantly thereafter. Large official financing emerged as the most common type of sovereign debt crisis in the aftermath of the 2008 global financial crisis.

Figure 1: Number of Countries in Crisis



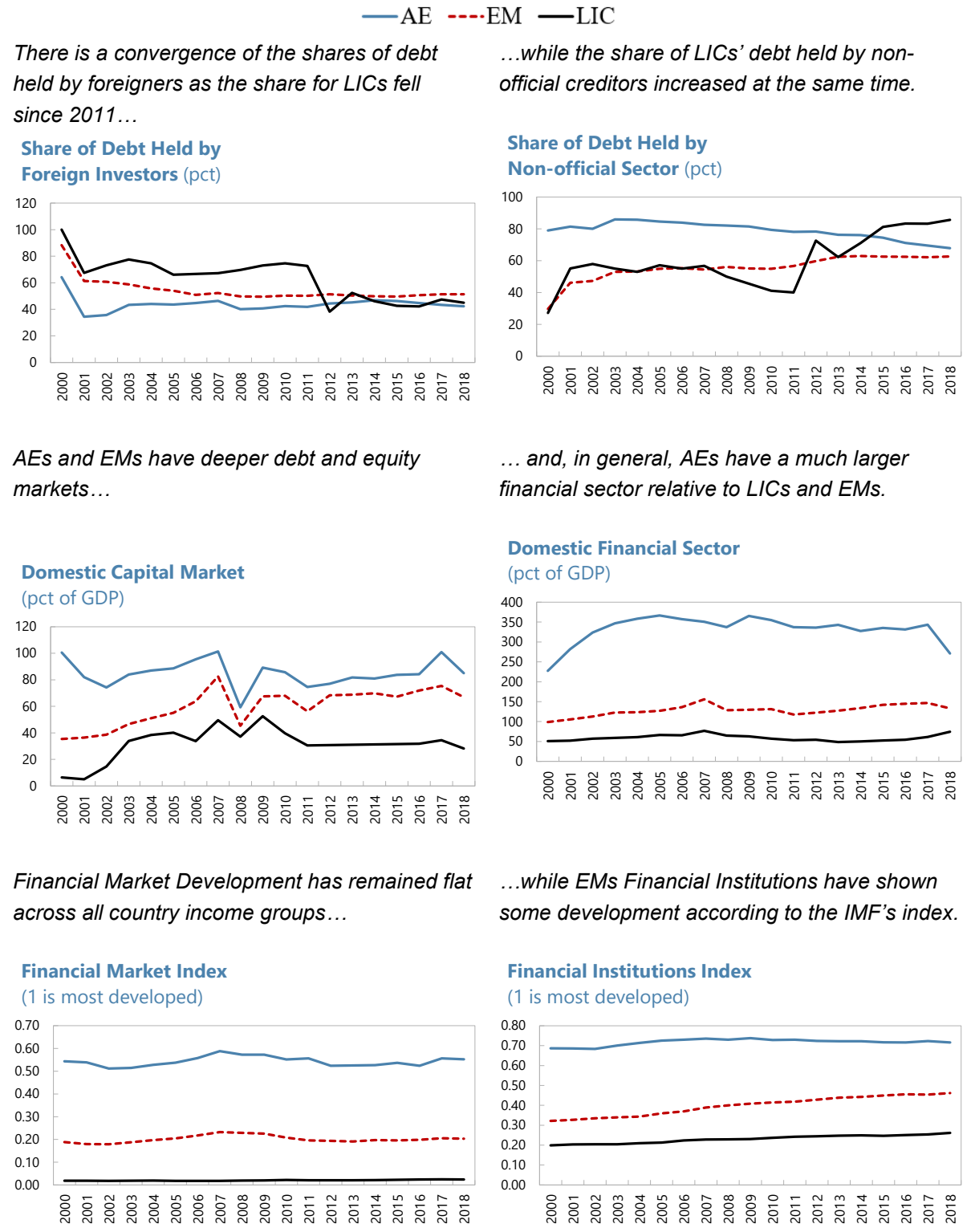
Source: Medas et al. (2018)

Our model has four important groups of explanatory variables besides the level of general government debt: share of debt by holder/investor type, size of the domestic financial sector, indices of financial development, and control variables. The variables in the first group originate from Arslanalp and Tsuda (2014), with data afterwards updated to 2019, and measure the share of government debt by investor type base for 34 advanced economies and 87 emerging markets, starting from 1989. The share of debt by investor type is first split by foreign and resident and then each of these two categories is split by official, bank, and nonbank shares. The second group comprises variables measuring the size of a country's domestic financial sector, represented by banking sector assets, stock market capitalization, pension and insurance company assets, and debt

[2] Medas et al. (2018) use quantitative thresholds for each criterion. A high-access financial arrangement from the IMF occurs if lending is over 100 percent of a country's quota (broadly based on its share in the global economy). They classify high inflation as over 35 percent for advanced economies and over 100 percent for developing ones. Loss of market access equates to over 1,000 basis points on sovereign or CDS spreads.

securities. These variables come from a variety of official sources such as the IMF's International Financial Statistics, the Bank of International Settlements, and the Financial Stability Board. The third group comprises variables obtained from the IMF's financial development index database to capture the depth, access and efficiency of financial markets and financial institutions of a country. The financial development (FD) index has two subindices, namely financial institutions (FI) and financial markets (FM), each having subcomponents measuring depth, access, and efficiency. The fourth group includes several control variables, such as the current account balance, international reserves, GDP growth, and an indicator of political risk rating. The level of general government debt comes from the IMF's fiscal affairs database. The description of variables and the data sources, as well as summary statistics and correlation coefficients for these variables, are in Annex I (Tables AI.1 and A1.2). Figure 1 summarizes several of the key variables by countries' income groups.

Figure 1: Select Variables by Country Type, 2000 – 2018



Sources: Arslanalp et al. 2014; IFS; WDI; BIS; Financial Stability Board; IMF Financial Development Index

The time span and coverage of our sample distinguishes our work from prior studies. By pairing a more detailed measure of fiscal crises with a rich set of explanatory variables, we help create a clearer view of the aggravating and mitigating factors of fiscal crises for both advanced economies and emerging markets. Table AI.2 in Annex I provides summary statistics of our sample.

IV. MODEL

We utilize a logit specification for the analysis to model our binary dependent variable. We select a logit rather than a probit model because the former assumes a slightly higher kurtosis in the distribution of residuals i.e., fatter tails. This presents a useful feature when modeling infrequent events like fiscal crises.

We prefer logit to more novel approaches in the crisis prediction literature such as machine learning tools, which, though deemed superior in predicting crises, have drawbacks of their own. Badia et al. (2020) use machine learning models, specifically random forest algorithms, to predict fiscal crises and suggest, in line with Mullainathan and Spiess (2017), that these algorithms give better out-of-sample predictions by potentially incorporating a very large number of predictors without running into overfitting problems. Hence, as a model for making predictions, machine learning tools tend to outperform traditional approaches such as logit or probit (Hellwig (2021)). Machine learning tools do however have important downsides. Mullainathan and Spiess (2017) note that the danger in using these tools is taking an algorithm built for predicting the dependent variable and presuming the parameter estimates have the properties typically associated with estimation outputs. They further note that the parameter estimates from machine learning algorithms are often inconsistent and unstable. Another important downside is that the machine learning approach makes it more difficult to distinguish relevant from irrelevant variables and to understand how each indicator affects the probability of a crisis (Degenhardt, Seifert and Szymczak (2019); Badia et al. 2020). Hence, for this paper, we prefer to use the more conventional logit model as we are interested in getting consistent parameter estimates to measure the marginal impacts of the various indicators of interest, as well as their interaction, on the probability of a fiscal crisis.

The equation below shows the details of our model specification. Y_{it} is the binary outcome variable taking the value of 1 if a country is in fiscal crisis for a given year based on the criteria outlined by Medas et al. (2018). Logit (Y_{it}) is modeled as below. X_{it} includes the four groups of explanatory variables discussed above. We include interaction terms, as the effect of explanatory variables on the probability of running into crisis could be different at different debt levels, and vice versa. In other words, the inclusion of interaction terms allows us to test whether non-linearities might exist. Z_{it} is the set of standard macroeconomic control variables and β_0 is a constant term.

$$\text{Logit}\,(\mathrm{Y}_{it}) = \beta_0 + \beta_1 x_{it} + \beta_2 x_{it} \times debt_{it} + \gamma Z_{it-1}$$

With this model, we do not attempt to establish causal relationships between the probability of running into a fiscal crisis and other explanatory variables. The focus of the analysis is to identify mitigating and aggregating factors that could help predict the probability of running into a fiscal crisis using observable variables and suggest clear quantitative interpretations.

We are fully aware that the public debt level and sovereign debt investment base composition could potentially move together with the probability of running into a fiscal crisis. We use lagged values of the variables measuring the share of government debt by investor type (resident and official status of the holders of sovereign debt). However, we did not use lagged values of the variables measuring the size and level of

development of the domestic financial market, as these are unlikely to be affected contemporaneously in any significant way by the dependent variable (the fiscal crisis dummy) as these variables usually evolve slowly over time.

We also, in the following section, present results comparing Emerging Markets economies ("EM") with the full sample ("All"). These results are obtained by running the same regression specification separately for EMs and for the full sample.

V. RESULTS

As noted above, our results seek to address two major and related questions. The first one is to ask, given the debt level, what the marginal effects of our explanatory variables (investor base, domestic financial markets and financial development index) on the probability of running into a fiscal crisis are and how they would change at different debt levels. The second question is the flip side of the first. Specifically, given the levels of the aforementioned explanatory variables, what are the marginal effects of debt on the probability of running into a fiscal crisis, and how do these effects change at various levels of those explanatory variables.

Role of the Investor Base: Some Regression Results

We first report some regression results for our logit regressions and discuss how to interpret them.
Table 1 below shows the regression results for the set of investor base as independent variables. A table with the full regression results is presented in Annex II (Tables AII.1, AII.2 and AII.3). Model (1) only includes debt level and control variables (which are not shown in the chart). Model (2) and Model (4) include nonresident investors and nonofficial investors one at a time. Model (3) and model (5) further add their interactions with debt levels. The signs of the coefficients reflect changes in the odds of running into a fiscal crisis. They suggest that holding other explanatory variables constant, a one unit increase in the share of debt held by nonresident investors increases the odds of running into a fiscal crisis and the effect becomes more prominent as the debt level increases. On the other hand, holding other explanatory variables constant, a one unit increase in the share of debt held by nonofficial investors decreases the odds of running into a fiscal crisis, and the effect is also larger with higher debt levels.

We assess that, relative to each other, models two through five all outperform the base model one in predicting the probability of running into a fiscal crisis based on the area under the receiving operating characteristics (AUROC) curve. This measure evaluates the classification power of a model by assessing trade-offs between true positive and false positive rates. A value of one indicates the model will predict an event, in this case a fiscal crisis, with no false positives or false negatives while a 0.5 value represents a random guess.

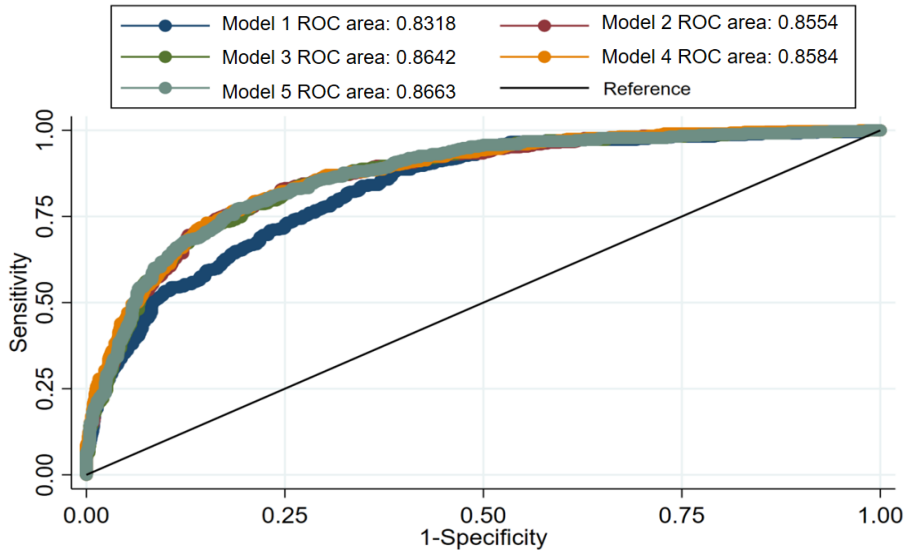
Figure 2 indicates that the models hold strong classification power and accuracy in general since they are well above the 0.5 shown by the 45-degree line and models two through five all outperform the base model one. Additionally, adding an interaction term improves the AUROC relative to the regressions without an interaction term. These results suggest that the interaction terms have some incremental explanatory power for classifying fiscal crises.

Table 1: Regression Results for the Investor Base

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5
Gov debt/GDP	0.0145***	0.0250***	0.0235***	0.0119***	0.0315***
	(0.00137)	(0.00229)	(0.00218)	(0.00428)	(0.00386)
Lagged nonresident share		0.0227***		0.00780*	
		(0.00246)		(0.00455)	
Lagged nonofficial share			-0.0188***		-0.00958**
			(0.00220)		(0.00420)
Gov debt/GDP *lagged nonresident				0.000237***	
				(6.33e-05)	
Gov debt/GDP *lagged nonofficial					-0.000159**
					(6.21e-05)
Observations	3,268	1,682	1,852	1,682	1,852

Note: Control variables are included but not shown here. Please refer to Table AII.1 for full regression results. *, **, and *** indicate significance at the 10, 5 and 1 percent level respectively.

Figure 2: AUROC Model Performance, Investor Base



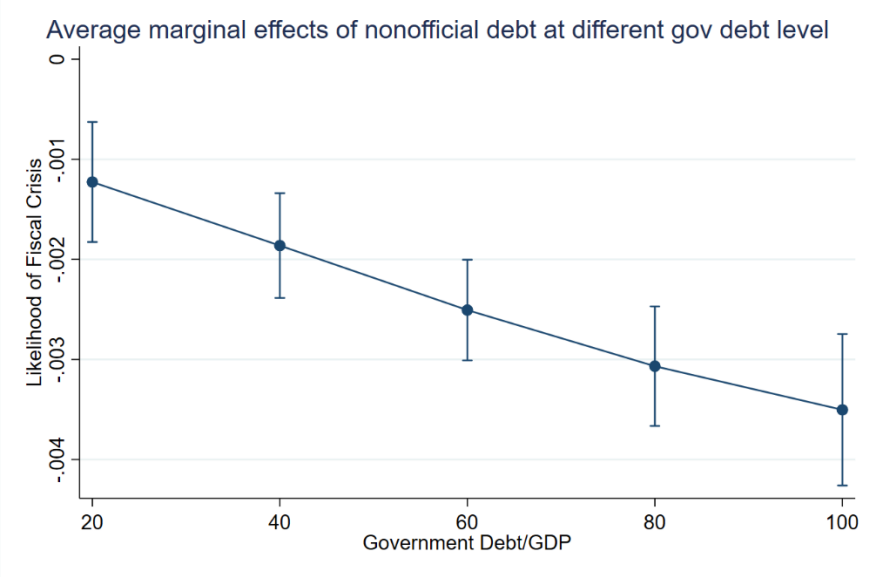
Computing marginal effects provides more intuitive interpretations than impacts of changes in explanatory variables on odds ratios. Due to the nonlinear nature of the logit model, the regressions do not provide a clear magnitude of a variable's marginal impact, as it depends on the level of other variables. In the following sections, instead of discussing the regression results, we will directly compute and trace out the marginal

impacts of explanatory variables of interest at various levels of other variables. Regression results are in Appendix II.

Marginal Effects of the Investor Base

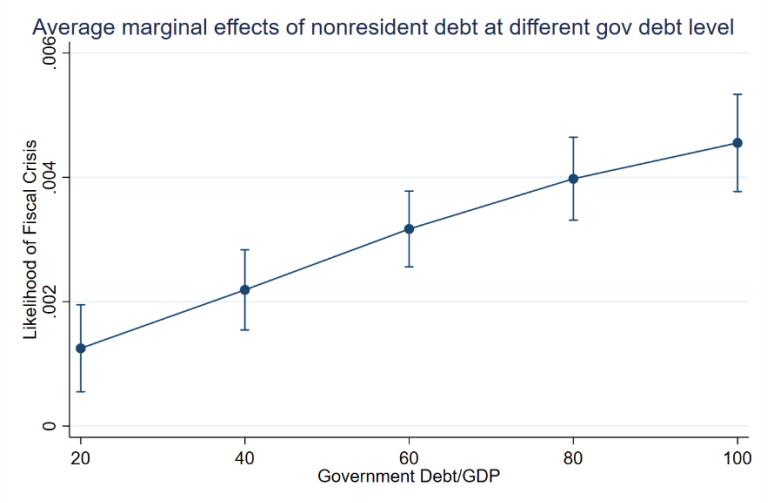
The results suggest that an increase in the share of non-official debt is associated with a lower likelihood of a fiscal crisis, while an increase in the share of non-resident debt is associated with a higher probability of a fiscal crisis. These results are consistent with those of the regressions in Table 1. If we further look across debt levels, the magnitude of the negative impact of an increase in the share of non-official debt on the likelihood of crisis increases as the debt level increases, meaning that a country with a higher debt level benefits more from having a larger non-official investor base (see Figure 3). Likewise, the adverse (positive) marginal effects of the share of nonresident investors on the crisis probability are also larger and significant for highly indebted countries (see Figure 4). Hereafter in the paper, the average marginal effects of each independent variable of interest are calculated at the average level of other variables, if not explicitly specified.

Figure 3: Average Marginal Effects of Nonofficial Debt at Different Government Debt Levels



Note: vertical lines refer to 90 confidence intervals

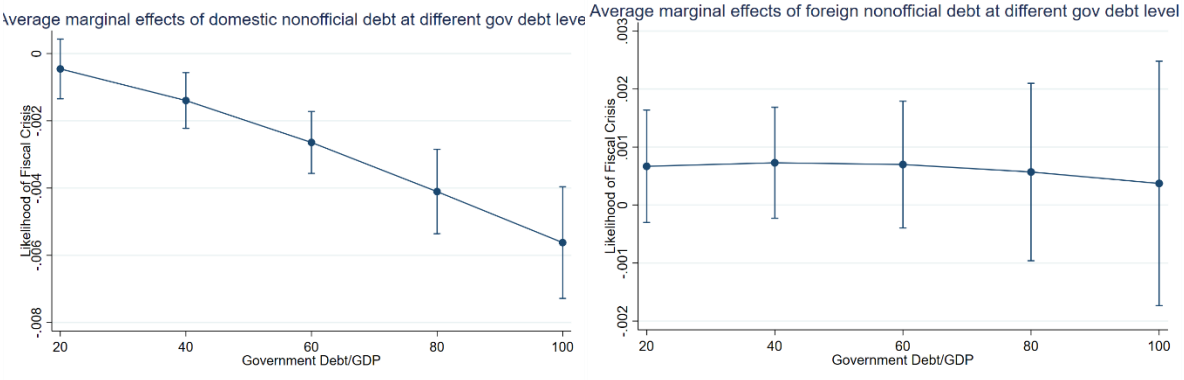
Figure 4: Average Marginal Effects of Nonresident Debt at Different Government Debt Levels



Note: vertical lines refer to 90 confidence intervals

The negative marginal impact of the overall debt held by the nonofficial sector on the probability of a crisis appears to reflect mainly changes in the share of domestic relative to foreign investors. We decompose the nonofficial investor base into domestic and foreign investors (Figure 5). A higher share of debt held by domestic nonofficial investors helps reduce the probability of running into crisis, and the effect is larger at higher debt levels, while increases in the share of debt held by foreign nonofficial investors do not significantly reduce the probability of a fiscal crisis.

Figure 5: Decomposition of Nonofficial Debt

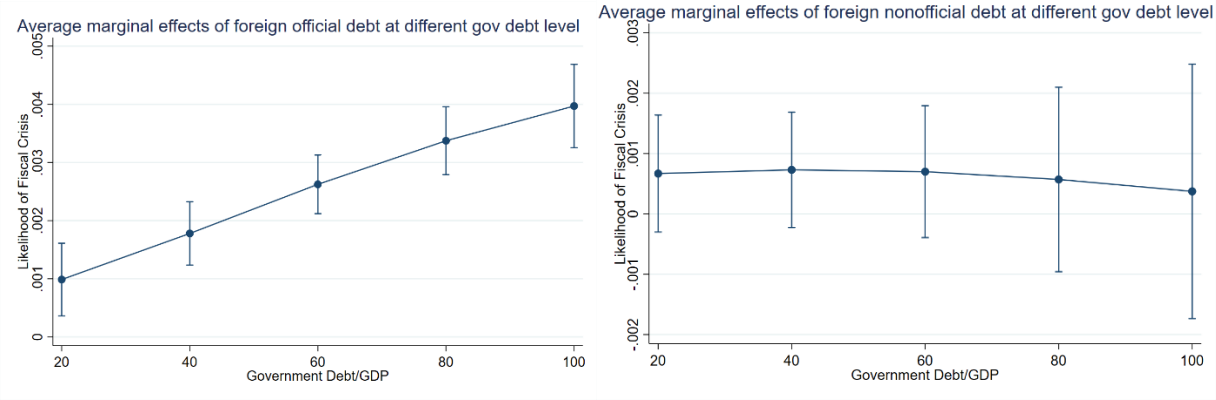


Note: vertical lines refer to 90 confidence intervals

A breakdown of the share of debt held by non-residents between the official and non-official sectors suggests that foreign official investors drive the patterns of the marginal impact of nonresident investors on the probability of a fiscal crisis. A higher share of debt held by foreign official investors is associated with a higher probability of running into a fiscal crisis, and the effect is more pronounced at higher debt levels (Figure 6, left chart). While this finding may seem counterintuitive—we would expect that nonofficial sectors would comprise more footloose investors that contribute to borrowers' fiscal crises—this finding could be explained by the willingness of official lenders to restructure the debt of sovereigns when the borrowers face debt servicing difficulties; recall that restructuring is one of the events constituting a fiscal crisis event of the borrowers in the dataset we use. Another possible explanation for this finding is that a higher share of public debt held by

foreign official investors could reflect lack of access by the sovereign to private capital markets, potentially because of poor prospects of future debt repayments. The marginal impact of the share of debt held by the nonofficial foreign sector falls at higher levels of debt and is not statistically significant (Figure 6, right chart).

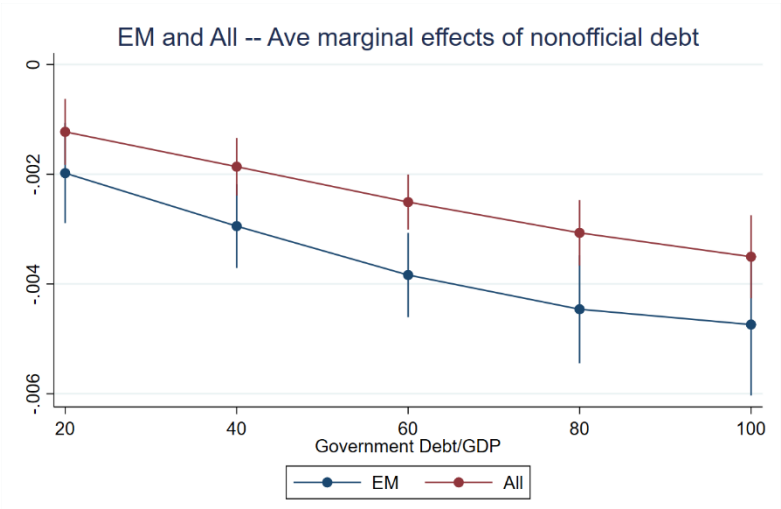
Figure 6: Decomposition of Nonresident Debt



Note: vertical lines refer to 90 confidence intervals

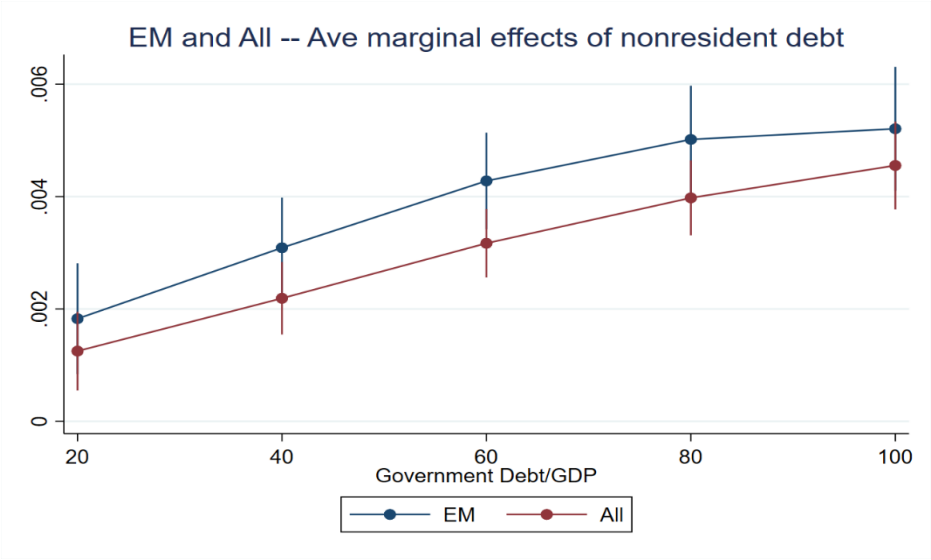
An analysis of the marginal impacts of the shares of EMs' debt held by various investors on the probability of a fiscal crisis suggests that the patterns for the EM subsample are similar to those of the full sample, but with larger magnitudes. The marginal effect of the share of debt held by nonofficial investors is larger for EM countries compared to the full sample, meaning that with one unit of increase in the share of nonofficial investors, there is a larger reduction in the probability of running into crisis (see Figure 7). Likewise, the marginal effect of the share of debt held by nonresident investors in increasing the probability of running into a crisis is larger (see Figure 8). Since the investor base dataset only contains EMs and AEs, the comparison suggests that the marginal effects of the shares of debt held by different investor types in affecting the probability of a are larger for EMs compared to AEs.

Figure 7: Average Marginal Effects of Nonofficial Debt at Different Government Debt Levels, Comparison Between EM and the Full Sample



Note: vertical lines refer to 90 confidence intervals

Figure 8: Average Marginal Effects of Nonresident Debt at Different Government Debt Levels, Comparison Between EM and the Full Sample

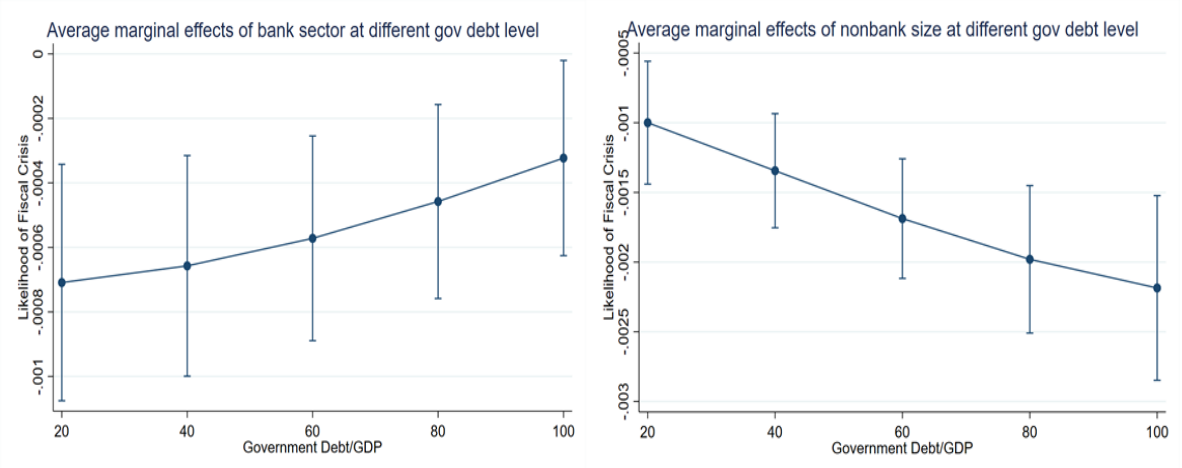


Note: vertical lines refer to 90 confidence intervals

Marginal Effects of Domestic Financial Markets

An investigation of the role of the level of development of domestic financial markets suggests that the sizes of both the banking and non-bank sectors have a negative marginal impact on the probability of a crisis but the patterns differ.[3] The marginal impacts of the nonbank sector are significantly larger at higher debt levels. Unlike the marginal impacts of the nonbank sector, the marginal impacts of the banking sector do not vary significantly at different debt levels (Figure 9).

Figure 9: Average Marginal Effects of Bank Sector and Nonbank Sector at Different Government Debt Levels

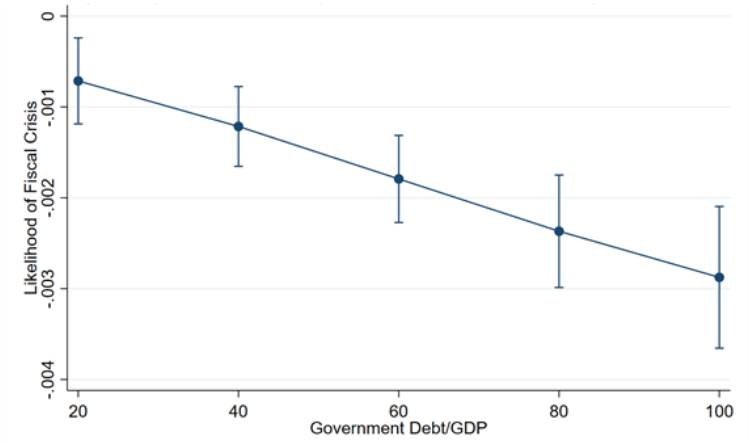


Note: vertical lines refer to 90 confidence intervals

[3] The size of the banking sector is defined as the size of the assets of the central banks and commercial banks, while the size of the nonbank sector is defined as the size of the assets of pension funds, insurance companies, and shadow banking institutions, plus stock market capitalization and domestic debt securities. All variables, if not noted otherwise, are defined as a percentage of GDP.

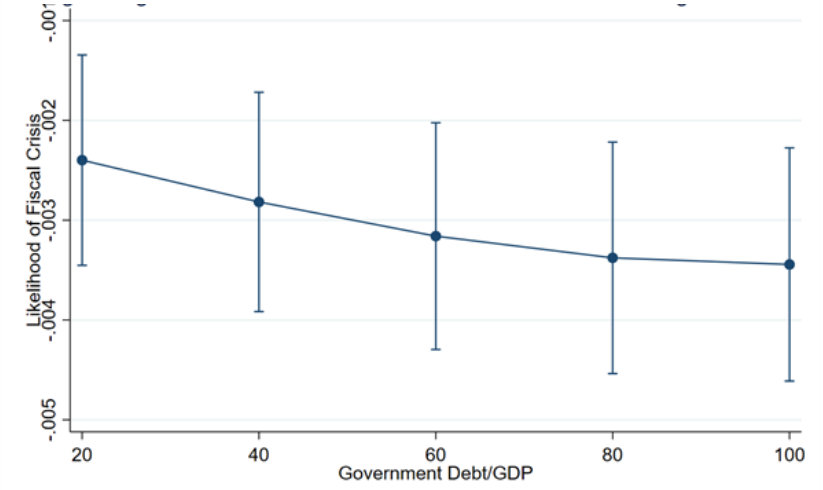
An analysis of the impacts of different segments of the nonbank sector suggests that capital markets play the key role in differentiating the marginal effect as debt level increases. To shed some light on what drives the pattern of the impacts of the nonbank sector, we further divide the size of the non-bank sector into size of the capital market, consisting of stock market capitalization and domestic debt securities, and size of nonbank financial institutions, including pension funds, insurance companies and shadow banking institutions. At higher debt levels, the marginal effects of the size of capital markets in reducing the probability of running into fiscal crisis is significantly larger than at lower debt levels (see Figure 10). The size of the nonbank financial institutions also has a negative marginal effect on the probability of a fiscal crisis, but the impact is not significantly different across debt levels (see Figure 11).

Figure 10: Average Marginal Effects of Capital Market Size at Different Government Debt Levels



Note: vertical lines refer to 90 confidence intervals

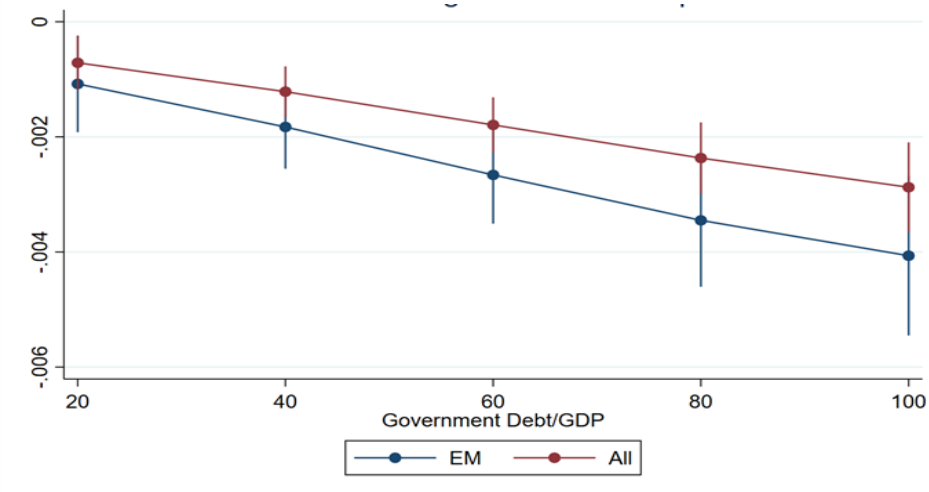
Figure 11: Average Marginal Effects of Nonbank Financial Sector Size at Different Government Debt Levels



Note: vertical lines refer to 90 confidence intervals

An investigation of the marginal impact of the size of the domestic financial markets on the probability of a crisis for EMs suggests, as was the case for the shares of the investors' base, that that EMs show similar pattern as the full sample but with larger magnitudes. We illustrate with the following chart the marginal impact of capital market at different sizes of debt in Figure 12.

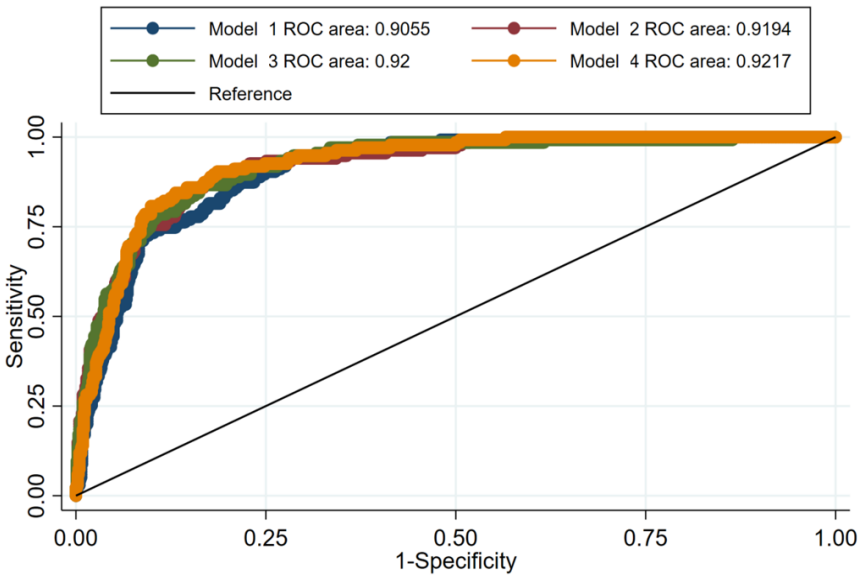
Figure 12: Average Marginal Effects of Capital Market Size at Different Government Debt Levels, Comparison Between EM and the Full Sample



Note: vertical lines refer to 90 confidence intervals

We include the regression results in Table 2 below.[4] We also perform the AUROC evaluation as we did for the investor base results and show the results in Figure 13 below. The AUROC suggests that all the regressions for the domestic financial markets give very strong scores (> 0.9), with nonbank financial sector regression giving a slightly higher score.

Figure 133: AUROC Model Performance, Domestic Financial Market



[4] The full set of regression results with all control variables are included in the tables in Annex II.

Table 2: Regression Results for the Domestic Financial Market

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
Gov debt/GDP	0.0126***	0.0240***	0.0314***	0.0196***
	(0.00208)	(0.00297)	(0.00465)	(0.00271)
Bank sector	-0.00641***			
	(0.00174)			
Gov debt/GDP *banksector	4.44e-05***			
	(1.57e-05)			
Nonbank sector		-0.0104***		
		(0.00335)		
Gov debt/GDP *nonbank		-4.96e-05		
		(4.80e-05)		
Capital market			-0.00669	
			(0.00492)	
Gov debt/GDP *capital market			-0.000203***	
			(7.68e-05)	
nonbank_financial				-0.0288***
				(0.00687)
Gov debt/GDP *nonbank_financial				5.44e-05
				(5.14e-05)
Observations	2,786	2,322	1,694	1,851

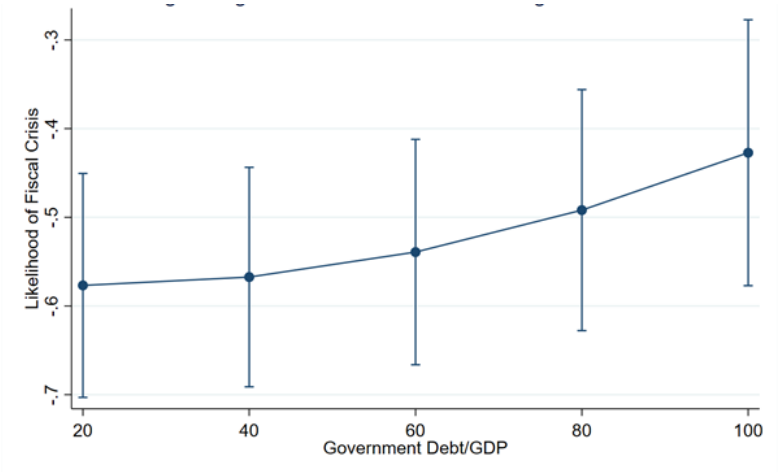
Note: Control variables are included but not shown here. Please refer to Table AII.2 for full results. *, **, and *** indicate significance at the 10, 5 and 1 percent level respectively.

Marginal Effects of Financial Development Index

An increase in the aggregate FD index or its subindices FM or FI reduces the probability of running into a fiscal crisis, and the magnitude of the marginal impact does not differ at various debt levels. The shape of the marginal impacts for FD, FI and FM are similar. Here we illustrate the marginal impact using FD (see Figure 14).

When we compare the marginal impact of financial development on the probability of a crisis for EM countries and for the full sample, EMs do not show significant differences in levels. This is partly due to the fact that, for the FD index, the coverage of countries in the sample is broader, including AEs, EMs and LICs. Accordingly, a comparison of EMs to the sample deviate from a simple comparison between EMs and AEs. The overall marginal impact for the full sample represents the average impact for the three groups of countries, and thus EMs do not show a significant difference relative to the sample.

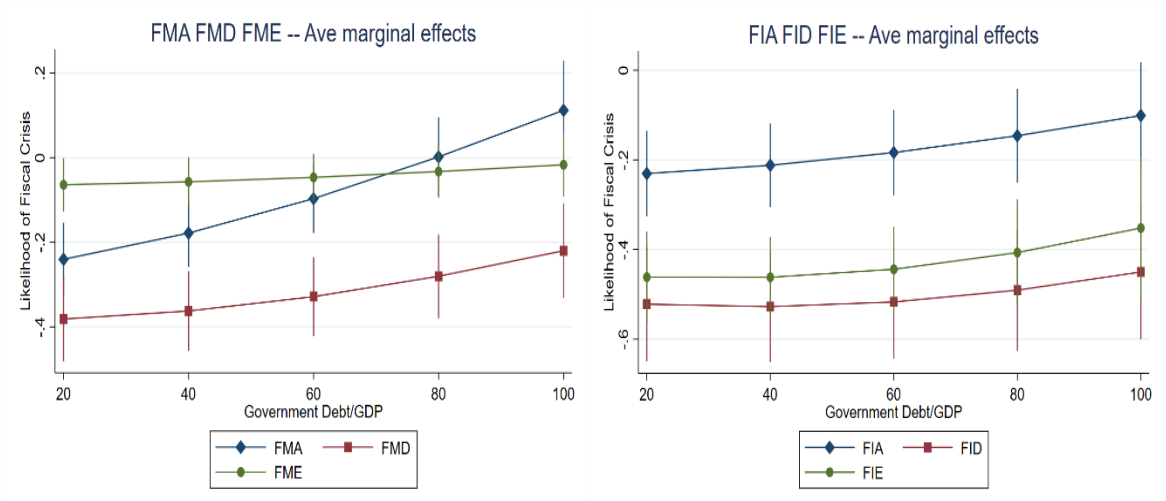
Figure 14: Average Marginal Effects of FD at Different Government Debt Levels



Note: vertical lines refer to 90 confidence intervals

The decomposition over FI and FM into their respective components — depth, access and efficiency (FID, FIA, FIE and FMD, FMA, FME) — suggests that depth has the most significant negative marginal impact on the probability of a fiscal crisis. According to the methodologies of compiling these indices, depth mainly measures the size of the financial market, access evaluates how easy it is to access financial resources, and efficiency measures the performance of financial markets. While the patterns of the marginal impacts at different debt levels are similar to that of the aggregate index FD, increases in FID and FMD indeed have larger impacts on reducing the probability of fiscal crisis compared to other subcomponents (Figure 15).

Figure 15: Decomposition of FM and FI



Note: vertical lines refer to 90 confidence intervals

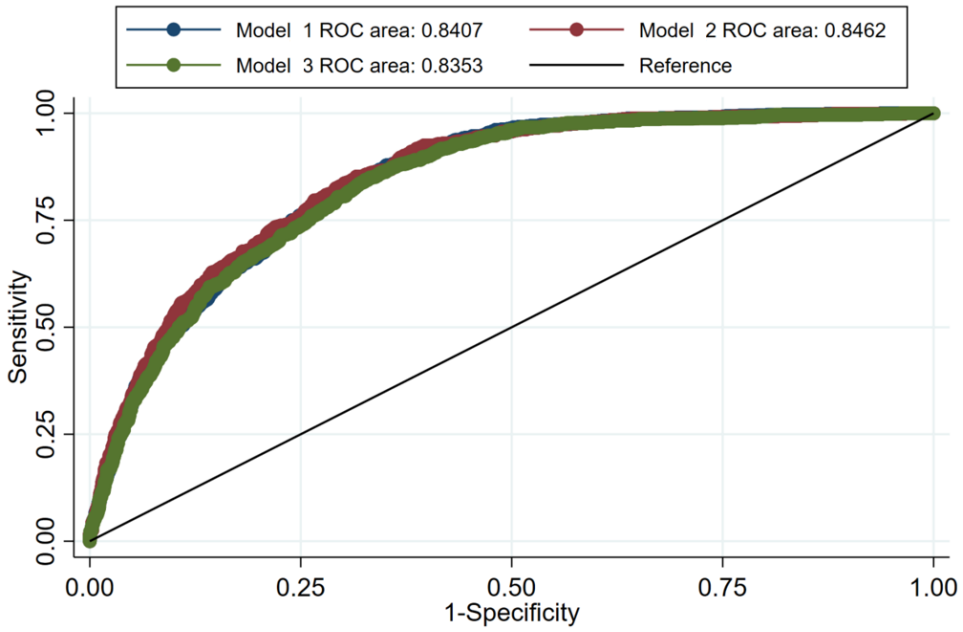
We include the regression results for FD, FI and FM in Table 3 below. We also perform the AUROC evaluation and show the results in Figure 16 below. The AUROC suggests that all the regressions for the domestic financial markets give strong scores (> 0.8), with FI regression giving a slightly higher score.

Table 3: Regression Results for Financial Development Index

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3
Gov debt/GDP	0.00859***	0.00718***	0.0117***
	(0.00208)	(0.00258)	(0.00164)
FD	-5.191***		
	(0.610)		
Gov debt/GDP *FD	0.0264***		
	(0.00561)		
FI		-5.911***	
		(0.622)	
Gov debt/GDP *FI		0.0239***	
		(0.00587)	
FM			-2.514***
			(0.453)
Gov debt/GDP *FM			0.0196***
			(0.00504)
ICRG_Political_Risk	-0.927*	-0.392	-1.690***
	(0.509)	(0.512)	(0.502)
Observations	3,228	3,228	3,228

Note: Control variables are included but not shown here. Please refer to Table AII.3 for full results. *, **, and *** indicate significance at the 10, 5 and 1 percent level respectively

Figure 15: AUROC Model Performance, Financial Development

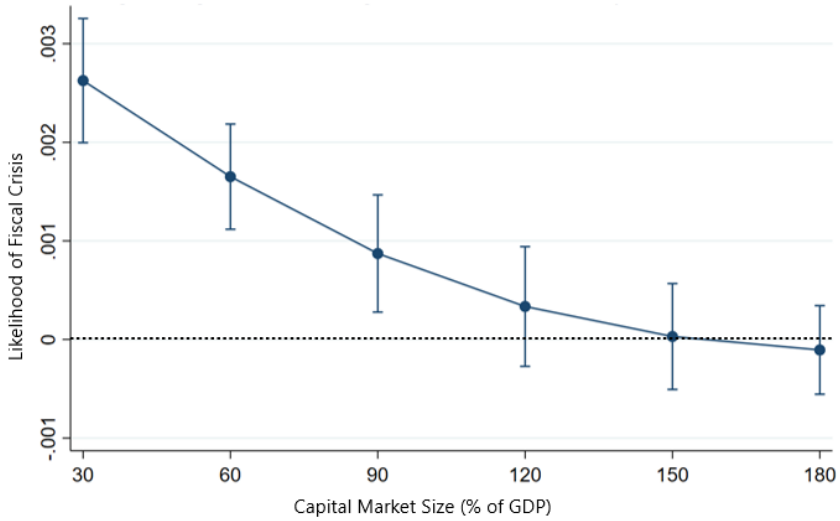


Marginal Impact of Debt

In this analysis, we flip our hypotheses and evaluate whether debt has a different effect on the probability of fiscal crises at different levels of other explanatory variables of interest. There are two notable findings from our empirical analysis.

First, the size of the domestic capital market has a significant impact on how public debt affects the likelihood of a fiscal crisis until it reaches around 100 percent of GDP. Figure 17 shows that a larger domestic capital market can help to mitigate the (positive) impact of public debt on the probability of a fiscal crisis until it reaches a threshold of around 100 percent of GDP, but the mitigating effect becomes progressively smaller as the size of the capital market increases and becomes statistically insignificant once this threshold is exceeded. In other words, once the size of the domestic capital market reaches around 100 percent of GDP, there is no evidence that a larger domestic capital market affects the marginal effect of higher public debt on the likelihood of a fiscal crisis, as the marginal effect becomes not statistically different from zero. A potential explanation is that, with deeper and more developed domestic capital markets, the government can increase its indebtedness by tapping less risky debt (local currency borrowing and borrowing from resident investors), thereby increasing the debt absorption capacity of the economy. However, there is a limit to how much the development and deepening of domestic capital markets can help contain the adverse impact of high debt on the probability of a crisis, the euro area debt crisis being a case in point. This finding for capital markets is unique amongst other financial variables; our analysis did not reveal other significant asymmetries.

Figure 16: Average Marginal Effects of Public Debt at Different Capital Market Sizes



The second key finding concerns the distinction between EMs and all countries. For varying capital market sizes, there is no statistically significant difference (see Figure 18). However, this is not the case for financial development. Figure 19 demonstrates that, at almost every level of financial development, debt has a larger and statistically different (positive) impact on the probability of a fiscal crisis for EMs relative to the full sample. This finding points to EMs' limited debt carrying capacity.

Figure 17: Average Marginal Effects of Government Debt at Different Capital Market Sizes by Country Type

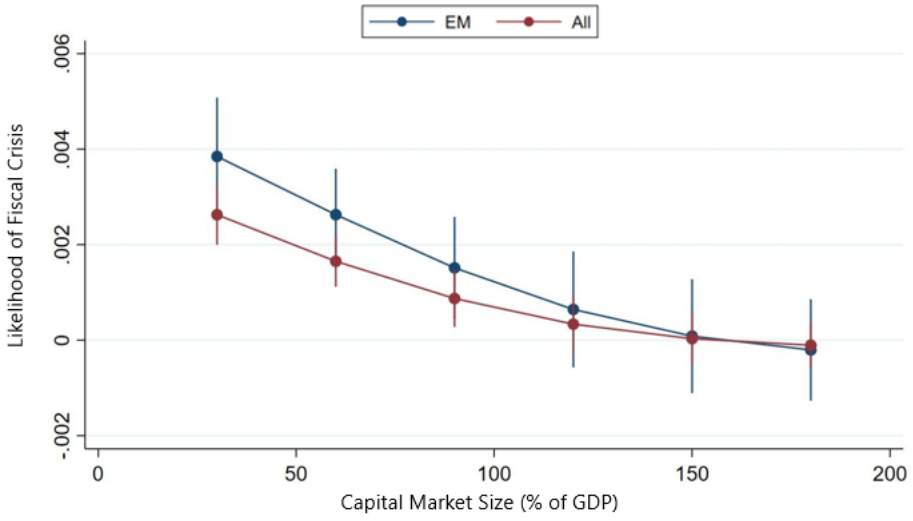
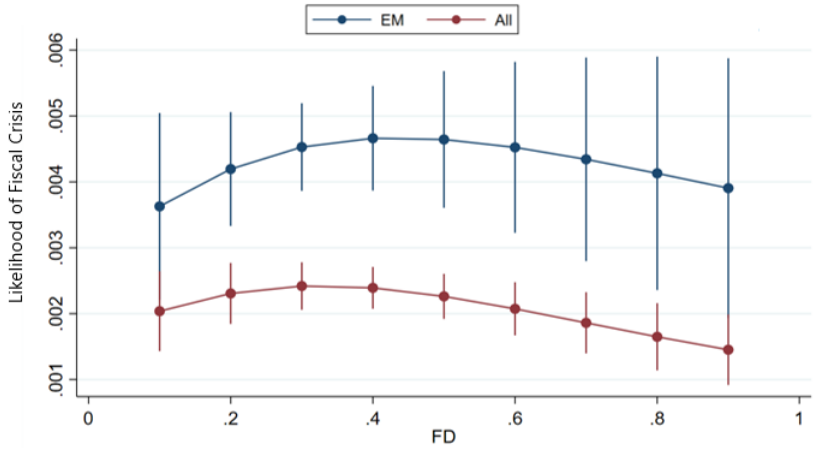


Figure 19: Average Marginal Effects of Government Debt at Different Levels of Financial Development by Country Type



Robustness checks

A number of robustness checks of our main results were carried out and are presented in Tables AIV.1 – AIV.6 in Annex IV.

A first set of robustness checks were carried out by dropping the debt restructuring component of the fiscal crisis dummy, the dependent variable. This was done to check whether the finding that a higher share of debt held by foreign official investors is associated with a higher probability of running into a fiscal crisis can be explained by a greater willingness of official lenders to restructure the debt of sovereigns (as restructuring is one of the events constituting a fiscal crisis event). The empirical results are broadly comparable with the baseline results, suggesting that this may not be an adequate explanation for this empirical finding.

A second set of robustness checks involved keeping only the first year of a crisis episode in the sample and dropping the subsequent years of the crisis episode. Looking at the results for the investor base, the statistical significance of the interaction terms of nonresident / nonofficial share with government debt to GDP disappears, suggesting that the marginal impact of the share of debt held by nonresident investors / nonofficial investors (that is, the composition of the sovereign debt investor base) on the probability of running into a fiscal crisis does not vary with the level of government debt. Moreover, the coefficients for the variables measuring the *size* of the domestic financial market become statistically insignificant, while this is not the case for the financial development indices. This suggests that, rather than the size of the domestic financial sector, it is the level of development of domestic financial markets (their depth, efficiency, and ease of access) which may have an impact on the vulnerability of an economy of running into a fiscal crisis.

VI. CONCLUSION

This paper contributes to the literature on predicting fiscal crises, focusing on the role of the government's debt investor base and the role of domestic financial development. Specifically, we investigate how the composition of the sovereign debt investor base and the size and development of domestic financial markets affect the probability of a fiscal crisis, after controlling for the level of public debt. We also investigate how changes in public indebtedness affect the probability of a fiscal crisis for given compositions of the sovereign debt investor base and different sizes and levels of development of the domestic financial sector.

Using logit estimation, we focus on marginal impacts of changes in key variables of interest on the probability of a fiscal crisis. We find that a larger share of debt held by the nonofficial sector is associated with a higher probability of running into a fiscal crisis, and that the magnitude of the negative impact is larger at higher debt levels. Moreover, countries with a larger share of debt held by nonresidents are more likely to run into a fiscal crisis, and the magnitude of the estimated positive impact is larger at higher debt levels. For EMs, the mitigating role of the share of non-official debt is larger, and the exacerbating impact of nonresident debt on the probability of a crisis is also larger, compared with the full sample.

Investigating the marginal impact of the size of domestic financial markets, we find that larger sizes of domestic financial markets are associated with a lower negative impact of higher debt on the probability of fiscal crises. Breaking down the size of domestic financial markets between banking and nonbank sectors, we find that the estimated magnitude of the negative marginal impact of the banking sector's size on the probability of running into crisis gets smaller at higher debt levels while that of the nonbank sector increases, with the latter being driven by the size of capital markets. We also find that EMs stand to benefit the most from deeper capital markets relative to the full sample, as the estimated magnitude of the mitigating role of a larger domestic capital market is larger for EMs than for the full sample.

Investigating the marginal impact of debt at different levels of explanatory variables of interest, we find that an increase in the debt level is almost always associated with increases the probability of running into fiscal crisis. This effect diminishes as the size of the domestic nonbank sector increases. EMs share similar patterns as the whole sample but the estimated marginal impact of an increase in debt on the probability of a crisis is always larger for EMs than for the full sample at various sizes/levels of the key variables of interest in this study.

In brief, our findings confirm the benefits of financial development, the danger of heavy reliance on a non-resident investor base, especially for EMs, and that EMs also have a lower debt carrying capacity. An area of future research is to investigate the marginal impact of the currency composition of debt on the probability of running into a crisis at different levels of domestic financial market development.

Annex I. Variables' Description, Summary Statistics, and Correlations

Table AI.1. Variables' Description

VARIABLES		DESCRIPTION	SOURCE
Explanatory Variable	Fiscal Crisis	Binary variable that determines if a country is in fiscal crisis due to credit events on sovereign debt, large official financing, loss of market access, or extremely high inflation. Covers 188 countries since 1988	FAD Fiscal Crisis Database
Regressors	Share of Debt Held by Investor Type	Compiles the government debt investor base for 34 advanced economies and 87 emerging markets, starting from 1989. First split by foreign and resident shares then each of those are split by official, bank, and nonbank shares.	Arslanalp et al. 2014
	Size of Domestic Financial Sector	Banking sector assets; stock market capitalization; pension and insurance company assets; corporate and sovereign debt securities	IFS; WDI; BIS; Financial Stability Board
	IMF Financial Development Index	Measures the depth, access and efficiency of financial markets and financial institutions of a country. Originally, Svirydzenka (2016) constructed the series.	IMF Financial development index database
	Government Debt	Total General Government Debt. IMF FAD first used then supplemented with WEO data when necessary	IMF FAD; WEO
	Other Macro Controls	Political Risk Rating; Current Account Balance; GDP Growth; International Reserves	The International Country Risk Guide (ICRG); WDI

Table AI.2. Summary Statistics of Variables

All Countries			
	Mean	Median	Stdev
Fiscal Crisis	0.26	0.00	0.44
Bank Sector (% of GDP)	87.63	60.86	84.97
Nonbank Sector (% of GDP)	71.31	28.69	104.14
Financial Sector (% of GDP)	112.30	65.30	130.34
Nonbank Financial Sector (% of GDP)	39.03	11.86	67.37
Capital Market (% of GDP)	60.36	39.46	60.87
Share Debt held by Nonofficial creditors	54.62	63.44	34.33
Share Debt held by Nonresident creditors	59.91	58.75	32.61
Financial Market Index	0.16	0.04	0.22
Financial Institution Index	0.34	0.29	0.22
Financial Development Index	0.26	0.19	0.21
ICRG Political Risk Rating	63.62	63.50	14.70
EM Countries			
Fiscal Crisis	0.27	0.00	0.44
Bank Sector (% of GDP)	82.88	62.08	75.23
Nonbank Sector (% of GDP)	53.16	27.90	73.41
Financial Sector (% of GDP)	100.20	68.02	99.27
Nonbank Financial Sector (% of GDP)	19.23	8.51	31.78
Capital Market (% of GDP)	55.98	38.23	57.48
Share Debt held by Nonofficial creditors	46.15	50.80	33.47
Share Debt held by Nonresident creditors	64.52	68.98	33.39
Financial Market Index	0.17	0.11	0.19
Financial Institution Index	0.33	0.33	0.16
Financial Development Index	0.26	0.25	0.14
ICRG Political Risk Rating	61.32	63.00	11.02

Table AI.3. Correlations Between Variables

	Fiscal Crisis
Share of debt held by…	
Nonresidents	0.34
Nonofficial sector	-0.35
Bank sector	-0.18
Size of…	
Nonbank sector	-0.23
Capital market	-0.22
Nonbank financial	-0.22
IMF Indices	
Financial Development Index	-0.27
Financial Institutions Index	-0.27
Financial Markets Index	-0.23

Annex II: Full Regression Results

Table AII.1. Full Regression Results for the Investor Base

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5
Gov debt/GDP	0.0145***	0.0250***	0.0235***	0.0119***	0.0315***
	(0.00137)	(0.00229)	(0.00218)	(0.00428)	(0.00386)
Lagged nonresident share		0.0227***		0.00780*	
		(0.00246)		(0.00455)	
Lagged nonofficial share			-0.0188***		-0.00958**
			(0.00220)		(0.00420)
Gov debt/GDP *lagged nonresident				0.000237***	
				(6.33e-05)	
Gov debt/GDP *lagged nonofficial					-0.000159**
					(6.21e-05)
Lagged current account balance	-0.0336***	-0.0513***	-0.0400***	-0.0537***	-0.0400***
	(0.00675)	(0.0101)	(0.00982)	(0.0102)	(0.00996)
Lagged Reserves/GDP	-0.0419***	-0.0322***	-0.0440***	-0.0254***	-0.0433***
	(0.00476)	(0.00617)	(0.00554)	(0.00632)	(0.00563)
Lagged GDP growth	-0.0728***	-0.0726***	-0.0867***	-0.0709***	-0.0864***
	(0.0112)	(0.0179)	(0.0164)	(0.0179)	(0.0171)
EM dummy	2.706***	2.416***	2.745***	2.388***	2.682***
	(0.205)	(0.309)	(0.311)	(0.309)	(0.311)
ICRG Political Risk	-1.988***	-3.957***	-3.095***	-4.117***	-3.063***
	(0.482)	(0.843)	(0.792)	(0.854)	(0.797)
Constant	-2.149***	-2.811***	-0.999	-1.898**	-1.406*
	(0.439)	(0.764)	(0.720)	(0.808)	(0.740)
Observations	3,268	1,682	1,852	1,682	1,852

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

Table AII.2. Full Regression Result for Size of Domestic Financial Market

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
Gov debt/GDP	0.0126***	0.0240***	0.0314***	0.0196***
	(0.00208)	(0.00297)	(0.00465)	(0.00271)
Banksector	-0.00641***			
	(0.00174)			
Gov debt/GDP *banksector	4.44e-05***			
	(1.57e-05)			
Nonbank		-0.0104***		
		(0.00335)		
Gov debt/GDP *nonbank		-4.96e-05		
		(4.80e-05)		
Capital market			-0.00669	
			(0.00492)	
Gov debt/GDP *capital market			-0.000203***	
			(7.68e-05)	
nonbank_financial				-0.0288***
				(0.00687)
Gov debt/GDP *nonbank_financial				5.44e-05
				(5.14e-05)
d_em	2.728***	2.089***	2.683***	1.896***
	(0.244)	(0.256)	(0.336)	(0.304)
d_lic	2.605***	1.723***	2.212***	1.780***
	(0.277)	(0.308)	(0.436)	(0.361)
ICRG_Political_Risk	-2.078***	-3.530***	-5.653***	-3.103***
	(0.528)	(0.767)	(0.962)	(0.918)
lag_CAB	-0.0288***	-0.0304***	-0.0658***	-0.0333***
	(0.00747)	(0.00916)	(0.0148)	(0.0106)
lag_Res/GDP	-0.0405***	-0.0264***	-0.0317***	-0.0362***
	(0.00562)	(0.00611)	(0.00870)	(0.00673)
lag_GDP_growth	-0.0816***	-0.113***	-0.160***	-0.117***
	(0.0123)	(0.0180)	(0.0254)	(0.0205)
Constant	-1.562***	-0.658	0.0559	-0.608
	(0.488)	(0.667)	(0.922)	(0.784)
Observations	2,786	2,322	1,694	1,851

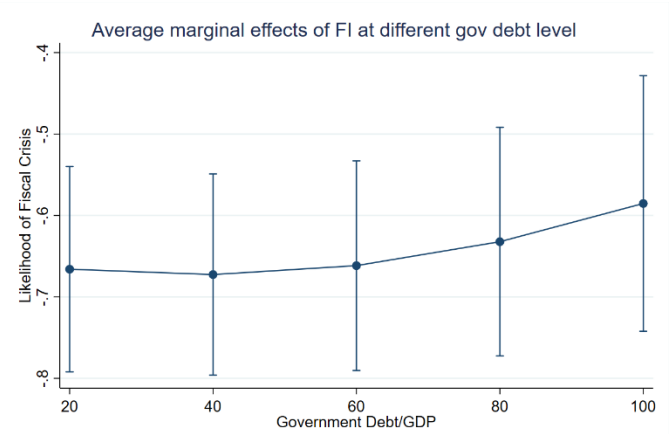
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

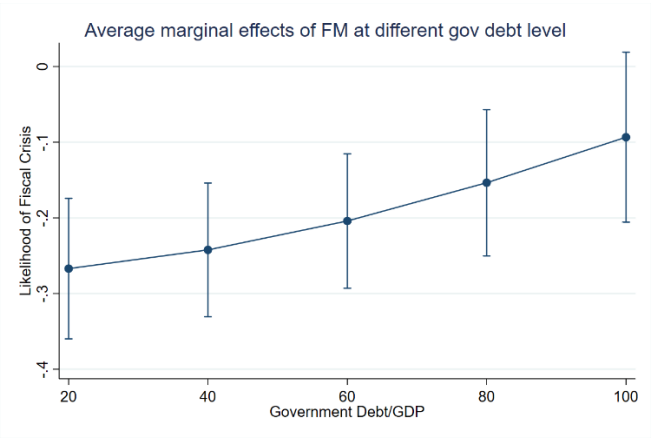
Table AII.3. Full Regression Results for Financial Development Index

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3
Gov debt/GDP	0.00859***	0.00718***	0.0117***
	(0.00208)	(0.00258)	(0.00164)
FD	-5.191***		
	(0.610)		
Gov debt/GDP *FD	0.0264***		
	(0.00561)		
FI		-5.911***	
		(0.622)	
Gov debt/GDP *FI		0.0239***	
		(0.00587)	
FM			-2.514***
			(0.453)
Gov debt/GDP *FM			0.0196***
			(0.00504)
ICRG_Political_Risk	-0.927*	-0.392	-1.690***
	(0.509)	(0.512)	(0.502)
lag_CAB	-0.0308***	-0.0362***	-0.0315***
	(0.00690)	(0.00690)	(0.00693)
lag_Res/GDP	-0.0381***	-0.0336***	-0.0424***
	(0.00475)	(0.00456)	(0.00493)
lag_GDP_growth	-0.0710***	-0.0769***	-0.0686***
	(0.0120)	(0.0121)	(0.0119)
d_em	2.181***	1.783***	2.693***
	(0.246)	(0.255)	(0.234)
d_lic	1.781***	1.386***	2.539***
	(0.288)	(0.296)	(0.267)
Constant	-0.998**	-0.364	-1.898***
	(0.466)	(0.479)	(0.457)
Observations	3,228	3,228	3,228

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

Annex III: Additional Results for FI and FM





Annex IV Robustness checks

Table AIV.1. Robustness check for dropping debt restructuring crisis periods, Investor Base

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5
Gov debt/GDP	0.00942***	0.0202***	0.0196***	0.00841*	0.0277***
	(0.00156)	(0.00258)	(0.00245)	(0.00474)	(0.00440)
Lagged nonresident share		0.0158***		0.00216	
		(0.00274)		(0.00509)	
Lagged nonofficial share			-0.0129***		-0.00382
			(0.00249)		(0.00473)
Gov debt/GDP *lagged nonresident				0.000222***	
				(7.14e-05)	
Gov debt/GDP *lagged nonofficial					-0.000158**
					(7.00e-05)
Lagged current account balance	-0.0624***	-0.0848***	-0.0721***	-0.0863***	-0.0728***
	(0.00868)	(0.0125)	(0.0119)	(0.0126)	(0.0121)
Lagged Reserves/GDP	-0.0357***	-0.0376***	-0.0472***	-0.0304***	-0.0466***
	(0.00527)	(0.00737)	(0.00662)	(0.00754)	(0.00682)
Lagged GDP growth	-0.0673***	-0.0759***	-0.0851***	-0.0749***	-0.0864***
	(0.0141)	(0.0210)	(0.0183)	(0.0211)	(0.0193)
EM dummy	2.011***	2.061***	2.308***	2.064***	2.277***
	(0.221)	(0.330)	(0.332)	(0.331)	(0.331)
ICRG Political Risk	-1.462**	-2.873***	-2.704***	-3.015***	-2.638***
	(0.600)	(0.962)	(0.903)	(0.973)	(0.907)
Constant	-2.276***	-2.867***	-1.356*	-2.100**	-1.822**
	(0.536)	(0.871)	(0.816)	(0.914)	(0.846)
Observations	2,777	1,512	1,680	1,512	1,680

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

Table AIV.2. Robustness check for dropping debt restructuring crisis periods, Size of Domestic financial market

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
Gov debt/GDP	0.00489*	0.0188***	0.0300***	0.0145***
	(0.00256)	(0.00318)	(0.00504)	(0.00305)
Banksector	-0.00716***			
	(0.00207)			
Gov debt/GDP *banksector	6.22e-05***			
	(1.80e-05)			
Nonbank		-0.0111***		
		(0.00356)		
Gov debt/GDP *nonbank		-8.33e-06		
		(4.52e-05)		
Capital Market			-0.00918	
			(0.00596)	
Gov debt/GDP *capital market			-0.000175**	
			(8.49e-05)	
nonbank_financial				-0.0263***
				(0.00734)
Gov debt/GDP *nonbank_financial				7.31e-05
				(5.51e-05)
d_em	2.093***	1.656***	2.470***	1.296***
	(0.267)	(0.272)	(0.355)	(0.328)
d_lic	1.215***	0.0992	0.676	-0.141
	(0.325)	(0.378)	(0.600)	(0.440)
ICRG_Political_Risk	-1.465**	-3.698***	-4.662***	-4.348***
	(0.653)	(0.904)	(1.100)	(1.101)
lag_CAB	-0.0549***	-0.0682***	-0.0918***	-0.0826***
	(0.00971)	(0.0122)	(0.0171)	(0.0148)
lag_Res/GDP	-0.0440***	-0.0344***	-0.0337***	-0.0452***
	(0.00707)	(0.00750)	(0.00987)	(0.00822)
lag_GDP_growth	-0.0680***	-0.104***	-0.142***	-0.113***
	(0.0157)	(0.0218)	(0.0286)	(0.0250)
Constant	-1.630***	-0.332	-0.686	0.578
	(0.596)	(0.783)	(1.054)	(0.925)
Observations	2,323	2,132	1,605	1,706

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

Table AIV.3. Robustness check for dropping debt restructuring crisis periods, Financial Development Index

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3
Gov debt/GDP	0.00280	-0.000152	0.00636***
	(0.00231)	(0.00282)	(0.00184)
FD	-4.150***		
	(0.685)		
Gov debt/GDP *FD	0.0274***		
	(0.00594)		
FI		-5.694***	
		(0.715)	
Gov debt/GDP *FI		0.0296***	
		(0.00619)	
FM			-1.782***
			(0.511)
Gov debt/GDP *FM			0.0193***
			(0.00546)
ICRG_Political_Risk	-0.499	0.228	-1.224*
	(0.643)	(0.651)	(0.626)
lag_CAB	-0.0617***	-0.0657***	-0.0638***
	(0.00893)	(0.00894)	(0.00900)
lag_Res/GDP	-0.0360***	-0.0326***	-0.0377***
	(0.00547)	(0.00544)	(0.00555)
lag_GDP_growth	-0.0685***	-0.0739***	-0.0682***
	(0.0149)	(0.0151)	(0.0149)
d_em	1.758***	1.345***	2.121***
	(0.262)	(0.273)	(0.248)
d_lic	0.807**	0.306	1.371***
	(0.329)	(0.339)	(0.307)
Constant	-1.532***	-0.781	-2.211***
	(0.563)	(0.578)	(0.554)
Observations	2,747	2,747	2,747

Standard errors in parentheses

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

Table AIV.4. Robustness check for only keeping the first year of the crisis as crisis years, Investor Base

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5
Gov debt/GDP	0.00347*	0.0105**	0.00853**	0.000101	0.00605
	(0.00185)	(0.00425)	(0.00401)	(0.00826)	(0.00672)
Lagged nonresident share		0.0164***		0.00479	
		(0.00455)		(0.00858)	
Lagged nonofficial share			-0.0100**		-0.0127*
			(0.00400)		(0.00699)
Gov debt/GDP *lagged nonresident				0.000196	
				(0.000125)	
Gov debt/GDP *lagged nonofficial					4.89e-05
					(0.000106)
Lagged current account balance	-0.0370***	-0.0704***	-0.0613***	-0.0734***	-0.0613***
	(0.0107)	(0.0174)	(0.0165)	(0.0181)	(0.0164)
Lagged Reserves/GDP	-0.0170**	-0.0117	-0.0248***	-0.00610	-0.0244***
	(0.00689)	(0.00902)	(0.00828)	(0.00949)	(0.00832)
Lagged GDP growth	-0.00102	-4.67e-05	-0.0197	0.000638	-0.0189
	(0.0183)	(0.0326)	(0.0239)	(0.0342)	(0.0239)
EM dummy	1.493***	0.736	1.250**	0.711	1.260**
	(0.346)	(0.481)	(0.509)	(0.478)	(0.513)
ICRG Political Risk	-1.470*	-3.387**	-2.992**	-3.730**	-3.019**
	(0.871)	(1.522)	(1.422)	(1.543)	(1.426)
Constant	-3.089***	-2.725**	-1.535	-1.906	-1.412
	(0.775)	(1.370)	(1.294)	(1.468)	(1.321)
Observations	2,530	1,320	1,486	1,320	1,486

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

Table AIV.5. Robustness check for only keeping the first year of the crisis as crisis years, Size of domestic financial market

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
Gov debt/GDP	0.00173	0.00820*	0.0155*	0.00710
	(0.00313)	(0.00476)	(0.00815)	(0.00445)
Banksector	-0.00267			
	(0.00281)			
Gov debt/GDP *banksector	2.01e-05			
	(2.53e-05)			
Nonbank		-0.00811*		
		(0.00424)		
Gov debt/GDP *nonbank		3.56e-07		
		(5.66e-05)		
Capital market			-0.00175	
			(0.00705)	
Gov debt/GDP *capital market			-0.000115	
			(0.000118)	
nonbank_financial				-0.0172*
				(0.00903)
Gov debt/GDP *nonbank_financial				4.39e-05
				(8.50e-05)
d_em	1.492***	1.143***	1.380***	0.843*
	(0.398)	(0.391)	(0.514)	(0.463)
d_lic	1.870***	1.081**	1.998***	0.772
	(0.466)	(0.488)	(0.652)	(0.571)
ICRG_Political_Risk	-1.469	-1.765	-2.407	-2.522
	(0.932)	(1.309)	(1.743)	(1.535)
lag_CAB	-0.0341***	-0.0509***	-0.0877***	-0.0570***
	(0.0119)	(0.0143)	(0.0235)	(0.0167)
lag_Res/GDP	-0.0160**	-0.0113	-0.0155	-0.0178*
	(0.00798)	(0.00871)	(0.0133)	(0.0100)
lag_GDP_growth	-0.0130	0.0210	0.0456	0.0170
	(0.0204)	(0.0311)	(0.0463)	(0.0367)
Constant	-2.778***	-2.586**	-3.155*	-1.816
	(0.858)	(1.146)	(1.646)	(1.319)
Observations	2,106	1,970	1,476	1,589

Table AIV.6. Robustness check for only keeping the first year of the crisis as crisis years, financial development index

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3
Gov debt/GDP	0.000575	0.00101	0.00238
	(0.00270)	(0.00353)	(0.00214)
FD	-5.162***		
	(1.106)		
Gov debt/GDP *FD	0.0225**		
	(0.00947)		
FI		-3.366***	
		(1.071)	
Gov debt/GDP *FI		0.0123	
		(0.0105)	
FM			-4.010***
			(0.899)
Gov debt/GDP *FM			0.0230***
			(0.00862)
ICRG_Political_Risk	-0.431	-0.558	-1.020
	(0.935)	(0.939)	(0.919)
lag_CAB	-0.0313***	-0.0362***	-0.0300***
	(0.0107)	(0.0106)	(0.0109)
lag_Res/GDP	-0.0153**	-0.0149**	-0.0169**
	(0.00646)	(0.00651)	(0.00683)
lag_GDP_growth	0.00451	0.000777	0.00757
	(0.0199)	(0.0203)	(0.0199)
d_em	0.833**	0.917**	1.168***
	(0.382)	(0.403)	(0.367)
d_lic	0.726	0.965**	1.198***
	(0.461)	(0.487)	(0.431)
Constant	-1.888**	-2.023**	-2.531***
	(0.811)	(0.836)	(0.795)
Observations	2,500	2,500	2,500

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