Banks, Government Bonds, and Default: What do the Data Say?

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November 2012

We use data from Bankscope to analyze the holdings of public bonds by 10,000 banks located in 170 countries and the role of these bonds in 14 sovereign crises over the period 1998-2010. We find that: i) during sovereign crises, banks on average hold about 14% of their assets in public bonds, ii) 87% of these bonds are bought by banks in normal times, particularly in financially less developed countries, iii) during sovereign defaults, banks on average increase their bondholdings by roughly 2% of their assets, but this increase is concentrated among large and profitable banks, and iv) during default episodes, a 10% increase in the bondholdings of a bank is associated with a 2.4% reduction in its loans, where bonds bought during normal times account for 70% of this effect. These results suggest that bank bondholdings are critical to understand the effects of sovereign debt crisis. They also suggest that, to a large extent, these bondholdings can be rationalized through a "liquidity view", whereby banks use bonds as part of their regular part activity to store liquidity and post as collateral

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1. Introduction

Current events in Europe vividly illustrate how government default can endanger domestic bank stability. Growing concerns of public insolvency and falling bond prices have caused severe stress in the European banking sector, which is loaded with Euro-area debt (Andritzky 2012). Problems are particularly severe for banks in troubled countries, which entered the crisis holding a sizeable share of their assets in their governments' bonds: roughly 5% in Portugal and Spain, 7% in Italy and an astounding 17% for the case of Greece (2010 Stress Test). To make things worse, since the onset of the crisis these banks appear to have substantially increased their exposure to the bonds of their financially distressed governments (Brutti and Sauré, 2012), leading to greater fragility. As *The Economist* recently put it, "Europe's troubled banks and broke governments are in a dangerous embrace."[1]

These events are hard to reconcile with conventional theories of sovereign defaults, in which bondholdings by domestic banks play no role.[2] To capture this link between sovereign defaults and the banking system, Gennaioli, Martin, and Rossi (2012) build a model where public defaults destroy the net worth of banks that hold public bonds, hindering financial intermediation. Using aggregate data, they also find some support for the idea that – after a sovereign default – the drop in financial intermediation is more pronounced in those banking sectors that hold more government bonds. To assess the empirical validity of the relationship between defaults and the banking system, however, much remains to be done.

[1] *The Economist*, December 17th 2011.

[2] The underlying assumption in these theories is that domestic banks – or, more generally, domestic agents of any kind – do not hold public bonds or, if they do, they are perfectly shielded from the consequences of a sovereign default (e.g. the government engineers a perfect bailout). Gennaioli et al. (2012), relax the assumption of perfect banks bailouts.

In this paper, we aim to fill this gap, and provide the first systematic analysis on the link between sovereign defaults, bondholdings by individual banks and their lending behavior. To do so, we use the BANKSCOPE dataset, which provides the most extensive source of information on the bondholdings and characteristics of banks, covering over 10,000 banks in 170 countries over the period 1998-2010. Crucially for us, these observations span 13 countries, 244 banks, and 615 bank-years observations in sovereign defaults episodes. Using this dataset, we document a set of novel facts bearing on the following questions:

- Is the European crisis special or have bank bondholdings played an important role in previous sovereign debt crises as well?
- If banks stand to lose from sovereign default, why do they hold so many public bonds in the first place? Is it because they demand bonds during "normal" times, as part of their regular business activity, or is it because they choose (or are induced) to buy them precisely as sovereign debt crises unfolds?
- Do greater bondholdings reduce bank loans during sovereign crises? If so, is the effect due primarily to the bonds accumulated by banks during normal times, or to those accumulated during the crisis?

To understand the relative role of country- versus bank-level factors in determining the demand for bonds and the unfolding of sovereign crises, we combine the BANKSCOPE data with information from IMF and World Bank sources on the macroeconomic conditions faced by banks in each of the countries in sample. Our goal in the analysis is to uncover stylized facts

about the distribution of bonds across banks and the role of bonds during default crises. We do not seek to test a specific model or identify a causal link between defaults and bondholdings.

To look at the data in a transparent way, we propose a methodology to decompose a bank's holding of public bonds along two dimensions. The first dimension concerns the extent to which bonds are accumulated during "normal times" or during "crisis times", i.e. during sovereign debt crises. The second dimension concerns the extent to which normal- or crisis-times bondholdings are determined by individual bank-characteristics or by country-level factors.

We believe that this decomposition is useful in thinking about the main alternative hypotheses on the default-bondholdings link. The first hypothesis, which could be denoted as the "liquidity view", sustains that banks hold bonds on a regular basis to store liquidity and to post them as collateral in borrowing arrangements (Bolton and Jeanne 2012, Gennaioli et al. 2012).[3] In this view, banks hold bonds as part of their normal business activity but public defaults destroy their ability to borrow and lend. The second hypothesis, which we label the "risk-taking" view, holds that banks demand public bonds in anticipation of, as well as during, sovereign crises in order to chase high returns, perhaps without fully internalizing the systemic consequences of doing so. Finally, there is the "government intervention" view, which sustains that banks hold public bonds because the government induces them to do so, using capital regulation in normal times and moral suasion during crises (e.g., Livshits 2009, Basu 2010).

Interestingly, each of these three hypotheses has different implications for our decomposition. The "liquidity" and "risk-taking" views, for instance, differ in their implications

[3] Of course, the general notion that government bonds provide liquidity to the private sector is not original to these papers (see, for instance, Holmstrom and Tirole 1998).

regarding normal- versus crisis-times bondholdings: in the liquidity view, banks build up bondholdings in normal times, while in the risk-taking view banks build up bondholdings in crisis times. At the same time, both the liquidity and the risk taking views predict that different banks should expose themselves differently to public bonds depending on their idiosyncratic investment opportunities or risk attitudes. By contrast, the "government intervention" view relies primarily – at least in normal times – on systematic country-wide factors that affect banks across the board, such as capital regulation. These hypotheses also differ in their implications for the effects of default on bank-lending: while default can be interpreted as an exogenous shock with respect to normal-times holdings, the same is not true for crisis-times bondholdings. This consideration will affect the interpretation of our estimates.

Our decomposition allows us to uncover the following main facts:

- The link between defaults and the bondholdings of banks is not unique to Europe, as it seems to play a key role in all sovereign crises across our sample. In countries that experience at least one sovereign default episode banks hold on average 13.63% of their assets in public bonds. On average, banks in those countries increase their holdings of public bonds from 13.03% to 14.94% of their assets during default episodes.
- A large fraction of bonds is accumulated during normal times (about 87%), and this pattern seems well accounted for by the "liquidity view" of bondholdings: banks that operate in financially less developed countries, that currently fund fewer loans, that take less risk, and that are less levered, hold a significantly larger amount of bonds.

- During sovereign defaults, consolidation of bonds in the banking sector is very unequal, primarily occurring in larger and more profitable banks and in countries with more financial intermediation. These time varying patterns seem consistent with both the "risk taking" and the "government intervention" views.
- During sovereign crises, the extent to which individual banks cut loans is increasing in the public bonds that they hold: a ten percent increase in a bank's holdings of public bonds in a defaulting country is associated with a 2.4% reduction in loans. Crucially, a bank's normal-time bonds account for about 70% of the total drop in loans. Bonds accumulated in crisis times matter only after controlling for the characteristics of banks buying them.

In sum, the data suggests that banks hold large amounts of public debt, exposing themselves to public default risk, and that these bondholdings have a significant effect on lending during sovereign debt crises. The data also seems to indicate that, to a large extent, banks hold bonds because public debt provides a store of liquidity. This is true especially in countries with a lower degree of financial development. There is also evidence that banking sectors accumulate public bonds during default crises, which is consistent with risk-seeking behavior and with the moral suasion by the government. This channel, however, appears to be relatively less important in accounting for default-related credit crunches.

This paper is related to different bodies of work. The first one studies the demand for government bonds. Krishnamurthy and Vissing-Jorgensen (2010) analyze the impact of changes in the supply of U.S. treasury bonds on their yields between 1926 and 2008, identifying a

liquidity and a safety component. Greenwood and Vayanos (2009) analyze the yields of U.S. public bonds of different maturities in light of a "preferred habitat" theory. Rather than looking at yields, we study the determinants of a bank's holding of government bonds and the extent to which they affect lending behavior in the event of default.

The second body of work studies the costs of sovereign defaults. Conventional theories of the cost of default emphasize market exclusion and external sanctions (see Eaton and Fernandez 1995). Because post-default market exclusion is typically short-lived (Gelos et al. 2011) and sanctions are seldom observed (Tomsz, 2007), however, there is an emerging consensus that this story is incomplete.[4] Recent research has tried to document the "collateral damage" caused by default on the domestic economy. Sandleris (2012) shows that defaults are followed by lower output growth. Arteta and Hale (2008) show that sovereign defaults are accompanied by a decline in foreign credit to the domestic private sector. Using aggregate data, Borensztein and Panizza (2009) show that sovereign defaults are accompanied by larger contractions in GDP when they happen in tandem with banking crises. As previously discussed, Gennaioli et al. (2012) document that sovereign defaults are accompanied by contractions in the ratio of credit to GDP, and that the intensity of these contractions in credit increases with banks' holdings of public bonds. The current paper departs from the above works by systematically analyzing bondholdings at the bank level, documenting both their determinants and their effects on lending in the event of a sovereign default.

[4] Arellano (2008) shows that in a standard infinite horizon model an output costs of default is needed (on top of market exclusion) in order to rationalize the observed low frequency of default events.

The paper proceeds as follows. Section 2 describes the data. Section 3 explains the basic methodology used to decompose banks' bondholdings into a time-invariant and a time-varying component, lays out our empirical strategy, and discusses alternative hypotheses. Sections 4 and 5 contain the main results of the paper. Finally, Section 6 concludes.

2. The Data

We obtain bank-level data from the BANKSCOPE dataset, which contains information on the holdings of public bonds for 10,281 banks in 174 countries over the period 1998-2010 (58,830 bank-year observations). This dataset, which is provided by Bureau van Dijk Electronic Publishing (BvD), provides information on a broad range of bank characteristics, such as size, leverage, risk taking, profitability, amount of loans outstanding, balances with the Central Bank and other interbank ratios. Most important for our purposes is that BANKSCOPE also reports banks' holdings of public bonds, although it does not specify the nationality of the bonds held by different banks. We shall return to this issue later on. The information in BANKSCOPE is suitable for international comparisons because DyK harmonizes the data.

We start with the complete sample of banks in BANKSCOPE. We filter out duplicate records, banks with negative values of all types of assets, banks with total assets smaller than $100,000, and years prior to 1997 when coverage is less systematic. This procedure results in 58,830 observations of the bondholdings variable at the bank-year level over 1998-2010. We then impose two additional requirements on remaining banks: first, that we observe at least two consecutive years of data so that we can perform our decomposition, and; second, that

data is available on all of the other main variables such as leverage, profitability, cash and short term securities, exposure to Central Banks, and interbank balances. Our main sample then consists of 4,723 banks in 151 countries for a total 25,132 bank-year observations. Commercial, cooperative and savings banks account for 92% of our sample; investment banks for 1.6%; the rest includes holdings, real estate banks, and other credit institutions.

Data on the macroeconomic conditions of the different countries is mostly obtained from the IMF's International Financial Statistics (IFS) and the World Bank's World Development Indicators (WDI).[5] To measure the size of financial markets we use the ratio of private credit provided by money deposit banks and other financial institutions to GDP, which is drawn from Beck et al. (2000). This widely used measure is an objective, continuous proxy for the size of the domestic credit markets. Finally, we follow the existing literature and proxy for sovereign default with a dummy variable based on Standard & Poor's, which defines default as the failure of a debtor (government) to meet a principal or interest payment on the due date (or within the specified grace period) contained in the original terms of the debt issue. According to this definition, a debt restructuring under which the new debt contains less favorable terms to the creditors. The Greek bond swap that was launched in February of 2012, for instance, is identified as a default by Standard & Poor's because the retroactive insertion of collective action clauses was deemed to materially change the original terms of the affected debt.[6]

[5] See Table AI in the Appendix for a description of variables.

[6] As with most previous studies, we focus on whether a default occurs and not on monetary measures of creditors' loss given default, for two main reasons. First, estimates of creditors' losses given defaults ("haircuts") are heavily dependent on the assumptions one makes about counterfactuals (e.g., Sturzenegger and Zettelmeyer (2005)). Second, it is widely accepted that sovereign defaults are very large and disruptive events. Moody's (2007) estimates the average recovery rate on sovereign bonds to be 55% on an issuer-weighted basis and 29% on a

Defined in this manner, our sample contains 14 sovereign default episodes of different duration in 13 countries, which are listed in the Table AII of the Appendix.

2.1 Data Comparability and Summary Statistics

The BANKSCOPE dataset has an established track record as it has already been used on a number of studies related to banking.[7] There is, however, one important dimension along which its reliability has not been scrutinized, namely, information on the holdings of government securities. To check the quality of this measure of bondholdings, we now compare it to other – more aggregate, less detailed – data sources on bondholdings, such as country-level data on "banks' net claims on the government" from the IMF, and bank- level data on public bonds from the recent European Stress Test.

[Table 1 here]

Table 1 compares the BANKSCOPE data with a proxy for bank bondholdings reported by the IMF. Panel A contains the mean and median bondholdings (as a share of total assets) of all banks in our sample, along with the standard deviation, as reported by BANKSCOPE. Mean bondholdings are quite high, at 8% of assets, while median bondholdings are approximately half as high. The standard deviation of bondholdings in the sample is also high. The highest bondholdings in the sample, for instance, are above 65% for selected banks in Argentina, Nigeria, India, Jamaica and Venezuela in 2003; the lowest bondholdings, in turn, are 0%, for example for over a quarter of all German banks throughout our sample period.

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volume-weighted basis. Sturzenegger and Zettelmeyer (2005) find that even under the most conservative assumptions, recovery rates range from a minimum of 13% to a maximum of 90% of the bonds' par value.

[7] See, for instance, Classens and Laeven (2004), and Kalemli-Ozcan et al. (2011).

Panel B reports the same information, but only for the subset of countries for which the IMF also reports banks' bondholdings. Panel C displays the IMF variable whose exact definition is "financial institutions' net claims to the government," computed as a share to total assets.[8] Mean, median and standard deviation of the IMF measure are very close to the BANKSCOPE data. The IMF data gives a slightly higher mean bondholdings, but measurement in the two datasets tends to converge towards the end of the sample. This discrepancy between IMF and BANKSCOPE data could be due to the fact that the former generically refers to claims on the government and not just to bonds, so it might capture non-bond finance as well. Alternatively, the banks used to construct the IMF measure may be different from the banks in BANKSCOPE.

Although the evidence from the IMF data is reassuring, it cannot address the quality of the BANKSCOPE data on a bank-by-bank basis. To address this issue, we compare our bank-level bondholdings data to those reported by the European stress test of 2010. Because the stress test breaks down bondholdings by their nationality, it allows us to evaluate one potential shortcoming of BANKSCOPE: namely, the latter simply reports an aggregate public bonds measure for each bank, without breaking such measure down by governments' nationalities.

Table 2 reports bondholdings from the European stress tests of 2010. This data refers only to holdings of bonds issued by European Union members, but this is not a significant shortcoming as – in the case of European banks – these make up almost the totality of bondholdings. Panel A of the table reports bondholdings for the full sample contained in the

[8] This variable reports the net positions of commercial banks, defined as holdings of securities plus direct lending minus government deposits, and it can be interpreted as a proxy for the bondholdings of banks. We are not the first to use this variable as a proxy for bondholdings. See, for instance, Gennaioli et al. (2012) and Kumhof and Tanner (2008).

stress test, whereas Panel B reports bondholdings for the subset of the banks in the stress test sample that is contained in BANKSCOPE. The bondholdings reported by BANKSCOPE are then depicted in Panel C. A comparison of both panels demonstrates that the data from both sources are highly comparable. In fact, the correlation between the bondholdings reported by BANKSCOPE and by the stress test for the same European banks is 85%.

[Table 2 here]

The evidence is reassuring also with respect to the nationality of bonds held by banks: even in highly integrated European bond markets, where domestic and foreign bonds are in many cases treated symmetrically by the regulatory framework, more than 75% of bank bondholdings correspond to domestic bonds. This share is in all likelihood much larger in many of the other countries in our sample, especially in the subset of developing countries that will provide most of our observations on sovereign defaults. Based on this evidence, we conclude that the BANKSCOPE measure is a good proxy for the domestic public bonds held by banks around the world, and use it as such in the remainder of the paper.

It is also useful to compare bank characteristics between banks in BANKSCOPE and those in the EU stress test. We focus on the characteristics that we use in our analysis: (i) bank size as measured by total assets, (ii) risk taking as the extent of investment in assets other than cash, liquid securities and government bonds, (iii) leverage as measured by one minus shareholders' equity as a share of assets, (iv) loans outstanding as a share of assets, (v) profitability as measured by operating income divided by assets, (vi) exposure to the Central Bank as measured

by deposits in the Central Bank as a share of assets, and (vii) balances in the interbank market.[9] Table 3 below provides descriptive statistics for these variables within our sample.

[Table 3 here]

There is a large variation in bank characteristics within the BANKSCOPE sample. Except for size, however, such variation is symmetric, in the sense that the mean and the median of the distribution are close to each other. The average bank invests roughly 90% of its resources in risky assets 60% of which are loans, 90% of its financing takes the form of debt (for an average leverage ratio assets/equity of about 10), and holds 3% of its assets in central bank reserves. Table 4 below shows the characteristics of banks involved in the stress test.

[Table 4 here]

Banks included in the stress test are much larger and extend more loans than the median BANKSCOPE bank. They also have lower exposure to the Central Bank and to the interbank market. Leverage and risk taking are of similar magnitude to those observed in BANKSCOPE.

To conclude, Table 5 reports correlations between bank characteristics in our sample.

[Table 5 here]

All correlations, except for some of those involving size, are significant at the one percent level. Bank profitability is positively correlated with size, exposure to the central bank and interbank

[9] For robustness, we adopt two different definitions for risk taking. The first definition measures the share of assets other than cash and bonds. This is our preferred definition because it more accurately reflects the status of bonds as "safe assets" in normal times, not just from the viewpoint of banks' preferences but also of risk weighting in capital regulation. The only problem of this definition of risk taking is that it mechanically decreases with bondholdings, potentially generating spurious correlations. As a result, we perform robustness tests using a definition of risk taking equal to the share of non-bond assets other than cash.

balances. It is, however, negatively correlated with risk taking, leverage, and loans outstanding. This is consistent with more profitable banks generating more cash, which needs to be temporarily stored in bonds and other liquid assets, and at the same time finding it easier time in raising equity (or in paying off debt), so that their leverage is lower.

3. Methodology and Competing Hypotheses

This section conceptually organizes our empirical exercise. A main objective of the latter is to tease out, in the data, the properties of the distribution of public bonds across banks both in normal times and during sovereign crises. We also wish to separate the effects occurring across countries from those occurring across banks within the same country. Section 3.1 describes how we perform such decomposition in the data. Section 3.2 describes our regression strategy. Section 3.3 illustrates that our analysis can teach us a lot about the merits of the main competing hypotheses on banks' demand for bonds and on the effect of default on bank loans.

3.1 The Decomposition of Bank Bondholdings

Let $b_{i,c,t}$ denote the ratio of government bonds over assets held at time t by bank i located in country c. We regress $b_{i,c,t}$ on a set of bank dummies and obtain the decomposition:

$$b_{i,c,t} = b_i + \hat{b}_{i,c,t}. \quad (1)$$

Here b_i is the predicted time-invariant component of bank *i*'s bonds, while $\hat{b}_{i,c,t}$ is the time varying residual of the same regression. We interpret b_i, which is the average bonds/asset ratio of bank i over time, as the normal-times or "normal" bondholdings of the bank. All time variation in bondholdings, including the one due to sovereign crises, is accounted for by $\hat{b}_{i,c,t}$.

It is reasonable to assume that the normal-times bonds b_i vary not only along idiosyncratic bank characteristics, but also along factors common to all banks in a country (e.g., financial development or regulation). To separate these sources of variation, we regress b_i on a set of country dummies, obtaining the decomposition:

$$b_i = b_c + \hat{b}_{i,c}, \tag{2}$$

where b_c is the predicted country-specific component of normal bondholdings (i.e., the average level of bondholdings of all banks in a given country over the entire sample period), while $\hat{b}_{i,c}$ is the residual from the same regression. By construction, $\hat{b}_{i,c}$ absorbs all idiosyncratic, bank-specific, factors affecting a bank's normal bondholdings.

We perform a similar decomposition with respect to the time-varying residual $\hat{b}_{i,c,t}$ obtained from Equation (1). Time variation in bondholdings can either be due to idiosyncratic characteristics (e.g. a bank's risk appetite during crises), or to common country-level factors (e.g. changing market conditions or moral suasion). To separate these sources of variation, we regress $\hat{b}_{i,c,t}$ on the interaction of time and country dummies, obtaining:

$$\hat{b}_{i,c,t} = b_{c,t} + \tilde{b}_{i,c,t}. \tag{3}$$

Component $b_{c,t}$ is the predicted (time-varying) bondholdings in the regression. It captures time variation common to all banks in a country, namely the "abnormal" country level bondholdings at time t (which is computed as the difference between the average bondholdings of banks in country c at time t and its country average over the entire sample period). The residual $\tilde{b}_{i,c,t}$ captures bank-specific time variation in bonds, measuring the "abnormal" bondholdings at time t for the bank (and the country where the bank is located).

To organize the empirical analysis, it is convenient to separate bank-specific and country-wide bondholdings. Regarding bank-specific bonds, $\hat{b}_{i,c}$ summarizes a bank's holdings in normal times, while $\tilde{b}_{i,c,t}$ summarizes the bank's idiosyncratic reaction to shocks, such as sovereign crises. Regarding country-wide factors, b_c captures the influence of these factors in normal times, while $b_{c,t}$ their influence over time, for instance during crises.

It is interesting to quantify the share of the total variation of bondholding that is accounted for by each of these four components. Table 6 performs this calculation in the full set of countries (Panel A) and in the subsample of defaulting countries (Panel B).

[Table 6 here]

Two intriguing features stand out. First, in the full sample, the normal component of bondholdings explains the lion's share of the total variation of bondholdings. In Panel A, the time invariant (or normal-times) component of bonds explains roughly 80% of the total variation. This time invariant component, in turn, is almost equally split between country- and bank-specific subcomponents. Thus, in the entire sample, most of the variation in bondholdings is accounted for by differences in normal-times bondholdings across banks and countries.

Second, the picture changes once we focus on the subset of countries that experienced at least one sovereign default during the sample period. In this case, as shown by Panel B, the time-varying component is almost as important as the normal component in explaining overall variation in banks' holdings of bonds. Quantitatively, the explanatory power of the time-varying component increases from 20% to 40%. In part, this change reflects lower cross country variation: any two countries picked from within the subsample of defaulters are likely to be more similar than any two countries picked randomly from the total sample. Indeed, the share of variation in normal-times bonds that is accounted for by country level factors drops drastically between Panels A and B, from 52% to 25%. At the same time, the relative importance of country-level factors in explaining time variation in bondholdings is almost unaffected, being equal to 22% in Panel A and to 21% in Panel B. This suggests that there is not a drastic drop of country-level heterogeneity, but rather that most of this heterogeneity plays out in the time variation, presumably when a sovereign default occurs.

To conclude, bank-specific factors account for most of the normal and the crisis components of bondholdings. They account for about 50% of the total variation in bondholdings within the full sample, and for 75% of it within the sample of defaulting countries. Bank-level heterogeneity thus seems critical for understanding the observed distribution of bondholdings, and perhaps also the impact of default on bank loans. This implies that empirical analyses based only on country-level aggregate data, which are the only ones performed so far, neglect the bulk of the variation in bonds, particularly during default events.

3.2 Empirical Strategy and Competing Hypotheses

Using the previous decomposition, we ask two questions. First, what factors determine a bank's bondholdings? Second, how do bondholdings shape the extent to which bank lending reacts to default? These questions are complementary. Any factor affecting a bank's demand for bonds (e.g. risk-taking attitudes) may independently affect bank lending during sovereign crises. Without accounting for the independent effect of such a factor, then, inferences on the role of bondholdings during crisis may be misleading. In their aggregate analysis, Gennaioli et al. (2012) dealt with this problem by controlling in their regressions for countrywide macroeconomic conditions, which could affect bondholdings but also exert an independent effect on financial intermediation. The richer bank-level and time series data of our current dataset allows for a much finer analysis, particularly regarding the factors affecting the demand for bonds, because it allows for a direct examination of heterogeneity across banks.

In the first part of our regression analysis, we study the determinants of banks' holdings of public bonds. We begin by considering the role of bank-specific characteristics. To do so, we run the following regressions:

$$\hat{b}_{i,c} = \beta \cdot X_{i,t-1} + \epsilon_{i,c}, \tag{4}$$

$$\tilde{b}_{i,c,t} = \alpha \cdot default_{c,t-1} \cdot X_{i,t-1} + \gamma \cdot X_{i,t-1} + \delta \cdot default_{c,t-1} + \epsilon_{i,c,t}. \tag{5}$$

With slight abuse of notation, the left hand side of Equation (4) does not have a time subscript because the value of $\hat{b}_{i,c}$ is the same over time. Vector $X_{i,t-1}$ instead contains the time t-1 value of the characteristics of bank *i* (size, risk taking, leverage, loans outstanding, profitability,

exposure to central bank, and interbank balances), while $default_{c,t-1}$ is a dummy variable taking value 1 if at t-1 country *c* was in default and value zero otherwise.

Equation (4) estimates the bank-level determinants of normal-time bonds. Because the dependent variable $\hat{b}_{i,c}$ is time invariant, coefficient β summarizes the effect of the time average of bank characteristics $X_{i,t-1}$. Equation (5) estimates the bank-level determinants of abnormal bondholdings during sovereign defaults. These effects of bank characteristics here are captured by the interactive vector of coefficients α.

We employ the same methodology to analyze the determinants of the country-level, systemic, component of bank bondholdings. To do so, we run the following regressions:

$$b_c = \beta_c \cdot X_{c,t-1} + \beta_i \cdot X_{i,t-1} + \epsilon_{i,c}, \tag{6}$$

$$b_{c,t} = \alpha_c \cdot default_{c,t-1} \cdot X_{c,t-1} + \gamma_c \cdot X_{c,t-1} +$$

$$+ \alpha_i \cdot default_{c,t-1} \cdot X_{i,t-1} + \gamma_i \cdot X_{i,t-1} + \delta \cdot default_{c,t-1} + \epsilon_{i,c,t}. \tag{7}$$

Again, with slight abuse of notation we drop the time subscript from b_c in Equation (6). Here $X_{c,t-1}$ is a vector containing the time t-1 value of country characteristics (private credit over GDP, default, GDP growth, aggregate leverage, unemployment growth, and inflation). The other variables are the same we defined in Equations (4) and (5).

Equation (6) estimates, through vector β_c, the persistent country-level determinats of normal-times bondholdings. In the same equation, vector β_i captures the role of persistent, country level, bank characteristics. Thus, β_i can help identify the role of capital regulation,

which affects country-level risk taking and leverage. Equation (7) measures, through vector α_c, the country-level determinants of abnormal bondholdings during default events.

In the second part of our regression analysis, we study how the impact of default on bank loans depends on a bank's bondholdings. Define by $\Lambda_{\mathrm{i,c,t}}$ the change in loans made by bank *i* in country *c* between time t-1 and t. We then run the following regression:

$$\Lambda_{\mathrm{i,c,t}} = \psi_n \cdot default_{c,t-1} \cdot b_i + \psi_{cr} \cdot default_{c,t-1} \cdot \hat{b}_{i,c,t} +$$

$$\zeta_n \cdot b_i + \zeta_{cr} \cdot \hat{b}_{i,c,t} + \delta \cdot default_{c,t-1} + \epsilon_{i,c,t}. \quad (8)$$

The regression separately estimates the impact – during sovereign crises – of normal-times bondholdings b_i and time-varying bondholdings $\hat{b}_{i,c,t}$ on the change in bank loans. The effect of the former is measured by coefficient ψ_n, that of the latter by coefficient ψ_{cr}.

In light of our previous analysis on the demand for bonds, we then estimate Equation (8) also by controlling for bank- and country- level variables. These capture factors affecting both a bank's demand for bonds and its ability/willingness to make loans during sovereign crises. This allows us to assess the extent to which the effect of bondholdings estimated in Equation (8) is due to bondholdings *per se*, or to the fact that bonds are accumulated by banks and countries where – for independent reasons – drops in loans are more likely to occur. In these specifications, we also include country dummies to control for unobserved time invariant country-level factors and time dummies to control for common shocks across countries.

Finally, we fully decompose bondholdings and estimate the following regression:

$$\Lambda_{\mathrm{i,c,t}} = \psi_{n,i} \cdot default_{c,t-1} \cdot \hat{b}_{i,c} + \psi_{cr,i} \cdot default_{c,t-1} \cdot \hat{b}_{i,c,t} +$$

$$+ \psi_{n,c} \cdot default_{c,t-1} \cdot b_c + \psi_{cr,c} \cdot default_{c,t-1} \cdot b_{c,t} + \cdots \quad (9)$$

This regression allows us to tease out not only, as in Equation (8), whether normal- or crisis-times bondholdings are responsible for the effect of default on loans, but also whether these effects are driven by variation in bonds across countries or banks. This aspect is critical for understanding whether the "dangerous embrace" between banks and governments is due primarily to common country-level factors, or whether individual banks contribute to create it with their idiosyncratic decisions to hold government bonds.

3.3 Interpretive Guidelines

We now provide guidelines for interpreting our regression estimates in light of alternative hypotheses on banks' holdings of public bonds. There are three broad hypotheses as to why banks demand public bonds and become exposed to sovereign defaults. The "liquidity" view holds that banks use public bonds as a way to store their funds in the short run, to finance future investments/outlays. According to this view, bondholdings are part of a bank's normal business activity, although they may be costly when a sovereign crisis breaks out (Bolton and Jeanne 2012, Gennaioli et al. 2012). The "risk taking view" holds that banks buy public bonds in anticipation of, as well as during, sovereign debt crises in order to seek high returns. According to this view, banks deliberately choose to take on sovereign risk, perhaps without fully internalizing the social cost of doing so (Livshits 2009, BIS 2011). Finally, the "government

intervention" view holds that banks hold public bonds because they are induced to do so, by capital regulation in normal times and by moral suasion during defaults (Basu 2010).

Ideally, any empirical attempt to disentangle among these different views would call for a thorough estimation of banks' demand for bonds. Doing so would require a rich description of the environment in which banks operate, involving bond returns, as well as the returns of alternative assets and a precise knowledge of the regulatory environment. Clearly, our dataset cannot provide this depth of information, as it has been constructed instead to cover the largest possible sample of banks and countries containing episodes of sovereign defaults. Even though it is difficult to univocally map the different views on bondholdings into specific bank– and country-level variables, each of them leaves distinct traces in our dataset. We provide one plausible interpretation of these traces below:

a) The liquidity view predicts that a bank's demand for public bonds should:

- Increase in bank: i) profitability, as profitable banks have more liquidity to manage, ii) size, because large banks can afford to hold less cash (and thus more bonds) owing to economies of scale in cash management (there is evidence of this in industrial firms, Opler et al. 1999), and iii) leverage, because safe securities such as public bonds allow the bank to borrow more in collateralized arrangements.
- Decrease in a bank's: i) average loans, which reduce its need to store liquidity, ii) alternative liquid assets such as central bank reserves or interbank loans, and iii) risk taking, for liquidity is a form of insurance, so it is not valuable for risk seeking banks.

- Decrease in country-wide: i) financial development, which increases the private provision of liquid assets substituting government bonds, ii) economic growth, which provides banks with investment opportunities, and iii) sovereign default crises, which render government bonds too risky/illiquid.

b) The risk "risk-taking view" predicts that the demand for bonds should:

- Increase during default crises, when risk premia on public bonds are large.
- Decrease in aggregate economic conditions, like economic growth, which presumably reduce the expected likelihood of default.

It is hard to draw firm predictions on which bank characteristics should lead to higher bondholdings according to the risk-taking view. Arguably, banks that are more risk tolerant and flush with liquidity could be expected to buy more public bonds during crises. We will see whether there are traces of these effects in the data.

c) Finally, the "government intervention" view predicts that the demand for public bonds should:

- Decrease in the laxity of bank regulation, which in our dataset would be reflected in the extent of aggregate risk taking and leverage allowed for by the government in normal times.
- Increase during sovereign default crises, owing to moral suasion.

Insofar as moral suasion is correlated with bank characteristics (e.g. bank size), this view should also have implications for bank levels determinants of the purchase of bonds during crises.

Sometimes a certain association between bonds and a bank/country characteristic is consistent with several hypotheses. It may be therefore be difficult to perfectly discriminate one hypothesis from the others in the data. In this respect, useful additional information is provided by the decomposition of bondholdings itself. In particular, we argue that:

- Normal-times bondholdings are mostly explained under the liquidity and government intervention views (the latter though capital regulation). Thus, Equations (4) and (6) tease out these two views. In this respect, insofar as regulation is enforced across banks roughly uniformly, political intervention cannot explain the bank-level variation in (4).
- Variation in bondholdings around defaults is either explained by the risk-taking or the government intervention views (the latter through moral suasion). Equations (5) and (7) thus evaluate these stories. Because moral suasion can be bank-specific (e.g. focus on large banks), government intervention may show up both in (5) and (7).
- The effect of normal-times bonds on bank loans in Equations (8) and (9) must be attributed either to the liquidity view or to capital regulation. In particular, the uniform effect of capital regulation is only included into coefficient $\psi_{n,c}$ of Equation (9).

The following table summarizes the main predictions.

	Liquidity	Risk Taking	Government Intervention
Normal-time bondholdings	**Expected** Bank characteristics: size (+), profitability (+), leverage (+), risk taking (-), average loans (-), other liquid assets (-). Country factors: financial development (-), economic growth (-), public default (-)	**Not expected**	**Expected** Explained by country level bank aggregates: Risk taking (-), leverage (-).
Crisis-time bondholdings	**Not expected**	**Expected** Increase during public defaults.	**Expected** Increase during public defaults, due to moral suasion.
Effect of normal-time bonds on bank loans during defaults	**Negative**	**No effect**	**Negative** (due to capital regulation)
Effect of crisis-time bonds on bank loans during defaults	**No effect**	**Negative**	**Negative** (due to moral suasion)

4. Determinants of Banks' Bondholdings

We now analyze what factors drive banks' holdings of government bonds. Section 4.1 considers the way in which normal-times and time-varying bondholdings depend on bank characteristics. Section 4.2 studies the role of country characteristics.

4.1 Bondholdings and bank-level characteristics

Table 7 reports the estimation of Equation (4) in Panel A, and of Equation (5) in Panel B. To show the explanatory power of individual bank characteristics, we report a set of univariate regressions. In the last columns, we include all controls together.

[Table 7 here]

Consider Panel A first. The variables with most explanatory power are risk taking and outstanding loans, which in columns (2) and (4) respectively account for 25% and 14% of the variation of the dependent variable. Consistent with the liquidity view, both variables have a negative impact on bonds: risk-seeking banks do not value the insurance provided by public bonds in normal times, and banks that on average fund many loans do not need to store liquidity to fill gaps in current investment opportunities. The positive impact of bank size on bonds seems also consistent with the liquidity view: it has been shown that such a mechanism operates at the firm level, where large firms use relatively less cash to manage their liquidity (Opler et al. 1999), and a similar mechanism may apply at the bank level. The negative effect of leverage in the univariate regression of column (3) is more puzzling, though. According to the liquidity view, banks should use bonds as collateral precisely to lever up, so we should observe a positive correlation between bonds and leverage. This prediction is restored once we include risk-taking as a control (see column (8)). These findings seem to indicate that, as levered banks also take more risk, they hold fewer bonds. Controlling for risk-taking eliminates this effect, though, and – consistent with the liquidity view – public bonds and leverage go together.[10]

When all variables are considered jointly, as in column (8) of Table 7, the results are thus consistent with the liquidity view. Bondholdings decrease in risk taking, average loans, in central bank reserves and interbank deposits. They increase in leverage and in bank size. Profitability is the only major bank characteristic whose effect does not seem to square with the liquidity view. In column (5), it has the predicted positive sign, but its coefficient becomes

[10] Similar patterns obtain if we use our other proxy of risk taking.

negative after we control for size (see column (8)). Perhaps this is due to profitable banks having better investment opportunities (aside from loans).

One concern with the regressions in Panel A is that they might capture the effect of bank characteristics during sovereign crises. This is because the dependent variable averages also bonds held by banks during sovereign defaults in the sample. To avoid this problem, we re-estimate the specification in column (8) within the subsample of countries that never experience a default, and we report the results in column (9). The coefficients remain of the predicted sign and of similar magnitude as in column (8), the one exception being bank size that becomes marginally insignificant (although it remains significant in the unreported univariate test). Overall, the evidence is consistent with the liquidity view, and column (8) shows that this can explain up to 35% of the idiosyncratic variation in normal-times bonds**.**

It is important to stress that the economic magnitude of these effects is large. A one-standard deviation increase in risk-taking is associated with 2.7% fewer bank bondholdings; a one-standard deviation increase in bank profitability is associated with a 0.25% increase in bank bondholdings; a one-standard deviation increase in size is associated with a 0.2% increase in bank bondholdings. These are large magnitudes. Another way to see this is to note that a bank in the bottom quartile of size, risk taking, leverage, and profitability has 6.3% of public bonds, while a bank in the top quartile of size, risk taking, leverage and profitability drops to 3.5%. The economic consequences of these differences is further amplified by the possibility that banks use public bonds to lever up and raise more funds.

Consider Panel B next. The time-varying component of idiosyncratic bonds is much harder to explain than the normal-times component. A bank's risk taking and loans outstanding continue to be the most successful explanatory variables, but now they account only for 1.5% and 0.6% of the time variation, respectively. These variables continue to be negatively correlated with bonds, and the interactive effect with default is negative as well. Banks that have riskier balance sheets and more loans outstanding react to default by reducing their holdings of public bonds. This could reflect deleveraging by these banks during sovereign crises.

The most intriguing results here concern bank size and profitability. Larger and more profitable banks buy more bonds during default episodes (see column (8). These results are different from what we obtained in the case of normal times bonds. In Panel A, when we excluded default episodes, bank size did not matter for bondholdings. Moreover, profitability had a negative effect on bonds, which could be rationalized – we argued – by the fact that profitability proxies for a bank's investment opportunities. But Panel B seems to say that, regardless of these opportunities, more profitable banks hold abnormally many bonds during defaults. And large banks do the same. These findings can be plausibly traced back to the "risk-taking" view of bondholdings: large banks are likely to have the capacity to bear additional risk (they indeed appear less risky in the data in normal times), and profitable banks are likely to have spare liquidity required to expand risky bondholdings. Thus, these banks may buy distressed public bonds to undertake a risky, albeit profitable, gamble. Another possible interpretation of these findings, though, is that they reflect government intervention. Moral suasion may be particularly effective for banks that are "too big to fail", or have enough

liquidity to invest.[11] Whatever the ultimate rationale for the behavior of these time-varying bondholdings, one thing is clear: they seem hard to account for through the liquidity view.

One important implication of these findings is that, be it through risk taking or moral suasion, it is relatively "better" banks – the larger and more profitable ones – that buy many public bonds during sovereign crises. Although defaults in our sample are associated with an increase in the holdings of public bonds by banks, on average by roughly 2% of assets, this process of consolidation is very unequal across banks. To appreciate the quantitative effects, Figure 1 plots the default-induced change in bank-specific bondholdings predicted by our regression for firms differing in their size and profitability. Banks in the lowest size decile decrease their bondholdings by 0.4% of assets, while bank in the highest size decile increase their bondholdings by almost 2% of assets. Similarly, banks in the lowest profitability decile decrease their bondholdings by 1% of assets, while bank in the highest size decile increase their bondholdings by almost 0.7% of assets.

[Figure 1 here]

These results imply that the impact of bondholdings on bank lending behavior during crises may be systematically under-estimated, because there is self-selection of "better" banks into buying distressed public bonds. Suppose that, during sovereign crises, more profitable and

[11] Two qualifications are in order here. Moral suasion works best if banks buy bonds at primary issues rather than in secondary markets, because the government may be more interested in rising fresh funds rather than in controlling secondary market prices (there are of course several reasons why government may prefer to prop the price of bonds in secondary markets, for instance to avoid large fluctuations in the balance sheets of intermediaries holding public bonds). Second, the findings of Panel B may also consistent with the following, distinct, hypothesis: large and profitable banks might be in a better position to bargain with the government over the repayment of defaulted bonds. As a result, they purchase bonds during crises (either from other banks or from foreigners) because their expected return from holding them is higher than that of other banks.

larger banks do not just buy more public bonds but also make relatively more loans. Then, if these bank characteristics are not properly controlled for, it may be spuriously concluded that larger bondholdings are not associated with stronger loan contractions – or, even, that they are associated with loan expansions – during crises. We shall return to this point in Section 5.

4.2 Country-level Bondholdings

Table 8 reports the estimation of Equation (6) in Panel A, and of Equation (7) in Panel B. To show the explanatory power of country-level variables, we first report a set of univariate regressions. In the last column of the table, we include all variables together.

[Table 8 here]

Consider Panel A first. The key fact here is that normal-times bonds decrease sharply in Private Credit to GDP. This is by far the most important explanatory variable, as it explains a staggering 67% of the variation alone. Another fact, which appears puzzling in light of the liquidity view, is the positive coefficient on sovereign default. The effect, however, is driven by the fact that sovereign defaults are more frequent in countries that are less financially developed, that have a lower ratio of Private Credit to GDP. Once we include this latter variable in the regression (see Column 6), the coefficient on sovereign default becomes negative. Panel A also shows that a higher frequency of banking crises increases bondholdings may be due to the fact that private

markets in countries that experience frequent crises are less developed, and banks have fewer private alternatives to government bonds.[12]

Once we introduce bank characteristics into columns (7) and (8), none of them appears to matter, with the exception of risk-taking. This result lends itself to alternative interpretations. On the one hand, higher aggregate risk taking could be a symptom of the existence of better private insurance mechanisms, which leads banks to hold less cash and public bonds. Alternatively, higher risk taking may capture laxer capital regulation, which reduces banks' willingness to hold government bonds.

Overall, Panel A is consistent with the notion that normal-times bonds are higher in countries that are less financially developed and that are more prone to financial crises. These findings are consistent with the "liquidity view": government bonds are useful where private liquidity provision is scant and profitable investments come by sporadically. Note that the model of Column (7) captures 84% percent of the cross-country variation in normal-time bonds. Together with the results of Table 7, Panel A, this leads us to conclude that the liquidity view receives considerable support in the data and that our statistical model indeed captures a large fraction of the variation in normal times bonds.

Consider finally Panel B, which seeks to explain the country-level component of time-varying bondholdings. It should be remembered from Table 4 that this component accounts for less 25% of the variation in time-varying bondholdings. Nevertheless, it displays some

[12] As we are dealing with aggregate country level bondholdings, also supply-side forces may play a role here. Indeed, it could be that governments in countries prone to banking crises may engage more heavily in intermediation (and in bailouts), and thus exhibit higher public debt levels.

interesting features. First, the interactions of country characteristics with sovereign default explain a large 40% of the total variance (see Column (9)). Default events thus trigger a large fraction of the comovement in the bondholdings of banks within a country. The variables with highest explanatory power of this comovement are Private Credit to GDP and Banking crises: interacted with default, they individually capture more than 30% of the total variation.

Looking at columns (8) and (9), it appears that sovereign defaults tend to reduce bondholdings on average across countries. This reduction is stronger in countries experiencing higher unemployment, lower inflation, and fewer banking crises. When introduced alone, Private Credit seems to be associated with a lower take up of bonds during default. The result changes when we introduce banking crises in the regression, however. A higher frequency of banking crises itself increases bondholdings during defaults. Once banking crises are controlled for, however, higher levels of Private Credit are associated with *higher* bank bondholdings during crises (see Columns (8) and (9)). This effect contrasts with the finding of Panel A, where Private Credit seemed to discourage normal-times bondholdings.

To conclude, Panel B shows that greater levels of financial intermediation (due to cyclical credit booms, or to more developed markets) are associated with larger bank purchases of bonds during crises.[13] Just like the result in Table 7 (Panel B) on the impact of bank profitability on bonds during defaults, this result on Private Credit is not consistent with the liquidity view (again, compare Panel A and B of Table 8). This suggests that the demand for

[13] To further distinguish whether the coefficient on Private Credit in columns (8) and (9) are due to temporary credit booms or to larger volumes of intermediation in normal times, Panel C controls for the level of Private Credit/GDP at time t-1 and its average level in the sample. Once country and bank-level variables are controlled for (see column 4), it is the flow (not the average level) of Private Credit that increases bondholding.

bonds changes during crises, and banks tend to buy more bonds either because of risk taking, the government's moral suasion, or both.

To sum up, our analysis reveals the following patterns in bondholdings. First, normal-times bondholdings are important. They account for 80% of the total variation of bonds in our sample, and they are largely explained by banks' demand for liquidity/insurance. Banks taking fewer risks, making fewer loans on average, and operating in countries that are less financially developed and prone to crises tend to hold a significantly larger amount of bonds. Second, default episodes alone explain 14% of the time variation of bonds. On average, banks take 16% more bonds during default, but the heterogeneity is substantial. Larger and more profitable banks, operating in countries that are more prone to banking crises but also characterized by larger financial intermediation, take up substantially more bonds during sovereign crises. These patterns are consistent with banks' risk taking and/or government intervention during crises.

5. The Effect of Default on Bank Loans

Equipped with these results on the determinants of bondholdings, we now study the impact of the latter on financial intermediation during sovereign crises. Table 9 reports our estimates of the effects of banks' bondholdings on their lending behavior. Recall from Section 3 that the dependent variable is changes in loans outstanding between year *t-1* and *t*.

Column (1) includes as explanatory variables the total bondholdings of a bank in year *t-1*, $b_{i,c,t-1}$, as well as their interaction with sovereign default. Columns (2)-(5) decompose the

total bondholdings of banks into their normal and crisis components, b_i and $\hat{b}_{i,c,t-1}$, which are allowed to have different regression coefficients. Relative to column (2), columns (3)-(5) progressively include bank and country characteristics. Finally, columns (5)-(6) decompose total bondholdings even further into the four orthogonal components. By doing so, we are able to assess the role of country- and bank- specific components, again controlling for bank- and country-level characteristics (and country dummies).

[Table 9 here]

Column (1) shows that, on average, sovereign defaults have an insignificant effect on the loans extended by banks. Moreover, this effect is independent of the bonds held by banks. Interestingly, Column (2) illustrates that this result is due to a composition effect: higher normal-times bondholdings have a strong negative effect on the loans extended by a bank during a sovereign crisis, while higher crisis-times bondholdings have a positive effect on the supply of loans during the crisis.

The effect of normal-times bondholdings estimated in Column 2 is quantitatively large. A ten percent increase in normal-times bondholdings in a sovereign default is associated with a subsequent drop in loans by 1.3%. As we will see, the effect becomes even stronger when we control for bank and country characteristics. This is an interesting finding because, in our decomposition, normal-times bondholdings are by construction orthogonal both to the default event and to country- (or bank-) specific shocks occurring around it. It is also interesting to understand why crisis-times bondholdings are associated with more lending during sovereign crises. One possibility is that the correlation is spurious because relatively better banks self

select into buying bonds during crises. Indeed, in Section 4 we saw that larger and more profitable banks buy more bonds during default episodes.

To assess whether this is the case, in column (3) we control for bank characteristics and their interaction with default, in the spirit of Equation (7) (Table 7A). Controlling for bank characteristics also allows us to assess the robustness of the coefficient on normal-time bonds, because the choice of bondholdings depends on those characteristics as well. These controls are thus important to minimize the possibility of estimating a spurious interaction between default and bonds. The results are reassuring and go in the expected direction. First, the coefficient that captures the interaction between default and time-varying bonds becomes negative (but insignificant) once bank characteristics are controlled for. This suggests that, as we had anticipated, the consolidation of bonds into more profitable and larger banks during crises creates a bias towards under-estimating the adverse impact of bondholdings on the default-induced drop in loans.[14] Second, the coefficient on the interaction between default and normal-time bondholdings remains negative, significant, and – as previously anticipated – increases in magnitude. Thus, not only is the negative effect of normal-time bondholdings robust, it actually becomes stronger when bank characteristics are included in the regression.

In column (4) we insert country dummies. This is a way to control for the endogeneity of normal-time bonds to country variables (see Table 8A) and for country omitted factors affecting the demand for loans. Again, the results go in the expected direction: now both the normal

[14] Also bank risk-taking plays a role here. In fact, banks with already risky balance sheets take relatively fewer bonds during crises. But then, because these banks are also those cutting loans the most, exclusion of risk taking from the regression can create the misleading impression that the banks having fewer bonds cut loans the most.

time and the crisis time component of bondholdings are significant, owing to the fact that introduction of country dummies reduces standard errors. This result indicates that default hurts the ability/willingness of banks to make new loans during crises because of two reasons. First, banks hold public bonds in normal times. Default catches them holding government bonds and hurts their balance sheets. This reduces their ability to make loans. Second, banks increase their bondholdings during sovereign crises, either because public bonds command a high risk premium and become an attractive investment or because the government induces them to do so. The purchase of bonds crowds out loans, and eventual drops in the value of bonds reduces loans even further.

In Columns (5)-(7) we break down bondholdings into their bank- and country-specific component. In these Columns we introduce bank characteristics, country dummies, and country-level variables in levels and interacted with default. Introducing country-level variables is important to control for aggregate determinants of the demand for loans. The result that emerges is that only the bank components matter. This implies that within country bank heterogeneity in the purchase of bonds in normal and in crisis times is important to understand default-induced credit contractions.

To summarize, we find that bondholdings play an important cost in shaping the extent to which sovereign defaults reduce bank loans. During sovereign defaults, after controlling for country and bank level variables, a ten percent increase in public bonds is associated with a subsequent drop in loans by 2.4%. Our analysis allows us to split this drop in terms of normal-times and crisis-times bondholdings. Normal-times bondholdings account for 70% of the drop

in loans during default. Crisis-times bondholdings account for 30% of the drop. Thus, normal-times bondholdings explain 2.3 times as much of crisis-time bondholdings. Another way to assess the magnitude of these effects is to see their strength in the context of the variation observed in the dataset. From column 4, we find that a one standard deviation increase in bondholdings in a defaulting country is associated with a 6.5% larger decrease in lending as a percentage of total assets, of which 4.5% is due to normal-times bondholdings and 2.0% to crisis-times bondholdings. These are large effects.

6. Conclusions

[TO BE WRITTEN]

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APPENDIX – TABLES AND VARIABLE DESCRIPTIONS

Table 1 – Descriptive statistics of bank bondholdings in Bankscope and IMF data, by year

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Overall
Panel A – Bankscope data by bank													
Mean	7.13	7.39	7.06	7.08	7.93	8.33	8.24	8.50	8.11	7.69	7.86	8.42	7.89
Median	4.08	4.02	3.34	3.15	3.13	3.54	3.83	4.13	3.96	3.58	3.62	4.40	3.86
Std Dev	9.03	9.52	9.94	10.59	11.73	12.38	11.40	11.34	10.93	10.37	10.33	10.67	10.65
No obs.	4,305	4,412	4,258	4,043	3,821	3,753	4,015	5,111	5,202	5,141	5,337	5,822	58,830
Panel B – Bankscope data by bank, Constant Sample													
Mean	6.74	6.24	5.79	5.49	6.21	6.94	6.39	6.48	6.06	5.57	5.65	6.82	6.18
Median	4.25	3.63	2.69	2.04	1.95	1.83	1.96	2.15	2.11	1.90	1.64	2.36	2.41
Std Dev	7.55	7.47	8.35	8.96	10.11	11.39	9.92	9.71	9.09	8.52	8.74	9.93	9.17
No obs.	2,005	2,109	2,071	1,998	1,875	1,841	1,783	1,914	2,421	2,442	2,341	2,332	25,132
Panel C – IMF data, by country													
Mean	8.53	10.79	11.42	11.53	10.85	10.78	9.67	8.12	7.31	6.69	5.71	.	9.06
Median	7.05	8.17	8.38	8.44	7.37	7.90	7.15	6.16	5.10	4.51	3.78	.	6.22
Std Dev	11.63	14.16	14.56	15.44	15.79	14.86	14.11	14.02	12.51	11.50	11.51		13.85
No obs.	53	64	65	116	118	118	120	120	121	121	120	.	1,136

Table 2 – Banks' Holdings of Government Bonds – Comparing the EU Stress Test 2010 and Bankscope

	Mean	Median	Std Deviation	No Countries	No Observations
Panel A – Full Sample					
E.U. Bonds	8.62	6.52	7.36	20	78
Own Bonds	6.07	4.58	6.20	20	78
PIIGS Bonds	4.25	2.07	5.64	20	78
Panel B –Constant Sample					
E.U. Bonds	7.27	5.65	6.16	18	49
Own Bonds	5.84	4.06	6.22	18	49
PIIGS Bonds	4.34	1.88	6.25	18	49
Panel C – Bankscope data, Constant Sample					
Bondholdings Bankscope	7.14	4.95	6.05	18	49
Panel D – Banks in Crisis Countries					
Greece					
E.U. Bonds	18.10	16.20	8.84	1	6
Own Bonds	17.15	15.33	9.53	1	6
PIIGS Bonds	17.17	15.34	9.51	1	6
Ireland					
E.U. Bonds	2.91	2.91	3.15	1	2
Own Bonds	1.42	1.42	1.14	1	2
PIIGS Bonds	1.79	1.79	1.64	1	2
Italy					
E.U. Bonds	8.31	8.25	2.95	1	5
Own Bonds	7.12	5.72	3.29	1	5
PIIGS Bonds	7.25	5.89	3.30	1	5
Portugal					
E.U. Bonds	7.26	6.41	3.63	1	4
Own Bonds	4.96	5.29	3.05	1	4
PIIGS Bonds	6.47	5.82	4.35	1	4
Spain					
E.U. Bonds	5.33	5.64	2.87	1	15
Own Bonds	4.83	5.51	2.55	1	15
PIIGS Bonds	5.11	5.63	2.77	1	15

Table 3 – Descriptive Statistics on Banks around the world – Source: Bankscope

Re-Do with Regression Sample

All variables scaled by assets (except assets; and interbank ratio, defined as the ratio of interbank assets and interbank liabilities, and expressed in % terms)

	Mean	Median	Std Deviation	No Countries	No Observations
Assets ($/M)	9,077.4	687.6	75,900.0	151	25,132
Risk Taking d1	90.2	94.9	11.0	151	25,067
Leverage	91.4	94.0	8.7	151	25,131
Loans Outstanding	56.6	59.7	16.9	151	25,119
Profitability	0.8	0.6	2.2	151	25,114
Exposure to Central Bank	3.0	1.5	4.5	151	24,270
Interbank Balances	13.7	10.4	12.6	151	25,067

Table 4 – Descriptive Statistics on EU Banks involved in the EU Stress Test 2010

Just for comparison with Bankscope Banks

All variables scaled by assets (except assets; and interbank ratio, defined as the ratio of interbank assets and interbank liabilities, and expressed in % terms)

	Mean	Median	Std Deviation	No Countries	No Observations
Assets ($/M)	153,478.3	137,649.3	730,428.3	18	49
Risk Taking	90.6	92.8	6.3	18	49
Leverage	94.5	94.0	14.3	18	49
Loans Outstanding	61.4	65.5	15.0	18	49
Profitability	0.3	0.4	0.7	18	49
Exposure to Central Bank	1.8	2.1	1.2	9	16
Interbank Balances	6.4	5.7	4.0	18	49

Table 5 – Pairwise Correlations

	Bank Size	Risk Taking	Leverage	Loans	Profitability	Exposure
Risk Taking	-0.0162**					
Leverage	0.2823***	0.2708***				
Loans Outstanding	0.0053	0.3955***	0.2196***			
Profitability	0.0121**	-0.1908***	-0.2311***	-0.1176***		
Exposure to Central Bank	0.0084	-0.4099***	-0.1552***	-0.1733***	0.1455***	
Interbank Balances	-0.0671***	0.0529***	-0.1654***	-0.5529***	0.0474***	0.1303***

Table 6 – Variance of Bondholdings and its decomposition

Panel A – Full Sample (N = 25,132)

	Bondholdings
Std dev.	0.0917196
Variance	0.0084125

Time-Invariant Component		Time-Varying Component	
79.10%		20.90%	
Country Component	Bank-specific Component	Country-year Component	Bank-specific Component
52.21%	47.79%	22.02%	77.98%

Panel B – Countries experiencing at least one default (N = 1,543)

	Bondholdings
Std dev.	0.1272554
Variance	0.0161939

Time-Invariant Component		Time-Varying Component	
57.12%		42.88%	
Country Component	Bank-specific Component	Country-year Component	Bank-specific Component
25.75%	74.25%	21.18%	78.82%

Table 7 – Determinants of Bank-Specific Bondholdings

Standard errors are clustered by bank.

Panel A – Bank-specific Time-Invariant Bondholdings – Bank-level determinants

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Bank Size$_{t-1}$	0.002***							0.001**	0.001
	(0.001)							(0.000)	(0.000)
Bank Risk Taking$_{t-1}$		-0.248***						-0.258***	-0.261***
		(0.012)						(0.012)	(0.013)
Bank Leverage$_{t-1}$			-0.036*					0.047***	0.039***
			(0.020)					(0.017)	(0.018)
Loans Outstanding$_{t-1}$				-0.119***				-0.081***	-0.077***
				(0.007)				(0.006)	(0.006)
Bank Profitability$_{t-1}$					0.115**			-0.071*	-0.149*
					(0.046)			(0.040)	(0.052)
Exposure to CB$_{t-1}$						-0.004		-0.283***	-0.296***
						(0.021)		(0.023)	(0.025)
Interbank Balances$_{t-1}$							0.005	-0.023***	-0.018**
							(0.007)	(0.008)	(0.008)
Constant	-0.025***	0.224***	0.035*	0.068***	0.001	0.002	0.001	0.234***	0.248***
	(0.008)	(0.011)	(0.019)	(0.004)	(0.001)	(0.001)	(0.002)	(0.021)	(0.022)
Observations	24,198	24,198	24,198	24,198	24,198	24,198	24,198	24,198	22,782
R-squared	0.005	0.251	0.004	0.138	0.003	0.001	0.001	0.350	0.355

Panel B – Bank-Specific Time-Varying Bondholdings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sovereign Default$_{t-1}$ *	0.005**							0.004*
Bank Size$_{t-1}$	(0.002)							(0.002)
Sovereign Default$_{t-1}$ *		-0.117***						-0.084**
Bank Risk Taking$_{t-1}$		(0.030)						(0.037)
Sovereign Default$_{t-1}$ *			0.008					-0.017
Bank Leverage$_{t-1}$			(0.027)					(0.032)
Sovereign Default$_{t-1}$ *				-0.079***				-0.040
Loans Outstanding$_{t-1}$				(0.022)				(0.031)
Sovereign Default$_{t-1}$ *					0.128*			0.150**
Bank Profitability$_{t-1}$					(0.067)			(0.069)
Sovereign Default$_{t-1}$ *						0.033		0.048
Exposure to CB$_{t-1}$						(0.069)		(0.090)
Sovereign Default$_{t-1}$ *							0.020	0.011
Interbank Balances$_{-1}$							(0.040)	(0.053)
Sovereign Default$_{t-1}$	-0.054**	0.090***	-0.006	0.038***	-0.000	-0.002	-0.002	0.043
	(0.024)	(0.025)	(0.023)	(0.013)	(0.004)	(0.006)	(0.007)	(0.039)
Bank Size$_{t-1}$	-0.000							-0.000**
	(0.000)							(0.000)
Bank Risk Taking$_{t-1}$		-0.028***						-0.037***
		(0.004)						(0.006)
Bank Leverage$_{t-1}$			0.005					0.014**
			(0.005)					(0.006)
Loans Outstanding$_{t-1}$				-0.005**				0.002
				(0.002)				(0.003)
Bank Profitability$_{t-1}$					-0.017			-0.043
					(0.028)			(0.031)
Exposure to C. Bank$_{t-1}$						0.013		-0.014
						(0.009)		(0.011)
Interbank Balances$_{t-1}$							-0.004**	0.001
							(0.002)	(0.003)
Constant	0.001	0.025***	-0.005	0.002	-0.000	-0.001	0.000	0.024***
	(0.002)	(0.004)	(0.005)	(0.001)	(0.001)	(0.001)	(0.001)	(0.007)
No Observations	19,365	19,365	19,365	19,365	19,365	19,365	19,365	19,365
R-squared	0.001	0.015	0.000	0.006	0.001	0.000	0.000	0.020

Table 8 – Determinants of Country-Specific Bondholdings

Standard errors are clustered by country.

Panel A – Countrywide Time-Invariant Bondholdings – Country-level determinants

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sovereign Default$_{t-1}$	0.088***					-0.077**	-0.071**	0.005
	(0.025)					(0.031)	(0.027)	(0.017)
GDP Growth$_{t-1}$		0.904***				-0.110	-0.135	0.089
		(0.316)				(0.121)	(0.111)	(0.215)
Aggregate Leverage$_{t-1}$			-0.601***			-0.011	-0.010	
			(0.002)			(0.157)	(0.144)	
Banking Crisis$_{t-1}$				0.150***		0.087**	0.079**	
				(0.033)		(0.033)	(0.031)	
Private Credit$_{t-1}$					-0.118***	-0.104***	-0.094***	-0.125***
					(0.017)	(0.020)	(0.020)	(0.031)
Bank Size$_{t-1}$							0.001	0.002
							(0.001)	(0.002)
Bank Risk Taking$_{t-1}$							-0.082**	-0.170***
							(0.032)	(0.047)
Bank Leverage$_{t-1}$							-0.005	-0.021
							(0.006)	(0.017)
Loans Outstanding$_{t-1}$							-0.002	0.006
							(0.006)	(0.007)
Bank Profitability$_{t-1}$							0.018	0.072
							(0.038)	(0.067)
Exposure to C. Bank$_{t-1}$							-0.040	-0.058
							(0.060)	(0.057)
Interbank Balances$_{t-1}$							-0.011	-0.001
							(0.015)	(0.019)
Constant	0.058***	0.033**	0.007	0.040***	0.164***	0.158	0.216*	0.350***
	(0.021)	(0.016)	(0.021)	(0.010)	(0.020)	(0.132)	(0.115)	(0.073)
No Observations	23,835	23,855	24,198	13,049	14,907	12,953	12,953	10,174
R-squared	0.059	0.200	0.264	0.503	0.671	0.829	0.844	0.758

Panel B – Country-year Systematic Time-Varying Bondholdings – Country-level determinants

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sovereign Default$_{t-1}$ *	-0.012							0.156	0.335
GDP Growth$_{t-1}$	(0.051)							(0.121)	(0.202)
Sovereign Default$_{t-1}$ *		-0.479*						-1.247***	-0.801**
Unemployment Growth$_{t-1}$		(0.288)						(0.369)	(0.395)
Sovereign Default$_{t-1}$ *			0.030					0.062**	0.117***
Inflation$_{t-1}$			(0.019)					(0.029)	(0.041)
Sovereign Default$_{t-1}$ *				0.018***					
Exchange Rate Depreciation$_{t-1}$				(0.004)					
Sovereign Default$_{t-1}$ *					-0.162			0.243***	0.116
Aggregate Leverage$_{t-1}$					(0.109)			(0.069)	(0.129)
Sovereign Default$_{t-1}$ *						0.016*		0.030**	0.031**
Banking Crisis$_{t-1}$						(0.009)		(0.013)	(0.012)
Sovereign Default$_{t-1}$ *							-0.155***	0.652***	0.666***
Private Credit$_{t-1}$							(0.056)	(0.117)	(0.222)
Sovereign Default$_{t-1}$	0.016*	0.033***	0.016*	0.008	0.144	0.002	0.049**	-0.289***	-0.292***
	(0.010)	(0.006)	(0.009)	(0.009)	(0.088)	(0.006)	(0.020)	(0.067)	(0.054)
GDP Growth$_{t-1}$	0.009							0.049	0.027
	(0.039)							(0.130)	(0.120)
Unemployment Growth$_{t-1}$		0.084						-0.350	-0.343
		(0.110)						(0.271)	(0.282)
Inflation$_{t-1}$			-0.004					0.004	0.003
			(0.012)					(0.022)	(0.020)
Exchange Rate Depreciation$_{t-1}$				-0.000					
				(0.004)					
Aggregate Leverage$_{t-1}$					-0.014			0.030	0.045
					(0.024)			(0.072)	(0.070)
Banking Crisis$_{t-1}$						0.024***		0.019*	0.018*
						(0.004)		(0.010)	(0.009)
Private Credit$_{t-1}$							-0.004	0.003	0.006
							(0.003)	(0.007)	(0.006)
Sovereign Default$_{t-1}$ *									0.000
Bank Size$_{t-1}$									(0.000)
Sovereign Default$_{t-1}$ *									0.035*
Bank Risk Taking$_{t-1}$ d1									(0.019)
Sovereign Default$_{t-1}$ *									-0.005
Bank Leverage$_{t-1}$									(0.004)
Sovereign Default$_{t-1}$ *									-0.010*
Loans Outstanding$_{t-1}$									(0.005)
Sovereign Default$_{t-1}$ *									-0.057
Bank Profitability$_{t-1}$									(0.046)
Sovereign Default$_{t-1}$ *									-0.002
Exposure to CB$_{t-1}$									(0.024)
Sovereign Default$_{t-1}$ *									-0.032*
Interbank Balances$_{-1}$									(0.018)
Bank Controls?									Yes
Constant	-0.000	-0.005***	0.000	-0.008	0.013	-0.002	0.003	-0.030	-0.006
	(0.003)	(0.001)	(0.003)	(0.009)	(0.022)	(0.002)	(0.003)	(0.064)	(0.041)
No Observations	23,500	21,111	23,499	8,546	23,835	13,049	14,811	12,675	12,617
R-squared	0.144	0.248	0.145	0.090	0.145	0.300	0.110	0.367	0.404

Panel C – Country-year Systematic Time-Varying Bondholdings – Country-level determinants

	(1)	(2)	(3)	(4)
Sovereign Default$_{t-1}$ *		-0.224*	-0.260***	0.654***
Private Credit$_{t-1}$		(0.117)	(0.041)	(0.219)
Sovereign Default$_{t-1}$ *		0.124	-18.62***	-0.915***
Private Credit (time-average)		(0.164)	(1.63)	(0.338)
Sovereign Default$_{t-1}$ *	-0.073**		-0.046*	
Banking Crisis$_{t-1}$	(0.030)		(0.025)	
Sovereign Default$_{t-1}$ *	0.139***		0.670***	
Banking Crisis (time-average)	(0.036)		(0.038)	
Sovereign Default$_{t-1}$	-0.007*	0.034	3.22***	-0.020
	(0.004)	(0.023)	(0.282)	(0.072)
Private Credit$_{t-1}$		-0.076	0.010	-0.063
		(0.058)	(0.034)	(0.049)
Private Credit (time-average)		0.074	-0.013	0.068
		(0.060)	(0.034)	(0.052)
Banking Crisis$_{t-1}$	0.075***		0.078***	
	(0.021)		(0.021)	
Banking Crisis (time-average)	-0.055**		-0.060**	
	(0.021)		(0.024)	
Other country-level variables and interactions?	No	No	No	Yes
Other bank-level variables and interactions?	No	No	No	Yes
Constant	-0.002	0.001	0.002	0.005
	(0.002)	(0.004)	(0.005)	(0.029)
No Observations	13,049	14,811	12,953	13,661
R-squared	0.389	0.128	0.407	0.277

Table 9 – Determinants of Changes in Loans – Compact version

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bank Bondholdings$_{t-1}$ *	0.014						
Sovereign Default$_{t-1}$	(0.023)						
Bank time-invariant Bondholdings$_{t-1}$ *		-0.128**	-0.348**	-0.347**			
Sovereign Default$_{t-1}$		(0.055)	(0.139)	(0.160)			
Bank-specific time-invariant Bondholdings$_{t-1}$ *					-0.332**	-0.539***	-0.530***
Sovereign Default$_{t-1}$					(0.140)	(0.147)	(0.137)
Country-wide time-invariant Bondholdings$_{t-1}$ *					-0.258*	-0.048	-0.254
Sovereign Default$_{t-1}$					(0.141)	(0.221)	(0.273)
Bank time-varying Bondholdings$_{t-1}$ *		0.104**	-0.131	-0.155**			
Sovereign Default$_{t-1}$		(0.049)	(0.080)	(0.069)			
Bank-specific time-varying Bondholdings$_{t-1}$ *					-0.138	-0.284**	-0.275***
Sovereign Default$_{t-1}$					(0.089)	(0.120)	(0.100)
Country-wide time-varying Bondholdings$_{t-1}$ *					-0.019	-0.250	-0.157
Sovereign Default$_{t-1}$					(0.217)	(0.176)	(0.212)
Bank Bondholdings$_{t-1}$	0.084***						
	(0.008)						
Bank time-invariant Bondholdings$_{t-1}$		0.060***	-0.061**	-0.073**			
		(0.009)	(0.028)	(0.029)			
Bank-specific time-invariant Bondholdings$_{t-1}$					-0.089***	-0.041	-0.052
					(0.030)	(0.068)	(0.052)
Country-wide time-invariant Bondholdings$_{t-1}$					-0.028	-0.123*	
					(0.033)	(0.069)	
Bank time-varying Bondholdings$_{t-1}$		0.180***	0.099***	0.121***			
		(0.029)	(0.037)	(0.029)			
Bank-specific time-varying Bondholdings$_{t-1}$					0.085**	0.174**	0.162***
					(0.035)	(0.073)	(0.044)
Country-wide time-varying Bondholdings$_{t-1}$					0.175***	0.362***	0.322***
					(0.062)	(0.100)	(0.114)
Sovereign Default$_{t-1}$	-0.018	0.005	0.259***	0.267***	0.231***	0.273***	0.262***
	(0.012)	(0.008)	(0.073)	(0.071)	(0.085)	(0.060)	(0.056)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects?				Yes			Yes
Bank-Level Controls and Interactions?			Yes	Yes	Yes	Yes	Yes
Country-Level Controls and Interactions?						Yes	Yes
Constant	-0.005**	-0.003	0.092***	0.044	0.086**	0.016	0.059
	(0.002)	(0.002)	(0.034)	(0.027)	(0.034)	(0.063)	(0.053)
No Observations	20,374	20,374	20,374	20,374	20,374	11,996	11,996
R-squared	0.027	0.037	0.069	0.106	0.072	0.119	0.135

Figure 1

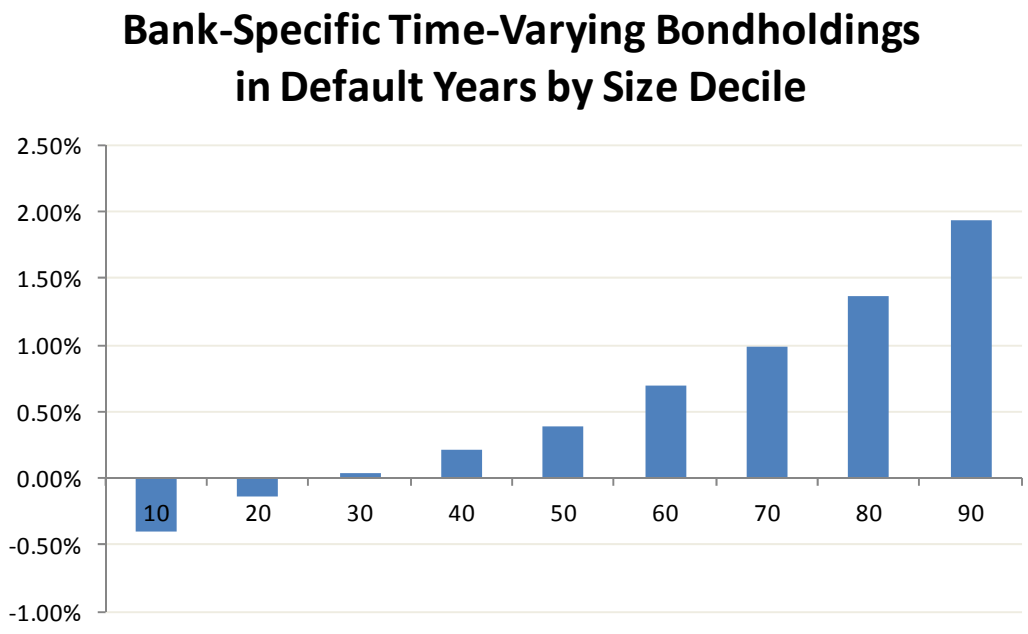

Figure 2

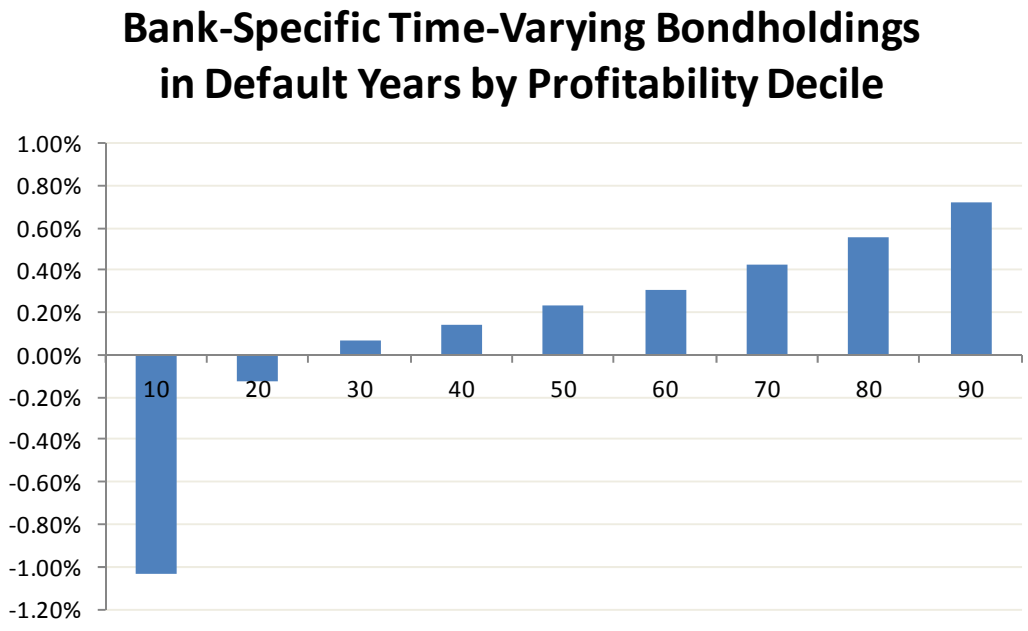

Table AI – Description of the Variables used in the Analysis

Variable	Definition
Bank-level variables	
Assets	Total book value of intangible, tangible and other fixed assets. Source: Bankscope.
Bank Bondholdings	Total holding of government securities, including treasury bills, bonds and other government securities, divided by total assets. Source: Bankscope.
Bank Size	Natural logarithm of total assets. Source: Bankscope.
Bank Risk Taking	One minus cash, due from banks, and total holding of government securities divided by total assets. Source: Bankscope.
Bank Leverage	One minus book value of equity (issued share capital plus other shareholders fund) divided by total assets. Source: Bankscope.
Loans	Total loans outstanding. Source: Bankscope.
Bank Profitability	Operating income divided by total assets. Source: Bankscope.
Exposure to Central Bank	Total exposure to central bank. Source: Bankscope.
Interbank Balances	Interest-earning balances with central and other banks, excluding impairment allowance, but including amounts due under reverse repurchase agreements, divided by total assets Source: Bankscope.
Country-level variables	
Sovereign Default	Dummy variable that equals 1 if the sovereign issuer is in default. Sovereign default is defined as the failure to meet a principal or interest payment on the due date (or within the specified grace period) contained in the original terms of the debt issue. In particular, each issuer's debt is considered in default in any of the following circumstances: (i) For local and foreign currency bonds, notes and bills, when either scheduled debt service is not paid on the due date, or an exchange offer of new debt contains terms less favorable than the original issue; (ii) For central bank currency, when notes are converted into new currency of less than equivalent face value; (iii) For bank loans, when either scheduled debt service is not paid on the due date, or a rescheduling of principal and/or interest is agreed to by creditors at less favorable terms than the original loan. Such rescheduling agreements covering short and long term debt are considered defaults even where, for legal or regulatory reasons, creditors deem forced rollover of principal to be voluntary. Source: Standard & Poor's (2008)
GDP Growth	Logarithm of gross national product per capita (Atlas method) from 1980 to 2005. Source: World Development Indicators (September 2008).
Aggregate Leverage	Country-year average of bank-level leverage. Source: Bankscope.
Banking Crisis	Dummy variable that equals 1 if the country is experiencing a banking crisis Banking crisis is defined as a situation in which the net worth of the banking system has been almost or entirely eliminated. Source: Caprio and Klingebiel (2001) and the updated data by Caprio et al. (2005).
Unemployment Growth	Annual percentage unemployment. Source: World Development Indicators (September 2008).
Inflation	Annual percentage inflation, GDP deflator. Source: World Development Indicators (September 2008).
Private Credit	Ratio of credit from deposit taking financial institutions to the private sector (International Financial Statistics lines 22d and 42d) to GDP (International Financial Statistics line 99b), expressed as a percentage. Line 22d measures claims on the private sector by commercial banks and other financial institutions that accept transferable deposits such as demand deposits. Line 42d measures claims on the private sector given by other financial institutions that do not accept transferable deposits but that perform financial intermediation by accepting other types of deposits or close substitutes for deposits (e.g., savings and mortgage institutions, post office savings institutions, building and loan associations, certain finance companies, development banks, and offshore banking institutions). Source: International Monetary Fund, International Financial Statistics (September 2008).

Table AII – Default Episodes and Bank-Years in Default

Country	Default Episodes	No Bank-Years	No Banks
Argentina	2001-2004	231	87
Ethiopia	1998-1999	2	1
Guyana	1998-2004	20	3
Honduras	1998-2004	79	21
Indonesia	1999-2000; 2002	17	13
Kenya	1998-2004	160	33
Nigeria	2002	41	41
Russia	1998-2000	40	31
Serbia	2004	2	2
Sudan	2001-2003	2	1
Tanzania	2004	1	1
Ukraine	1998-2000	14	7
Zimbabwe	2000-2004	6	3
Total		615	244

Table AIII – Bondholdings and Changes in Loans in Sovereign Default Years – Full Version

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bank Bondholdings$_{t-1}$ *	0.014						
Sovereign Default$_{t-1}$	(0.023)						
Bank time-invariant Bondholdings$_{t-1}$ *		-0.128**	-0.348**	-0.347**			
Sovereign Default$_{t-1}$		(0.055)	(0.139)	(0.160)			
Bank-specific time-invariant Bondholdings$_{t-1}$ *					-0.332**	-0.539***	-0.530***
Sovereign Default$_{t-1}$					(0.140)	(0.147)	(0.137)
Country-wide time-invariant Bondholdings$_{t-1}$ *					-0.258*	-0.048	-0.254
Sovereign Default$_{t-1}$					(0.141)	(0.221)	(0.273)
Bank time-varying Bondholdings$_{t-1}$ *		0.104**	-0.131	-0.155**			
Sovereign Default$_{t-1}$		(0.049)	(0.080)	(0.069)			
Bank-specific time-varying Bondholdings$_{t-1}$ *					-0.138	-0.284**	-0.275***
Sovereign Default$_{t-1}$					(0.089)	(0.120)	(0.100)
Country-wide time-varying Bondholdings$_{t-1}$ *					-0.019	-0.250	-0.157
Sovereign Default$_{t-1}$					(0.217)	(0.176)	(0.212)
Bank Bondholdings$_{t-1}$	0.084***						
	(0.008)						
Bank time-invariant Bondholdings$_{t-1}$		0.060***	-0.061**	-0.073**			
		(0.009)	(0.028)	(0.029)			
Bank-specific time-invariant Bondholdings$_{t-1}$					-0.089***	-0.041	-0.052
					(0.030)	(0.068)	(0.052)
Country-wide time-invariant Bondholdings$_{t-1}$					-0.028	-0.123*	
					(0.033)	(0.069)	
Bank time-varying Bondholdings$_{t-1}$		0.180***	0.099***	0.121***			
		(0.029)	(0.037)	(0.029)			
Bank-specific time-varying Bondholdings$_{t-1}$					0.085**	0.174**	0.162***
					(0.035)	(0.073)	(0.044)
Country-wide time-varying Bondholdings$_{t-1}$					0.175***	0.362***	0.322***
					(0.062)	(0.100)	(0.114)
Sovereign Default$_{t-1}$	-0.018	0.005	0.259***	0.267***	0.231***	0.273***	0.262***
	(0.012)	(0.008)	(0.073)	(0.071)	(0.085)	(0.060)	(0.056)
Bank Size$_{t-1}$ *			-0.008***	-0.005***	-0.008***	0.004	0.004
Sovereign Default$_{t-1}$			(0.001)	(0.001)	(0.001)	(0.004)	(0.004)
Bank Risk Taking$_{t-1}$ *			-0.176**	-0.176**	-0.161*	-0.199**	-0.188***
Sovereign Default$_{t-1}$			(0.070)	(0.071)	(0.090)	(0.074)	(0.058)
Bank Leverage$_{t-1}$ *			0.098***	0.059***	0.099***	0.009	0.008
Sovereign Default$_{t-1}$			(0.018)	(0.010)	(0.018)	(0.028)	(0.030)
Loans Outstanding$_{t-1}$ *			-0.141**	-0.175**	-0.137**	-0.288***	-0.292***
Sovereign Default$_{t-1}$			(0.066)	(0.070)	(0.055)	(0.040)	(0.041)
Bank Profitability$_{t-1}$ *			0.223	0.179	0.269*	-0.119	-0.166
Sovereign Default$_{t-1}$			(0.157)	(0.147)	(0.152)	(0.137)	(0.153)
Exposure to Central Bank$_{t-1}$ *			-0.074	-0.161*	-0.084	-0.396***	-0.464***
Sovereign Default$_{t-1}$			(0.117)	(0.087)	(0.120)	(0.136)	(0.139)
Interbank Balances$_{t-1}$ *			0.026	0.025	0.031**	0.082***	0.077***
Sovereign Default$_{t-1}$			(0.018)	(0.025)	(0.014)	(0.024)	(0.019)
Bank Size$_{t-1}$			0.001*	0.001**	0.001*	0.000	0.000
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Bank Risk Taking$_{t-1}$			-0.074***	-0.031	-0.068***	0.017	0.002
			(0.026)	(0.022)	(0.026)	(0.063)	(0.040)
Bank Leverage$_{t-1}$			-0.016	0.005	-0.012	0.010	0.012
			(0.012)	(0.009)	(0.012)	(0.015)	(0.015)
Bank Loans Outstanding$_{t-1}$			-0.034**	-0.051**	-0.038**	-0.045**	-0.040**
			(0.015)	(0.022)	(0.014)	(0.022)	(0.018)
Bank Profitability$_{t-1}$			-0.084	-0.091	-0.098	0.108	0.159
			(0.154)	(0.147)	(0.150)	(0.097)	(0.101)
Exposure to Central Bank$_{t-1}$			0.045*	0.092***	0.034	0.050	0.129***
			(0.025)	(0.021)	(0.023)	(0.059)	(0.042)
Interbank Balances$_{t-1}$			0.009	-0.002	0.007	-0.011	-0.005
			(0.007)	(0.005)	(0.007)	(0.010)	(0.004)
Sovereign Default$_{t-1}$ *						0.009	0.046

GDP Growth$_{t-1}$						(0.110)	(0.088)
Sovereign Default$_{t-1}$ *						-0.046*	-0.048
Banking Crisis$_{t-1}$						(0.023)	(0.033)
Sovereign Default$_{t-1}$ *						-0.252*	-0.157
Private Credit$_{t-1}$						(0.130)	(0.125)
GDP Growth$_{t-1}$						0.120	0.096
						(0.077)	(0.059)
Banking Crisis$_{t-1}$						0.011	0.018
						(0.010)	(0.029)
Private Credit$_{t-1}$						-0.015**	-0.055
						(0.007)	(0.034)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects?				Yes			Yes
Constant	-0.005**	-0.003	0.092***	0.044	0.086**	0.016	0.059
	(0.002)	(0.002)	(0.034)	(0.027)	(0.034)	(0.063)	(0.053)
No Observations	20,374	20,374	20,374	20,374	20,374	11,996	11,996
R-squared	0.027	0.037	0.069	0.106	0.072	0.119	0.135