

# The role of bond finance in firms' survival during the Asian crisis

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## Abstract

In this paper, we assess the effects of bond financing on firm survival during the 1997-98 Asian crisis. Using a novel database covering the period 1995 to 2006 for five Asian economies most affected by the crisis - Indonesia, Korea, Malaysia, Singapore and Thailand - our paper demonstrates that access to bond finance substantially increases the probability of survival. Our results also indicate that bond issuers are shielded from the adverse effects of the Asian crisis. Nevertheless, when we test for the impact of currency denomination of bonds on firms' survival probabilities we find that while firms issuing bonds in local currency are not affected during the 1997-98 period, firms with foreign bond issuance face an increased probability of failure.

Key words: Firm survival, Bond financing, Financial crisis  
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# 1 Introduction

What is the effect of bond financing on corporate failures? Bolton and Freixas (2008) argue that bond financing, as a form of long-term finance, does not expose firms to the risks of bank runs and systemic crises. While bank-financed firms are fully exposed to the risk of bank loans, bond-financed firms are shielded from the adverse effects of a financial crisis and therefore are more likely to survive. It is generally accepted that during hard times lenders are more likely to withhold funds and interrupt lines of credit to less creditworthy firms forcing some of them to fail.

The main goal of this paper is to quantify the effects (and assess the importance) of bond financing in influencing firm survival. We do this using a novel dataset that combines several sources including Thomson Financial Primark, Bondware, Bloomberg, Zephyr and the Bank for International Settlements. We then go further to examine if bond-financed firms are shielded from the adverse effects of the Asian crisis. Given that bond markets in Asia were largely underdeveloped during the crisis it is not clear whether access to financial markets dampened the effects of the crisis. We are able therefore to assess the potential offsetting role of bond finance in determining business failures.

The East Asian twin crisis (currency and banking crisis) is an ideal setting to study the link between firms' survival and access to bond markets because during this period most corporations were heavily dependent on domestic and foreign bank finance to supplement internal funds for investment, with smaller and medium sized enterprises almost exclusively reliant on domestic bank loans. When the crisis erupted the funding to banks and then to corporations fell dramatically, and in the absence of local corporate bond markets to provide an alternative source of funding the effects of the crisis were amplified (Eichengreen et al. (2006)).

The theoretical motivation for the role of bond financing in survival is related to the 'track record' reputation that firms can establish in the bond market. Reputation, which is a concept that was made popular by Diamond (1991), is based on the history of firms'

credit risk and can be used to access the bond market under favourable terms. Firms with access to bond markets are able to bear the significant fixed cost of issuing a bond, which is generally higher than the fixed cost of taking out a bank loan, and thus to give a good signal to lenders for their reputation. These reputational effects may become even more relevant during periods of economic crises where bond issuers might be able to overcome financial problems by extending external finance and re-negotiating existing bank loans. For example, banks could re-schedule the loans for issuers, and trade creditors may extend their funding to support customers with long-lasting relationships. This may not be the case for bank dependent non-issuing firms that do not have established a track record in the market. Non-issuers therefore may find it more expensive to obtain external funding at times of hardship. These considerations suggest that reputational effects for bond issuers can be beneficial for their survival, especially during economic crises.

Figure 1 presents prima facie evidence suggesting that East Asian firms with access to bond markets may be better equipped to weather systemic crises. Using our data to compare issuers and non-issuers, we show that the latter category exhibits significantly more failures throughout the sample period. Importantly, this difference is even more pronounced during the crisis. For example, in the year 1997 the number of failing firms that do not have access in the bond market (non-issuers) is about 12 times higher compared to bond issuers. This startling difference between issuers and non-issuers maybe explained by the fact that the former group of firms has an established ‘track record’ in the market and therefore is associated with the lower degree of informational asymmetry.

Our work is related to three different strands of literature. First, we build on the empirical and theoretical literature that looks at the importance of financial status and borrowing constraints on firms’ survival chances and concludes that firms in bad financial shape are more likely to fail (see Zingales (1998); Bunn and Redwood (2003); Clementi and Hopenhayn (2006); Farinha and Santos (2006) and Bridges and Guariglia (2008)). A second relevant strand of literature has emphasised the important role of macroeconomic environment in

survival. Alvarez and Görg (2009) offer evidence from Latin America and Bhattacharjee et al. (2009) from the UK showing that changes in the macroeconomic environment may interact with relevant firm and industry features in amplifying exit hazards. A third related line of work is the literature on the emerging economies financial development. According to BIS (2005) reports, the development of the financial system in general will help firms to better endure financial crises and avoid currency mismatches. However, the progress of development in Asia, especially for corporate bonds, remains painfully slow (Borensztein et al. (2006) and Eichengreen et al. (2006)).

This study improves on the existing empirical studies in several ways. We start by examining the role of bond financing in firms' survival. It is well known that in the presence of information asymmetries in capital markets, firms prefer internal to external finance, but at some point as firms grow, self-funding typically becomes insufficient to finance their investment projects and so they turn to sources of external finance from the markets, in preferential order for equity, debt and banks.<sup>1</sup> In this paper, we focus on bond finance and investigate whether bond issuers are more likely to survive compared to non-issuing firms. Further, using comparable micro level panel of five economies - Indonesia, Korea, Malaysia, Singapore and Thailand - that were hit the hardest during the 1997-98 Asian crisis we assess the implications of the crisis on survival for bond issuers and non-issuers. In particular, we look at the importance of reputation, established through bond issuance, on the likelihood of failure during the Asian crisis and test whether being a bond issuer is more of an advantage in attenuating failure hazards. We also consider the currency denomination of bonds, distinguishing between domestic and foreign issued bonds to evaluate their impact during the twin Asian crisis.

The remainder of the paper is laid out as follows. Section two illustrates the empirical specifications and the econometric methodology. In Section three we present a descriptive analysis of our data. Section four presents the empirical evidence. In section five we check

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<sup>1</sup>This sequence arises from the 'pecking-order' hypothesis by Myers and Majluf (1984) and a literature has developed to explore the composition of external finance based on this hypothesis.

the robustness of our findings. Section six concludes the paper.

## 2 Empirical implementation

To assess the importance of bond financing in influencing firm survival we use a complementary log-log model (cloglog), a discrete time proportional hazard model, for the empirical estimations (see Bandick and Görg (2010); Ilmakunnas and Nurmi (2010) and Tsoukas (2011)). To capture the particular nature of the dataset, given that is collected on a yearly basis, the cloglog model is more appropriate compared to the Cox model.<sup>2</sup> Survival methods are also adequate in the presence of right-censored observations and are able to handle time-varying covariates.

The assumption of the proportional hazard model is that the hazard ratio depends only on time at risk,  $\theta_0(t)$  (the so-called baseline hazard) and on explanatory variables affecting the hazard independently of time,  $exp(\beta'X)$ . The hazard ratio is then given by:

$$\theta(t, X) = \theta_0(t)exp(\beta'X) \tag{2.1}$$

The discrete-time hazard function,  $h(j, X)$ , shows the interval hazard for the period between the beginning and the end of the  $j^{th}$  year after the first appearance of the firm. This hazard rate, which is the rate at which firms fail at time  $t$  given that they have survived in  $t - 1$ , takes the following form:

$$h(j, X) = 1 - exp[-exp(\beta'X + \gamma_j)] \tag{2.2}$$

We are particularly interested in identifying the  $\beta$  parameters, which show the effect of the explanatory variables incorporated in vector  $X$  on the hazard rate.<sup>3</sup> Vector  $X$  captures

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<sup>2</sup>In addition, the cloglog model has the same assumptions on the coefficient vector  $\beta$  as the continuous-time version of the proportional hazard model (Prentice and Gloeckler (1978)).

<sup>3</sup>We define a firm as failed when its company status is that of dead. We elaborate on the construction of the failure dummy in the next section. Note that we use the terms failure and survival interchangeably.

characteristics of the firm, industry and the macroeconomic environment. Further, period specific effects on the hazard are captured by  $\gamma_j = \log \int_{\alpha_{(j-1)}}^{\alpha_j} \theta_0(t) dt$ .

Motivated by Clementi and Hopenhayn (2006), who develop a theory of borrowing constraints and study its implications for firm survival among other firm dynamics,<sup>4</sup> we consider three dimensions of financial health from the balance sheet, namely leverage, profitability and collateral assets. The financial condition of the firm is an important determinant of firm failure as argued by Zingales (1998), Bunn and Redwood (2003) and Bridges and Guariglia (2008). Considering the likely response of leverage (*LEVERAGE*), as measured by the firm's total debt to total assets, we remark that high levels of existing debt are associated with a worse balance sheet situation, which would increase moral hazard and adverse selection problems, and lead to the inability of firms to obtain external finance at a reasonable cost (see Levin et al. (2004)). Zingales (1998) and Farinha and Santos (2006) show that highly leveraged carriers and start-ups are less likely to survive. We expect therefore a positive relationship between leverage and the probability of failure.

The next financial component is a profitability ratio (*PROFITABILITY*) defined as the ratio of the firm's profits before interests and tax to its total assets. Following Bunn and Redwood (2003) and Bridges and Guariglia (2008) we use this measure to proxy for the firm's ability to generate profits. Profitable firms can use their internal funds as a buffer to absorb unexpected losses, reducing the probability of insolvency and the hazard of failure. Therefore, we anticipate a positive relationship between profitability and the likelihood of survival.

As an additional financial indicator we include a measure of tangible assets, which is measured as tangible assets to total assets (*COLLATERAL*). This variable indicates the firm's ability to pledge collateral for debt finance. Assets that are more tangible sustain more external financing because tangibility increases the value that can be recaptured by

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<sup>4</sup>Their model generates a role for capital structure in an asymmetric information setup. The theoretical frameworks on survival were firstly introduced by Hopenhayn (1992) and Jovanovic (1982) without considering a role for moral hazard.

creditors in case of borrower's default. Collateral has also been found to affect firms' chances of survival. Farinha and Santos (2006) and Bridges and Guariglia (2008) document that firms with a larger fraction of tangibles in their balance sheets are more likely to survive for a longer period of time. Thus, we expect a negative relationship between collateral and the incidence of failure.

In addition to financial characteristics our specifications include a choice of control variables guided by the existing empirical and theoretical literature on the determinants of firm survival. It is recognised that a firm's size plays an important role in determining firm failure, (Clementi and Hopenhayn (2006)), and is expected to decrease the incidence of failure. Large firms tend to face lower barriers in accessing the capital markets, while smaller firms with more severe information problems tend to face a higher risk of insolvency and illiquidity and consequently a higher risk of failure (Mata and Portugal (1994); Audretsch and Mahmood (1995) and Dunne et al. (1998)). Hence, we introduce size (*SIZE*) measured as the logarithm of the firm's real total assets.<sup>5</sup> We also incorporate its squared term (*SIZE*<sup>2</sup>) to allow for non-linearities. Further, we include firms' age since firms with an established track record are less likely to fail than those that are younger because new entrants face a greater risk of failure due to the 'liability of newness' effect (Stinchcombe (1965)). A large number of empirical and theoretical papers have shown that younger firms are more likely to fail (e.g Jovanovic (1982); Audretsch and Mahmood (1995) and Clementi and Hopenhayn (2006)) and this would be the case both for domestic and multinational firms as noted by Görg and Strobl (2002). Thus, we introduce age (*AGE*) which measures the number of years a firm has been listed on the stock exchange.

We also attempt to control for macroeconomic and industry-specific conditions in our models. To this end, we control for macroeconomic effects by adding the real effective exchange rates, which measures the exchange rate environment.<sup>6</sup> Baggs et al. (2009) document

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<sup>5</sup>To check the robustness of our results we use two alternative measures of size such as the number of employees and real sales. Our results, not reported here for brevity, remain largely unaffected.

<sup>6</sup>The Bank for International Settlement calculates effective exchange rate as geometric weighted averages of bilateral exchange rates adjusted by relative consumer prices.

a negative association between survival and appreciation of the Canadian dollar. We expect the exchange rate (*EXCHANGE*) to decrease the survival prospects of firms. To control for economies of scale of the industry, we add the minimum efficient scale of the industry (*MES*), measured as the log of median output in sector  $j$ .<sup>7</sup> Empirical evidence concerning the influence of *MES* on firm survival is ambiguous. At one extreme, one might expect firms entering industries with large minimum efficient scale to have lower probabilities of survival than firms entering other industries, Mata and Portugal (1994). At the other extreme, industries with high *MES* are usually industries showing high price cost margins, which should increase firm survival (Audretsch (1991)). We expect *MES* to significantly affect firm survival but its sign will be determined by the data. We also include a set of country and industry dummies that control for institutional differences between countries and for fixed effects across industries.

In order to establish whether firms' survival prospects change when we consider a role for bond financing, we include the term *BOND* which is a dummy equal to 1 if firm  $i$  issues a bond in year  $t$ , and 0 otherwise. Thus, we record the bond history in each firm. This specification is aimed at capturing the direct impact of bond finance on firm survival. The direct effect is judged from the sign and significance of the coefficient  $\beta_9$ . The estimated model is specified as follows:

$$h(j, X) = 1 - \exp[-\exp(\beta_0 + \beta_1 LEVERAGE + \beta_2 PROFIT + \beta_3 COLLATERAL + \beta_4 SIZE + \beta_5 SIZE^2 + \beta_6 AGE + \beta_7 EXCHANGE + \beta_8 MES + \beta_9 BOND + \gamma_j)] \quad (2.3)$$

Equation (2.3) is modified to include interactions between bond issuers with a crisis dummy to show variations in firms' survival prospects for crisis and out of crisis periods.

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<sup>7</sup>We also employ the *MES* defined as the log of median employment size in the industry, used by Görg and Strobl (2003). Results remain largely unchanged.

To do so we include a time period dummy (*CRISIS*) that takes the value of one in years 1997-98, and zero otherwise. This test is motivated by the theoretical argument of Bolton and Freixas (2008), that bond-financed firms are shielded from the direct effect of a financial crisis. The sign and the significance of the interacted terms will reveal whether the impact of bond finance on firm survival differs for tranquil and turbulent periods.

$$\begin{aligned}
 h(j, X) = 1 - \exp[-\exp(\beta_0 + \beta_1 LEVERAGE + \beta_2 PROFIT + \beta_3 COLLATERAL + \beta_4 SIZE \\
 + \beta_5 SIZE^2 + \beta_6 AGE + \beta_7 EXCHANGE + \beta_8 MES + \beta_9 BOND + \beta_{10} BOND * CRISIS \\
 + \beta_{11} CRISIS + \gamma_j)] \quad (2.4)
 \end{aligned}$$

Finally, we model the differential impact of currency denomination of bonds on the incidence of failure during the 1997-98 crisis.

## 3 Data

### 3.1 Data description

The data for this paper are drawn from different sources including Thomson Financial Primark, Bondware, Bloomberg, Zephyr and the Bank for International Settlements. These are combined in a new way to cast light on the probability of failure in the Asian region. The data cover firms in emerging Asia mostly affected by the 1997-98 crisis - Indonesia, Korea, Malaysia, Singapore and Thailand. The time period is 1995 through 2006,<sup>8</sup> which covers the period of the East Asian crisis and the aftermath of the crisis which has been characterised by a significant regional development in terms of size, liquidity and sophistication.

The Thomson Financial Primark database offers balance sheet and profit and loss ac-

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<sup>8</sup>Data for 2007 were removed from our sample due to the fact that it may contain some early effects of the recent global financial crisis.

counts data for firms in the East Asian region. We provide information on financial accounts and ratios for Asian firms operating in all sectors of the economy. The data on bond issues are drawn from Bondware and Bloomberg. We use Bondware to identify all corporate bonds issued in international markets and we use Bloomberg to identify similar data for firms that issue bonds in the domestic Asian markets. Our coverage of bond issues therefore embraces both firms with issues in hard currencies, which are almost exclusively US dollar denominated, and firms with local currency denominated bonds. Before the crisis, issuance in local currency bonds by corporations was very limited but in the post-crisis period it went up significantly (see Fernandez and Klassen (2004)). In our data 55% of bonds are denominated in domestic currency and the remaining 45% in foreign currency. Data on the real effective exchange rates, which are meant to proxy for changes in the macroeconomy, are taken from the Bank for International Settlements.

We use Zephyr to obtain data on mergers and acquisitions for the sampled firms. Thomson Financial Primark reports firms as ‘dead’ but it may be possible that some firms could be recorded as ‘dead’ not because they failed but because they merged with another firm instead. Employing Zephyr we are able to identify and drop those firms that are mistakenly coded as ‘dead’ in our data. This will ensure that our dependent variable has been accurately constructed to capture firms that failed and did not exit the sample due to mergers and acquisitions.

Following normal selection criteria used in the literature, we exclude companies that did not have complete records for all explanatory variables and firm-years with negative sales. To control for the potential influence of outliers, we exclude observations in the 0.5 percent from upper and lower tails of the distribution of the regression variables. Our combined sample contains data for 382 firms in Indonesia, 951 in Korea, 878 in Malaysia, 556 in Singapore and 622 in Thailand, a total of 3,389 firms.

## 3.2 Sample analysis

By way of preliminary analysis, we show the evolution of failures over time in Figure 2. This figure shows that our sample is dominated by firms that failed in 1997 which coincided with the onset of the Asian crisis and 1998 which marked the end of the crisis. Apart from this period the distribution of failures over time is reasonably stable. Summary statistics for the variables used in our empirical analysis are provided in Table 1. Means and standard deviations of the firm-specific variables and financial indicators are presented for the total sample (column 1), for failed and surviving firms (columns 2 and 3) and for those firms that are issuers and those that are non-issuers (columns 5 and 6). Further, the p-values of a test for the equality of means are presented in columns 4 and 7. Looking at columns 2 and 3 we observe that surviving firms are larger than failed firms. This finding implies that firm size is an important determinant in business failures. The proxy for age shows that survivors are also longer listed on the stock exchange suggesting that those firms that are able to build track record in the market are more likely to reduce the incidence of failure. Both findings are in line with the previous empirical and theoretical research, which shows that the probability of exit decreases with firm size and age (e.g Jovanovic (1982) and Clementi and Hopenhayn (2006)). Regarding the financial variables, surviving firms display higher levels of profitability, they are more collateralised and less indebted. This supports the notion put forward by a number of studies (see Zingales (1998); Bunn and Redwood (2003); Clementi and Hopenhayn (2006); Farinha and Santos (2006) and Bridges and Guariglia (2008)) that firms which display healthier balance sheets are less likely to fail. Further, surviving firms are more likely to be bond issuers and less likely to be affected by the crisis. These differences between sub-samples are statistically significant in all cases.

On the basis of bond financing (columns 5 and 6), we observe that the average firm's failure rate for non-issuers (0.114) is almost 1.5 times higher than the corresponding figure for bond issuers (0.077). These statistics highlight the importance of bond financing in attenuating exit hazards. We find that firms with access to bond finance are larger, confirming

the information asymmetry problem that small firms face (see Calomiris et al. (1995)). We also observe that bond issuers are more leveraged, consistent with the notion that higher levels of leverage is often perceived as a good sign of borrowing capacity in the bond markets (see Dennis and Mihov (2003)). They also have lower levels of profitability and collateral compared to non-issuers. The former finding shows that more profitable firms may find it optimum to delay their entry to bond markets consistent with the limited liquidity assumption. The latter statistic implies that having more tangible assets is not necessarily an advantage for bond issuance, unlike for bank finance where tangible assets can be pledged as collateral. In addition, bond issuers are less likely to fail during the financial crisis (0.092) in contrast with non-issuers (0.155).

In summary, these preliminary statistics show that firms' failure rates are related to bond finance, financial healthiness and the crisis. In the sections that follow we provide formal econometric analysis of the determinants of firm failures, the effect of financial crisis, and the role of bond financing. Thus, it remains to be seen whether these statistical findings are confirmed when we control for a number of factors which are known to play a role in survival models.

## **4 Main results**

### **4.1 Bond finance and the Asian crisis**

The East Asian financial system suffered severe damages during the crisis primarily due to the underdeveloped bond market and the weak banking sector. One basic premise of this paper is that access to bond finance is associated with the establishment of reputation in the market (Diamond (1991)). If reputational effects are in play we should expect to find bond issuers to be less likely to fail, everything else equal. In addition, we anticipate reputation to be of particular importance during the crisis. This is because non-issuing firms, which are more informational opaque and lack track record, will have a higher probability of failure.

In Table 2, column 1 we report the direct impact of bond finance on failure as shown in Equation (2.3). We observe that the coefficient on the bond issuance dummy exerts a negative impact on the likelihood of failure. The finding is economically important since a change in the dummy from 0 to 1 (non-issuer to issuer) will reduce the exit probability by 51%.<sup>9</sup> Firms that are able to borrow through the issuance of bond debt are those that can bear the significant fixed cost of accessing the bond market, which is higher than the fixed cost of taking out a bank loan, and signal their lenders for their good reputation. Bond-financed firms might be able to overcome any credit burden and thus they are less likely to fail. This empirical result supports the argument of good reputation established through bond issuance.

Financial indicators have the expected impact on firms' chances of failure. In particular, firms with high levels of *LEVERAGE* face higher probabilities of failure compared to those with low leverage confirming previous reported empirical evidence (Zingales (1998) and Farinha and Santos (2006)). High levels of debt would increase moral hazard and asymmetric information problems, and would lead to a higher probability of failure. The effect is economically important since a one percent increase in leverage would raise the probability of failure by 26%.

Next, *PROFITABILITY* measures the extent to which high-profitable firms face a lower risk of failure. It enters with the expected negative sign implying that an increase in profitability ratio lowers the hazard of failure. This result is consistent with previous findings that more profitable firms are less likely to fail (Bunn and Redwood (2003) and Bridges and Guariglia (2008)). A one percent increase in firms' profits would decrease failure rates by 1%.

The coefficient on *COLLATERAL*, the proxy for the degree of firms' collateralisation, attracts the expected negative sign and it has a highly significant impact on firms' failure prospects. Firms with high levels of tangible assets are able to pledge collateral and to obtain

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<sup>9</sup>This is calculated using the exponentiated coefficient:  $\exp(-0.719)=0.49$ ,  $(1-0.49)*100=51\%$

more external funding but also to pursue risk-shifting strategies (Bridges and Guariglia (2008) and Farinha and Santos (2006)). This effect is large since increasing collateral by one percent would reduce the incidence of failure by 47%.

With respect to our firm-specific controls, the results on *SIZE* and *SIZE*<sup>2</sup> indicate that there is a non-linear relationship between firm size and the likelihood of survival. A significant coefficient of the squared logarithm of real total assets shows that the advantages of a bigger size decrease with increasing size. The coefficient on firm *AGE* exerts a negative and significant impact on failure. This finding is in line with previous theoretical and empirical evidence which shows that younger firms that lack reputation in the market are more likely to fail (e.g Jovanovic (1982); Audretsch and Mahmood (1995) and Clementi and Hopenhayn (2006)).

The results on the *MES* and the exchange rate (*EXCHANGE*) behave as conjectured. Firms operating in industries with high MES are more likely to fail, which is consistent with Mata and Portugal (1994). Further, the proxy for the macroeconomic condition has a positive effect on failure which supports the theory that a stronger local currency raises the probability of firms to fail (Baggs et al. (2009)).<sup>10</sup>

Next, following Equation (2.4) we report in column 2 of Table 2 the results that evaluate the response of firms' survival to bond financing during and outside the crisis. The coefficient on bond issuance indicates the response of the dependent variable for out of crisis periods, while the coefficient on the interacted term indicates the change in the response during the crisis period. The bond dummy enters with a negative and significant coefficient which shows that bond issuers are more likely to survive during tranquil periods. This result is not only statistically but also economically important since a change in the bond dummy will decrease the hazard of failure by 52%. The insignificant coefficient on the interaction implies that the effect of bond financing on survival during the crisis period is not statistically different

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<sup>10</sup>We have also attempted to control for the macroeconomic conditions by replacing the real effective exchange rate with the growth in GDP. We find, but do not report to save space, that our main results remain unchanged.

from its effect during tranquil periods. Therefore, bond issuance is associated with lower exit probabilities throughout the cycle. This suggests that bond issuance, as a measure of external finance, improves firms' survival probabilities. The importance of reputation may become even more relevant during periods of economic crises where bond issuers might be able to overcome financial problems by extending external finance and re-negotiating existing bank loans. This finding confirms the argument of Bolton and Freixas (2008) that 'bond issuers are shielded from the direct effect of a financial crisis' (p. 37).<sup>11</sup>

Finally, the coefficient on the *CRISIS* dummy shows the positive and highly significant effect on the likelihood of failure for non-issuers. Changing the dummy from 0 to 1 (out of crisis to crisis) the probability of failure is increased by 60% supporting the view that during downturns economic activity faces a general slowdown which is likely to affect bank credit, business profitability and survival among other firms' real decisions. The coefficients on the control and financial variables retain their significant effect on the probability of failure.

#### 4.1.1 Accounting for bond endogeneity

It is possible that the offsetting role of bond financing in firm survival, may be due to the endogenous nature of bond issuance decision. To address this concern we take two steps. First, we employ a propensity score matching technique and second we estimate the probability of failure as a function of past bond issuance.<sup>12</sup>

To begin with the first approach, we employ sampled matching techniques described by Heckman et al. (1998) and recently employed in the bond IPO literature by Hale and Santos (2009). Under the matching assumption and conditional on the propensity score, bond issuance is random. The idea of the propensity score matching method is to find, for every bond issuing firm, a similar firm that has remained a non-issuer. Therefore, the

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<sup>11</sup>It should be noted, however, that access to bond finance may not always be a panacea for all economies. During the 1997-98 crisis, corporate bond markets were largely underdeveloped and quickly evaporated when they needed the most. Eichengreen et al. (2006) report that bond markets in Asia were unable to provide a "spare tyre" during the crisis and bond yields on new issues skyrocketed.

<sup>12</sup>Employing an instrumental variables estimator would be suitable for firm survival. However, it is hard to find and justify the appropriateness of firm-level instruments, given the nature of our data.

matching technique constructs a sample of issuers and non-issuers with similar pre-issuance characteristics, e.g. size, liquidity, growth etc. To construct a matched sample, we estimate a probit model of the probability (or propensity score) to issue the bond in any given year, using a number of firm-specific indicators. All time varying variables are lagged once to ensure exogeneity. The choice of our explanatory variables is guided by the relevant IPO literature (see Datta et al. (2000)).<sup>13</sup> The Probit model is formulated as:

$$Pr(BOND_{it} = 1) = F(a_0 + a_1SIZE_{i(t-1)} + a_2AGE_{i(t-1)} + a_3LEVERAGE_{i(t-1)} + a_4LIQUIDITY_{i(t-1)} + a_5COLLATERAL_{i(t-1)} + a_6GROWTH_{i(t-1)} + \epsilon_{it}) \quad (4.1)$$

Once the propensity scores are calculated, we use the ‘caliper’ matching method to select the nearest control firms in which the propensity score falls within a pre-specified radius as a match for a bond issuer.<sup>14</sup> Therefore, we carefully construct a sample of bond issuers and matched non-issuers, and estimate Equations (2.3) and (2.4) on this matched sample using the propensity hazard model. Hence, our matched sample consists of only those firms that are similar in the probability of issuing a bond.

Results reported in Table 3 are very close with those presented in Table 2. The dummy on bond finance is negative and significant indicating that switching from non-issuers to issuers would directly reduce the incidence of failure. In addition, we find, once again, that bond-financed firms are directly shielded from the adverse effects of the crisis, while non-issuers are more likely to fail during this period. However, we should note that comparing Table 3 with Table 2, we observe some quantitative differences. In particular, the impact of collateral and firm size is no longer statistically significant, whereas the coefficients on

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<sup>13</sup>We also estimate a probit model of the probability of accessing the public debt market using the set of firm-specific characteristics included in our econometric models. When Equations (2.3) and (2.4) are estimated for the matched sample, results are very similar with those presented in Table 2.

<sup>14</sup>In order to match issuers and non-issuers we use the PSMATCH2 routine in Stata 10.1 described in Leuven and Sianesi (2003). In our analysis, the pre-specified radius is set to 0.01.

bond issuance (Table 3, columns 1 and 2) are smaller in magnitude and significance. This is not unexpected since we constructed the matched sample based on the similarity of a linear combination of these variables. Further, to confirm that our results are not driven by firm selection we report in the Appendix mean variable differences between issuers and non-issuers for the total and the matched sample. While there are significant differences in all firm-specific variables for bond issuers and non-issuers when we consider the full sample, these differences disappear in the matched sample.<sup>15</sup>

The second approach that we follow to address reverse causality and endogeneity is to estimate the hazard of failure conditional on past bond issuance. We use the bond finance lagged once instead of its contemporaneous value. It is plausible to assume that firm managers will take into account the last period’s bond issuance when making production decisions today or even entering into business. However, it is harder to argue that production decisions of today will influence the firm’s decision to issue bond yesterday, eliminating possible reverse causality problems. Estimated results are presented in Table 4. The coefficient on lagged bond issuance although lower in magnitude, remains negative and significant, in line with our finding in Table 2. Further, bond issuing firms are more likely to survive in and out of the crisis.<sup>16</sup> This result, confirms the theoretical argument by Bolton and Freixas (2008) that issuers are shielded during economic downturns, due to their reputation in the market, and therefore are more likely to survive.

## 4.2 Currency denomination

Having presented the beneficial effects of bond issuance, we now check whether there is a differential impact of currency denomination of bonds on firms’ failure probabilities during the crisis. In Table 2 we presented evidence that bond issuers are shielded from the crisis and we argued that this can be explained by reputational effects. However, one plausible

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<sup>15</sup>Table A-1 presents statistics for a number of firm-specific indicators that were used in the estimation of the propensity score.

<sup>16</sup>We also estimate the probability of failure on bond finance lagged twice. Our results remain largely unchanged.

question is whether this argument holds if we consider the fact that some firms were relying on bonds denominated in foreign currency when the crisis burst in 1997. World bank (1999) reports that 58% of the long-term loans in the East Asia and Pacific were denominated in US dollars and over 20% in Japanese yen, whilst others were denominated in multiple currencies. The denomination of debt in foreign currencies was also extended in bond markets. After the devaluation of domestic currencies, indebted firms found it expensive to repay their foreign currency denominated debt.

In column 1 of Table 5 we make the distinction between firms that issue bond debt in foreign currency and those that issue bond debt in domestic currency. Therefore we construct the dummy *Domestic* which takes the value 1 if firm  $i$  issues a domestic bond in year  $t$ , and 0 otherwise and the dummy *Foreign* which is equal to 1 if firm  $i$  issues a foreign bond in year  $t$ , and 0 otherwise. The reference category is the *Non-issuer* dummy which takes the value 1 if firm  $i$  never issues a bond throughout the sample period, and 0 otherwise. Looking at column 1 we observe that issuing in either local or foreign currency bonds would increase survival prospects.<sup>17</sup> Changing a firm's status from non-issuer to domestic (foreign) bond issuer implies an increase in the likelihood of survival by 64% (40%). In other words, firms with bond debt, irrespective of the currency denomination, are more likely to survive compared to non-issuers. This finding corroborates the reputational effect that was identified in Table 2.

Next, column 2 focuses on the impact of the crisis on the hazard of failure for domestic and foreign issuers with the reference category being, once again, the non-issuing firms. The foreign and domestic terms are interacted with the crisis dummy to gauge the change in the response of failure relative to the out of crisis periods. The insignificant coefficient on the interaction of domestic issues with the crisis dummy shows that firms holding bonds denominated in domestic currency face the same increased probability of survival in and out of the crisis. This result pinpoints that domestic bond issuers are shielded from the

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<sup>17</sup>The p-value for the test of equality for the coefficients on foreign issuers and domestic issuers is 0.000.

adverse effect of the crisis. Moving to issuers of foreign denominated bonds, the negative and significant effect of bond debt on the hazard of failure during tranquil periods is overshadowed by the sign reversal observed for the same group of issuers during the crisis. Firms with foreign issues are fully exposed to the Asian crisis. This might not be seen as a surprising result because it reflects the fact that firms with foreign denominated lending had a particular problem during the twin Asian crisis since debts became much more burdensome when the exchange rate collapsed. Finally, the coefficients on the crisis dummy, the control and financial variables retain their signs and their significant impact on survival.

## **5 Additional tests**

Overall, our results suggest that bond financing plays an important offsetting role in firm survival. In this section we subject this finding to a number of checks in order to ensure robustness. These additional checks involve estimation of our main empirical specifications controlling for bank finance and trade credit and correcting for unobserved heterogeneity in our panel. The section offers a test of robustness of the results in Table 2 (where we look at the direct impact of bond finance on failure and its offsetting role during the crisis) and all the reported findings are compared to Table 2.

### **5.1 Controlling for other sources of external finance**

Given that bond finance is not the only available option for firms' external finance, one concern is that other sources such as equity finance, bank finance and trade credit may have a central place in determining business failures. Our model controls for stock market reputation since we include the number of years a firm has been listed on the stock exchange, but it does not explicitly account for other options of external finance. Following Mateut et al. (2006) we consider trade credit, measured as the ratio of the firm's trade credit to its total liabilities, to account for firms that use trade credit as an additional source of external

finance because they cannot get credit from banks. In addition, in the absence of data on the relationship between banks and firms we construct a bank finance variable, which is defined as the ratio of the firm's short-term debt to its total debt and it was firstly introduced by Kashyap et al. (1993), to control for the fact that Asian firms rely heavily on bank loans. We estimate therefore Equations (2.3) and (2.4) augmented with trade credit and bank finance.

We present these results in Table 6 and compare them with results in Table 2. The coefficients on bank finance and trade credit are positive and significant indicating that higher levels of debt from bank finance or trade creditors would increase the probability of failure. In addition, our previous results on bond finance are re-confirmed in that bond issuers are more likely to survive and remain largely unaffected during the crisis. On the contrary, non-issuers are more likely to fail during the Asian crisis. Again, our financial indicators appear to be important determinants of firm failures and have the expected signs. In sum, we can conclude that our core findings are not materially affected by other sources of external finance.

## 5.2 Unobserved firm heterogeneity

An econometric concern with panel data studies is the unobserved firm heterogeneity which can bias the results. There might be some unobserved characteristics that cannot be observed by us but they would probably be observed by the investment bank, concerning firms' ability to issue bonds and to survive in the market. The estimated specifications, presented in section 4, do not incorporate the unobserved heterogeneity element. To correct for this bias we use the random-effects version of complementary log-log model to take account of unobserved heterogeneity and to check whether the results on the role of bond financing in the hazard of failure, presented in Table 2, are biased. Results in Table 7 show that bond issuing firms face a higher probability of survival whereas they remain unaffected during the crisis. The signs and significance of the control variables do not change once unobserved heterogeneity is taken into account.

## 6 Conclusion

Using a novel financial dataset for five Asian economies - Indonesia, Korea, Malaysia, Singapore and Thailand - that were hit the hardest during the 1997-98 crisis, we find that bond market reputation affects positively the likelihood of survival of firms issuing bonds. Above all, we find that bond financed firms are shielded from the adverse effects of the crisis while non-issuers are more likely to fail during this period. Yet, the currency denomination of bonds affects significantly different the survival chances of firms during the crisis, with foreign bond issuers facing a higher probability of failure and domestic issuers being unaffected.

Our results have important policy implications. If access to bond finance is one factor that could ameliorate emerging markets crises and protect firms against failures, then the promotion of regional and well-functioning bond markets should be at the top of the policymakers' agenda. Ideally, this should be done along with the development of a sound banking system since balanced financial systems would improve firms' performance and survival prospects. But our results are also highly relevant for western economies which have recently faced the deepest recession since the second world war. They highlight the importance of facilitating access to liquid and resilient bond markets especially when banks decide to interrupt lines of credit during crises.

## References

- Alvarez, R. and Görg, H.: 2009, Multinationals and plant exit: Evidence from Chile, *International Review of Economics and Finance* **18**, 45–51.
- Audretsch, D.: 1991, Firm survival and the technological regime, *Review of Economics and Statistics* **73**, 441–450.
- Audretsch, D. and Mahmood, T.: 1995, New firm survival: New results using a hazard function, *Review of Economics and Statistics* **97**, 97–103.
- Baggs, J., Beaulieu, E. and Fung, L.: 2009, Firm survival, performance, and the exchange rate, *Canadian Journal of Economics* **42**, 393–421.
- Bandick, R. and Görg, H.: 2010, Foreign acquisition, plant survival, and employment growth, *Canadian Journal of Economics* **43**, 547–573.
- Bhattacharjee, A., Higson, C., Holly, S. and Kattuman, P.: 2009, Macroeconomic instability and business exit: Determinants of failures and acquisitions of UK firms, *Economica* **76**, 108–131.
- BIS: 2005, Developing corporate bond markets in Asia, *Working Paper 26*, Bank for International Settlements.
- Bolton, P. and Freixas, X.: 2008, How can emerging market economies benefit from a corporate bond market?, in E. Borensztein, K. Cowan, B. Eichengreen and U. Panizza (eds), *Bond Markets in Latin America. On the Verge of a Big Bang?*, MIT Press.
- Borensztein, E., Eichengreen, B. and Panizza, U.: 2006, Debt instruments and policies in the new millennium: New markets and new opportunities, *Working Paper 558*, Inter-American Development Bank.
- Bridges, S. and Guariglia, A.: 2008, Financial constraints, global engagement, and firm survival in the UK: Evidence from micro data, *Scottish Journal of Political Economy* **55**, 444–464.
- Bunn, P. and Redwood, V.: 2003, Company accounts based modelling of business failures and the implications for financial stability, *Working Paper 210*, Bank of England.
- Calomiris, C., Himmelberg, C. and Wachtel, P.: 1995, Commercial paper, corporate finance, and the business cycle: a microeconomic perspective, *Canergie-Rochester Conference Series on Public Policy* **42**, 203–250.
- Clementi, L. and Hopenhayn, H.: 2006, A theory of financing constraints and firm dynamics, *Quarterly Journal of Economics* **54**, 229–265.
- Datta, S., Iskandar-Datta, M. and Patel, A.: 2000, Some evidence on the uniqueness of initial public debt offerings, *Journal of Finance* **55**, 715–743.
- Dennis, D. and Mihov, V.: 2003, The choice among bank debt, non-bank private debt: Evidence from new corporate borrowings, *Journal of Financial Economics* **70**, 3–28.
- Diamond, D.: 1991, Monitoring and reputation: The choice between bank loans and directly placed debt, *Journal of Political Economy* **99**, 689–721.
- Dunne, T., Roberts, M. and Samuelson, L.: 1998, Patterns of firm entry and exit in US manufacturing industries, *Rand Journal of Economics*, **19**, 495–515.
- Eichengreen, B., Borensztein, E. and Panizza, U.: 2006, A tale of two markets: Bond market development in East Asia and Latin America, *Occasional paper*, Hong Kong Institute for Monetary Research.
- Farinha, M. and Santos, J.: 2006, The survival of start-ups: Do their funding choices and bank relationships at birth matter?, *Mimeo*.
- Fernandez, D. and Klassen, S.: 2004, Choice of currency by East Asia bond issuers, *Working Paper 30*, Bank for International Settlements.
- Görg, H. and Strobl, E.: 2002, Multinational companies and indigenous development: An empirical analysis, *European Economic Review* **46**, 1305–1322.

- Görg, H. and Strobl, E.: 2003, Multinational companies, technology spillovers and plant survival, *Scandinavian Journal of Economics* **105**, 581–595.
- Hale, G. and Santos, J.: 2009, Do banks price their informational monopoly?, *Journal of Financial Economics* **93**, 185–206.
- Heckman, J., Hidehiko, I. and Petra, T.: 1998, Matching as an econometric evaluation estimator, *Review of Economic Studies* **65**, 261–294.
- Hopehayn, R.: 1992, Entry, exit and firm dynamics in long run equilibrium, *Econometrica* **60**, 1127–1155.
- Ilmakunnas, P. and Nurmi, S.: 2010, Dynamics of export market entry and exit, *Scandinavian Journal of Economics* **112**, 101–126.
- Jovanovic, B.: 1982, Selection and evolution of industry, *Econometrica* **50**, 3–37.
- Kashyap, A., Stein, J. and Wilcox, D.: 1993, Monetary policy and credit conditions: Evidence from the composition of external finance, *American Economic Review* **83**, 78–98.
- Leuven, E. and Sianesi, B.: 2003, Psmatch2: Stata module to perform full mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing, *Technical report*, Available at <http://ideas.repec.org/c/boc/bocode/s432001.html>.
- Levin, A., Natalucci, F. and Zakrajsek, E.: 2004, The magnitude and cyclical behaviour of financial market frictions', *Working Paper 2004-70*, Board of Governors of the Federal Reserve System.
- Mata, J. and Portugal, P.: 1994, Life duration of new firms, *Journal of Industrial Economics* **27**, 227–243.
- Mateut, S., Bougheas, S. and Mizien, P.: 2006, Trade credit, bank lending and monetary policy transmission, *European Economic Review* **50**, 603–629.
- Myers, S. and Majluf, N.: 1984, Corporate financing and investment decisions when firms have information investors do not have, *Journal of Financial Economics* **131**, 187–221.
- Prentice, R. and Gloeckler, L.: 1978, Regression analysis of grouped survival data with application to breast cancer data, *Biometrics* **34**, 57–67.
- Stinchcombe, F.: 1965, Social structure and organizations, in J. March (ed.), *Handbook of Organizations*, Chicago: Rand McNally.
- Tsoukas, S.: 2011, Firm survival and financial development: Evidence from a panel of emerging Asian economies, *Journal of Banking and Finance*, forthcoming .
- World bank: 1999, The global development finance, *Annual publication*, World Bank.
- Zingales, L.: 1998, Survival of the fittest or the fattest? Exit and financing in trucking industry, *Journal of Finance* **53**, 905–938.

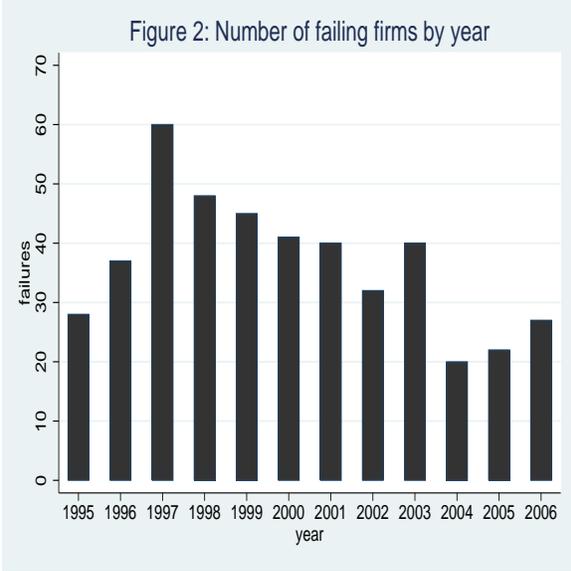
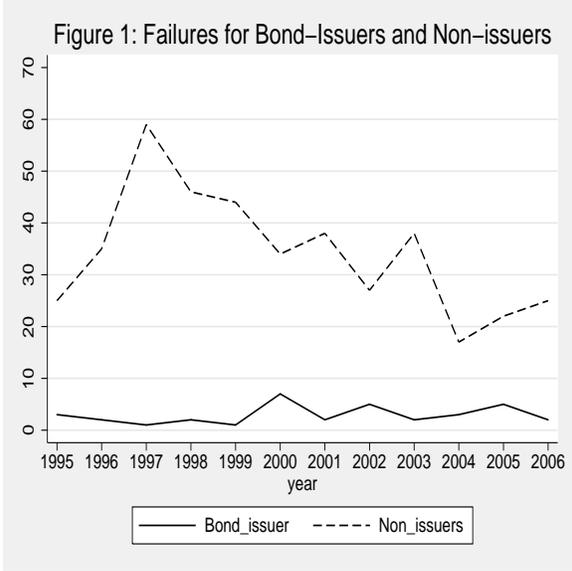


Table 1: Summary statistics

	Total Sample	Fail <sub>it</sub> =1	Fail <sub>it</sub> =0	Diff.	Bond <sub>it</sub> =1	Bond <sub>it</sub> =0	Diff.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Fail<sub>it</sub></i>	0.112 (0.31)	1.00 (0.00)	0.000 (0.00)	-	0.077 (0.26)	0.114 (0.32)	0.000
<i>Age<sub>it</sub></i>	14.081 (4.81)	12.230 (5.07)	14.315 (4.72)	0.000	13.536 (4.65)	14.126 (4.82)	0.000
<i>Size<sub>it</sub></i>	14.645 (3.68)	14.601 (3.69)	14.994 (3.62)	0.000	17.971 (3.22)	14.371 (3.58)	0.000
<i>Leverage<sub>it</sub></i>	0.692 (0.91)	0.978 (1.26)	0.656 (0.85)	0.000	0.786 (0.76)	0.684 (0.92)	0.000
<i>Profitability<sub>it</sub></i>	6.426 (54.14)	-11.718 (73.76)	8.717 (50.67)	0.000	1.133 (38.94)	6.863 (55.18)	0.000
<i>Collateral<sub>it</sub></i>	0.716 (0.31)	0.582 (0.38)	0.732 (0.29)	0.000	0.646 (0.31)	0.721 (0.30)	0.000
<i>Bond<sub>it</sub></i>	0.076 (0.26)	0.052 (0.22)	0.079 (0.27)	0.000	1.00 (0.00)	0.00 (0.00)	-
<i>Crisis<sub>it</sub></i>	0.150 (0.37)	0.256 (0.43)	0.137 (0.34)	0.000	0.092 (0.28)	0.155 (0.36)	0.000
<i>Observations</i>	27941	3132	24809		2128	25813	

Notes: The table presents sample means. Standard deviations are reported in parentheses. *Fail<sub>it</sub>* is a dummy that equals 1 if firm *i* fails in year *t*, and 0 otherwise. *Age<sub>it</sub>* measures the number of years a firm has been listed on the stock exchange. *Size<sub>it</sub>* is denoted by the log of real assets. *Leverage<sub>it</sub>* is measured as the firm's total debt to assets ratio. *Profitability<sub>it</sub>* is the ratio of the firm's profits before interest and tax to its total assets. *Collateral<sub>it</sub>* is defined as the ratio of the firm's tangible assets over its total assets. *Bond<sub>it</sub>* is a dummy which takes the value 1 if firm *i* issues a bond in year *t*, and 0 otherwise. The *Crisis<sub>it</sub>* is a dummy representing the Asian crisis and takes the value 1 in years 1997-98, and 0 otherwise. The subscript *i* indexes firms, and the subscript *t*, time, where *t* = 1995-2006. Variables are measured in thousands of US dollars.

Table 2: Bond finance and the Asian crisis

	Bond Finance (1)	Bond Finance*Crisis (2)
<i>Leverage<sub>it</sub></i>	0.229*** (14.82)	0.221*** (14.23)
<i>Profitability<sub>it</sub></i>	-0.004*** (-11.92)	-0.004*** (-11.14)
<i>Collateral<sub>it</sub></i>	-0.631*** (-9.80)	-0.644*** (-9.95)
<i>Size<sub>it</sub></i>	-0.122** (-2.35)	-0.125** (-2.43)
<i>Size<sub>it</sub><sup>2</sup></i>	0.007*** (4.20)	0.007*** (4.16)
<i>Age<sub>it</sub></i>	-0.100*** (-23.11)	-0.100*** (-23.04)
<i>Exchange<sub>t</sub></i>	0.025*** (14.79)	0.023*** (13.83)
<i>MES<sub>j</sub></i>	0.655*** (3.52)	0.646*** (3.47)
<i>Bond<sub>it</sub></i>	-0.719*** (-8.25)	-0.735*** (-7.62)
<i>Bond<sub>it</sub> * Crisis<sub>it</sub></i>		0.298 (1.43)
<i>Crisis</i>		0.471*** (10.61)
<i>Log – likelihood</i>	-8376	-8316
<i>Observations</i>	27941	27941

Notes: Complementary log-log regression results are reported. The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. Robust z-statistics are presented in the parentheses. The following countries are included in the regressions: Indonesia, Korea, Malaysia, Singapore and Thailand. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. Country dummies and industry dummies are included in the model. Also see notes to Table 1.

Table 3: Accounting for bond endogeneity in a matched sample

	Bond Finance (1)	Bond Finance*Crisis (2)
<i>Leverage<sub>it</sub></i>	0.340*** (5.68)	0.351*** (5.49)
<i>Profitability<sub>it</sub></i>	-0.005*** (-2.90)	-0.003* (-1.67)
<i>Collateral<sub>it</sub></i>	0.010 (0.03)	0.130 (0.38)
<i>Size<sub>it</sub></i>	-0.216 (-1.32)	-0.218 (-1.30)
<i>Size<sub>it</sub><sup>2</sup></i>	0.009* (1.92)	0.009 (1.64)
<i>Age<sub>it</sub></i>	-0.078*** (-4.58)	-0.077*** (-4.52)
<i>Exchange<sub>t</sub></i>	-0.023** (-2.44)	-0.013 (-1.63)
<i>MES<sub>j</sub></i>	-1.876*** (-2.89)	-1.984*** (-3.13)
<i>Bond<sub>it</sub></i>	-0.322** (-2.05)	-0.352** (-2.12)
<i>Bond<sub>it</sub> * Crisis<sub>it</sub></i>		-0.148 (-0.38)
<i>Crisis<sub>it</sub></i>		1.323*** (4.80)
<i>Log – pseudolikelihood</i>	-589.6	-570.1
<i>Observations</i>	3,029	3,029

Notes: Complementary log-log regression results on the matched sample are reported. The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. Robust z-statistics are presented in the parentheses. The following countries are included in the regressions: Indonesia, Korea, Malaysia, Singapore and Thailand. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. Country dummies and industry dummies are included in the model. Also see notes to Table 1.

Table 4: Accounting for bond endogeneity using past bond issuance

	Bond Finance (1)	Bond Finance*Crisis (2)
<i>Leverage<sub>it</sub></i>	0.225*** (13.16)	0.212*** (12.23)
<i>Profitability<sub>it</sub></i>	-0.004*** (-12.54)	-0.004*** (-11.68)
<i>Collateral<sub>it</sub></i>	-0.576*** (-8.01)	-0.592*** (-8.15)
<i>Size<sub>it</sub></i>	-0.123** (-2.13)	-0.129** (-2.25)
<i>Size<sub>it</sub><sup>2</sup></i>	0.007*** (3.86)	0.007*** (3.82)
<i>Age<sub>it</sub></i>	-0.103*** (-20.82)	-0.103*** (-20.60)
<i>Exchange<sub>t</sub></i>	0.020*** (10.69)	0.016*** (9.06)
<i>MES<sub>j</sub></i>	0.570*** (2.75)	0.559*** (2.70)
<i>Bond<sub>it-1</sub></i>	-0.671*** (-6.85)	-0.668*** (-6.01)
<i>Bond<sub>i(t-1)</sub> * Crisis<sub>it</sub></i>		0.211 (0.96)
<i>Crisis<sub>it</sub></i>		0.624*** (13.30)
<i>Log – pseudolikelihood</i>	-7119	-7028
<i>Observations</i>	24,894	24,894

Notes: Complementary log-log regression results on the matched sample are reported. The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. Robust z-statistics are presented in the parentheses. The following countries are included in the regressions: Indonesia, Korea, Malaysia, Singapore and Thailand. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. Country dummies and industry dummies are included in the model. Also see notes to Table 1.

Table 5: Currency denomination of bonds, survival and the Asian crisis

	Bond Finance (1)	Bond Finance*Crisis (2)
<i>Leverage<sub>it</sub></i>	0.229*** (14.85)	0.221*** (14.25)
<i>Profitability<sub>it</sub></i>	-0.004*** (-11.90)	-0.004*** (-11.10)
<i>Collateral<sub>it</sub></i>	-0.625*** (-9.69)	-0.643*** (-9.91)
<i>Size<sub>it</sub></i>	-0.117** (-2.24)	-0.121** (-2.34)
<i>Size<sub>it</sub><sup>2</sup></i>	0.007*** (4.02)	0.007*** (4.01)
<i>Age<sub>it</sub></i>	-0.100*** (-23.14)	-0.100*** (-23.04)
<i>Exchange<sub>t</sub></i>	0.025*** (14.73)	0.023*** (13.79)
<i>MES<sub>j</sub></i>	0.651*** (3.50)	0.640*** (3.44)
<i>Domestic<sub>it</sub></i>	-1.030*** (-7.40)	-1.011*** (-6.87)
<i>Foreign<sub>it</sub></i>	-0.503*** (-4.63)	-0.505*** (-4.08)
<i>Domestic<sub>it</sub> * Crisis<sub>it</sub></i>		0.015 (0.06)
<i>Foreign<sub>it</sub> * Crisis<sub>it</sub></i>		0.624** (2.48)
<i>Crisis</i>		0.473*** (10.66)
<i>Log – likelihood</i>	-8372	-8312
<i>Observations</i>	27941	27941

Notes: Complementary log-log regression results are reported. The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. *Domestic<sub>it</sub>* is a dummy which takes the value 1 if firm *i* issues a domestic bond in year *t*, and 0 otherwise. *Foreign<sub>it</sub>* is a dummy which takes the value 1 if firm *i* issues a foreign bond in year *t*, and 0 otherwise. Robust z-statistics are presented in the parentheses. The following countries are included in the regressions: Indonesia, Korea, Malaysia, Singapore and Thailand. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. Country dummies and industry dummies are included in the model. Also see notes to Table 1.

Table 6: Robustness: Additional sources of external finance

	Bond Finance (1)	Bond Finance*Crisis (2)
<i>Leverage<sub>it</sub></i>	0.257*** (15.56)	0.246*** (14.60)
<i>Profitability<sub>it</sub></i>	-0.004*** (-10.61)	-0.004*** (-10.05)
<i>Collateral<sub>it</sub></i>	-0.395*** (-4.91)	-0.416*** (-5.15)
<i>Size<sub>it</sub></i>	-0.034 (-0.56)	-0.046 (-0.76)
<i>Size<sub>it</sub><sup>2</sup></i>	0.006*** (3.02)	0.006*** (3.07)
<i>Age<sub>it</sub></i>	-0.077*** (-15.05)	-0.078*** (-15.02)
<i>Exchange<sub>t</sub></i>	0.022*** (11.21)	0.020*** (10.54)
<i>MES<sub>j</sub></i>	0.622*** (3.27)	0.615*** (3.24)
<i>Trade<sub>it</sub></i>	0.398*** (3.27)	0.436*** (3.52)
<i>Bank<sub>it</sub></i>	0.181** (2.49)	0.165** (2.26)
<i>Bond<sub>it</sub></i>	-0.720*** (-7.64)	-0.739*** (-7.16)
<i>Bond<sub>it</sub> * Crisis<sub>it</sub></i>		0.312 (1.49)
<i>Crisis<sub>it</sub></i>		0.446*** (8.79)
<i>Log – likelihood</i>	-7181	-7136
<i>Observations</i>	24027	24027

Notes: Complementary log-log regression results are reported. The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. *Trade<sub>it</sub>* is the ratio of the firm's trade credit over its total liabilities. *Bank<sub>it</sub>* is defined as the ratio of the firm's short term debt over its total debt. Robust z-statistics are presented in the parentheses. The following countries are included in the regressions: Indonesia, Korea, Malaysia, Singapore and Thailand. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. Country dummies and industry dummies are included in the model. Also see notes to Table 1.

Table 7: Robustness: Controlling for unobserved heterogeneity

	Bond Finance (1)	Bond Finance*Crisis (2)
<i>Leverage<sub>it</sub></i>	0.401*** (5.26)	0.423*** (5.22)
<i>Profitability<sub>it</sub></i>	-0.002* (-1.75)	-0.002* (-1.93)
<i>Collateral<sub>it</sub></i>	-1.332*** (-4.29)	-1.556*** (-5.28)
<i>Size<sub>it</sub></i>	-0.492 (-1.58)	-0.412 (-1.34)
<i>Size<sub>it</sub><sup>2</sup></i>	0.023** (2.06)	0.019* (1.68)
<i>Age<sub>it</sub></i>	-0.140*** (-7.01)	-0.141*** (-7.53)
<i>Exchange<sub>t</sub></i>	0.019*** (2.87)	0.021*** (2.73)
<i>MES<sub>j</sub></i>	2.171** (2.19)	1.381 (1.13)
<i>Bond<sub>it</sub></i>	-1.554*** (-3.16)	-1.283** (-2.56)
<i>Bond<sub>it</sub> * Crisis<sub>it</sub></i>		-0.219 (-0.27)
<i>Crisis</i>		0.321* (1.91)
<i>Log – likelihood</i>	-1813	-1814
<i>Observations</i>	27941	27941

Notes: Random-Effects complementary log-log regression results are reported. The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. Robust z-statistics are presented in the parentheses. The following countries are included in the regressions: Indonesia, Korea, Malaysia, Singapore and Thailand. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. Country dummies and industry dummies are included in the model. Also see notes to Table 1.

Table A-1: Mean variable differences between bond issuers and non-issuers in the pre-issuance period

<b>Matched sample</b>						
	Mean Treated	Mean Control	% Bias	%Bias Reduction	t-test	t-test (p-value)
<i>Leverage<sub>it</sub></i>	0.789	0.765	3.1	79.4	0.73	0.466
<i>Collateral<sub>it</sub></i>	0.735	0.733	0.7	96.0	0.20	0.839
<i>Size<sub>it</sub></i>	17.32	17.24	2.4	97.4	0.70	0.486
<i>Liquidity<sub>it</sub></i>	0.418	0.412	3.1	89.6	0.89	0.372
<i>Age<sub>it</sub></i>	13.799	13.824	-0.6	95.3	-0.16	0.874
<i>Growth<sub>it</sub></i>	0.091	0.076	4.6	54.5	1.38	0.168
<b>Total sample</b>						
	Mean Treated	Mean Control	% Bias	%Bias Reduction	t-test	t-test (p-value)
<i>Leverage<sub>it</sub></i>	0.786	0.670	15.0	-	5.19	0.000
<i>Collateral<sub>it</sub></i>	0.734	0.779	-18.7	-	-6.92	0.000
<i>Size<sub>it</sub></i>	17.359	14.18	93.3	-	34.83	0.000
<i>Liquidity<sub>it</sub></i>	0.418	0.478	-30.2	-	-10.98	0.000
<i>Age<sub>it</sub></i>	13.794	14.391	-12.6	-	-4.78	0.000
<i>Growth<sub>it</sub></i>	0.092	0.059	10.1	-	3.61	0.000

Notes: *Liquidity* is the ratio of total current assets over total liabilities and *Growth* is the change in sales. Also see notes to Table 1.