



WP/16/253

# IMF Working Paper

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Lost and Found: Market Access and Public Debt Dynamics

by Antonio Bassanetti, Carlo Cottarelli, and Andrea Presbitero

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I N T E R N A T I O N A L M O N E T A R Y F U N D

**IMF Working Paper**

Strategy, Policy, and Review Department

**Lost and Found: Market Access and Public Debt Dynamics**

**Prepared by Antonio Bassanetti,\* Carlo Cottarelli,† Andrea Presbitero#**

Authorized for distribution by Seán Nolan

December 2016

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**Abstract**

The empirical literature on sovereign debt crises identifies the *level* of public debt (measured as a share of GDP) as a key variable to predict debt defaults and to determine sovereign market access. This evidence has led to the widespread use of (country-specific) debt thresholds to assess debt sustainability. We argue that the level of the debt-to-GDP ratio, whose use is justified on a theoretical and empirical ground, should not be the only fiscal metric to assess the complex relationship between public debt and debt defaults/market access. In particular, we show that, in a large panel of emerging markets, the *dynamics* of the debt ratio plays a critical role for market access. In particular, given a certain level of debt, a steadily declining debt ratio is associated with a lower probability of debt distress/market loss and with a higher likelihood of market re-access once access had been lost.

JEL Classification Numbers: F34, G15, H62, H63

Keywords: Debt Sustainability, Fiscal Crises, Default, Market Access, International Capital Markets

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We thank Aitor Erce (discussant), colleagues at the IMF and participants at the Sovereign Debt Restructuring Workshop (CIGI and University of Glasgow), the 18<sup>th</sup> Bank of Italy Workshop on Public Finance, the XXVIII Villa Mondragone International Economic Seminar, and at seminars at the European Commission and the European Stability Mechanism (ESM) for comments on earlier drafts. The views expressed in this paper are those of the author(s) and do not necessarily represent neither those of the IMF and IMF policy, nor those of the Bank of Italy.

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## 1 INTRODUCTION

The surge in public debt ratios since the 2008–09 global economic and financial crisis—first in advanced economies and, more recently, also in emerging economies—and the related high profile cases of loss of market access by some European countries have revived the interest in the determinants of distress in government paper markets.

The empirical literature has explored this issue on various occasions and it has consistently shown that a high level of the public debt-to-GDP ratio is one of the key trigger of loss of market access (see, among others, Manasse *et al.* 2003; Reinhart *et al.* 2003; Kraay and Nehru 2006; Manasse and Roubini 2009; Ghosh *et al.* 2012).<sup>1</sup> These analyses have focused almost exclusively on the level of the debt ratio, not on its dynamics, i.e. whether the ratio was stable, rising or declining at the time when market access was lost. Consistent with this strand of literature, the level of the debt ratio is considered as the key element when it comes to debt sustainability assessments made by official lenders such as the IMF, the World Bank and, recently, the OECD (Fall *et al.* 2015). This is, for example, the way in which debt sustainability has been defined, at least until recently, in the Greek program (or in other IMF-supported financial arrangements). And in its surveillance work the IMF uses specific debt thresholds at least to signal the need for more in-depth analysis of debt sustainability.<sup>2</sup>

Thus, a first goal of the paper is to evaluate the extent to which debt dynamics considerations are relevant in affecting the probability of a sovereign debt crisis. Our analysis, based on a large sample of emerging markets spanning the period from 1970 to 2014, shows that indeed debt dynamics is a robust predictor of debt distress episodes above and beyond the effect of debt levels. In particular, starting for example from a debt at 100 percent of GDP, we find that reducing the debt-to-GDP ratio by 10 percentage points over two years halves the

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<sup>1</sup> In a widely cited review of sovereign debt and defaults, Panizza *et al.* (2009, p. 672) conclude that “the probability of a debt crisis is positively associated with higher levels of total debt and higher shares of short-term debt, and negatively associated with GDP growth and the level of international reserves. Defaults are also related to more volatile and persistent output fluctuations, less trade openness, weaker institutions, and a previous history of defaults”.

<sup>2</sup> See, for example, the emphasis given to public debt thresholds — both in terms of triggering a more in-depth analysis and of highlighting a more significant level of risk—in the guidance note drafted for IMF staff to assess public debt sustainability for market-access countries (IMF, 2013). Note also the straightforward statements made by IMF papers regarding some high-profile IMF-supported programs such as the ones for Greece (“Research suggests 105 to a maximum of 120 percent of GDP as a sustainable range for debt in market access countries” in IMF, 2011, p. 68) and for Ukraine (“Once the debt operation is completed, fiscal adjustment entrenched, and growth restored, the debt ratio is expected to gradually converge to 71 percent of GDP, near the [debt sustainability assessment] high-risk benchmark” in IMF, 2015b, p. 68). The IMF’s debt sustainability assessment does look at the dynamics of the public debt ratio but primarily to assess whether the ratio falls below certain thresholds—the threshold for sustainability—within a certain time span (typically five years). For an overview of the importance of debt levels in the Fund’s debt sustainability analysis, see Schadler (2016).

(continued)

probability of debt distress compared to an opposite scenario with a 10 percentage points increase in the debt ratio over the same period.

Identifying the conditions that facilitate regaining market access—once this has been lost—is also a very relevant topic, including in resolving public debt crisis, because the IMF can legally lend large amount of resources (the so-called “exceptional access” cases) only if the country satisfies a number of conditions, including having prospects for gaining/regaining access to private capital markets within a timeframe that facilitates the repayment of all of its obligations to the Fund (IMF 2015a). Also in this case, the empirical literature has paid more attention to debt levels rather than to the dynamics of the debt-to-GDP ratio in affecting the likelihood of market loss and re-access (Gelos *et al.* 2011).<sup>3</sup> Cruces and Trebesch (2013), for instance, show that regaining market access takes longer for countries with higher debt-to-GDP ratios. In a related analysis, Asonuma and Trebesch (2016) look more closely at debt dynamics and find that market re-access is more likely for countries that had a preemptive debt restructuring rather than a post-default restructuring. Of course, for a return to market access, the fiscal stance would have to have been corrected with respect to the time of market loss. Indeed, Kaminsky and Vega-Garcia (2016) show that countries able to significantly reduce the debt-to-export ratio over a five-year horizon experience shorter default spells. And yet interesting question arise. In particular, does market re-access require that the debt ratio falls below a certain level, notably the level at which market access had been lost—or an even lower one? Or does it require that the debt ratio is decreasing, or decreasing at a certain speed, even if it exceeds the level at which access had been lost? Thus, a second goal of the paper is to assess the conditions under which countries re-enter the market, particularly with respect to debt dynamics and levels. Our evidence indicates that, indeed, market re-access does not necessarily occur at a debt level lower than the one at which access was lost. Again, what is critical for regaining market access is the dynamics of the debt-to-GDP ratio, more than its level.

The paper is organized as follows. Section 2 sketches the analytical reason why both the level and the dynamics of the debt ratio could affect market access. Section 3 presents the data used for the empirical analysis. Section 4 investigates empirically whether the risk of a fiscal crisis is related just to the level of the debt ratio, or whether debt dynamics also plays a critical role. Section 5 analyzes whether—once market has been lost—the return to market access requires the debt ratio to fall under a certain threshold or just to be declining. Section 6 concludes by drawing some policy implications.

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<sup>3</sup> See Tomz and Wright (2013) for an overview of sovereign debt, defaults, and market re-access.

## 2 THEORETICAL UNDERPINNINGS TO THE EMPIRICAL SPECIFICATION

The focus on the debt-to-GDP ratio as a determinant of market assess finds a rationale in the standard approach to debt sustainability analysis. Presumably, investors will stop lending to a government if they believe the government is unlikely to pay them back, which would happen if the primary surplus needed to service public debt and keep it at least stable is not too high politically and economically.<sup>4</sup> In other words, the higher the public debt-to-GDP ratio is, the more likely it is that the primary surplus needed to service it approaches a ceiling that the country will not be able to sustain over time (and hence would lead to default). The primary surplus ( $p$ , expressed as a share of GDP) needed to stabilize the debt-to-GDP ratio ( $d$ ) is given by:

$$p^* = [(r - g)/(1 + g)] d$$

where  $r$  and  $g$  are, respectively, the interest rate on public debt and the GDP growth rate. This equation provides a rationale for including as explanatory variable of the likelihood of market distress  $r$ ,  $g$  and, most of all  $d$ . One could note that this approach implies that the debt ratio should be multiplied by  $(r-g)$  when entered a regression explaining market loss. This is rarely done, perhaps because one could argue that, in turn, both  $r$  and  $g$  are a function of the debt level. Moreover, it is not obvious what the right  $r$  should be, because the relevant one is not necessarily the backward-looking average interest rate on the debt stock, but should be the rate expected to prevail over the medium term.<sup>5</sup> Thus, also to allow a better comparison of our result with those of the prevailing literature, we will enter the above variables in a linear, non-multiplicative, form.

Many empirical analysis of the likelihood of debt default also include directly the primary surplus itself. This could be justified, if we assume that markets feel reassured by seeing the primary surplus approaching the required  $p^*$ . Other variables that may affect the vulnerability of market access, such as the government's borrowing requirement (an indicator of liquidity, if not solvency, concerns) are also sometimes considered.

Debt dynamics can, however, also be quite relevant. An increase in the public debt ratio may signal the difficulty of the government in raising the primary balance and, hence, a possible continuation of the increase in the future. Moreover, if the debt ratio is increasing, the primary surplus needed to stabilize it will also rise over time, making the adjustment even

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<sup>4</sup> The stability of the debt ratio is, in turn a condition for the intertemporal budget constraint of the government to be met. More specifically, if we define  $r$  and  $g$  to be, respectively, the interest rate on public debt and the GDP growth rate, for any  $r > g$  (i.e. the condition needed for the economy to be dynamically efficient as defined by Diamond, 1965) the stability of the debt ratio implies that the government intertemporal budget constraint (a condition sometimes referred to as no-Ponzi game condition) is met (see, for example, Bartolini and Cottarelli, 1994).

<sup>5</sup> In any case, the backward-looking interest rate would have to be corrected for exchange rate losses if debt is denominated in foreign currencies.

more difficult. Furthermore, if  $r$  and  $g$  are endogenously determined, depending on the debt level itself, this would further raise the required debt-stabilizing primary balance with respect to today's primary balance, making the adjustment even harder. The opposite would happen in case of debt declines.

These arguments suggest the need to assess whether, empirically, the willingness of the market to purchase a country's debt is indeed related primarily to the level of public debt, or also to its dynamics.

### 3 DATA

The dataset used for the empirical analysis was assembled by IMF staff.<sup>6</sup> It spans the period 1970–2014, has annual frequency, and originally included both emerging markets and advanced economies. However, in order to work with a broadly homogeneous set of countries—at least in terms of stage of development—and considering that debt distress episodes of advanced economies are rather few, our econometric investigation will be limited to the subsample of emerging markets. For such economies, episodes of debt distress have been identified as inclusive of cases of: external and domestic defaults (i.e. arrears on principal or interest payments to commercial or official creditors), restructurings and rescheduling (i.e. changes of the original terms of the debtor-creditor contract). The information on distress events comes from combining different sources on: fiscal crises episodes (Baldacci *et al.*, 2011), private sovereign debt restructurings (Cruces and Trebesch, 2013), Paris Club arrangements, arrears to official and private creditors (World Development Indicators database), selected sovereign defaults and restructurings of foreign and local currency bonds (Moody's, 2013). As a useful reference, a database on sovereign defaults to both private and official creditors created recently at the Bank of Canada (Beers and Nadeau, 2014) was also used to complement the data.<sup>7</sup>

Figure 1 illustrates that—while rather irregular—the occurrence of distress episodes (Panel A) peaked in the 1980s and 1990s, with the distribution of the number of countries in distress (Panel B) being particularly concentrated in those same decades, before declining over the last 15 years. The large majority of the 115 debt distress episodes covered by the dataset involves episodes on external debt, with just a few cases (less than 10 percent of total) related to domestic debt default.

In order to complement our analysis, we also relied—though just for illustrative purposes—on a second dataset, again assembled by IMF staff and specifically focused on the

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<sup>6</sup> We are grateful to the IMF staff for sharing this large and detailed dataset with us. We are also grateful for sharing the second dataset mentioned below.

<sup>7</sup> The final version of the dataset was amended to exclude unclear cases, episodes related to political crises, and countries that split up during the time range under consideration.

(continued)

identification of episodes of loss of market access (LMA). The dataset spans a shorter interval—1990–2013—includes 45 countries (advanced, emerging, and frontier market economies), and identifies around 50 episodes of LMA, which are too few to form the basis of a rigorous statistical analysis, but are rather useful for graphical inspection to verify our intuition and corroborate the analysis.<sup>8</sup> In particular, the dataset identifies LMAs by defining them as “*unexpected lack of issuance of bonds or loans or announcement of default/restructuring, whichever is earlier*”.<sup>9</sup> As emphasized by IMF (2016), this definition is rather broad, including distress events that have not necessarily implied a default or a debt restructuring. This is particularly relevant considering that—for example—in the aftermath of the global financial crisis some advanced European economies lost market access without neither defaulting nor restructuring their debt.<sup>10</sup> In order to assess whether there has been an “*unexpected lack of issuance*”, as a first step IMF staff evaluated each country’s previous issuance pattern on the basis of a number of criteria like frequency and amounts issued relative to financing needs, among others.<sup>11</sup> In a second step, deviations with respect to those patterns were analyzed to identify LMAs.<sup>12</sup> Note that, in almost all cases, LMAs involved a full stop to issuance; thus—for all these instances—this definition also involves a clear identification of the moment when market re-entry occurred.

For the overlapping period between the two datasets, the distribution of LMAs broadly resembles that of debt distresses, but with a relatively higher number of countries losing access in the aftermath of the global financial crises (Figure 2).<sup>13</sup>

#### 4 DEBT DISTRESS/LOSS OF MARKET ACCESS

We start our empirical investigation by concentrating on what may trigger episodes of debt distress. As already mentioned, we argue that the focus on debt levels, while certainly justified on a theoretical and empirical ground, is insufficient and that the dynamics of the

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<sup>8</sup> While the original LMA dataset has a monthly frequency, we turned it into an annual one in order to reduce noise and make it homogeneous with the dataset on debt distress episodes. In particular, we qualified each observation by country  $i$  and year  $t$  as a LMA observation if, during that year, the country suffered from a loss of market access for at least three months.

<sup>9</sup> This dataset was used by IMF staff to conduct part of the analysis underpinning a recent paper on the IMF’s lending framework and sovereign debt (see Annex III–IMF, 2016).

<sup>10</sup> Of course, several other examples of this kind exist.

<sup>11</sup> When evaluating these criteria, IMF staff took also due account whether the country was a regular or an infrequent issuer.

<sup>12</sup> In order to qualify as LMA, such deviations should not be explainable by other factors. As a result of the two-steps process, out of the 45 countries included in the dataset, 31 experienced a loss of market access at least once in the sample period.

<sup>13</sup> For further information on the datasets used in the paper, see Tables A1–A2.

(continued)



debt ratio plays a relevant role. A simple observation of the data can clarify this point.

Figure 3 (Panel A)—based on the dataset on debt distresses—plots the level of public debt (as a share of GDP) in the year before the distress episode (which occurs at  $t=0$ ) together with the change in public debt between  $t-3$  and  $t-1$  (as a share of GDP in  $t-3$ ).<sup>14</sup> The chart shows that distress episodes are spread across a wide range of debt-to-GDP ratios. In four/fifth of the cases, distress events followed increases in public debt, while just a few episodes were preceded by debt declines. There is also a notable cluster of countries that experienced distress with relatively moderate debt levels (around 30–40 percent of GDP), but following a sharp debt accumulation. To better evaluate such evidence, Panel B plots the same variables as Panel A, but based on a random draw of 40 non-distress events. In this case—and as expected—countries are rather evenly distributed between instances of, respectively, rise and decline of public debt, thereby reinforcing the intuition that being particularly correlated with periods of debt increase is a specific feature of distress episodes.

Albeit with fewer observations, the same broad evidence is confirmed also when—instead of episodes of debt distress—we focus more specifically on episodes of loss of market access as reported in the second dataset (Figure 4).

#### 4.1–Multivariate Analysis

Against this background, our empirical analysis of the relationship between distress episodes and debt levels/changes is based on two steps. Firstly, we assess whether the main determinants of debt distress as identified by the available literature—and including the level of the debt ratio—are confirmed to play a significant role also in the context of our dataset. Once verified that the same broad traditional results would apparently continue to hold, we will then move to the second stage by investigating whether the addition of the debt dynamics—so far neglected by the literature—substitutes for or, rather, integrates the list of traditional determinants of fiscal crisis/debt distress.

In doing so, we will first resort to a linear probability model (LPM) and, in a second moment, check for robustness of our results through a standard probit model. While aware of the shortcomings of the LPM, its simplicity, ease of interpretation, and good approximation of marginal probabilities—as argued for example by Angrist and Pischke (2009)—make a compelling case for its use as a starting point of the analysis before moving—also for the sake of comparison with the broader literature—to the more commonly used probit model. In addition, the LPM is more flexible when dealing with a time and country fixed effect than the probit model, which is subject to the incidental parameter bias (Lancaster 2000). Finally, it is worth noting that about 90 percent of the probabilities of debt distress predicted using the LPM are in fact bounded in the 0–1 interval.

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<sup>14</sup> Beyond unclear cases as described in Section 2, the chart excludes episodes for which there are less than two years between subsequent defaults.

We define the dependent variable as a binary indicator that identifies sovereign (external and domestic) debt distress events by country  $i$  in year  $t$ , and we estimate the following model:

$$\Pr(\text{Debt distress}_{i,t}) = \Phi(\text{DEBT}_{i,t-1}; \Delta\text{DEBT}_{(t-3,t-1)}; \text{CONTROLS}_{i,t-1})$$

where  $\Phi$  is a linear function in the case of an LPM, and a standard normal cumulative distribution function in the case of the probit model. In defining the dependent variable, only the first year of each distress event will be considered, the subsequent years—if any—of the same episode being dropped from the sample in order to avoid the post-crisis bias which can affect the estimates of what triggers a debt distress (Bussiere and Fratzscher 2006).<sup>15</sup>

The key explanatory variables of the regressions will be the level of public debt (as a share of GDP) in  $t-1$  and the change of public debt between  $t-3$  and  $t-1$ , as a ratio of initial GDP.<sup>16</sup> The choice of the set of control variables is based on the existing literature on sovereign defaults, and includes the primary balance, the level of international reserves, the current account balance (all as a share of GDP), per capita GDP, real GDP growth, inflation (measured by the GDP deflator) and the change in the exchange rate (to take into account valuation effects on the stock of public debt), all measured in  $t-1$ . In the baseline specification, we control for time-varying common shocks by including global GDP growth (in real terms) and the US 10-year interest rate; then, we also allow for a more flexible specification replacing global growth and US rates with year fixed effects.<sup>17</sup>

In line with a large strand of literature (Noy, 2004; Jorra, 2012; Aizenman and Noy, 2013), our baseline set of results is based on the estimation of a pooled model, without country fixed-effects, given that they wash out from the data much of the cross-sectional variation we are interested in (i.e. comparing countries at different level of indebtedness). The estimated coefficients have thus to be interpreted in a cross-sectional way: namely the coefficients on the debt level and debt dynamics variables will inform about the presence of significant differences in the likelihood of debt distress across countries with different levels of debt and/or a different debt trajectory. However, we will also estimate a more demanding model with country fixed effects (and then with both year and country fixed effects): in that case, coefficients can be interpreted in a within-country dimension.

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<sup>15</sup> With the unfolding of a crisis, there might well be feedbacks from a debt event to the explanatory variables on the right-hand side of the model, with a potential impact on the interpretation of their estimated coefficients. By dropping from the sample the country-year pairs after the start of a crisis—and until the crisis event is over—we follow the approach already adopted by Gourinchas and Obstfeld (2012), Catão and Milesi-Ferretti (2014), Papi *et al.* (2015), and Kaminsky and Vega-Garcia (2016).

<sup>16</sup> More precisely, to disentangle the change in the debt-to-GDP ratio due to variations in debt to the ones due to GDP growth, the change of public debt is defined as the difference between debt in  $t-1$  and debt in  $t-3$ , over GDP in  $t-3$ .

<sup>17</sup> For summary statistics and definitions of the variables used in the regressions, see Table A2.

(continued)

## 4.2–Results

Results of the LPM model are reported in Table 1. The results in column 1, which do not control neither for debt dynamics, nor for time varying common shocks and country fixed effects, are broadly in line with the literature. GDP growth and the primary balance are negatively correlated with the probability of distress, which instead increases with the level of the public debt-to-GDP ratio.<sup>18</sup> A higher income level is associated with a lower likelihood debt distress, while inflation, the level of reserves, the current account and the exchange rate are not statistically significant.

Moving to columns 2–6, results indicate that the dynamic of public debt does matter: its coefficient is always significant, including when controlling for time varying common shocks (column 3), year fixed effects (column 4), country fixed effects (column 5) and country and year fixed effects (column 6).

In particular, a 10 percentage points decrease of public debt between  $t-3$  and  $t-1$ , measured as a ratio of GDP at  $t-3$ , translates—everything else equal—into a statistically significant decrease of the probability of debt distress in the range of 2.7–3.0 percentage points, depending on the specification.<sup>19</sup> To put things in context, given that the average probability of distress in the sample is around 3.8 percent per year, a 2.7–3.0 percentage points decline is indeed quite large—corresponding to a decline in the range of 71–79 percent. An example of a hypothetical case—rather than on the average of the sample—can help appreciating the result: on the ground of results reported in column 6—which are based on the model with country and year fixed effects—for a country with a debt ratio stable at 100 percent, the estimated conditional probability of distress is in the order of 9.1 percent; if that country had been reducing its debt ratio by 5 percentage points over the course of the previous two years, its conditional probability of distress would decline to 7.5 percent (and further down to 5.9 percent if the debt ratio were to be reduced by 10 percentage points in two years).

Results of columns 2–6 confirm that the level of public debt is also significantly associated with the likelihood of distress, but the magnitude of this association is smaller than that of debt dynamics: the marginal effect indicates that a country with a debt-to-GDP ratio higher by 10 percentage points than that of another country (say 100 vs. 90 percent, for example) has a probability of distress which is 0.5–1.0 percentage points higher, depending on the specification.

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<sup>18</sup> The interpretation of the negative correlation between distress probabilities, on one side, and primary surplus and growth, on this other side, is straightforward, given the standard debt dynamics equation.

<sup>19</sup> It should be recalled that the coefficients of the LPM has a very simple interpretation as marginal probabilities: they measure that change in the probability that the dependent variable equals 1 (i.e. probability of debt distress) for a one-unit change of the explanatory variable of interest, holding everything else constant. It should also be recalled that, differently from probit models, marginal probabilities as estimated by the LPM are constant (i.e. they do not change at different values of the explanatory variables).

### 4.3–Robustness

The results obtained with the LPM are broadly confirmed when we move to a probit model, whose estimates are reported in Table 2. However, adding year and/or country fixed-effects (columns 4–6) imposes a reduction of the sample size in the probit estimates, given that years and country with no crisis are dropped from the sample as there is no within-year or within-country variability. This is another reason for which we report the LPM estimates as our baseline set of results.

Focusing on column 3—which is our preferred specification given the loss of observations when controlling for country and year fixed effects—it emerges that a decrease of public debt between  $t-3$  and  $t-1$  of 10 percentage points with respect to initial GDP translates into a statistically significant decrease of the probability of distress of about 1.6 percentage points. While smaller than the one estimated with the LPM, such a decrease remains significant and quite sizeable. In fact, when compared with the average probability of default in the sample (3.8 percent per year), it still represents a 42 percent decline.<sup>20</sup>

Results of Table 2 also confirm that the association of the level of public debt with the likelihood of debt distress is significant and smaller than that of debt dynamics. Considering again the case of a country with a debt-to-GDP of 100 percent, the average partial effect indicates that the probability of distress is 0.3 (column 3) percentage points higher than a country with a debt at 90 percent of GDP.

Figure 5 illustrates the average partial effects also for other selected variables. Furthermore, Figure 6 provides a visual representation of the effect of debt levels and debt dynamics on the probability of debt distress: while debt level clearly matters for debt sustainability, the role of debt dynamics is also important and it becomes even more important at relatively high levels of debt. Comparing two countries with the same debt-to-GDP ratio (100 percent, for example), but one with debt declining by 5 percent of initial GDP over the previous two years (lower curve) and the second one with debt increasing by 5 percent of initial GDP over the same time interval (upper curve), Figure 6 shows that the former has a probability of debt distress which is more than 3 percentage points lower than the latter.

To test the robustness of our key finding about the importance of debt dynamics and avoid that its coefficient picks up the effect of some omitted variable, we augmented the model controlling for other possible drivers of debt distress episodes. Since the inclusion of additional controls comes at the cost of reducing the sample size, we add those variables one

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<sup>20</sup> If we consider the same hypothetical example illustrated in the case of the LPM of a country with a debt ratio stable at 100 percent, the results of the probit model (in this case without country and year fixed effects) indicate that the estimated conditional probability of distress would be in the order of 4.1 percent and that—should that country reduce its debt ratio by 5 percentage points over the course of two years—its conditional probability of distress would decline to 2.6 percent.

(continued)

at the time. In particular, we control for: 1) the degree of political stability (which may also be interpreted as a proxy for the quality of institutions); 2) gross financing needs; 3) the presence of an IMF-supported program signed in the previous year; 4) episodes of debt defaults in the previous 5 years. Results are reported in Table 3 (columns 1–4); they do not show any significant effect of these additional control variables. More importantly, the inclusion of these variables does not affect the coefficient on debt dynamics, apart when gross financings need are included though this is due to the consequent reduction in sample size.<sup>21</sup>

Restricting the sample to the post–1990 period, so to avoid the Latin-American debt crisis, does not alter our main findings (column 5). One could also argue that the effect of a change in debt could be driven by episodes of debt restructurings; in column 6 we thus drop such episodes from the sample and find that debt dynamics continues to matter (the same holds true when excluding debt restructuring episodes in the previous 5 years).

We also tested whether the effect of a change in debt could depend on whether debt is increasing or decreasing. We explicitly test this hypothesis in column 7, splitting the coefficient on debt dynamics between positive and negative changes. Results indicate that the dynamic of public debt matters irrespective of debt increasing or declining, although the coefficient on the change in the debt ratio is significantly higher when the ratio is increasing than when it is declining. This means that an increasing debt-to-GDP ratio is really what matters for debt distress events, which is consistent with the fact that crisis mostly occur when public debt is not just high, but also rising (Figure 3). However, this does not imply that countries should just aim at stabilizing debt at high levels. A declining debt (at a certain speed) not only lowers the likelihood of a crisis with respect to a situation in which debt is constant (although not by a huge amount); it also makes a country resilient to shocks that would, otherwise, lead to a rise in the debt ratio and, thus, to an increase in the likelihood of market distress.

As a further element of reflection, starting from the specification of column 3 in Table 1, we have tried to explore possible non-linear effects of debt. The inclusion of debt-to-GDP and its squared term indicates the presence of a U-shaped curve, which is statistically significant, with a minimum at about 30 percent. In that sense, when the debt-to-GDP ratio exceeds the 30 percent threshold, its marginal effect on the probability of default is increasing with the level of indebtedness, confirming that dynamics matter. By contrast, we do not find any robust evidence of a differential effect of debt dynamics conditional on the initial level of the debt-to-GDP ratio.<sup>22</sup>

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<sup>21</sup> The lack of significance of the gross financing needs and the fact that the debt dynamics variable is not significant in the same small sample even excluding gross financing needs would rule out the fact that a rollover risk rather than an increasing debt is triggering a distress episode.

<sup>22</sup> Results are not shown, but they are available upon request from the authors.

Finally, we tested for the presence of outliers that may drive the results—and especially the key coefficients on debt dynamics—running a set of regressions as the one reported in column 3 of Table 1 dropping either one country or one year at the time. The estimated coefficient on the debt dynamics variable and the associated 90 percent confidence intervals are plotted in Figure A1, which shows that the coefficient is pretty stable over the two jackknife samples.

## 5 RETURN TO MARKET

We now move on to investigate the role played by the level and dynamics of debt in regaining market access once access has been lost. In these circumstances, the need for countries to correct the fiscal stance in order to make it sustainable would presumably imply that the return to market access at least requires the debt ratio not to be rising. The question is whether it is also required that the debt ratio falls below a certain level, in particular the level at which market was lost, or whether it is sufficient for the debt ratio to be decreasing (may be at a certain speed).

We define market re-access as the first year after the end of a debt distress episode, as defined in Section 3. Preliminary graphical inspection suggests that for a return to market access it is not necessarily required that the debt ratio falls below a certain level, and—in particular—the level at which market access had been lost—or an even lower one. Actually, Figure 7, Panel A—which is based on the dataset on LMAs—shows that in nearly half of the cases, re-access occurred at significantly higher levels. While this appears to be particularly evident for countries whose debt ratio at the time of the loss of market access was in the 25 to 50 percent range, it also applies to cases—and particularly relevant ones—characterized by a much higher initial debt ratio. Albeit less striking, also Panel B—which is based on the dataset on debt distresses—indicates that having the debt ratio decreasing below a certain level is not a necessary pre-condition for a return to ‘normal’ times.

Besides, like for market loss, also for market re-access the dynamics of the debt ratio seems to play a non-negligible—and symmetrical role. Figure 8, Panel A—based on the dataset on debt distress—suggests that a declining debt ratio appears to have generally increased the possibilities of exiting from a situation of debt distress (most observations are below the zero line), hence presumably enhancing the willingness of markets to re-purchase a country’s debt. The evidence is less clear-cut in Panel B which, however—being based on the dataset on LMAs—has to rely on much fewer observations.

### 5.1–Multivariate Analysis

Like for market losses, also in this case we resorted to both an LPM and a probit model for our empirical analysis. Clearly, the definition of the binary dependent variable is now different as it identifies the year of the return to the market—by country  $i$  in year  $t$ —once

access had been lost. More specifically—and likewise the approach adopted for market losses—only the first year of each market re-entry has been considered, while the subsequent access years have been dropped to avoid that estimated coefficients be somehow impacted by potential feedbacks from market re-access to the explanatory variables.

This research design is explicitly aimed at looking at the episodes of market re-access, but it has two limitations. First, it is silent about the factors that would contribute to sustain market access in a durable way over the medium-long term.<sup>23</sup> Second, the empirical strategy led to a sizeable reduction of the sample (to less than 400 observations) and additional caution is needed in the interpretation of results. One reason is that we had to restrict the analysis only to countries that experienced market losses, as measured by a debt distress episode. A second reason is that, being the periods of market access generally rather prolonged, dropping all the years subsequent to market re-entry implies a notable loss of observations. As a result, our sample shrank considerably

The key explanatory variables of the regressions continue to be the level of public debt (as a share of GDP) in  $t-1$  and the change of public debt between  $t-3$  and  $t-1$ . Also the choice of the set of control variables is similar to that used for the analysis of market losses. Results of the LPM model are reported in Table 4.

The most striking result is the statistical significance and the role played by debt dynamics. Continuing along the lines of the example we made for market losses, it is worth noting that—according to the estimates—a 10 percentage points decrease of the public debt ratio between  $t-3$  and  $t-1$ , calculated with respect to initial GDP, implies—everything else equal—an increase of the probability of market re-access in the range of 4.3–4.8 percentage points. Considering that—once market had been lost—the average probability of re-access in the sample is around 13.8 percent per year, a 4.4–4.8 percentage points increase corresponds to a rise of around 31–35 percent. To put it in other terms, should a country without market access and with a 100 percent debt ratio reduce its debt-to-GDP by 5 percentage points over the course of the previous two years, its conditional probability of market re-access would increase by around 1.6 percent, from 4.4 to 6.2 percent, which is rather sizeable.

It is also worth noting that, differently from the case of market losses, the introduction of debt dynamics in the model makes the coefficient on the level of public debt no more statistically significant, even though it maintains the correct sign, indicating a negative correlation between the debt-to-GDP ration and the probability of re-access. The result may point to a lesser role of the level of public debt in determining re-access than in triggering market loss/debt distress, thereby confirming the evidence emerged from the graphical

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<sup>23</sup> However, we focus on sustained episodes of market re-access and we ignore short periods of market access (between one and three years) that are preceded and followed by debt distress years. In other words, we consider consecutive years of debt distress separated by three or less years of tranquil period as a unique episode of debt distress. Another reason for this choice is to avoid the fact that our key explanatory variable—the change on debt between  $t-3$  and  $t-1$ —may be affected by past distress episodes.

(continued)

inspection that for a return to market access it is not necessarily required for the debt ratio to fall below a specific level. Granted, when controlling for year fixed effects, the level of debt remains significant to the detriment of debt dynamics but, as said, controlling for fixed effects with such a small number of observations may lead to spurious results.<sup>24</sup> In any case, the magnitude of the association of the debt level with the likelihood of market re-access would remain rather small: according to the estimated marginal effect, a country with a debt-to-GDP ratio lower by 10 percentage points than that of another country has a probability of re-accessing the market which is around 2 percentage points higher (Table 4, column 4).

Among the remaining variables, it is most surprising—also when compared to the results for market losses—that real GDP growth seems not to contribute significantly to the probability of a return to ‘normal’ times and market access. But again, the reduced dimension of the sample may play a role also in this case.

## 5.2–Robustness

The results obtained with the LPM are largely confirmed—once again—by the probit model (Table 5) with an average partial effect of the debt dynamics on the probability of re-access broadly similar to that estimated with the LPM (the same goes also for the debt level). Interestingly, the probit estimates show that both the level and the dynamic of public debt matter for market re-access, once we control for country fixed-effects.

Similar to what showed when discussing the loss of market access, Figure 9 illustrates the average partial effects also for other selected variables, and the growth of the debt-to-GDP ratio emerges as a key factor associated with the likelihood of regaining market access. Finally, Figure 10 plots the estimated probability of market re-access as a function of debt levels and for situations in which public debt is decreasing, flat, or increasing. In this case while the level of debt seems to matter for market re-access, it is clear that debt dynamics plays a dominant role: for example, a country with a debt at 100 percent of GDP, but that declined by 5 percent of initial GDP over the previous two years (upper curve) has a similar probability of market re-access of another country with a much lower debt (10 percent of GDP) but on a rising path (5 percentage points in the previous two years; lower curve).

In Table 6 we report a set of additional results in which we augmented the model with a set of other macroeconomic controls, which have been excluded in the baseline specification (columns 1–5). We do not find that they significantly affect the likelihood of market re-access; the coefficient on debt dynamics remains negative and statistically significant. As done when looking at the loss of market access, we allow for an asymmetric effect of the change in debt. Results indicate that the effect of debt dynamics is driven by episodes of debt reduction, which are significantly associated with a higher probability to re-access the market (column 6). Again, one could interpret these findings on the role of debt dynamics as driven by large episodes of debt restructuring, which lower debt and facilitate access to international

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<sup>24</sup> The same holds true when adding country fixed effects. Results are available upon request.



capital markets (Asonuma and Trebesch 2016). However, our baseline results hold even in a restricted sample that exclude the episodes of debt restructuring (column 7, we find a similar result if we exclude episodes of debt restructuring in the previous five years).

## 6 CONCLUSIONS AND POLICY IMPLICATIONS

The main conclusion from the empirical analysis presented in this paper is that assessing the likelihood of loss of market access, as well as the one of market re-entry, without considering the dynamics of the public debt-to-GDP ratio is likely to lead to wrong policy conclusions. Debt dynamics does matter and – together with the level of public debt—it matters in a major way in affecting both the probability of loss of market access and of regaining it. This result is robust under various model specifications and sample features. In particular, our evidence shows that a decreasing debt-to-GDP ratio is associated with a lower probability of events of sovereign debt distress, particularly with respect to a scenario in which the debt ratio is increasing, and with a higher probability of market re-access once access has been lost, both across and within countries.

This is good news in a world in which public debt ratios have, particularly in many advanced economies, reached unprecedented levels after the 2008–09 global economic and financial crisis. These levels have prompted many observers to conclude that some “cold turkey” intervention to reduce public debt-to-GDP ratio – notably a massive fiscal tightening or a major debt restructuring—is necessary if countries want to free themselves from the persistent exposure to a public debt crisis or, for those who have lost market access, if they want to regain it. But massive fiscal tightening can backfire, economically and politically, and debt restructuring operations are risky and costly (Brooks and Lombardi 2015), particularly when debt is held by private domestic investors who suffer a sizable wealth loss (see Reinhart *et al.* 2015 for a discussion of policy options to reduce public debt).

This paper shows that the risk of losing market access is significantly lower when the debt-to-GDP ratio starts declining, especially if it is considered that a declining debt ratio makes a country resilient to shocks that would otherwise lead to an increase in debt (and, as we have shown, it is really the combination of high and increasing debt that triggers crises). Moreover, a declining debt ratio is significantly associated with the likelihood of re-entry. All this evidence bodes well for the possibility of fiscal adjustment policies based on gradual declines in the debt-to-GDP ratio (see Mauro and Zilinski 2016 for a similar conclusion). However, one should keep in mind that a protracted fiscal adjustment would still be necessary for this kind of policy to be successful in bringing down the probability of debt distress, especially if a country starts from high debt levels.

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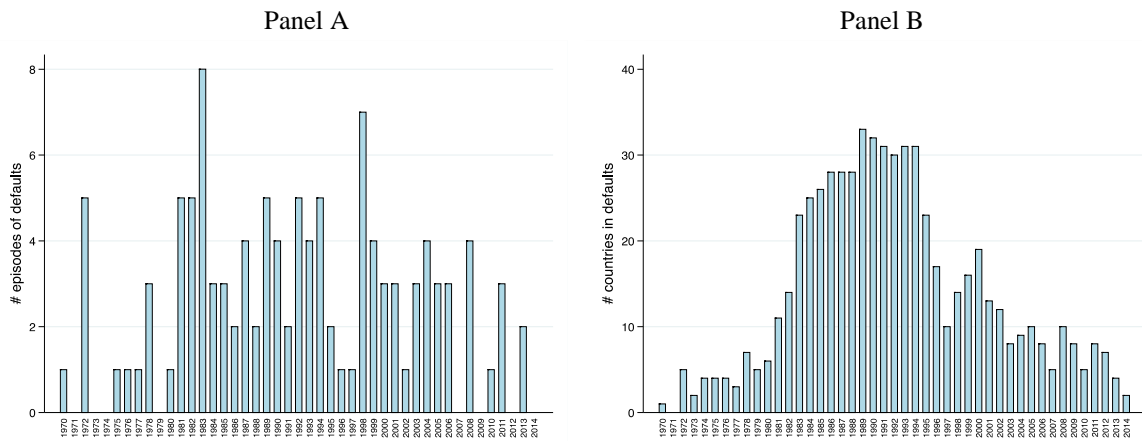
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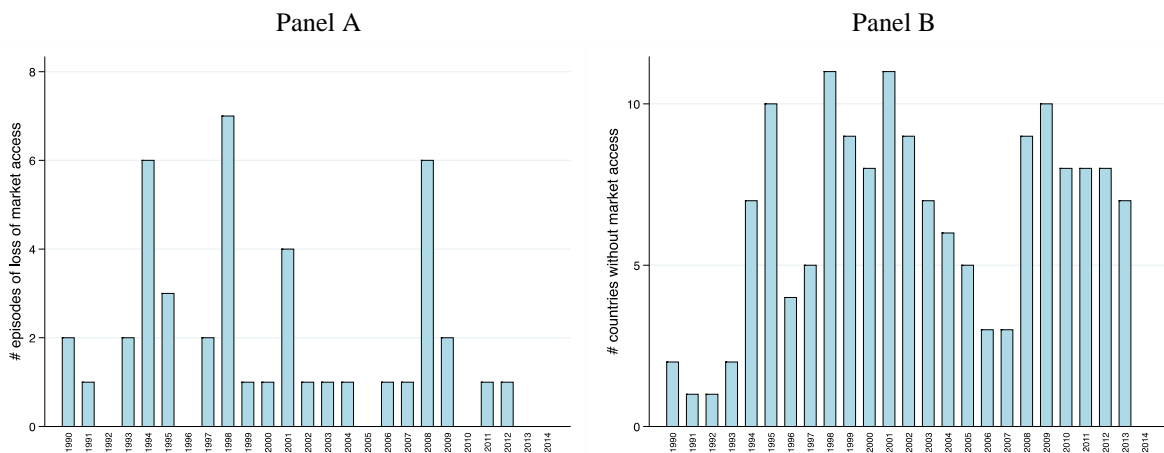
## Figures

Figure 1. Sovereign debt distresses, by number of episodes and countries 1970–2014



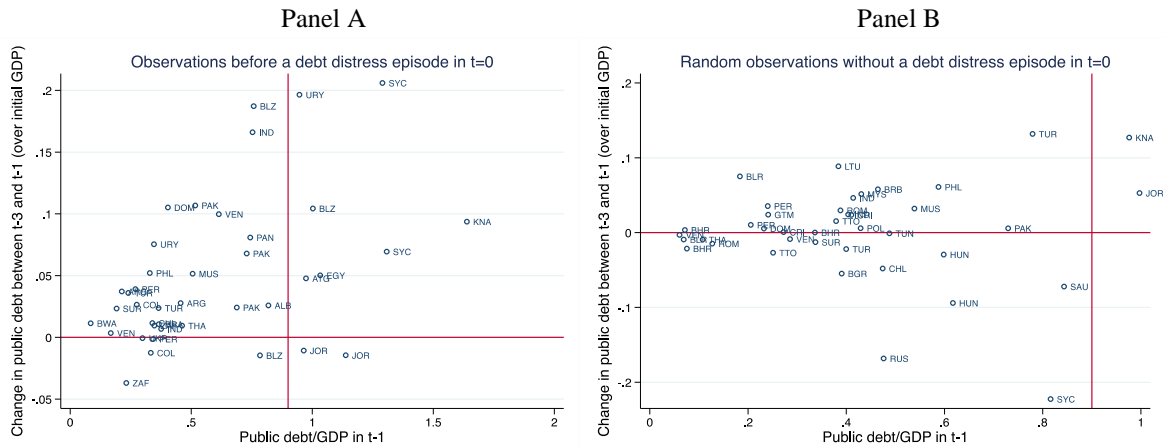
Notes: the charts report the number of debt distress episodes (panel A) and of countries in debt distress (panel B) in emerging markets, by year.

Figure 2. Sovereign losses of market access, by number of episodes and countries 1990–2013



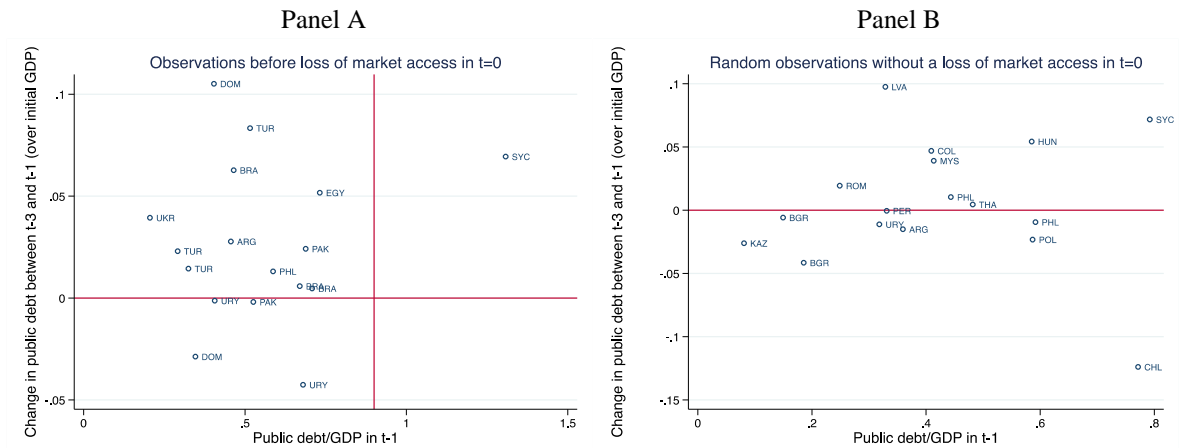
Notes: the charts report the number of episodes of loss of market access (panel A) and of countries without market access (panel B), by year, for advanced economies and emerging markets.

Figure 3. Public debt levels and dynamics before debt distress events



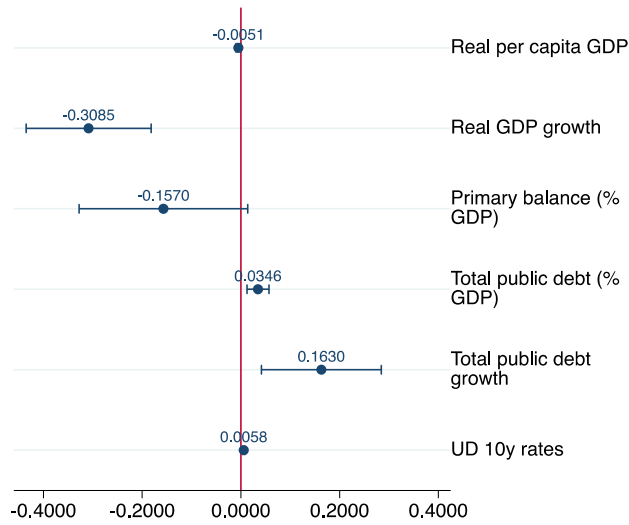
Notes: Panel A reports a scatter of debt default episodes, plotting the change in public debt in the previous two years (i.e. between  $t-3$  and  $t-1$ , as a share of initial GDP) over the level of the initial public debt-to-GDP ratio. Panel B plots the same variables but for a random sample of 40 non-default episodes. The vertical line corresponds to the 90 percent debt-to-GDP ratio (often indicated as a relevant debt threshold), while the horizontal line separates positive and negative changes in the debt ratios.

Figure 4. Public debt levels and dynamics before losses of market access



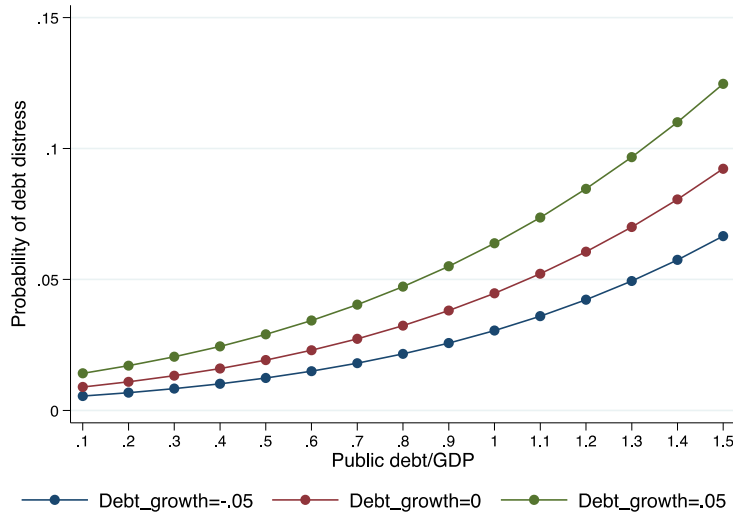
Notes: Panel A reports a scatter of loss of market access episodes, plotting the change in public debt in the previous two years (i.e. between  $t-3$  and  $t-1$ , as a share of initial GDP) over the level of the initial public debt-to-GDP ratio. Panel B plots the same variables but for a random sample of 17 episodes of market access. The vertical line corresponds to the 90 percent debt-to-GDP ratio (often indicated as a relevant debt threshold), while the horizontal line separates positive and negative changes in the debt ratios.

Figure 5. Average partial effects, selected variables



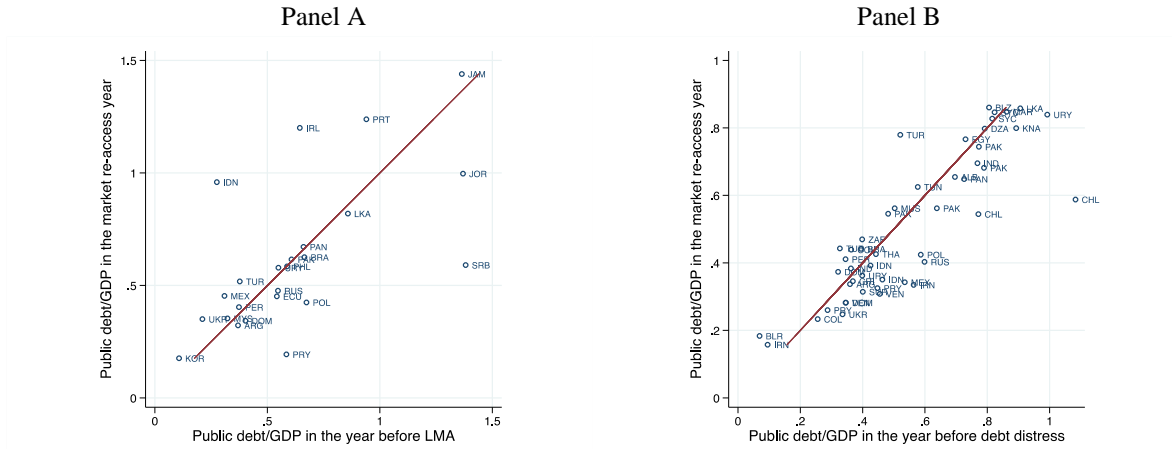
Notes: based on estimates reported in Table 2, column 3. The chart reports the point estimate of the average partial effects for selected variables and the associated 90 percent confidence interval. The average default probability is 0.038.

Figure 6. Debt distress, debt levels, and debt dynamics



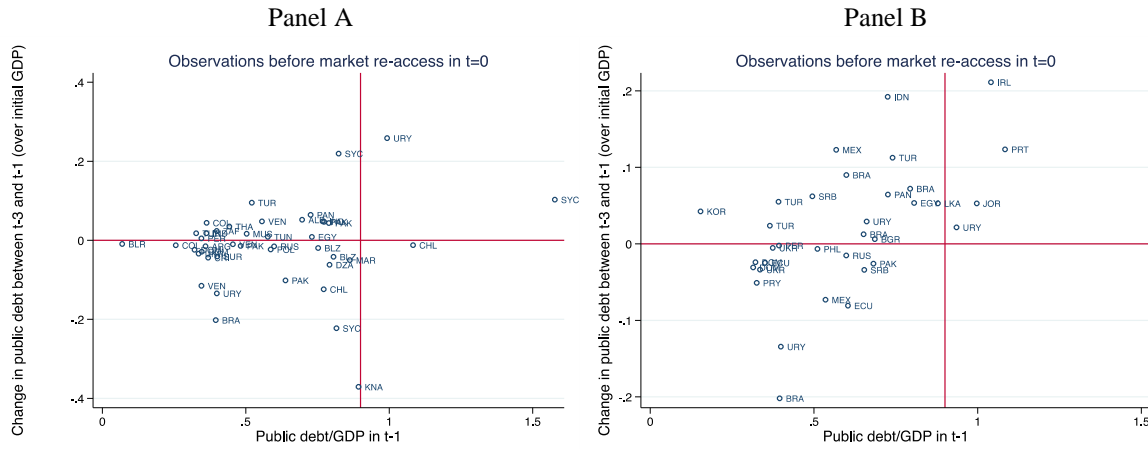
Notes: based on estimates reported in Table 2, column 3. The chart reports the estimated probability of debt distress as a function of the public debt-to-GDP ratio in year  $t-1$ , for three different levels of changes in debt (-5 percent, 0 percent, and +5 percent of initial GDP, calculated between  $t-3$  and  $t-1$ ).

Figure 7. Market access and the level of public debt



Notes: the charts report the public debt-to-GDP ratio in the year of market re-access as a function of the debt ratios in the year before the loss of market access (Panel A) and in the year of debt distress (Panel B).

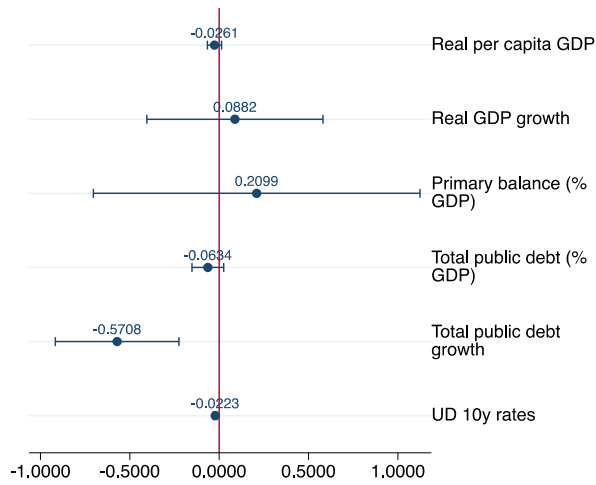
Figure 8. Public debt levels and dynamics before market re-access



Notes: the charts report a scatter of market re-access episodes, plotting the change in public debt in the previous two years (i.e. between  $t-3$  and  $t-1$ , as a share of initial GDP) over the level of the public debt-to-GDP ratio in the year before market re-access. Panel A consider the debt distress episodes to define loss of market access and re-access, while Panel B directly uses the dataset on loss of market access. The vertical line corresponds to the 90 percent debt-to-GDP ratio (often indicated as a relevant debt threshold), while the horizontal line separates positive and negative changes in the debt ratios.

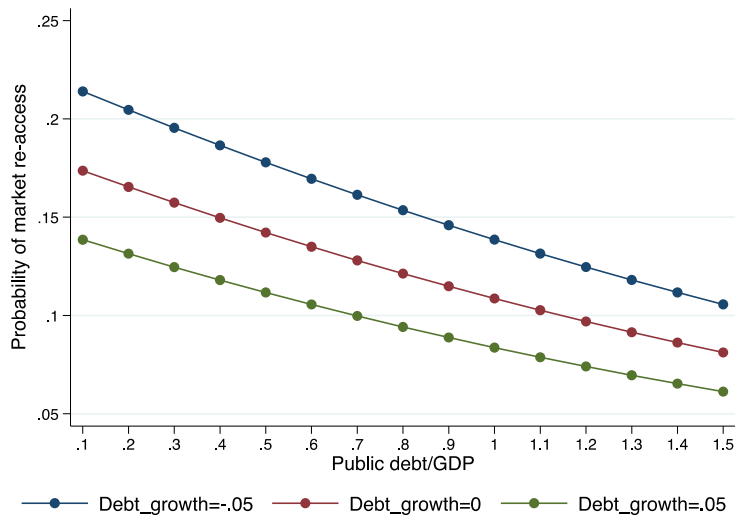


Figure 9. Average partial effects, selected variables



Notes: based on estimates reported in Table 5, column 2. The chart reports the point estimate of the average partial effects for selected variables and the associated 90 percent confidence interval. The average probability of market re-access is 0.138.

Figure 10. Market re-access, debt levels, and debt dynamics



Notes: based on estimates reported in Table 5, column 2. The chart reports the estimated probability of market re-access as a function of the public debt-to-GDP ratio in year  $t-1$ , for three different levels of changes in debt (-5 percent, 0 percent, and +5 percent of initial GDP, calculated between  $t-3$  and  $t-1$ ).

## Regression tables

Table 1. Determinants of debt distress/loss of market access—Linear probability estimates

Dep. Var.: Debt distress (0/1)	(1)	(2)	(3)	(4)	(5)	(6)
Log of real GDP pc (t-1)	-0.0125** (0.0060)	-0.0150** (0.0062)	-0.0058 (0.0065)	-0.0040 (0.0061)	0.0117 (0.0448)	0.0110 (0.0502)
Real GDP growth (t-1)	-0.5615** (0.2582)	-0.6145** (0.2556)	-0.6327** (0.2490)	-0.6415** (0.2430)	-0.7779*** (0.2625)	-0.8056*** (0.2522)
Primary balance over GDP (t-1)	-0.3324** (0.1652)	-0.0844 (0.1793)	-0.1032 (0.1892)	-0.1812 (0.1870)	-0.0438 (0.2447)	-0.1241 (0.2444)
Reserve over GDP (t-1)	-0.0921 (0.0697)	-0.0762 (0.0694)	0.0166 (0.0642)	0.0206 (0.0607)	0.0228 (0.1118)	0.0540 (0.1042)
Current account balance over GDP (t-1)	0.0230 (0.0733)	0.0009 (0.0750)	0.0093 (0.0766)	0.0381 (0.0696)	-0.0850 (0.1531)	-0.0582 (0.1297)
Deflator (t-1)	-0.0187 (0.0313)	0.0020 (0.0308)	-0.0189 (0.0342)	-0.0008 (0.0275)	-0.0295 (0.0380)	-0.0133 (0.0299)
Change in exchange rate (t-1)	0.0283 (0.0320)	0.0105 (0.0287)	0.0102 (0.0340)	0.0014 (0.0306)	0.0021 (0.0370)	-0.0101 (0.0331)
Public debt over GDP (t-1)	0.0777** (0.0329)	0.0526** (0.0260)	0.0669** (0.0250)	0.0788*** (0.0242)	0.0819** (0.0368)	0.0983*** (0.0313)
Change in public debt over GDP between t-3 and t-1		0.2786*** (0.0961)	0.2975*** (0.1001)	0.3061*** (0.1068)	0.2869** (0.1198)	0.3010** (0.1247)
US 10year rate			0.0129*** (0.0029)		0.0150*** (0.0044)	
World growth			-0.0027 (0.0032)		-0.0020 (0.0035)	
Observations	1,052	1,052	1,052	1,052	1,052	1,052
R <sup>2</sup>	0.0502	0.0502	0.0698	0.1761	0.1080	0.2153
Country FE	No	No	No	No	Yes	Yes
Year FE	No	No	No	Yes	No	Yes

Notes: based on the dataset on episodes of debt distress. The table reports the regression coefficients and, in brackets, the associated standard errors, clustered by country. \* significant at 10 percent; \*\* significant at 5 percent; \*\*\* significant at 1 percent. A constant is included.

Table 2. Determinants of debt distress/loss of market access—probit estimates

Dep. Var.: Debt distress (0/1)	(1)	(2)	(3)	(4)	(5)	(6)
Log of real GDP pc (t-1)	-0.0094*** (0.0034)	-0.0106*** (0.0039)	-0.0051* (0.0029)	-0.0040 (0.0044)	-0.0002 (0.0407)	0.0392 (0.0466)
Real GDP growth (t-1)	-0.3392*** (0.1029)	-0.3398*** (0.0973)	-0.3085*** (0.0770)	-0.4563*** (0.1130)	-0.6306*** (0.1126)	-0.6715*** (0.1978)
Primary balance over GDP (t-1)	-0.3361*** (0.1292)	-0.1875 (0.1304)	-0.1570 (0.1038)	-0.2648** (0.1245)	-0.1555 (0.2315)	-0.0631 (0.2212)
Reserve over GDP (t-1)	-0.0711 (0.0845)	-0.0565 (0.0836)	0.0147 (0.0566)	0.0338 (0.0722)	-0.0615 (0.2012)	-0.1019 (0.2018)
Current account balance over GDP (t-1)	-0.0396 (0.0580)	-0.0310 (0.0583)	-0.0174 (0.0519)	0.0001 (0.0608)	-0.1307 (0.1616)	-0.0682 (0.1217)
Deflator (t-1)	-0.0048 (0.0150)	0.0021 (0.0154)	-0.0085 (0.0138)	-0.0360 (0.0348)	-0.0213 (0.0209)	-0.0524 (0.0450)
Change in exchange rate (t-1)	0.0078 (0.0112)	0.0028 (0.0106)	0.0046 (0.0104)	0.0242 (0.0249)	-0.0073 (0.0184)	0.0230 (0.0316)
Public debt over GDP (t-1)	0.0409*** (0.0151)	0.0264 (0.0163)	0.0346** (0.0136)	0.0470** (0.0189)	0.0862** (0.0362)	0.1127** (0.0458)
Change in public debt over GDP between t-3 and t-1		0.1846** (0.0817)	0.1630** (0.0739)	0.2265** (0.0935)	0.2243* (0.1147)	0.3136** (0.1240)
US 10year rate			0.0058*** (0.0013)		0.0089*** (0.0026)	
World growth			-0.0003 (0.0023)		0.0005 (0.0040)	
Observations	1,052	1,052	1,052	687	640	405
Country FE	No	No	No	No	Yes	Yes
Year FE	No	No	No	Yes	No	Yes
Pseudo R <sup>2</sup>	0.150	0.148	0.191	0.296	0.224	0.368
Log-Likelihood	-156.4	-150.3	-142.6	-111.3	-120.2	-85.28
AIC	330.8	320.5	309.3	290.6	262.4	222.6
BIC	375.6	370.1	368.8	444.7	311.5	326.7
AUROC	0.803	0.797	0.829	0.881	0.841	0.905
s.e.	0.0344	0.0349	0.0307	0.0239	0.0268	0.0190

Notes: based on the dataset on episodes of debt distress. The table reports the average partial effects and, in brackets, the associated standard errors, clustered by country. \* significant at 10 percent; \*\* significant at 5 percent; \*\*\* significant at 1 percent. A constant is included. The AUROC is a measure of overall predictive accuracy of the model. An uninformative model would have a value of 0.5; a perfect predictor would have a value of 1.

Table 3. Determinants of debt distress/loss of market access, LPM—additional results

Dep. Var.: Debt distress (0/1)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log of real GDP pc (t-1)	-0.0045 (0.0074)	-0.0030 (0.0062)	-0.0038 (0.0061)	-0.0067 (0.0071)	-0.0083 (0.0064)	-0.0041 (0.0059)	-0.0069 (0.0064)
Real GDP growth (t-1)	-0.4162** (0.1910)	-0.1357 (0.2336)	-0.6020** (0.2486)	-0.6282** (0.2480)	-0.4035* (0.2288)	-0.2550 (0.2166)	-0.6246** (0.2469)
Primary balance over GDP (t-1)	0.0105 (0.2008)	0.0007 (0.2772)	-0.1230 (0.1917)	-0.1009 (0.1915)	-0.0413 (0.1725)	-0.1870 (0.1782)	-0.0849 (0.1909)
Reserve over GDP (t-1)	0.0350 (0.0608)	0.0451 (0.0953)	0.0189 (0.0635)	0.0149 (0.0681)	0.0416 (0.0597)	0.0438 (0.0585)	0.0134 (0.0652)
Current account balance over GDP (t-1)	0.0430 (0.0786)	0.0150 (0.0672)	0.0275 (0.0840)	0.0120 (0.0783)	0.0028 (0.0714)	0.0106 (0.0654)	0.0127 (0.0794)
Deflator (t-1)	-0.0151 (0.0294)	-0.0580 (0.0765)	-0.0208 (0.0342)	-0.0183 (0.0343)	0.0198 (0.0279)	-0.0162 (0.0261)	-0.0244 (0.0339)
Change in exchange rate (t-1)	0.0105 (0.0365)	0.1569 (0.1048)	0.0074 (0.0331)	0.0102 (0.0342)	-0.0032 (0.0335)	0.0109 (0.0297)	0.0136 (0.0338)
Public debt over GDP (t-1)	0.0343 (0.0308)	0.0923* (0.0462)	0.0689*** (0.0252)	0.0715*** (0.0266)	0.0734*** (0.0251)	0.0717*** (0.0220)	0.0510 (0.0305)
Change in public debt over GDP between t-3 and t-1	0.2075** (0.0980)	0.2046 (0.1443)	0.2917*** (0.0981)	0.2846*** (0.0951)	0.2973*** (0.1010)	0.2567** (0.1004)	
US 10year rate	0.0110** (0.0043)	0.0069 (0.0052)	0.0126*** (0.0029)	0.0130*** (0.0030)	0.0089** (0.0044)	0.0103*** (0.0028)	0.0126*** (0.0029)
World growth	-0.0025 (0.0029)	-0.0044 (0.0032)	-0.0028 (0.0033)	-0.0026 (0.0033)	-0.0031 (0.0025)	-0.0006 (0.0031)	-0.0030 (0.0033)
Political stability	-0.0009 (0.0009)						
Gross financing needs		-0.0744 (0.1029)					
Past IMF program			0.0343 (0.0242)				
Past default				-0.0102 (0.0211)			
Change in public debt over GDP between t-3 and t-1, negative							0.1426* (0.0815)
Change in public debt over GDP between t-3 and t-1, positive							0.5367* (0.2955)
Observations	815	669	1,052	1,052	883	1,043	1,052
R <sup>2</sup>	0.0471	0.0573	0.0728	0.0702	0.0528	0.0523	0.0717
Country FE	No	No	No	No	No	No	No
Year FE	No	No	No	No	No	No	No
Sample	1972-2014	1972-2014	1972-2014	1972-2014	1990-2014	Exc. restruct	1972-2014

Notes: based on the dataset on episodes of debt distress. The table reports the regression coefficients and, in brackets, the associated standard errors, clustered by country. \* significant at 10 percent; \*\* significant at 5 percent; \*\*\* significant at 1 percent. A constant is included.

Table 4. Determinants of market re-access—Linear probability models

Dep. Var.: Market re-access (0/1)	(1)	(2)	(3)	(4)
Log of real GDP pc (t-1)	-0.0185 (0.0261)	-0.0215 (0.0266)	-0.0164 (0.0318)	0.1066 (0.1459)
Real GDP growth (t-1)	0.1660 (0.2808)	0.0695 (0.2697)	0.1932 (0.2799)	0.1028 (0.2566)
Primary balance over GDP (t-1)	0.6492 (0.4830)	0.3244 (0.5317)	0.2351 (0.6345)	0.1057 (0.7422)
Public debt over GDP (t-1)	-0.1185** (0.0462)	-0.0598 (0.0590)	-0.0500 (0.0644)	-0.2079** (0.0929)
Change in public debt over GDP between t-3 and t-1		-0.4790** (0.2006)	-0.4268** (0.1897)	-0.4268 (0.2596)
US 10year rate (t)	-0.0241*** (0.0057)	-0.0210*** (0.0058)		-0.0279*** (0.0096)
World growth (t)	0.0007 (0.0177)	0.0071 (0.0168)		0.0119 (0.0179)
Observations	370	370	370	370
R <sup>2</sup>	0.0468	0.0590	0.1956	0.1419
Country FE	No	No	No	Yes
Year FE	No	No	Yes	No

Notes: based on the dataset on episodes of debt distress. The table reports the regression coefficients and, in brackets, the associated standard errors, clustered by country. \* significant at 10 percent; \*\* significant at 5 percent; \*\*\* significant at 1 percent. A constant is included.

Table 5. Determinants of market re-access—Probit models

Dep. Var.: Market re-access (0/1)	(1)	(2)	(3)	(4)
Log of real GDP pc (t-1)	-0.0238 (0.0243)	-0.0261 (0.0243)	-0.0239 (0.0405)	0.0235 (0.1354)
Real GDP growth (t-1)	0.1971 (0.3097)	0.0882 (0.2997)	0.2123 (0.4759)	0.3181 (0.2867)
Primary balance over GDP (t-1)	0.6341 (0.5034)	0.2099 (0.5556)	0.1515 (0.7838)	-0.2239 (0.6228)
Public debt over GDP (t-1)	-0.1090** (0.0480)	-0.0634 (0.0539)	-0.0836 (0.0872)	-0.2326** (0.0962)
Change in public debt over GDP between t-3 and t-1		-0.5708*** (0.2105)	-0.7536** (0.3020)	-0.5651** (0.2468)
US 10year rate (t)	-0.0257*** (0.0064)	-0.0223*** (0.0065)		-0.0325*** (0.0104)
World growth (t)	0.0006 (0.0171)	0.0080 (0.0156)		0.0113 (0.0153)
Observations	370	370	258	339
Country FE	No	No	No	Yes
Year FE	No	No	Yes	No
Pseudo R-squared	0.0632	0.0842	0.148	0.189
log-Likelihood	-139	-135.9	-109.3	-116.5
AIC	292	287.8	282.6	246.9
BIC	319.4	319.1	396.3	273.7
AUROC	0.353	0.345	0.235	0.285
s.e.	0.0354	0.0350	0.0329	0.0313

Notes: based on the dataset on episodes of debt distress. The table reports the average partial effects and, in brackets, the associated standard errors, clustered by country. \* significant at 10 percent; \*\* significant at 5 percent; \*\*\* significant at 1 percent. A constant is included. The AUROC is a measure of overall predictive accuracy of the model. An uninformative model would have a value of 0.5; a perfect predictor would have a value of 1.

Table 6. Determinants of market re-access, LPM—additional results

Dep. Var.: Market re-access (0/1)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log of real GDP pc (t-1)	-0.0201 (0.0268)	-0.0253 (0.0283)	-0.0300 (0.0256)	-0.0207 (0.0270)	-0.0214 (0.0261)	-0.0247 (0.0250)	-0.0081 (0.0395)
Real GDP growth (t-1)	-0.1261 (0.2883)	-0.1581 (0.2804)	0.1660 (0.2734)	0.0743 (0.2789)	0.0742 (0.2738)	0.0652 (0.2975)	0.2075 (0.3337)
Primary balance over GDP (t-1)	0.3444 (0.5368)	0.4552 (0.5811)	0.3555 (0.5456)	0.2969 (0.5035)	0.3195 (0.5324)	0.1653 (0.5499)	0.6565 (0.6914)
Public debt over GDP (t-1)	-0.0665 (0.0607)	-0.0507 (0.0593)	-0.0349 (0.0620)	-0.0559 (0.0589)	-0.0604 (0.0597)	-0.0978* (0.0542)	-0.0333 (0.0784)
Change in public debt over GDP between t-3 and t-1	-0.4662** (0.2012)	-0.4525** (0.2106)	-0.4832** (0.2076)	-0.4825** (0.2033)	-0.4800** (0.2045)		-0.5782*** (0.2084)
US 10year rate	-0.0194*** (0.0061)	-0.0200*** (0.0061)	-0.0209*** (0.0066)	-0.0209*** (0.0057)	-0.0211*** (0.0056)	-0.0217*** (0.0060)	
World growth	0.0060 (0.0173)	0.0058 (0.0173)	0.0056 (0.0169)	0.0068 (0.0170)	0.0071 (0.0167)	0.0068 (0.0167)	
Deflator (t-1)	-0.0300 (0.0319)						
Change in exchange rate (t-1)		-0.0198 (0.0148)					
Reserve over GDP (t-1)			0.0088 (0.2969)				
Current account balance over GDP (t-1)				0.0502 (0.2705)			
Past IMF program					0.0030 (0.0408)		
Change in public debt over GDP between t-3 and t-1, negative						-1.3187** (0.5205)	
Change in public debt over GDP between t-3 and t-1, positive						-0.1099 (0.2194)	
Observations	356	331	349	370	370	370	305
R <sup>2</sup>	0.0560	0.0604	0.0621	0.0591	0.0590	0.0698	0.2234
Sample	1972-2014	1972-2014	1972-2014	1972-2014	1990-2014	1972-2014	Exc. restruct
Country FE	No	No	No	No	No	No	No
Year FE	No	No	No	No	No	No	No

Notes: based on the dataset on episodes of debt distress. The table reports the regression coefficients and, in brackets, the associated standard errors, clustered by country. \* significant at 10 percent; \*\* significant at 5 percent; \*\*\* significant at 1 percent. A constant is included.

**Annex (intended for online publication only):****Additional Tables**

Table A1. Sample

Country	Data on debt distress		Data on LMA	Country	Data on debt distress		Data on LMA
	EM	Regression			EM	Regression	
Albania	1	1		Kazakhstan	1	1	1
Algeria	1	1		Korea	0		1
Angola	1			Kuwait	1	1	
Antigua and Barbuda	1	1		Latvia	1	1	1
Argentina	1	1	1	Lebanon	1		
Armenia	1	1		Libya	1	1	
Australia	0			Lithuania	1	1	1
Austria	0		1	Luxembourg	0		
Azerbaijan	1			Macedonia, FYR	1		
Bahamas, The	1	1		Malaysia	1	1	1
Bahrain	1	1		Malta	0		
Barbados	1	1		Mauritius	1	1	
Belarus	1	1		Mexico	1		1
Belgium	0			Morocco	1	1	
Belize	1	1	1	Namibia	1	1	
Bosnia and Herzegov..	1			Netherlands	0		
Botswana	1	1		New Zealand	0		
Brazil	1	1	1	Norway	0		
Brunei Darussalam	1			Oman	1	1	
Bulgaria	1	1	1	Pakistan	1	1	1
Canada	0			Panama	1	1	1
Chile	1	1	1	Paraguay	1		1
China	1		1	Peru	1	1	1
Colombia	1	1	1	Philippines	1	1	1
Costa Rica	1	1		Poland	1	1	1
Croatia	1	1	1	Portugal	0		1
Cyprus	0		1	Qatar	1	1	
Czech Republic	0			Romania	1	1	1
Denmark	0			Russia	1	1	1
Dominican Republic	1	1	1	Saudi Arabia	1	1	
Ecuador	1		1	Serbia	1		1
Egypt	1	1	1	Seychelles	1	1	1
El Salvador	1			Singapore	0		
Equatorial Guinea	1			Slovak Republic	0		
Estonia	0			Slovenia	0		
Fiji	1			South Africa	1	1	1
Finland	0			Spain	0		1
France	0			Sri Lanka	1		1
Gabon	1			St. Kitts and Nevis	1	1	
Georgia	1			Suriname	1	1	
Germany	0			Swaziland	1		
Greece	0		1	Sweden	0		
Guatemala	1	1		Switzerland	0		
Hungary	1	1	1	Syria	1		
Iceland	0			Thailand	1	1	1
India	1	1	1	Trinidad and Tobago	1	1	
Indonesia	1		1	Tunisia	1	1	
Iran	1			Turkey	1	1	1
Ireland	0		1	Turkmenistan	1		
Israel	0			Ukraine	1	1	1
Italy	0		1	United Kingdom	0		
Jamaica	1	1	1	United States	0		
Japan	0			Uruguay	1	1	1
Jordan	1	1	1	Venezuela	1	1	



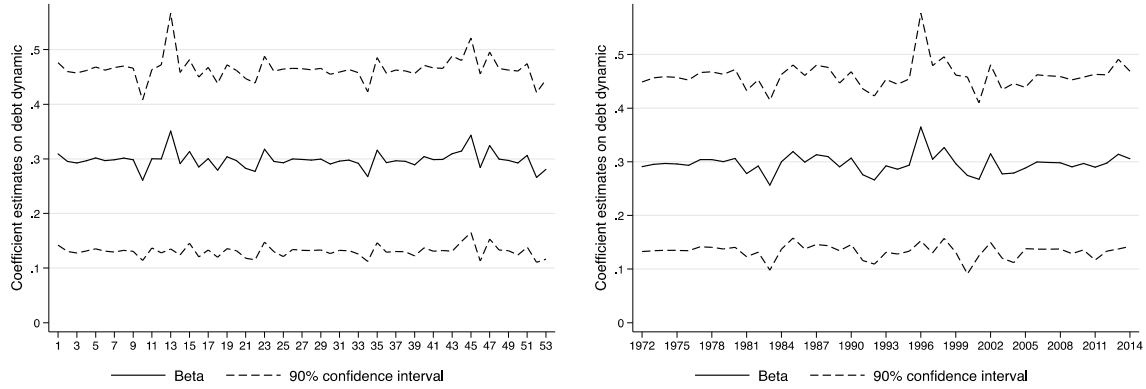
Table A2. Summary statistics and variable definitions

Variable	Obs.	Mean	S.D.	Min	Max
Debt distress (0/1)	1,052	0.0399	0.1959	0	1
Log of real GDP pc (t-1)	1,052	8.3293	0.9450	5.6064	11.0194
Real GDP growth (t-1)	1,052	0.0423	0.0401	-0.1514	0.2617
Primary balance over GDP (t-1)	1,052	0.0046	0.0408	-0.1067	0.1635
Reserve over GDP (t-1)	1,052	0.1049	0.0988	0.0023	1.1125
Current account balance over GDP (t-1)	1,052	-0.0201	0.0914	-0.5431	0.4087
Deflator (t-1)	1,052	0.1381	0.2940	-0.0883	4.0958
Change in exchange rate (t-1)	1,052	0.0900	0.3235	-0.2807	3.9546
Public debt over GDP (t-1)	1,052	0.4402	0.2660	0	1.6386
Change in public debt over GDP between t-3 and t-1	1,052	0.0119	0.0624	-0.9014	0.2585
Political stability	815	67.0601	9.0508	32	87
Gross financing needs over GDP (t-1)	669	0.0802	0.1094	-0.2313	1.1096
Past IMF program (0/1)	1,052	0.1217	0.3271	0	1
Past default (0/1)	1,052	0.2281	0.4198	0	1
Restructuring (0/1)	1,052	0.0086	0.0921	0	1
US 10-year rate	1,052	5.1982	2.4841	1.8	13.92
World growth	1,052	2.8097	1.4620	-2.0713	6.3735
Re-access (0/1)	370	0.1378	0.3452	0	1

Notes: Summary statistics are calculated for the largest sample used in the regression analysis. *Debt distress* is a dummy variable equal to one if country *i* experiences an episode of debt distress (see text, Section 3 for further details) in year *t*, and zero otherwise. *Log of real GDP pc* is the logarithm of GDP per capita in constant USD; *Real GDP growth* is the year-on-year percentage change of real GDP; *Primary balance over GDP* is the ratio of the government primary balance over GDP; *Reserve over GDP* is the ratio of international reserves over GDP; *Current account balance over GDP* is the ratio of the current account balance over GDP; *Deflator* is defined as the yearly change in the GDP deflator; *Exchange rate* is the yearly change in the exchange rate defined as national currency per USD, period average; *Public debt over GDP* is the ratio of government debt over GDP; *Change in public debt over GDP* is defined as the change in government debt between *t-3* and *t-1* over GDP in *t-3*; *Political stability* is the political risk rating published by ICRG; *Gross financing needs over GDP* is the ratio of gross financing need over GDP, estimated by IMF staff; *Past IMF program* is a dummy equal to one for the agreement year of IMF-supported programs and zero otherwise; *Previous defaults* is a dummy equal to one for countries that have experienced at least a debt distress episode in previous 5 years; *Restructuring* is a dummy equal to one in the year of debt restructuring (as defined by Cruces and Trebesch 2013); *US 10-year rate* is the 10-year treasury constant maturity rate (from FRED); *World growth* is the annual world percentage growth rate of GDP at market prices based on constant local currency (from the World Development Indicators); *Re-access* is a dummy variable equal to one if country *i* re-gains market access in year *t* after having lost it (meaning *Debt distress* = 1, see text - Section 5 - for further details), and zero otherwise.

## Additional Charts

Figure A1. Determinants of debt distress/loss of market access—Jackknife samples



Notes: each chart reports the coefficient on the change in public debt over GDP between  $t-3$  and  $t-1$ , estimated by LPM for the baseline specification (Table 1, column 3), dropping one country at the time (left-hand side chart), or one year at the time (right-hand side chart).