Firm survival and financial development: Evidence from a panel of emerging Asian economies

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This version: November 15, 2010

Abstract

Using a panel of five Asian economies - Indonesia, Korea, Malaysia, Singapore and Thailand - over the period 1995–2007 we analyze the links between firm survival and financial development. We find that traditionally used measures of financial development play an important role in influencing firm survival. When stock markets become larger or more liquid firms' survival chances improve. On the contrary, we show that higher levels of financial intermediation can increase firm failures. We also find that the beneficial effects of stock market development are more pronounced during the later years of our sample, while the adverse effects of bank intermediation have declined over time. Finally, large firms are more likely to benefit from developments in financial markets compared to small firms.

JEL classification: E44; D92; L20; O10
Keywords: Firm survival; Firm-specific characteristics; Financial development

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1. Introduction

Does it matter for firm survival whether a country's financial system is more or less developed? The idea that the financial system has a central role to play in economic fluctuations is an old one (see Gertler (1988)). Following the seminal work of Goldsmith (1969), several empirical studies have documented the existence of a strong positive link between the functioning of the financial system and various aspects of economic activity such as investment, employment and economic growth (see for instance, King and Levine (1993); Rajan and Zingales (1998) and Levine (2006)). These studies, however, remain largely silent about the role of financial development in firms' survival prospects. Such evidence is important for understanding the mechanism by which financial development affects survival and can better inform policy makers, especially in the context of emerging Asian economies that are undergoing periods of deregulation and redesign (see Hasan et al. (2009)).

The purpose of this paper is to provide, for the first time a systematic empirical analysis of the impact of financial development on firm survival by looking at the direct effect of financial development indicators on firm survival after controlling for firm, industry and macroeconomic effects. Our empirical approach focuses on two of the most important aspects of financial development - banking development and stock market development. The motivation to do so stems from two important considerations. First, in the Asian region banks dominated the financial markets for many years, but recently Asian economies have become less bank centered and large strides were taken to develop equity and bond markets. Second, emerging East Asian economies are characterized by a highly volatile environment and high risk of bankruptcy making therefore the analysis of corporate failures very relevant.[1] To this end, we analyze the survival prospects of 2,892 listed firms from five Asian economies (Indonesia, Korea, Malaysia, Singapore and Thailand) that experienced significant failure

[1]Compared to Western economies, emerging Asian countries experience significantly higher corporate failure rates: according to our dataset, failure rates in Indonesia, Korea, Malaysia, Singapore and Thailand are respectively 9%, 9%, 10%, 6% and 15%, compared to only 1.5% in the UK (Bridges and Guariglia (2008) and Görg and Spaliara (2009)).

rates over the last decade.

Corporate failures can be affected directly by the development of the financial system for a number of reasons. To begin with equity markets, at higher levels of equity development corporate failures should be reduced. Larger equity markets with greater liquidity reduce investment risk and the cost of accessing the paper market thereby providing a workable alternative to meet firms' external funding requirements.[2] Therefore, gaining access to an alternative source for external financing can shield firms against failures, particularly when banks decide to interrupt lines of credit. Moving to banking development, increased levels of bank lending might adversely affect firm survival since emerging Asian markets are inherent to bank runs and therefore higher levels of banking intermediation could impede firms' performance and survival prospects. Furman and Stiglitz (1998) suggest that Asia's dependence on banks was important for the 1997-98 financial crisis, while Beck et al. (2006) show that financial intermediary development can magnify the impact of macroeconomic shocks if there is limited access to external financial markets.[3] In our paper we also recognize that the effect of institutional development on firm failures has evolved over time due to recent East Asian efforts to strengthen their financial markets. In addition, growth in stock markets and banks may not influence all firms in the same way. Therefore, we allow for the fact that firms of different sizes might respond to the growth of equity size, liquidity and banking intermediation differently.

The value added of the present paper is threefold. First, we consider a direct role for financial development in influencing business failures. In addition to the firm-specific and financial indicators previously considered(i.e leverage, profits, collateral, size and age), this study also considers the impact of different measures of financial development. This approach complements the existing empirical and theoretical literature on firm survival and borrowing constraints (see Zingales (1998); Bunn and Redwood (2003); Clementi and Hopenhayn

[2]If there is a large volume of trading, it may be possible for brokers to spread their fixed costs more widely and thus reduce transactions costs.

[3]The issue of economic growth, macroeconomic shocks and banking systems is highlighted in Hasan et al. (2009) and Dovern et al. (2010).

(2006); Farinha and Santos (2006); Bridges and Guariglia (2008) and Görg and Spaliara (2009)), which highlights the role of financial condition in firm survival.

The second main contribution of the paper is that, using comparable multi-country data made up by firm-level panels, we are able to assess whether the financial development-survival nexus has changed over time since the recent developments in the Asian financial markets. The financial system in Asia has undergone significant changes and developments over the past decade and it may be possible that the role of financial development in firm survival has become more (or less) pronounced. The most prominent initiative towards the development of a regional financial market has been the establishment of the Asian Bond Fund, which was initiated in 2003 and extended in 2005.

Finally, we are able to identify which firms are more likely to benefit from the financial development with respect to corporate failures. Intuitively, we do not expect all firms to be equally affected by financial development since large firms are able to tap financial markets, while small firms are more likely to be financially constrained and may be unable to access financial services due to significant fixed costs. Thus, large firms may be better equipped to take advantage of developments in financial markets and consequently improve their performance. Attempts to identify groups of companies that are financially constrained using criteria such as the firm size (Carpenter and Guariglia (2008) and Spaliara (2009)) or firm age (Guariglia (2008) and Spaliara (2009)) have been found to play an important role in various aspects of firm behavior (e.g investment and employment). Bridges and Guariglia (2008) found that financial constraints are important in firm survival but their effect can be mitigated with global engagement. In this paper we will test whether there is a differential effect of financial development indicators on the failure probabilities of small and large firms.

The remainder of the paper is laid out as follows. Section 2 illustrates the baseline specification and econometric methodology. In Section 3 we describe our data and provide some summary statistics. Section 4 presents the empirical evidence. In section 5 we check the robustness of our findings. Section 6 concludes the paper.

2. Empirical methodology and baseline specification

We use the theoretical analysis by Clementi and Hopenhayn (2006) as a starting point for our empirical analysis. In their model borrowing constraints affect firm survival and this generates a role for capital structure in an asymmetric information setup. In our empirical analysis we take on board these predictions and we also consider the effects of financial development on firm survival. In order to establish whether financial development changes firms' survival prospects, we model the determinants of firm survival and check whether the indicators of financial development are statistically significant determinants of firms' hazard of failure. We define a firm as failed in a given year when its company status is that of dead.[4] Following the recent literature on firm survival (for example Görg and Spaliara (2009) and Görg and Bandick (2010)) our empirical models are estimated with the complementary log-log model (cloglog) which is equivalent to the discrete time version of the proportional hazard model. Given that our data are collected on a yearly basis, the cloglog model is more appropriate compared to the Cox model.[5] Estimating the models with the proportional hazard model will allow us to capture the exact time of failure and the potential right censoring bias. The baseline proportional hazard of a firm failing at time t is formulated as:

$$h(t) = h_0(t)exp(\alpha' FD + \beta' X + \gamma' Y + \delta' Z) \tag{1}$$

where $h(t)$ is the rate at which firms fail at time t given that they have survived in $t-1$, for a given number of covariates. $h_0(t)$ is the baseline hazard function at time t when all of the covariates are set to zero. To test whether firm exit is affected by *country-level financial development*, we include the term FD, which denotes the vector of financial development

[4]The Thomson Financial database reports firms as 'dead' but it does not distinguish whether firms in liquidation or receivership are included in this category. However, to ensure that the definition of 'dead' firms does not include takeovers we have employed the Zephyr database. Details on the construction of our dependent variable are provided in the next section. Also note that we use the terms failure and survival interchangeably.

[5]In addition, the cloglog model has the same assumptions on the coefficient vector $\hat{a}$, which denotes failure times, as the continuous-time version of the proportional hazard model (Prentice and Gloeckler (1978)).

measures such as stock market size (Market Capitalization), the liquidity of the stock market (Stock Market Value Traded), the size of the banking system (Private Bank Credit) and the importance of deposit-money banks (Bank Assets), respectively. X comprises a vector of financial variables assumed to capture the effect of financial health on the likelihood of survival. Y is a vector of firm-specific, industry-specific characteristics and macroeconomic control variables. Lastly, Z is a set of industry dummies (calculated at the 4-digit level) that control for fixed effects across industries and country dummies accounting for institutional differences between countries.

To incorporate a role for finance in the survival model, as suggested by the theoretical model of Clementi and Hopenhayn (2006), vector X considers three dimensions of financial health from the balance sheet, namely leverage, profitability and collateral assets.[6] We define leverage ($LEVERAGE$), as total debt over total assets, to measure the firm's overall indebtedness. Higher levels of existing debt are often associated with a poorer balance sheet, and thus firms with higher levels of debt face greater difficulties obtaining funds on the markets (see Zingales (1998) and Bougheas et al. (2006)). We expect therefore a positive relationship between leverage and the probability of failure.

The profitability ratio ($PROFITABILITY$) is defined as earnings before interest and taxes relative to total assets to measure a firm's ability to generate profits. It is widely recognized that internal funds can serve as a buffer to absorb unexpected losses, reducing the probability of insolvency and, therefore, the expected bankruptcy cost (see Bunn and Redwood (2003); Bridges and Guariglia (2008) and Görg and Spaliara (2009)). We therefore expect to find profitability to decrease the probability of failure.

Collateral ($COLLATERAL$) is defined as tangible assets over total assets and proxies for the firm's ability to pledge collateral for external finance. In the survival literature, access to collateral assets is very important since Farinha and Santos (2006) and Bridges and Guariglia (2008) document that firms with a larger fraction of tangibles in their balance sheets are

[6] Our firm-specific financial indicators are lagged one period to mitigate potential endogeneity concerns and have been deflated using the GDP deflator for the relevant country.

more likely to survive. Thus, we expect firms with a high collateral ratio to experience lower probabilities of failure.

Vector Y includes a choice of control variables guided by the existing empirical literature on the determinants of firm survival. According to Geroski (1995), a firm's size plays an important role in determining firm failures. Small firms tend to be associated with the higher degree of information asymmetry and therefore are more at risk of failure than large firms (Dunne et al. (1998) and Clementi and Hopenhayn (2006)). Accordingly, we include firm size ($SIZE$) defined as the logarithm of the firm's real total assets. We also incorporate its square ($SIZE^2$) to allow for non-linearities. Further, we introduce age (AGE) which measures the number of years a firm has been listed on the stock exchange, and AGE^2 to control for nonlinear effects. Firms with an established track record are less likely to fail than those that are younger because they are usually more able to withstand past economic and financial downturns and therefore face a smaller liquidation risk. This would be the case both for domestic and multinational firms as noted by Görg and Strobl (2002).

In vector Y we also control for the macroeconomic and industry-specific conditions by adding the GDP growth and the minimum efficient scale of the industry (MES). It should be noted that without controlling for GDP growth the impact of financial development on survival might simply reflect overall development and not something specific about the financial system. We add therefore the GDP growth to control for the macroeconomic environment and demand factors in particular and we expect it to be negatively associated with the firm's probability to fail.[7] To control for the extent of economies of scale in the industry, we add MES measured as the log of median output in each sector of the economy. There is a consensus that attaining minimum efficient scale raises a firm's survival prospects (Audretsch (1991)) and therefore we expect a negative relationship between MES and corporate failures.

[7]To check the robustness of our results we replaced GDP growth with the exchange rate, which measures the exchange rate environment. Our results, not reported here for brevity, remain unaffected. As an additional test we have added time dummies to our models in order to control explicitly for business cycle effects. The results are robust to this modification but due to space considerations are omitted.

3. Data and summary statistics

The data for this paper are drawn from different sources including Thomson Financial Primark, Zephyr, the Asian Development Bank and the World Bank. These are combined in a new way to cast light on the effect of financial development on the probability of failure in the Asian region. The data cover firms in five emerging Asian economies - Indonesia, Korea, Malaysia, Singapore and Thailand - over the period 1995-2007.[8]

3.1. Firm-level data

The Thomson Financial Primark database offers balance sheet and profit and loss accounts data for firms in the East Asian region. Our initial data set includes a total of 41,641 annual observations on 4,651 listed companies. We provide information on financial accounts and ratios for Asian firms operating in all sectors of the economy for the years 1995-2007.

We use Zephyr, which is distributed by Bureau Van Dijk, to obtain data on mergers and acquisitions for the sampled firms. The Thomson Financial Primark database 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. In addition, by allowing for both entry and exit, the panel has an unbalanced structure which helps mitigate potential selection and survivor bias. Our sample contains data for 358 firms in Indonesia, 917 in Korea, 871 in Malaysia, 596 in Singapore and 530 in Thailand, a total of 3,272

[8] We have also attempted to remove 2007 from our sample due to the fact that it may contain some early effects of the recent global financial crisis. The results, which are available upon request, remain unchanged.

firms. Of these firms, 2,892 are listed on the stock exchange (88.4%) and 380 are unlisted (11.6%). However, due to the fact that our empirical models include the AGE variable, which measures the number of years a firm has been listed on the stock exchange, only listed firms are included in the estimations. Thus our final panel includes 2,892 firms for five Asian economies. Our sample can be considered as representative of the broader aggregate in terms of the population of listed firms. Figure 1 compares the number of listed companies in our data with those reported in the World Bank database (WDI). We observe that our sample tracks very well the corresponding aggregate figure and therefore our sample is an accurate reflection of the universe of listed Asian companies. Finally, we note that both lines show an upward trend which is consistent with the view that stock markets have become increasingly important in Asia over the last decade.

3.2. Indicators of financial development

Data on financial development indicators are taken from the World Development Indicators (WDI, November 2008 version), described in Beck et al. (2003). Annual data on GDP growth come from the Asian Development Bank. In line with the literature on financial development we use various aggregate indicators that proxy for financial development to ensure robustness.[9] We use two indicators to capture the development of the stock market, which provides 'arm's-length finance' (see Beck et al. (2000) and Levine (2006)). We rely on both the size and the liquidity of the stock market. A larger market size (stock market capitalization/GDP) indicates that investors have confidence in the market's ability to channel funds into the most efficient projects. Greater market liquidity (total stock market value traded/GDP) implies lower transactions costs and wider market participation.

We employ two indicators to measure financial intermediary development. First, we consider the quantity of funds that is channeled through the banking system to investors in

[9] In our main results we use annual values of financial development indicators over the period 1995—2007 to avoid significant informational loss. However, to address concerns regarding reverse causality we have re-estimated our models using financial development indicators in the initial year of our estimation period, 1995. The results, which are available upon request, are robust to this modification.

the private sector (private bank credit/GDP). This indicator shows the overall development in private banking system. According to Baltagi et al. (2008) this is the most important banking development indicator because it quantifies the extent to which new firms have opportunities to obtain bank finance. Second, we look at the ratio of deposit-money bank assets to GDP (bank assets/GDP). This indicator captures the overall size of the banking sector (see King and Levine (1993)).

3.3. Descriptive statistics

Summary statistics for the firm-specific variables used in our empirical analysis are provided in Table 1. The figures are presented for all firms (column 1), those firms that failed (column 2) and those that are survivors (column 3). A final column reports the p-value of a test for whether there is a significant difference between values for failing and surviving firms. On the basis of three different financial variables we find that failing firms are more leveraged, less profitable and less collateralized compared to survivors. 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); Bridges and Guariglia (2008) and Görg and Spaliara (2009)) that firms in bad financial shape are more likely to fail. We also observe that failing firms are smaller and younger than surviving firms. This is 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)). These differences between sub-samples are statistically significant in all cases.

Table 2 reports summary statistics for firm-specific and financial variables by country. We find that firms in Singapore and Malaysia maintain the lowest levels of leverage and the highest levels of profitability. In addition, Korean and Singapore firms are the most collateralized across the five countries included in this study. Finally, Indonesian firms display the largest values of size and Thai firms are older (i.e longer listed on the stock exchange).

The evolution of financial development indicators over time is depicted in Figure 2.[10] The upper panel refers to the indicators of stock market development, while the lower panel to indicators of banking development. We observe a sharp decline for both stock market indicators (market capitalization and market value traded) during the East Asian crisis in 1997-98, followed by a noticeably high growth in the post crisis period. Market capitalization dropped substantially in 2002 but has grown rapidly after 2003. This significant drop in 2002 may reflect the aftermath of the stock market crash which was related to the dotcom bubble bursting with primary adverse effects in the US stock exchange and secondary effects in Asia and Europe. Market value traded has maintained levels between two and a half times higher than values in 1997-98, and it is growing steadily over time. This indicates that stock markets have become more liquid, which reflects the greater diversity of investors and the relative improvement in the trading environment due to faster settlement and more rapid dissemination of information. Finally, the banking development indicators (private bank credit and bank assets) remained at elevated levels during the crisis, followed by a sharp decline in the subsequent years. Both indicators run up during the crisis and this was reflected in high leverage, or debt to equity in East Asian corporate sectors (see World Bank (1999)). It is clear, however, that after the crisis both indicators have declined substantially, which implies that Asian financial systems are noticeably less bank centered in the later years of our sample.

All four indicators of financial development are summarized across countries in Table 3. The data reveal clear heterogeneity in financial development of the five economies used in this study. For instance, the average lowest values of stock market size and liquidity are shown for Indonesia. Malaysia and Singapore have the largest stock market capitalization, while Korea has the most liquid stock market followed by Singapore. According to Eichengreen (2004), the stock market is important in these economies because the authorities have aggressively promoted its development. With respect to the development of the banking sys-

[10] These figures refer to the five economies included in the present study.

tem, we observe that bank intermediation is especially important in Malaysia and Thailand. Finally, Singapore experience the lowest average failure rate, while Malaysia and Thailand are characterized by the highest failure rates. Taken together these figures suggest that more market-oriented economies such as Singapore experience the lowest failure rates, while more bank-based economies, such as Thailand experience the highest failure rates.

It remains to be seen, though, whether these preliminary findings continue to hold when we control for a number of factors which are known to play a role in firms' survival studies. In the sections that follow we test within a formal regression analysis framework whether financial development has a statistically significant influence on firms' survival prospects.

4. Results

4.1. Financial development and firm survival

We begin our enquiry with a baseline model of business failure as shown in Equation (1). The probability of corporate failure is modeled as a function of the country-level financial development indicators, the firm-specific control variables, financial variables, industry characteristics and macroeconomic conditions. The predicted probability of exit, evaluated at the mean of the independent variables is 9.5%, which is close to the actual exit rates across countries reported in the summary statistics.

Table 4 reports results for the baseline model, where the financial development indicators are used one by one in successive columns (1, 2, 3 and 4). The point estimates on measures of financial development suggest a robust relationship between firm survival and the development of the financial system. In columns 1 and 2 the coefficients on stock market size ($Market\ Capitalization$) and liquidity ($Market\ Value\ Traded$) are negative and significant suggesting that larger and more efficient stock markets would reduce the incidence of business failures. These results suggest that in economies with more developed stock markets firms are able to hedge, pool risk, and access an alternative source of external financing, raising their

survival chances.[11] The relationship between stock market development and firm survival is not only statistically, but also economically important. To illustrate the effect let us consider the coefficient on market capitalization as shown in column 1 of Table 4. Moving from the 25th percentile of the distribution of market capitalization (41.2%) to the 50th percentile (88%) would increase firms' survival chances by 17.8 percentage points.[12] Therefore, moving to a market-based system would provide the means to free Asian economies from excessive dependence on banking intermediation and to foster the development of a more diversified and efficient financial sector. In addition, market-based economies are better in allocating resources to investment projects that promise the highest returns and therefore are able to facilitate more productive long-term investments (Levine (1991)). Finally, market-oriented systems are better in reducing asymmetric information (Hermes and Lensink (2000)). This may be due to the engagement of international rating agencies and local agencies, which can reduce information asymmetry in the capital markets.

Moving to the banking development indicators, we observe that the coefficients on both *Private Bank Credit* and *Bank Assets*, which are shown in columns 3 and 4 respectively, are positive and significant at the one percent level. To assess the economic importance of banking development let us focus on the coefficient on private bank credit as shown in column 3 of Table 4. Moving from the 25th percentile of the distribution of private bank credit (84%) to the 50th percentile (101%) would result into 19.7 percentage points higher chance of corporate failure. These findings suggest that firms' chances of failure are increasing in financial intermediary development. There are strong reasons to believe that increasing bank intermediation can lead to failures. The relatively short maturity of most bank loans means that a macroeconomic shock can generate a source of endogenous fragility due to the asset-liability mismatch. This may leave Asian corporations vulnerable

[11] As already noted, when financial markets develop both in terms of size and liquidity, it may be possible for brokers to spread their fixed costs more widely and thus reduce the thresholds that bar firms' entry to financial markets.

[12] This is calculated as follows: ln(88)-ln(41.2)=0.75 and 0.75*(-0.238)=-0.178, where -0.238 is the coefficient on stock market capitalization in the cross-country regressions.

to a disruptive credit crunch and the depreciation of the exchange rate can cause serious balance-sheet damage, in the worst case leading highly leveraged firms into bankruptcy.[13] The vulnerability of corporations to this position was highlighted with the onset of the Asian crisis. When the crisis occurred the funding to banks and then to corporates fell dramatically, and in the absence of alternative sources of finance for firms and banks, the real effects of the crisis were amplified.[14] Further, Rajan (1992) presents the costs of bank financing in a theoretical setup. Based on the model's predictions, banks can extract rent from firms' investment projects, thus reducing the payoff that accrues to the firms and consequently reducing their efforts to undertake innovative activities. In turn, the literature on firm survival (see Audretsch and Mahmood (1995)) shows that less innovative firms are unable to establish and maintain a competitive advantage in the market and thus they are more likely to fail. In addition, Farinha and Santos (2006) show that higher levels of bank debt are more likely to increase the incidence of corporate failures. Finally, the negative association between bank intermediation and firm survival is also related to previous empirical findings in the finance–growth literature. For example, Guariglia and Poncet (2008) find a negative association between finance and growth in China, while Beck et al. (2006) provide evidence of a magnifying role of financial intermediaries in the propagation of macroeconomic shocks in economies where firms have limited access to external finance. Consistent with this view De Gregorio and Guidotti (1995) find a robust negative relationship between financial intermediation and growth in Latin American economies. The upshot is that more financial intermediation in emerging markets is often a sign of fragile and overleveraged financial systems, especially when these economies are exposed to extreme economic conditions.

Firm-specific financial indicators have the expected impact on firms' failure. In particu-

[13]This implication is consistent with Furman and Stiglitz (1998) as discussed in Eichengreen (2004).

[14]The most severe experiences were in those countries with the most highly leveraged companies prior to the crisis – Indonesia, Korea and Thailand. Much of the corporate debt was foreign currency denominated therefore the reversal of capital inflows with the subsequent depreciation of the exchange rate had a sharp adverse effect on investment and output.

lar, firms with high levels of $LEVERAGE$ face higher probabilities of failure compared to those with low leverage confirming previous reported empirical evidence (Zingales (1998); Farinha and Santos (2006); Bridges and Guariglia (2008) and Görg and Spaliara (2009)). High levels of debt would increase moral hazard and adverse selection problems, and would lead to a higher probability of failure. $PROFITABILITY$ 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); Bridges and Guariglia (2008) and Görg and Spaliara (2009)). The coefficient on $COLLATERAL$ 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 more external funding but also to pursue risk-shifting strategies (Bridges and Guariglia (2008) and Farinha and Santos (2006)).

With respect to our firm-specific controls, the coefficients on $SIZE$ and $SIZE^2$ enter with the expected signs but only the latter is significant. The coefficients on firm AGE exert a negative and significant impact on failure and this finding is in line with previous theoretical and empirical evidence which shows that failure rates decrease with the firm's track record (e.g Jovanovic (1982) and Clementi and Hopenhayn (2006)). Finally, the coefficients on AGE^2 are positive and significant suggesting significant non-linearities.

The results on the MES and the GDP growth (GDP) behave as conjectured. Firms operating in industries with high MES are more likely to survive, which is consistent with Audretsch (1991), whereas improved economic conditions reduce the probability of failures in line with Alvarez and Görg (2009).

4.2. Evolution over time

Having identified a direct relationship between financial development and firm survival, we now explore whether this linkage has evolved over time. Asian countries have sought to increase financial market development to avoid dependence on foreign capital as was the

case in the 1990s around the time of the 1997-98 Asian crisis. In the post-crisis period, East Asian economies established a working group on financial market development and the priority was given to the development of stock and bond markets. This would provide the means to free Asian economies from excessive dependence on bank intermediation and to foster the development of a more diversified and efficient financial sector. Large strides have since been taken to improve the capital markets at the country and regional level. Perhaps the most prominent initiative has been the move towards a regional bond market with the establishment of the Asian Bond Fund, referred to as the ABF, in 2003 to purchase dollar denominated Asian government bond issues. This initiative was then extended in 2005, to an open fund with purchases of local currency government bond issues. It is therefore of primary interest to investigate whether the relationship between firm survival and financial development has been influenced by the recent East Asian efforts to strengthen their legal and financial systems and building secondary-market infrastructure.

We should expect the creation of such pan-regional model to give boost to the integration of national markets. This will make investors more willing to participate in a security market that represents claims on a basket of regional bonds diversifying away idiosyncratic national risk (Eichengreen (2004)). In addition, according to Borensztein et al. (2008) bond markets grow together with the rest of the financial system (banking system and stock markets) and thus all markets will benefit. In a context of a greater financial development, we anticipate the negative effect of banking development on survival to loose its relevance over time. Similarly, we would expect that the impact of stock market development on firms' failures to be more pronounced once the initiatives took place.[15] In order to test this hypothesis, we interact the indicators of financial development with a time period dummy as follows: $FD{*}Late$ and $FD{*}(1 - Late)$, where $Late$ takes the value one in years 2003 to 2007, and zero for the years 1995 through 2002.[16]

[15] A similar exercise was carried out by Guariglia and Poncet (2008) in order to test for the evolution of the finance-growth nexus in China.

[16] Our results were robust to defining the time period dummy *Late* equal to one in 2005 to 2007, in order to capture the second phase of the Asian Bond Fund.

Results for the evolution of financial development over time are reported in Table 5. We observe that the coefficients on *Market Capitalization* and *Market Value Traded* reported in columns 1 and 2 are negative and highly significant only for the late period (2003–07) suggesting that stock market development is beneficial to firms' survival once the regional initiatives took place in 2003. To gauge the economic effect we consider the coefficient on market capitalization for the late period as shown in column 1 of Table 5. Moving from the 25th percentile of the distribution of market capitalization (41.2%) to the 50th percentile (88%) would result into 87 percentage points higher chance of survival during the late period of our sample. The coefficients for both indicators during the pre-2003 period are insignificant and quantitatively unimportant. These results lend support to our hypothesis that the relationship between firm survival and stock market development has been strengthened by the recent East Asian efforts to build secondary-market infrastructure.

Coming to our banking development indicators, column 3 shows that the estimated positive effect of *Private Bank Credit* on firms' chances of failing is confined only to the pre-2003 period. We observe a sign reversal for the later years of our sample, which suggests that the adverse effect of banking development on firm survival has declined over time, hindering firm survival to a lower extent. To assess the effect of private bank credit on firm survival during the late period of our sample, we can focus on the coefficient reported in column 3 of Table 5. Increasing private bank credit from the 25th percentile (84%) to the 50th percentile (101%) would increase firms' survival prospects by 18 percentage points. Column 4 shows that the coefficient on *Bank Assets* is negative and highly significant for the later years of our sample, while insignificant for the pre-2003 period. Finally, tests of equality reported at the foot of Table 5 suggest significant differences between the interacted coefficients. These results confirm our hypothesis that the adverse effects of banking development indicators became weaker during 2003-2007, which might reflect the reforms in the financial system that reduced Asian banks' inefficiencies.

4.3. The differentiated effect of firm size

In this sub-section we test whether all firm types are equally affected by financial development. We use firm size as a sorting device because small firms are more likely to be associated with the higher degree of information asymmetry and therefore may find it difficult to access capital markets and benefit when financial development takes place. The importance of size in firms' real activities was emphasized in the empirical financing constraints literature. Size was employed as a criterion by Guariglia (2008) and Spaliara (2009) and is the key proxy for capital market access by manufacturing firms in Gertler and Gilchrist (1994) because small firms are more vulnerable to capital market imperfections and thus more likely to be financially constrained. In addition, there is evidence that the nexus between growth and financial development is related to firm size. Beck et al. (2005) find that the financial system affects the growth of small firms more severely across a wide set of both developed and developing economies. Consistent with this view, Guiso et al. (2004) show that financial development fosters the growth of small firms more than large firms in Italy.

Given that our objective is to verify whether there is a differential effect of financial development on the failure probabilities of small and large firms, we interact our financial development indicators as follows: $FD{*}Small$ and $FD{*}(1 - Small)$, where $Small$ is a dummy variable equal to one if the firm's real total assets are below the upper quartile of the distribution of the assets of all the firms in that particular industry and year, and zero otherwise. This exercise is based on the consideration that small firms tend to face greater asymmetric information problems and have therefore smaller chances of survival, as financing constraints become binding. Large firms, on the other hand, are likely to be less financially constrained and will be better equipped to take advantage of the development of the financial system. If this hypothesis were true, when banking development takes place, which was found to increase the incidence of firm failure, we should expect small firms to be more severely affected than large firms. On the other hand, in a market-based system, which is associated with a decrease in firm failures, we should expect improvements in financial services (in terms of size or liquidity of the stock market) to disproportionately help large firms. This is

because large firms can access capital markets, while significant fixed costs may prevent small firms from accessing capital markets (Greenwood and Jovanovic (1990)). Therefore, when considering the banking system development we expect to find weaker effect on large firms' probabilities of failure: the coefficients associated with $FD*(1 - Small)$ should be smaller than those associated with $FD*Small$. The exact opposite pattern should be observed when stock market development takes place: the coefficients associated with $FD*(1 - Small)$ should be larger than those associated with $FD*Small$.

Table 6 reports the estimated coefficients on the interacted financial system characteristics as well as our control variables. The results show that both *Market Capitalization* and *Market Value Traded* (columns 1 and 2) are significant only for large firms, which do not face binding financing constraints and they are able to tap the capital markets, while they are insignificant for small firms. Tests of equality suggest that the coefficients are significantly different from each other in one out of two cases. To ascertain the economic effect, consider the coefficient on market capitalization for large firms, as shown in column 1 of Table 6. Moving from the 25th percentile of the distribution of market capitalization (41.2%) to the 50th percentile (88%) would increase large firms' survival chances by 61 percentage points. This result confirms our hypothesis that greater development in stock markets, both in terms of size and liquidity, shields only large firms against failures since they find it easier to access stock markets due to smaller information and transaction costs. Therefore, stock market development is particularly beneficial to large firms.

The coefficients on the banking development as shown in columns 3 and 4 are significant for both types of firms. We find that at higher levels of banking development (measured by *Private Bank Credit* and *Bank Assets* respectively) both small and large firms' survival prospects are adversely affected but the coefficients on small firms are two times larger that of large firms. In addition, for both indicators these coefficients are significantly different from each other (p-values are 0.00 in both cases). To see the economic magnitude, consider the case of private bank credit. Bringing up private bank credit from the 25th percentile (84%)

to the 50th percentile (101%), the coefficient estimates in column 3 of table 6 indicate that small (large) firms' failing chances would increase by 20 (13) percentage points. This finding lends support to the story that higher levels of banking intermediation affect differently firms' survival prospects, with bank-dependent small firms being the most affected.

5. Robustness tests

In this section we subject our a findings to a number of tests to ensure robustness. These additional checks involve estimation of our empirical models with random-effects Probit and IV Probit, considering whether the effects of financial development differ during and outside the Asian crisis as well as between market-based and bank-oriented economies, using alternative cut-off points for the definition of small and large firms, and employing additional measures of financing constraints.

5.1. Alternative estimation methods

While the complementary log-log model captures the exact time of failure it does not take into account the panel nature of the dataset nor does it control for the potential endogeneity of our regressors. In order to address these potential concerns we take two steps. First, we verify whether our results are robust to using a random-effects Probit estimator which explicitly controls for unobserved heterogeneity. Second, we employ IV Probit techniques, which allow the firm-specific variables to be endogenous and then instrumenting for them through a two-stage procedure. Leverage, profitability, collateral, size and size squared are instrumented using their lagged levels in t-1. In addition, when we partition our sample to small and large firms our instruments set includes leverage, profitability, collateral, size, size squared and the interactions of the indicators of financial development with the dummy variable *Small* all lagged once. Since we are using IV estimators we check for the validity of the instruments using a Sargan test statistic of the overidentifying restrictions, reported at the foot of the table of results. In all cases the Sargan test confirms that the instrumental variables used in our empirical models are valid.

The results for the baseline model (shown in Table 4) are reported in Table 7. Results from the random-effects Probit models are reported in columns 1 to 4, while results from the IV Probit models are shown in columns 5 to 8. We observe that in most cases the presented pattern of financial development indicators confirms our main findings and all our control variables retain their signs and significance. Specifically, in Table 7 we continue to observe that stock market development would directly reduce firms' failure prospects, while higher levels of financial intermediary development would increase firms' chances of failing. We have also used random-effects Probit and IV Probit methods for partitioning our sample into different time periods and firm classes. The results of these robustness tests are summarized below, but not reported-they are available from the author upon request. We find that the positive effects of stock market development on firm survival are more pronounced during the later period of our sample, while the adverse effects of banking development have been reduced over time. Furthermore, we find that large firms are more likely to benefit from developments in financial markets compared to small firms. Finally, bank-dependent small firms are adversely affected at higher levels of financial intermediation. We therefore conclude that our main findings are not driven by unobserved heterogeneity not accounted for in the complementary log log models. In addition, we show that the extent of endogeneity bias is very limited in our sample and our findings are robust to an instrumental variables technique.

5.2. The Asian crisis

Our empirical specifications consider whether the effects of financial development on firm survival have changed over time by partitioning our sample into pre- and post-2003, but do not consider whether these effects vary with the state of the economy. Our sample covers the Asian crisis and this would provide a natural experiment to compare the impact of financial development on firm survival in and out of the crisis. Therefore, we construct the dummy variable *Crisis* that takes the value one in years 1997 and 1998, and zero otherwise. We aim to capture the fact that the second half of 1997 saw the unprecedented collapse of the stock

markets and currencies of several Asian countries. There is evidence that the Asian crisis adversely influenced the ability of firms to access credit on international markets through sudden stops of capital inflows (see Calvo (1999)).

To understand whether the effects of financial development on firms' survival chances were different during and outside the Asian crisis we interact the indicators of financial development with the $Crisis$ and $1 - Crisis$ terms. This test is a modification of estimated models in Table 5 and results are reported in Table 8. We observe that the coefficients on stock market development indicators are negative and significant outside the Asian crisis which suggests that developments in the stock market would increase firms' survival prospects during tranquil periods. This finding may be explained by the fact that stock market efficiency varies with the level of equity development (see Kim and Shamsuddin (2008)) and during the 1997-98 crisis most Asian stock markets were characterized as inefficient. The results for the crisis period are less clear cut. We find that larger stock markets would not influence firms' chances of survival during adverse economic events, while only market value traded is significant during the crisis. Once again, p-values of the tests of equality show significant differences among the interacted terms. On the contrary, we observe a positive association between firms' survival chances and banking development indicators both in and out of the crisis. The coefficients, however, on the indicators of banking development during the crisis are almost three times larger compared with those outside the crisis. In addition, they are significantly different from each other (p-values are 0.00 for both cases). This result implies that the adverse effects of banking intermediation on firm survival are stronger during bad economic times and confirms Beck et al. (2006) who show that monetary shocks are magnified by the existence of significant financial intermediation. On the whole, our findings suggest that the beneficial effects of stock market development on firm survival are stronger during tranquil periods, while the adverse effects of banking development are more potent during extreme economic conditions.

5.3. Financial architecture

While most emerging Asian economies are thought to be mainly bank-based, we noted earlier in the paper that there is substantial heterogeneity in financial development of the five economies used in this study. In addition, Kim and Shamsuddin (2008) use the level of equity market development, which is measured by the FTSE classification of equity markets, to categorize Korea and Singapore into the 'advanced' or 'developed' group of emerging economies and Indonesia, Malaysia and Thailand into the 'secondary' emerging markets group. In our context economies with higher levels of equity market development are more likely to be market-based, while those with lower levels of equity market development are more likely to be bank-based. Thus, Korea and Singapore can be considered as market-based systems compared to Indonesia, Malaysia and Thailand which can be characterized as bank-based systems. Accordingly, we define the dummy variable *Market based* that takes the value one for Korea and Singapore, and zero for Indonesia, Malaysia and Thailand. Our baseline models presented in Table 4 do not distinguish the effects of financial development between bank-oriented and market-based systems and in this exercise we interact the indicators of financial development with the *Market based* and 1-*Market based* terms. We therefore attempt to check whether the effects of financial development on firms' survival prospects differ across these two groups of countries.

We report results of this exercise in Table 9. We find that all four indicators of financial development are negative and highly significant for the group of market-based economies (Korea and Singapore). As we would expect larger and more liquid stock markets would increase firms' survival prospects in economies which stock markets have a comparative advantage in performing important functions such as capital formation, risk sharing and information production. In addition, higher levels of financial intermediation can increase firms' survival chances since firms in economies with developed financial markets are able to access alternative sources of finance and therefore can obtain external funding at a reasonable cost. Moving to the group of bank-centered economies (Indonesia, Malaysia and Thailand) we do not find a significant effect of stock market development on firms' survival prospects,

but we do find that more financial intermediation would increase firm failures in economies with less developed stock exchanges. This finding is in line with Beck et al. (2006) who argue that in these economies banks cannot easily substitute deposits for other sources of finance and firms are mainly bank dependent without having access to alternative sources of funding. Finally, the tests of equality show that the interacted coefficients display significant differences in all cases.

5.4. Alternative cut-off points

In our main empirical results, we used the 75th percentile as a cut-off value for small and large firms. In order to ensure that our results are not driven from the way that we divide our sample, we use the 50th percentile as an alternative cut-off point. Specifically, we classify small firms as those whose total assets are below the median of the distribution of the assets of all the firms in that particular industry and year, and zero otherwise. We then re-estimate the models from Table 6 and report the results in Table 10. We find that large firms show the same sensitivity to stock market development, while small firms remain unaffected (p-values are 0.00 for both cases). In addition, we continue to observe that the coefficients on the private banking development are significant for both types of firms, but with significantly higher values for small firms (p-value is 0.01). The coefficients on the bank assets are significant for both small and large firms with significantly larger effects for the former category (p-value is 0.04). In summary, we can conclude that our main empirical results are robust to alternative cut-off values.

5.5. Additional proxies for financing constraints

Thus far we have examined whether there is a differential effect of financial development indicators on the failure probabilities of small and large firms. This classification is related to the well established empirical financing constraints literature (see for example Fazzari et al. (1988) and the discussion in Brown and Petersen (2009) and Chae et al. (2009)). Therefore, we now check whether other proxies for financing constraints can be used for robustness.

First, we rely on firms' bank dependency, as measured by the ratio of short term debt to total debt.[17] Second, we employ an indicator of firms' riskiness, as measured by the Z-score.[18] Specifically, we create a dummy variable *BankDep*, which is equal to one if the firm's ratio of short term debt to total debt is above the bottom quartile of the distribution of the short term debt to total debt ratio of all the firms in that particular industry and year, and zero otherwise. In addition, we generate a dummy variable *Risky*, which is equal to one if the firm's Z-score is below the upper quartile of the distribution of the Z-score of all the firms in that particular industry and year, and zero otherwise.

We re-estimate the models from Table 6 and report the results in Tables 11 and 12. We find that the coefficients on the stock market development indicators are negative and significant for firms more likely to be unconstrained (less bank dependent and safe), while insignificant for their constrained counterparts (with the only exception being risky firms). Thus, we continue to observe that unconstrained firms are more likely to benefit from developments in the stock markets. Moving to the indicators of banking development, we find that the coefficients on the private bank credit and bank assets are significant for both types of firms, but with significantly higher values for constrained firms.[19] Therefore, bank dependent and risky firms are more likely to be adversely affected by increased banking intermediation and this confirms our main findings.

6. Conclusions

Using a panel for five Asian economies - Indonesia, Korea, Malaysia, Singapore and Thailand - we find that country-level indicators of financial development have an important

[17] It is generally accepted that higher levels of bank dependency are associated with firms which are more likely to be financially constrained (see Spaliara (2009)).

[18] Following Altman (1968) the Z-score is calculated as follows: Z-score = 0.012*X1 + 0.014*X2 + 0.033*X3 + 0.006*X4 + 0.999*X5, where X1 is the ratio of working capital to total assets, X2 is the ratio of retained earnings to total assets, X3 is the ratio of earnings before interest and tax to total assets, X4 denotes the ratio of the market value of equity to the book value of total debt, and X5 is the share of sales in total assets. The higher the Z-score the less risky a firm can be considered. Therefore, risky firms are more likely to be characterized by financing constraints (see Guariglia and Mateut (2010)).

[19] P-values for tests of equality of the coefficients are as follows: 0.19 and 0.09 when we use the bank dependency as sorting device and 0.00 for both cases when we use the Z-score as sorting device.

role to play in influencing firm survival. When stock markets develop, both in terms of size and liquidity, firms' survival chances improve. In other words, moving towards a more market-based system is likely to reduce the incidence of business failures. On the contrary, we show that greater banking intermediation can increase firm failures and we argue that bank-based systems in emerging Asian markets are inherent to bank runs and therefore could impede firms' survival prospects.

When we consider whether the linkage between survival and financial development has evolved over time, we find that the beneficial effects of stock market development are more pronounced during the later years of our sample, while the adverse effects of bank intermediation have declined over time. Finally, after separating firms into different categories using their size as sorting device we find that large firms would benefit the most from developments in the stock market, while small firms are most severely affected from high levels of financial intermediation. This implies that not all firms are equally affected by financial development, reflecting the higher risk characteristics associated with small firms that are financially constrained and subject to greater information asymmetries. These results were robust to using an instrumental variables technique, to controlling for unobserved heterogeneity, to using alternative cut-off points for the definition of small and large firms and to including additional proxies for financing constraints. In addition, our results suggest that the main effects of financial indicators on firm survival chances differ during and outside the Asian crisis, and for bank- and market-based countries.

Our results provide new evidence that the development of the financial system along with firms' financial condition can play a key role in determining corporate failures. Developing better equity and bond markets may help to avoid excessive dependence on bank intermediation and the problem of sudden stops and creditor runs, which are an inherent feature of short-term credit markets. Thus less reliance on banks means a correspondingly lower exposure to banking crises. It is important to note that Asian economies would benefit from better diversified financial systems in which well developed stock and bond markets

would complement their banking systems. Asian policy makers should therefore promote the development of a sound banking system and well-functioning financial markets at the same time in order to facilitate the development of a balanced economy and to improve firms' performance and survival prospects.

7 Appendix

7.1 Structure of the panels

Number of obs. per firm	Number of observations				
	Indonesia	Korea	Malaysia	Singapore	Thailand
	(1)	(2)	(3)	(4)	(5)
2	10	24	6	15	29
3	65	77	20	40	90
4	68	189	50	41	112
5	40	331	107	99	111
6	58	512	142	101	93
7	89	424	175	116	139
8	114	488	293	178	102
9	161	653	201	283	110
10	180	215	173	222	90
11	189	405	404	367	99
12	924	745	1131	454	230
13	807	1548	4299	2040	3126
Total	2705	5611	7001	3956	4333

Acknowledgments

Part of this paper was written while the author was a visiting fellow at Columbia Business School and the Hong Kong Institute of Monetary Research; their hospitality is gratefully acknowledged. I would like to thank an anonymous reviewer, Charles Calomiris and Marina-Eliza Spaliara for helpful comments and suggestions. Financial support through the UK Economic and Social Research Council Grant Ref: PTA-026-27-1790 is gratefully acknowledged. Any remaining errors are my own.

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Table 1: Summary statistics for firm-specific variables used in the empirical models

	All firms	Fail=1	Fail=0	Diff.
	(1)	(2)	(3)	(4)
Leverage	0.63	0.92	0.61	0.000
	(0.81)	(1.15)	(0.76)	
Profitability	7.62	-8.91	9.36	0.000
	(50.62)	(64.42)	(68.42)	
Collateral	0.72	0.59	0.73	0.000
	(0.30)	(0.37)	(0.28)	
Size	14.04	14.01	14.38	0.000
	(3.44)	(3.38)	(3.44)	
Age	14.25	12.88	14.39	0.000
	(4.94)	(5.06)	(4.91)	
Observations	23,606	2,247	21,359	

Notes: The table presents sample means. Standard deviations are reported in parentheses. The p-value of a test of the equality of means is reported. *Fail* is a dummy that equals 1 if the firm fails, and 0 otherwise. *Leverage* is measured as the firm's total debt to assets ratio. *Profitability* is the ratio of the firm's profits before interest and tax to its total assets. *Collateral* is defined as the ratio of the firm's tangible assets over its total assets. *Size* is denoted by the log of real assets. *Age* measures the number of years a firm has been listed on the stock exchange. The time period is 1995-2007. Variables are measured in thousands of US dollars.

Table 2: Summary statistics for firm-specific variables by country

	Leverage	Profitability	Collateral	Size	Age	Observations
	(1)	(2)	(3)	(4)	(5)	(6)
Indonesia	0.72	4.87	0.71	18.9	15.33	2705
	(0.63)	(30.20)	(0.33)	(2.15)	(4.87)	
Korea	0.56	6.35	0.78	18.61	10.96	5611
	(0.49)	(25.11)	(0.27)	(1.63)	(4.48)	
Malaysia	0.51	7.42	0.67	12.09	15.53	7001
	(0.48)	(31.50)	(0.25)	(1.66)	(4.35)	
Singapore	0.48	10.11	0.74	11.29	14.87	3956
	(0.47)	(31.07)	(0.29)	(1.90)	(5.27)	
Thailand	0.61	5.77	0.69	14.45	15.78	4333
	(0.58)	(27.55)	(0.34)	(1.78)	(3.96)	

Notes: The table presents sample means. Standard deviations are reported in parentheses. *Leverage* is measured as the firm's total debt to assets ratio. *Profitability* is the ratio of the firm's profits before interest and tax to its total assets. *Collateral* is defined as the ratio of the firm's tangible assets over its total assets. *Size* is denoted by the log of real assets. *Age* measures the number of years a firm has been listed on the stock exchange. The time period is 1995-2007. Variables are measured in thousands of US dollars.

Table 3: Summary statistics for development indicators and failure rates by country

	Market Capitalization	Market Value Traded	Private Bank Credit	Bank Assets	Failure
	(1)	(2)	(3)	(4)	(5)
Indonesia	0.25	0.10	0.31	0.42	0.09
	(0.06)	(0.04)	(0.15)	(0.08)	(0.29)
Korea	0.58	1.36	0.82	0.85	0.09
	(0.23)	(0.52)	(0.14)	(0.17)	(0.28)
Malaysia	1.62	0.66	1.31	1.32	0.10
	(0.39)	(0.42)	(0.23)	(0.15)	(0.30)
Singapore	1.62	0.98	1.02	1.21	0.06
	(0.18)	(0.48)	(0.10)	(0.12)	(0.25)
Thailand	0.53	0.37	1.14	1.26	0.15
	(0.18)	(0.16)	(0.27)	(0.24)	(0.36)

Notes: The table presents sample means. Standard deviations are reported in parentheses. *Market Capitalization* is defined as the ratio of stock market capitalization to GDP. *Market Value Traded* is measured as the ratio of total stock market value traded to GDP. *Private Bank Credit* is given by the ratio of private bank credit to GDP. *Bank Assets* is calculated as the ratio of deposit-money bank domestic assets to GDP. *Failure* is the average rate of failure at the firm-level.

Figure 1: Comparing our data with a broader aggregate

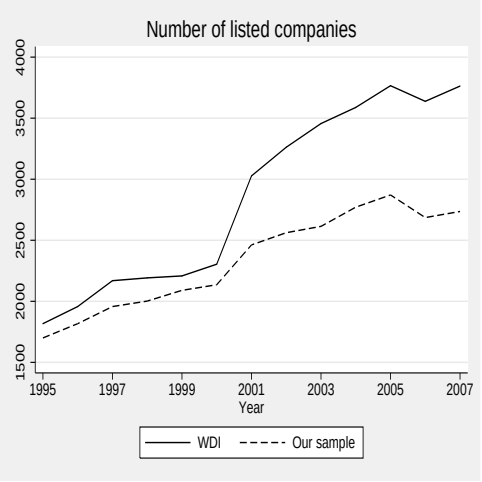

Table 4: Financial development and firm survival

	(1)	(2)	(3)	(4)
Market Capitalization	-0.238**			
	(-1.96)			
Market Value Traded		-0.319***		
		(-4.42)		
Private Bank Credit			1.094***	
			(11.99)	
Bank Assets				1.007***
				(6.92)
Leverage	0.250***	0.250***	0.257***	0.258***
	(13.72)	(13.71)	(13.85)	(13.98)
Profitability	-0.004***	-0.004***	-0.004***	-0.003***
	(-9.73)	(-9.76)	(-9.55)	(-9.39)
Collateral	-0.675***	-0.675***	-0.644***	-0.654***
	(-8.87)	(-8.86)	(-8.41)	(-8.57)
Size	-0.095	-0.094	-0.103	-0.108*
	(-1.49)	(-1.46)	(-1.63)	(-1.70)
$Size^2$	0.004**	0.004**	0.005**	0.005**
	(2.10)	(2.06)	(2.43)	(2.47)
Age	-0.138***	-0.138***	-0.127***	-0.131***
	(-6.73)	(-6.73)	(-6.18)	(-6.39)
Age^2	0.002***	0.002***	0.002**	0.002**
	(2.72)	(2.73)	(2.25)	(2.41)
GDP	-0.027***	-0.021***	-0.015***	-0.009
	(-5.00)	(-3.99)	(-2.93)	(-1.45)
MES	-0.014	-0.015	-0.013	-0.010
	(-0.06)	(-0.06)	(-0.05)	(-0.04)
Observations	23606	23606	23606	23606
$Log-likelihood$	-6591	-6580	-6528	-6566

Notes: Proportional hazard model results are reported. The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. All firm-specific variables are lagged one period. 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 models. Also see notes to Table 1.

Table 5: Evolution over time

	(1)	(2)	(3)	(4)
*Market Capitalization*Late*	-1.162***			
	(-12.43)			
Market Capitalization(1 − Late)*	0.057			
	(0.64)			
*Market Value Traded*Late*		-1.559***		
		(-15.59)		
Market Value Traded(1 − Late)*		0.033		
		(0.53)		
*Private Bank Credit*Late*			-1.018***	
			(-8.19)	
Private Bank Credit(1 − Late)*			0.338***	
			(3.46)	
*Bank Assets*Late*				-1.304***
				(-8.21)
Bank Assets(1 − Late)*				-0.001
				(-0.01)
Leverage	0.229***	0.221***	0.225***	0.223***
	(11.57)	(11.23)	(11.28)	(11.10)
Profitability	-0.004***	-0.004***	-0.004***	-0.004***
	(-9.12)	(-9.47)	(-9.10)	(-9.09)
Collateral	-0.737***	-0.749***	-0.719***	-0.728***
	(-9.36)	(-9.55)	(-9.12)	(-9.24)
Size	-0.041	0.011	-0.026	-0.024
	(-0.64)	(0.17)	(-0.40)	(-0.36)
$Size^2$	0.002	0.000	0.002	0.002
	(1.15)	(0.04)	(0.85)	(0.77)
Age	-0.125***	-0.127***	-0.121***	-0.123***
	(-6.15)	(-6.27)	(-5.95)	(-6.07)
Age^2	0.002**	0.002**	0.002*	0.002**
	(2.11)	(2.27)	(1.96)	(2.05)
GDP	-0.008	-0.012**	-0.002	-0.004
	(-1.58)	(-2.37)	(-0.52)	(-0.88)
MES	-0.077	-0.083	-0.076	-0.078
	(-0.31)	(-0.33)	(-0.31)	(-0.31)
Observations	23606	23606	23606	23606
Log − likelihood	-6238	-6207	-6206	-6208
Test of equality (p-value): *Market Capitalization*	0.00			
Test of equality (p-value): *Market Value Traded*		0.00		
Test of equality (p-value): *Private Bank Credit*			0.00	
Test of equality (p-value): *Bank Assets*				0.00

Notes: Proportional hazard model results are reported. The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. *Late* is a time period dummy that takes the value one in years 2003, 2004, 2005, 2006 and 2007, and zero for the years 1995 to 2002. All firm-specific variables are lagged one period. Robust z-statistics are presented in the parentheses. The test of equality is reported as a chi-squared statistic. 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 models. Also see notes to Table 1.

Table 6: The differentiated effect of firm size

	(1)	(2)	(3)	(4)
*Market Capitalization*Small*	-0.145			
	(-1.20)			
Market Capitalization(1 − Small)*	-0.819***			
	(-4.52)			
*Market Value Traded*Small*		-0.060		
		(-0.81)		
Market Value Traded(1 − Small)*		-0.173*		
		(-1.75)		
*Private Bank Credit*Small*			1.131***	
			(12.50)	
Private Bank Credit(1 − Small)*			0.743***	
			(5.26)	
*Bank Assets*Small*				1.085***
				(7.48)
Bank Assets(1 − Small)*				0.683***
				(3.92)
Leverage	0.250***	0.256***	0.257***	0.258***
	(13.63)	(12.05)	(13.80)	(13.92)
Profitability	-0.004***	-0.004***	-0.004***	-0.003***
	(-9.86)	(-10.94)	(-9.56)	(-9.38)
Collateral	-0.652***	-0.538***	-0.630***	-0.639***
	(-8.55)	(-6.05)	(-8.23)	(-8.37)
Size	-0.202***	-0.093	-0.209***	-0.225***
	(-2.90)	(-1.16)	(-2.92)	(-3.13)
$Size^2$	0.009***	0.005*	0.009***	0.010***
	(3.70)	(1.78)	(3.80)	(4.00)
Age	-0.136***	-0.130***	-0.124***	-0.127***
	(-6.62)	(-5.44)	(-6.02)	(-6.21)
Age^2	0.002***	0.002**	0.002**	0.002**
	(2.64)	(2.00)	(2.11)	(2.27)
GDP	-0.027***	-0.054***	-0.015***	-0.008
	(-5.06)	(-11.10)	(-2.95)	(-1.25)
MES	-0.054	-0.206	-0.054	-0.054
	(-0.22)	(-0.70)	(-0.22)	(-0.22)
Observations	23606	23606	23606	23606
Log − likelihood	-6580	-6570	-6521	-6558
Test of equality (p-value): *Market Capitalization*	0.00			
Test of equality (p-value): *Market Value Traded*		0.21		
Test of equality (p-value): *Private Bank Credit*			0.00	
Test of equality (p-value): *Bank Assets*				0.00

Notes: Proportional hazard model results are reported. The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. *Small* is a dummy variable equal to one if the firm's real total assets are below the upper quartile of the distribution of the assets of all the firms in that particular industry and year, and zero otherwise. All firm-specific variables are lagged one period. Robust z-statistics are presented in the parentheses. The test of equality is reported as a chi-squared statistic. 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 models. Also see notes to Table 1.

Table 7: Robustness: alternative estimation methods for the baseline models

	R-E (1)	R-E (2)	R-E (3)	R-E (4)	IV (5)	IV (6)	IV (7)	IV (8)
Market Capitalization	-0.517**				-0.078			
	(-2.25)				(-1.55)			
Market Value Traded		-0.494***				-0.124***		
		(-3.61)				(-3.90)		
Private Bank Credit			0.814***				0.584***	
			(3.57)				(10.38)	
Bank Assets				0.802*				0.459***
				(1.89)				(5.85)
Leverage	0.229***	0.229***	0.238***	0.235***	0.194***	0.194***	0.199***	0.200***
	(4.76)	(4.72)	(5.03)	(4.87)	(11.56)	(11.54)	(11.82)	(11.89)
Profitability	-0.002*	-0.002*	-0.002**	-0.001*	-0.005***	-0.005***	-0.005***	-0.005***
	(-1.81)	(-1.91)	(-2.07)	(-1.82)	(-10.17)	(-10.16)	(-10.28)	(-10.11)
Collateral	-0.866***	-0.866***	-0.828***	-0.831***	-0.346***	-0.347***	-0.336***	-0.341***
	(-4.58)	(-4.61)	(-4.40)	(-4.32)	(-7.13)	(-7.14)	(-6.89)	(-7.01)
Size	-0.176	-0.187	-0.193	-0.214	-0.083**	-0.082**	-0.092***	-0.091**
	(-1.14)	(-1.24)	(-1.36)	(-1.39)	(-2.33)	(-2.32)	(-2.60)	(-2.58)
$Size^2$	0.010**	0.011**	0.011**	0.012**	0.004***	0.004***	0.004***	0.004***
	(2.05)	(2.24)	(2.38)	(2.33)	(3.05)	(3.02)	(3.51)	(3.44)
Age	-0.181***	-0.174***	-0.162***	-0.170***	-0.051***	-0.051***	-0.049***	-0.050***
	(-3.72)	(-3.57)	(-3.48)	(-3.46)	(-8.74)	(-8.75)	(-8.40)	(-8.53)
Age^2	0.004**	0.004**	0.004**	0.004**	0.0009**	0.0001**	0.0002**	0.0001**
	(2.25)	(2.09)	(1.99)	(2.02)	(2.19)	(2.22)	(2.06)	(2.11)
GDP	0.001	0.004	-0.002	0.004	-0.009***	-0.006*	-0.004	-0.001
	(0.06)	(0.34)	(-0.19)	(0.27)	(-2.87)	(-1.91)	(-1.24)	(-0.46)
MES	0.346	0.115	0.044	-0.024	-0.350***	-0.350***	-0.347***	-0.348***
	(0.53)	(0.14)	(0.07)	(-0.03)	(-7.21)	(-7.21)	(-7.15)	(-7.17)
Observations	23606	23606	23606	23606	23558	23558	23558	23558
$Sargan(p-value)$	-	-	-	-	0.71	0.89	0.92	0.94
$Log-likelihood$	-1546	-1548	-1539	-1550	-6569	-6561	-6508	-6548

Notes: Random-effect Probit regression results are reported in columns 1 to 4. IV Probit regression results are reported in columns 5 to 8. The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. In the IV Probit regressions leverage, profitability, collateral, size and size squared are instrumented using their lagged levels in t-1. Robust z-statistics are presented in the parentheses. The Sargan statistic is a test of the overidentifying restrictions, distributed as chi-square under the null of instrument validity. 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 models. Also see notes to Table 1.

Table 8: Robustness: the Asian crisis

	(1)	(2)	(3)	(4)
*Market Capitalization*Crisis*	0.070			
	(0.60)			
Market Capitalization(1 − Crisis)*	-0.574***			
	(-4.34)			
*Market Value Traded*Crisis*		0.471***		
		(6.85)		
Market Value Traded(1 − Crisis)*		-0.558***		
		(-8.16)		
*Private Bank Credit*Crisis*			0.783***	
			(8.36)	
Private Bank Credit(1 − Crisis)*			0.264*	
			(1.90)	
*Bank Assets*Crisis*				1.129***
				(8.17)
Bank Assets(1 − Crisis)*				0.409***
				(2.67)
Leverage	0.245***	0.242***	0.251***	0.251***
	(13.28)	(13.17)	(13.64)	(13.55)
Profitability	-0.004***	-0.004***	-0.004***	-0.004***
	(-10.50)	(-10.68)	(-10.62)	(-10.63)
Collateral	-0.673***	-0.665***	-0.636***	-0.631***
	(-8.80)	(-8.68)	(-8.30)	(-8.22)
Size	-0.085	-0.071	-0.086	-0.088
	(-1.33)	(-1.10)	(-1.35)	(-1.39)
$Size^2$	0.004*	0.003*	0.004**	0.004**
	(1.95)	(1.67)	(2.08)	(2.13)
Age	-0.134***	-0.135***	-0.126***	-0.124***
	(-6.52)	(-6.56)	(-6.08)	(-5.98)
Age^2	0.002**	0.002***	0.002**	0.002**
	(2.53)	(2.58)	(2.17)	(2.10)
GDP	0.004	0.002	0.012**	0.041***
	(0.65)	(0.32)	(2.04)	(5.90)
MES	-0.031	-0.033	-0.027	-0.029
	(-0.13)	(-0.13)	(-0.11)	(-0.12)
Observations	23606	23606	23606	23606
Log − likelihood	-6509	-6485	-6489	-6471
Test of equality (p-value): *Market Capitalization*	0.00			
Test of equality (p-value): *Market Value Traded*		0.00		
Test of equality (p-value): *Private Bank Credit*			0.00	
Test of equality (p-value): *Bank Assets*				0.00

Notes: Proportional hazard model results are reported. The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. *Crisis* is a time period dummy that takes the value one in years 1997 and 1998, and zero otherwise. All firm-specific variables are lagged one period. Robust z-statistics are presented in the parentheses. The test of equality is reported as a chi-squared statistic. 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 models. Also see notes to Table 1.

Table 9: Robustness: financial architecture

	(1)	(2)	(3)	(4)
*Market Capitalization*Market based*	-2.077***			
	(-13.31)			
Market Capitalization(1-Market based)*	0.065			
	(0.35)			
*Market Value Traded*Market based*		-0.712***		
		(-9.15)		
Market Value Traded(1-Market based)*		0.037		
		(0.91)		
*Private Bank Credit*Market based*			-3.930***	
			(-15.89)	
Private Bank Credit(1-Market based)*			1.712***	
			(20.52)	
*Bank Assets*Market based*				-4.047***
				(-18.45)
Bank Assets(1-Market based)*				3.173***
				(19.54)
Leverage	0.242***	0.243***	0.221***	0.218***
	(13.06)	(13.16)	(11.58)	(11.14)
Profitability	-0.004***	-0.004***	-0.004***	-0.004***
	(-10.09)	(-10.32)	(-10.17)	(-9.08)
Collateral	-0.684***	-0.675***	-0.641***	-0.651***
	(-8.91)	(-8.84)	(-8.27)	(-8.31)
Size	-0.043	-0.070	-0.031	-0.037
	(-0.66)	(-1.09)	(-0.48)	(-0.57)
$Size^2$	0.002	0.003*	0.002	0.002
	(1.12)	(1.65)	(0.87)	(0.91)
Age	-0.135***	-0.139***	-0.120***	-0.119***
	(-6.55)	(-6.74)	(-5.83)	(-5.81)
Age^2	0.002***	0.002***	0.002*	0.002*
	(2.58)	(2.72)	(1.95)	(1.95)
GDP	-0.031***	-0.028***	-0.007	0.031***
	(-5.78)	(-5.36)	(-1.53)	(5.33)
MES	-0.051	-0.035	-0.056	-0.061
	(-0.20)	(-0.14)	(-0.22)	(-0.24)
Observations	23606	23606	23606	23606
$Log-likelihood$	-6474	-6530	-6324	-6243
Test of equality (p-value): *Market Capitalization*	0.00			
Test of equality (p-value): *Market Value Traded*		0.00		
Test of equality (p-value): *Private Bank Credit*			0.00	
Test of equality (p-value): *Bank Assets*				0.00

Notes: Proportional hazard model results are reported. The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. *Market based* is a dummy variable that takes the value one for Korea and Singapore, and zero for Indonesia, Malaysia and Thailand. All firm-specific variables are lagged one period. Robust z-statistics are presented in the parentheses. The test of equality is reported as a chi-squared statistic. 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 models. Also see notes to Table 1.

Table 10: Robustness: alternative cut-off points

	(1)	(2)	(3)	(4)
*Market Capitalization*Small*	-0.130			
	(-1.03)			
Market Capitalization(1 − Small)*	-0.363***			
	(-2.94)			
*Market Value Traded*Small*		0.119		
		(1.34)		
Market Value Traded(1 − Small)*		-0.268***		
		(-3.06)		
*Private Bank Credit*Small*			1.173***	
			(12.37)	
Private Bank Credit(1 − Small)*			1.023***	
			(10.68)	
*Bank Assets*Small*				1.099***
				(7.33)
Bank Assets(1 − Small)*				0.980***
				(6.68)
Leverage	0.254***	0.253***	0.261***	0.261***
	(13.82)	(11.78)	(13.83)	(13.96)
Profitability	-0.004***	-0.005***	-0.004***	-0.003***
	(-9.73)	(-11.25)	(-9.47)	(-9.32)
Collateral	-0.713***	-0.580***	-0.675***	-0.678***
	(-9.39)	(-6.54)	(-8.69)	(-8.77)
Size	-0.014	0.018	-0.052	-0.067
	(-0.19)	(0.23)	(-0.76)	(-0.99)
$Size^2$	0.002	0.002	0.004*	0.004**
	(1.14)	(0.68)	(1.90)	(2.05)
Age	-0.139***	-0.129***	-0.125***	-0.129***
	(-6.81)	(-5.43)	(-6.11)	(-6.34)
Age^2	0.002***	0.002*	0.002**	0.002**
	(2.76)	(1.95)	(2.17)	(2.36)
GDP	-0.027***	-0.051***	-0.015***	-0.008
	(-5.10)	(-10.29)	(-2.97)	(-1.31)
MES	-0.052	-0.238	-0.049	-0.039
	(-0.21)	(-0.81)	(-0.20)	(-0.15)
Observations	23606	23606	23606	23606
Log − likelihood	-6585	-5273	-6525	-6564
Test of equality (p-value): *Market Capitalization*	0.00			
Test of equality (p-value): *Market Value Traded*		0.00		
Test of equality (p-value): *Private Bank Credit*			0.01	
Test of equality (p-value): *Bank Assets*				0.04

Notes: Proportional hazard model results are reported. The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. *Small* is a dummy variable equal to one if the firm's real total assets are below the median of the distribution of the assets of all the firms in that particular industry and year, and zero otherwise. All firm-specific variables are lagged one period. Robust z-statistics are presented in the parentheses. The test of equality is reported as a chi-squared statistic. 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 models. Also see notes to Table 1.

Table 11: Robustness: bank dependency as an alternative proxy for financing constraints

	(1)	(2)	(3)	(4)
*Market Capitalization*BankDep*	-0.137			
	(-1.07)			
Market Capitalization(1 − BankDep)*	-0.229*			
	(-1.72)			
*Market Value Traded*BankDep*		-0.088		
		(-1.04)		
Market Value Traded(1 − BankDep)*		-0.192**		
		(-2.49)		
*Private Bank Credit*BankDep*			0.927***	
			(11.52)	
Private Bank Credit(1 − BankDep)*			0.854***	
			(7.79)	
*Bank Assets*BankDep*				0.704***
				(4.41)
Bank Assets(1 − BankDep)*				0.643***
				(3.96)
Leverage	0.294***	0.293***	0.300***	0.300***
	(14.85)	(14.72)	(14.92)	(14.97)
Profitability	-0.003***	-0.003***	-0.003***	-0.003***
	(-7.88)	(-7.78)	(-7.75)	(-7.66)
Collateral	-0.368***	-0.379***	-0.365***	-0.369***
	(-3.94)	(-4.10)	(-3.90)	(-3.96)
Size	0.005	-0.021	-0.004	-0.008
	(0.07)	(-0.29)	(-0.06)	(-0.11)
$Size^2$	0.003	0.003	0.003	0.003
	(1.11)	(1.38)	(1.39)	(1.39)
Age	-0.031	-0.029	-0.028	-0.029
	(-1.23)	(-1.16)	(-1.10)	(-1.13)
Age^2	-0.001	-0.001	-0.001	-0.001
	(-0.95)	(-1.01)	(-1.10)	(-1.07)
GDP	-0.024***	-0.021***	-0.017***	-0.013*
	(-3.83)	(-3.39)	(-2.84)	(-1.88)
MES	-0.145	-0.134	-0.135	-0.134
	(-0.56)	(-0.52)	(-0.53)	(-0.52)
Observations	20607	20607	20607	20607
Log − likelihood	-5705	-5703	-5669	-5696
Test of equality (p-value): *Market Capitalization*	0.07			
Test of equality (p-value): *Market Value Traded*		0.07		
Test of equality (p-value): *Private Bank Credit*			0.09	
Test of equality (p-value): *Bank Assets*				0.19

Notes: Proportional hazard model results are reported. The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. *BankDep* is a dummy equal to one if the firm's ratio of short term debt to total debt is above the bottom quartile of the distribution of the short term debt to total debt ratio of all the firms in that particular industry and year, and zero otherwise. All firm-specific variables are lagged one period. Robust z-statistics are presented in the parentheses. The test of equality is reported as a chi-squared statistic. 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 models. Also see notes to Table 1.

Table 12: Robustness: Z-score as an alternative proxy for financing constraints

	(1)	(2)	(3)	(4)
*Market Capitalization*Risky*	-0.159			
	(-1.31)			
Market Capitalization(1 − Risky)*	-0.427***			
	(-3.23)			
*Market Value Traded*Risky*		-0.258***		
		(-3.51)		
Market Value Traded(1 − Risky)*		-0.520***		
		(-5.51)		
*Private Bank Credit*Risky*			1.179***	
			(12.71)	
Private Bank Credit(1 − Risky)*			0.759***	
			(7.23)	
*Bank Assets*Risky*				1.046***
				(7.24)
Bank Assets(1 − Risky)*				0.650***
				(4.23)
Leverage	0.250***	0.250***	0.250***	0.251***
	(13.60)	(13.67)	(13.21)	(13.37)
Profitability	-0.003***	-0.003***	-0.003***	-0.003***
	(-8.68)	(-8.94)	(-7.98)	(-7.85)
Collateral	-0.653***	-0.663***	-0.601***	-0.618***
	(-8.59)	(-8.69)	(-7.81)	(-8.09)
Size	-0.130**	-0.097	-0.143**	-0.143**
	(-2.03)	(-1.52)	(-2.25)	(-2.26)
$Size^2$	0.005**	0.004*	0.005***	0.005***
	(2.44)	(1.96)	(2.65)	(2.64)
Age	-0.138***	-0.138***	-0.124***	-0.128***
	(-6.72)	(-6.74)	(-6.05)	(-6.26)
Age^2	0.002***	0.002***	0.002**	0.002**
	(2.75)	(2.75)	(2.20)	(2.37)
GDP	-0.027***	-0.021***	-0.015***	-0.009
	(-5.07)	(-4.02)	(-2.78)	(-1.47)
MES	0.003	-0.003	0.018	0.021
	(0.01)	(-0.01)	(0.07)	(0.08)
Observations	23606	23606	23606	23606
Log − likelihood	-6575	-6570	-6490	-6531
Test of equality (p-value): *Market Capitalization*	0.00			
Test of equality (p-value): *Market Value Traded*		0.00		
Test of equality (p-value): *Private Bank Credit*			0.00	
Test of equality (p-value): *Bank Assets*				0.00

Notes: Proportional hazard model results are reported. The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. *Risky* is a dummy equal to one if the firm's Z-score falls below the upper quartile of the distribution of the Z-score of all the firms in that particular industry and year, and zero otherwise. All firm-specific variables are lagged one period. Robust z-statistics are presented in the parentheses. The test of equality is reported as a chi-squared statistic. 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 models. Also see notes to Table 1.

Figure 2: Evolution of development indicators