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What drove the growth of the corporate bond markets in Asia?

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Abstract

Using data on outstanding market value and value of bonds issued by financial and non-financial companies, we investigate the development of the corporate bond markets in ten Asian countries from 1995 to 2014. We confirm that a number of macroeconomic and institutional factors are significantly related to the depth of the corporate bond markets. Furthermore, we determine a strong positive association between creditor rights, level of domestic credit, and the outstanding and issue values of corporate bonds. Finally, our results indicate that the development of the corporate bond markets may have helped mitigate the outcome of the global financial crisis of 2008 in Asia.

Keywords: corporate bond markets, corporate bond issuance, market crisis, Asian markets

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1 Introduction

In the last two decades, the corporate bond markets in Asia have expanded rapidly. In fact, since the global financial crisis of 2008, the issuance of corporate bonds in the region has grown fourfold. In addition, corporate bond market capitalization increased from almost 17% of the region's GDP in 2008 to more than 24% in 2012. The growth of the global corporate bond markets accelerated after 2009, driven mainly by the Asian domestic corporate bond markets (Levinger and Li, 2014).

The corporate bond markets are viewed nowadays as a “spare tire” for Asian firms, compensating for the decline in lending from European and US financial institutions during the financial crisis of 2008. According to the spare tire view, a financial crisis can be mitigated if a country has the legal and market infrastructure that allows its capital markets to provide alternative financing to firms when the banking systems cannot be used. The corporate bond markets may be a substitute for bank lending and make the financial system more resistant to a crisis. Creating a spare tire of the sort just described was one of the main aims of various government initiatives that were undertaken to boost the domestic bond markets after the Asian financial crisis of 1997 (for overviews, see Plummer and Click, 2005; Packer and Remolona, 2012; Park, 2017).

In our study, we argue that the development of the corporate bond markets in Asia helped mitigate the outcome of the recent global financial crisis. However, as the development of the corporate bond markets was uneven across the region, the question of what drives the development of the corporate bond markets in some Asian countries remains. We attempt to answer this question by providing insights into the growth of the corporate bond markets in Asia following the crisis of 1997.

Empirical studies investigating the determinants of domestic corporate bond market development in Asia are limited in scope. Most of the few existing studies emphasize the importance of economic indicators and legal rights as drivers of bond market development. We extend existing research and consider a larger variety of factors that may influence corporate bond market development in ten Asian countries. We use data on the size of the corporate bond markets as well as on the value of corporate bond issues in the years 1995–2014. Hence, the data cover the periods following the Asian financial crisis of 1997 and the global financial crisis of 2008.

Our study extends the existing literature in three ways. First, we present an updated analysis of the development of the corporate bond markets. While many studies only use the total outstanding sovereign and corporate debt to study the development of the bond market, we view these two markets separately and possibly driven by different factors. Samaoui et al. (2017) argue that the issuance of sovereign bonds may foster the development and supply of corporate bonds. We find, however, that a large sovereign bond market has a negative effect on corporate bond market issuance. The results confirm that the two markets are driven by different factors, so we focus only on those factors that are relevant for the development of the corporate bond markets. Moreover, in our study, we control for crisis periods, including the global financial crisis of 2008.

Second, we focus not only on the size of the bond markets, but more importantly, on the value of the capital raised by companies in the bond markets. Current studies use the outstanding value of the sovereign and/or corporate debt to GDP ratio as a measure of bond market development. A significant drawback of this measure is that although it captures the amount of debt outstanding, it does not consider the amount of debt raised in a given year. Consequently, high levels of debt from previous years may give the impression of a well-functioning corporate bond market even when the amount of new funds raised in the debt market is small. We tackle this problem by focusing on the factors determining the issue of new securities in the corporate bond markets. Doing so allows us to study the issuance behavior of companies during systematic banking crises as well as the financial crisis of 2008. In addition, we study the determinants of bond issues by financial and non-financial companies. Our results indicate that the determinants explaining the development of the corporate bond markets in terms of size and issuance differ. Moreover, we find differences in the factors determining the issuance size of bonds by non-financial and financial companies.

Lastly, we present strong evidence that the corporate bond markets may have acted as a spare tire during the global financial crisis. However, during the previous systematic banking crises, the corporate bond markets—due to sluggish development—did not provide any stabilization for Asian countries. Hence, we argue that the initiatives undertaken by governments since the Asian financial crisis of 1997 may have helped develop the corporate bond markets, which nowadays provide stability to the financial sector and foster economic development.

The rest of the paper is organized as follows. Section 2 summarizes the literature and presents the development of the corporate bond markets in selected Asian countries since 1997. Section 3 describes the data and discusses the factors affecting the size and issuance values of the corporate bond markets. Section 4 discusses the empirical strategy and shows the estimation results for various factors, whereas Section 5 discusses the results from the “horse race” regression and presents the results of the robustness test. Section 6 concludes the paper.

2 Literature review

This section discusses the few empirical studies that investigate the determinants of the development of domestic corporate bond markets. First, we discuss the results of cross-country studies, and then review those that focus solely on Asia.

Eichengreen and Luengnaruemitchai (2004) consider a broad set of determinants of bond market development using panel data for 41 countries for the period from 1990 to 2001. They find that larger economies with stronger institutions, less volatile exchange rates, and more competitive banking sectors tend to be positively associated with bond market capitalization. Claessens et al. (2007) focus on public bond market development in 35 countries over the period 1993–2000. They find that economies that are larger and have greater domestic investor bases, as measured by the size of the financial system, have larger domestic bond markets. They show that less flexible exchange regimes are associated with less domestic debt relative to foreign borrowing. In addition, they report that the development of the government bond markets is determined by the level of inflation, fiscal burden, legal origin, and capital account openness. Burger and Warnock (2006) analyze the development of the bond markets in 49 countries. Their main findings suggest that countries with stable inflation rates and stronger creditor rights have more developed bond markets. In addition, their results indicate that bond markets and banking systems share some fundamental factors. Bae (2012) investigates the determinants of government, financial, and corporate bond market development using data from 43 countries over the period 1990–2009. He reports that the degree of economic development is the most important variable in explaining cross-country variation in all three types of bond markets and finds no other variable that is robustly related to the financial bond markets. In addition, he reports that the fiscal balance, interest rate, domestic credit provided by banks, and existence of a

well-developed government bond market are relevant for the development of corporate bond markets. Recently, Samoui et al. (2017) analyze the development of the government and corporate bond markets in 42 countries over the period 1990–2013. Using the generalized method of moments (GMM) procedure, they address the problem of endogeneity of the explanatory variables and confirm that a combination of structural, financial, and institutional factors seems to exert a significant effect on the bond markets.

Bhattacharyay (2013) analyzes the development of the government and corporate bond markets in 10 Asian countries over the period 1998–2008. His results suggest that size and economic development in addition to openness and variability in interest rates are good predictors of the development of corporate bond markets. Burger et al. (2015), in a study of 42 smaller Asian countries, document that their economies may enable bond market development by lowering inflation and strengthening the legal rights of borrowers. In line with this finding, Park (2017), who also investigates the development of corporate bond markets in Asia, finds that better macroeconomic performance with stronger institutions contributes to the development of corporate bond markets in terms of size.

2.1 Background

The East Asian financial crisis of 1997 is sometimes called the “crisis of success.” The crisis was the result of a boom of international lending followed by an abrupt capital outflow in 1997. Although capital inflows should in general be seen as a sign of good image and trust in an economy, the structure of the incoming capital is of crucial importance. In the case of East Asia, capital inflows were not stable in the short term, and most debt was incurred in foreign currency. This was a sign of vulnerability in the financial system rather than a strength. The openness to capital flows had been seen as a beneficial strategy for emerging economies, yet after 1997, this paradigm came to be questioned, and the role of the structure of foreign capital (in the long term or short term) as well as the importance of domestic capital were highlighted (Weisbrot, 2007).

International banks provided a significant amount of capital to domestic banks and non-financial companies in Asia before the crisis of 1997. The features of capital inflow were quite differentiated among Asian countries. For example, in Korea, lending was mainly to banks, while in Indonesia, lending was mainly to non-financial

companies. The structure of foreign capital created the problem of “double mismatch.” First, the problem was related to the fact that short-term and volatile loans were used by East Asian entities to finance long-term investments in the real sector. Second, double mismatch refers to currencies; that is, there was a mismatch between the currency of a loan that was obtained by an Asian company/bank and the currency of its income. In 1997–1998, the withdrawal of foreign capital resulted in the depreciation of exchange rates (Radelet and Sachs, 2000).

The East Asian financial crisis was a sophisticated phenomenon and created a double mismatch; these factors, however crucial, are not enough to understand the complexity of this crisis. Apart from excessive leverage, a rising fraction of non-performing loans and the role of poor regulatory and institutional environments in some countries were among the sources of the turmoil that researchers underline, especially in the Philippines, Thailand, and Malaysia. It is nevertheless worth paying attention to the cases of particular countries. In Korea, for example, the key problem was excessive lending to large companies by banks that were effectively controlled by those companies (chaebols). In Indonesia, the important vulnerability was the fact that capital requirements were not strictly followed (Corsetti et al., 1998).

The strong dependence of economies on commercial banks for domestic financing is highlighted as one of the most important vulnerabilities of the Asian countries in 1997 (Bhattacharyay, 2013). In addition, the lack of well-developed and liquid corporate bond markets was an important factor that reinforced the escalation of risks before the Asian crisis of 1997, which made the final consequences more severe. As Greenspan (1999) figuratively says, “*The lack of a spare tire is of no concern if you do not get a flat. East Asia had no spare tires.*” The role of developing local financial markets in emerging economies is still being underlined as a vital factor reinforcing stability. According to the IMF (2017), the governments in emerging economies should pay particular attention to domestic financial markets (equity- and bond-market depth and liquidity), because they provide a chance to increase resilience to global financial shocks.

Eichengreen and Luengnaruemitchai (2004), and Bhattacharyay (2013) argue that corporate bonds may be treated as diversification tools that make investors independent from sovereign bonds and other tools. This leads to the conclusion that the development of local currency corporate bonds may be—at least in theory—the perfect

solution for improving the stability of East Asian financial systems. Consequently, policymakers undertook several regional initiatives to create and encourage the growth of corporate bond markets following the crisis of 1997.

In 2003 and 2004, the Executives' Meeting of East Asia-Pacific Central Banks (EMEAP) launched two projects, namely, Asian Bond Funds 1 and 2 (ABF 1 and 2), which were aimed at promoting the regional bond markets. Another important project was the Asian Bond Market Initiative (ABMI), which was launched by the Association of South-East Asian Nations to establish effective market infrastructure². Among the ABMI projects were the establishment of a regional bond guarantee agency, the creation of a regional settlement and clearance system for bonds, and the strengthening of regional rating agencies (Bhattacharyay, 2013).

Mizen and Tsoukasy (2014) evaluate the impact of ABF, ABF2, and the ABMI policies on corporate bond market size and liquidity in Asia using the difference-in-differences model. In their study, they examine whether companies in the nine countries that took part in the aforementioned policy projects were more likely to issue corporate bonds, compared to a control group of companies from Taiwan. The results show that ABF, ABF2, and ABMI had a positive impact on the probability of issuance. Indeed, one can state that the initiatives undertaken in Asia ended with success, as the region witnessed significant growth in bond financing in the years 1998–2008. The total bond market grew by more than 217% during that period, with the sovereign bond market growing by more than 275%, and the corporate bond market growing by almost 66% (Bhattacharyay, 2013). These numbers illustrate a significant shift in the Asian financial systems toward capital markets in the last two decades. The Asian corporate bond markets relative to the economy are significantly larger than the markets in South America nowadays, yet they remain small in comparison to the markets in developed economies (Burger et al., 2015).

Figure 1 shows the development path of the corporate bond markets in the countries in our sample in terms of the total value of local currency corporate bonds outstanding and relative to GDP³. On one hand, the countries differ significantly in

² Members of ASEAN are Brunei, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam in partnership with China, Japan and South Korea.

³ Hong Kong, People's Republic of China, Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam, Japan, and Korea.

terms of economic and financial development. On the other hand, in all but Japan, we observe substantial growth in the corporate bond markets in the last two decades.

[Figure 1]

Figures 2–3 present detailed development paths for corporate bond issuances in the countries in our sample. Figure 2 illustrates the development of the corporate bond issuances relative to GDP in two series, namely, with and without bonds issued by financial institutions. Figure 3 shows the annual value of total corporate bond issuance from 1995 to 2014.

[Figure 2-3]

Interestingly, in spite of the global financial crisis in 2008, the amount of emerging Asian corporate bond issuances unrated or rated by local credit agencies increased in the period 2005–2009 by approximately 331% (Shim, 2012). The increased size of issuance may indicate that the corporate bond market fulfilled the spare tire function in East Asia during the recent financial crisis. Jeasakul et al. (2014) indicates that the East Asian economies showed relatively high resilience during the recent financial crisis, whereas Rai (2011) underlines the relative stability of their currencies. The important question, however, remains whether the changes in the structure of the financial system helped mitigate the financial crisis in Asia, and what the actual channels of potential positive impact were. We leave those questions for future research; in this study, we focus mainly on the factors behind the rapid growth of the Asian corporate bond markets in the last two decades.

3 Data and descriptive statistics

We use a panel data set with annual observations for the following Asian countries: China, Hong Kong, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, Thailand, and Vietnam. The country coverage and time dimension choices are primarily based on the availability of corporate bond market data in the AsianBondsOnline database, which tracks the bond market in Asian countries. In addition, we supplement the data using the World Bank database, from which we retrieve most of the independent variables. The definitions of the variables and their data sources are presented in Table A.1 in the Appendix.

We constructed a panel of 200 country-year observations for the ten Asian countries. The panel covers the years 1995–2014, and it is unbalanced owing to missing

data for some years for some of the countries in the sample. We are aware that with the small number of countries, and hence of observations, we need to be careful with the interpretation of our results. Nevertheless, we use a unique data set, which allows us to better explore the development of the corporate bond markets than previous empirical studies do. Below, we describe in more detail the data we gathered on the bond markets, as this information is central and unique to our analysis.

3.1 Variable definitions

3.1.1 Corporate bond market development

In this study, we employ several dependent variables to measure the development of a given corporate bond market. In the literature, the most widely used measure is the ratio of total corporate bonds outstanding to GDP. A drawback of this measure is that it captures the total amount of debt outstanding but not the amount of funds currently raised by companies. Thus, the ratio may show a large value of debt raised in the past, whereas the amount of capital raised currently may be small. However, we employ this widely used variable, as it is less cyclical than total bond issue value and thus, is better for making comparisons across countries and across time periods.

Our second measure is the ratio of total bond issues to GDP during a year. A drawback of this measure is that corporate debt is strongly influenced by the business cycle (Bernanke and Gertler, 1989). Moreover, Becker and Ivashina (2014) show that companies are more likely to issue public debt during a contraction of bank credit supply. Consequently, the authors find a substitution effect between bank credit and public debt and present a strong pro-cyclical pattern in the debt financing mix of the companies.

The ratio of the value of corporate bonds issued to GDP includes debt issued by financial and non-financial companies, even though both types of firms differ strongly in terms of their capital needs. Thus, we use two additional measures to control for corporate bonds issued by non-financial and financial companies. We retrieve the data on the market value of corporate bond issues by non-financial companies and their average maturity from the World Bank. The value of the bonds issued by financial companies is the total value of corporate bonds issued minus the bonds issued by non-financial companies. We find some inconsistencies in the information about the total

value of corporate bonds retrieved from AsianBondsOnline and the value of non-financial company bonds retrieved from the World Bank. In those cases, we prioritize the information provided by the AsianBondsOnline. We consider that the existing discrepancies between the two data sets do not affect the results of this study.

In measuring both corporate bonds outstanding and bond issues, we restrict our focus to public debt issued in local currency. We do so because we are especially interested in the determinants of the development of the domestic public bond market, which helps a country's companies raise funds for future development and potentially decrease the double mismatch dilemma. Moreover, Asian corporate bond markets are characterized by their high proportion of bonds denominated in local currency. According to Levinger and Li (2014), the share of corporate bonds issued in local currency in Asia was 83% in 2009–13, which was significantly higher than in other emerging market regions. As an example, in Latin America, the local currency issuance of corporate bonds accounted for only 28% of the bond markets in the same period.

3.1.2 *Independent variables*

Based on the existing empirical research, we identify several factors that may determine the development of the bond markets in Asian countries. We group those factors into four broad categories characterizing the country, namely, economic, financial system, banking sector, and institutional framework.

We follow mainly Eichengreen and Luengnaruemitchai (2004) in the choice of economic variables that determine the development of the corporate bond markets. We use real *GDP* as a proxy for the size of the economy of a given country. It is assumed that small countries may have a problem in developing efficient bond markets because they are not able to attract large companies (even domestic ones), which in turn may lead to lower coverage by analysts and investment bankers. Therefore, small countries may have problems developing deep and liquid corporate bond markets. We also control for the development stage of the economy using the variable real *GDP per capita*. Less developed countries are more likely to have more volatile investment environments and weaker institutional frameworks. Indeed, Bhattacharyay (2013) indicates that there is a positive association between the level of economic development and bond market development in Asia. Rajan and Zingales (2003) indicate that countries' openness to international competition increases domestic competition, which

may positively affect financial system development. Moreover, an open economy in principle may broaden the investor base for local currency corporate bonds owing to the substantial presence of foreign investors. We measure a country's *Openness* by using the ratio of total exports of goods and services to GDP. In the regressions later on, we will employ as control variables real GDP per capita and openness interchangeably. We follow this strategy as Frankel and Romer (1999) document that international trade has a large positive effect on a country's income level. Bhattacharyay (2013) argues that a stable exchange rate encourages bond market development. We control for the stability of the *Exchange rate* volatility of a country using the standard deviation of the 12-monthly exchange rates over a 1-year period. Burger et al. (2010) show that countries with better historical inflation performance have more developed local bond markets. Hence, we employ the annual change of consumer price index to control for the level of inflation. Lastly, we control for the recent global financial crisis (*GF crisis*) using a dummy variable, which takes the value 1 for the years 2008–2009 and 0 otherwise. The crisis affected Asian economies through both trade and financial channels, whereas export and stock prices declined by more than 30% and 60%, respectively (Keat, 2009). On one hand, a financial crisis may lead the decline of the corporate bond markets. On the other hand, the corporate bond markets may replace long-term lending by banks during a financial crisis. According to Tendulkar and Hancock (2014), an additional key driver of the development of the corporate bond markets following a crisis may be the “search for yield” by investors. Hence, the financial crisis may have a positive impact on the growth of the corporate bond markets in Asia.

We control for the structure of the country's financial system by adding the variable stock market capitalization (*Market cap*) to GDP. A sizeable stock market may signal a market-based financial system, which may positively affect the development of the corporate bond markets. However, a large stock market may still be shallow, which would result in high volatility of returns, thereby weakening the development of the corporate bond markets. We control for market volatility (*Volatility*) using a variable presenting the average of the 360-day volatility of the national stock market index.

A sizeable domestic government debt market may have a negative impact on the development of the private bond market. The variable *Public debt* controls for the size of public debt, especially the government debt market. The variable is calculated as the ratio of the total amount of domestic public debt securities to GDP. Eichengreen

and Luengnaruemitchai (2004) claim that an active corporate bond market needs a benchmark yield curve provided by a market for government bonds. Aschauer (1989), however, states that increased public capital crowds out private investment. Hence, we expect that a significant increase in government domestic debt may negatively affect private credit.

Cowan et al. (2008) find that a large domestic investor base in the form of well-developed private pension funds has a positive impact on the development of the corporate bond markets in Latin America. Hence, we employ the variable *Pension funds*, which represents the value of pension fund assets to GDP.

Becker and Ivashina (2014) find strong evidence of a substitution effect between bank credit and private debt, which occurs when the availability of bank credit declines or the performance of banks deteriorates. We control for the credit supply in the banking sector using the ratio of domestic credit provided by the banking sector to GDP (*Bank credit*). In addition, we use return on equity (*ROE*) and bank interest spread (*Bank spread*) to control for bank performance. Previous research suggests that banks may use their power to suppress the development of capital markets (Benston, 1994). Beck et al. (2006), however, present strong evidence that concentrated banking systems are more stable. Consistent with these findings, Schaeck et al. (2009) find that concentration decreases the probability of a crisis and increases the time to crisis. Hence, we expect banking sector concentration to be positively related to the size of the country's corporate bond market. The combined market share, using the assets of the five largest banks, serves as proxy for the power of banks in a country (*Concentration*).

Lastly, we include a dummy variable, *Banking crisis*, which takes a value of 1 during a systematic banking crisis and 0 otherwise. Allen et al. (2012) find that the corporate bond markets move in the same direction as bank credit during a bank crisis.

Burger et al. (2010) document that countries with stronger legal institutions have more developed local bond markets than do those with weaker institutions. In line with this finding, Gu and Kowalewski (2016) find that a country's level of creditor protection determines corporate bond market development. We control for creditor protection using the *Creditor rights index* of Djankov et al. (2007) as a proxy for country-level bondholder protection. The index, which ranges from 0 (weak) to 4 (strong), measures the laws and regulations that limit expropriation from secured creditors in a country.

Improved information disclosure may overcome adverse selection in the credit markets and contribute to their development (Jappelli and Pagano, 2002). We proxy for information access using the dummy variable *Public registry*, which equals 1 if a public credit registry operates in the country and 0 otherwise. Djankov et al. (2008) document that the efficiency of debt enforcement is an economically and statistically significant predictor of the development of debt markets across countries. We control for this effect by employing the variable *Enforcement*, which measures the days required to enforce a contract. Allen et al. (2012) suggest that financial regulation affects the structure of financial systems during both normal and crisis periods. We use an index for *Regulatory quality*, which captures perceptions on the ability of the government to formulate and implement sound policies and regulations that promote private sector development. The index ranges from 0 to 100.

3.2 Descriptive statistics

In Table 1, we present the descriptive statistics of the data, which show a noticeable variation in the capital market measures across countries. The variable *Corporate bonds outstanding* exhibits high cross-sectional variability, ranging from 0.00 to 74.53% with a mean of 17.55%. The results indicate that there are significant differences in the development of the corporate bond markets across countries. As expected, the alternative variable *Corporate bond issue*, which shows the amount of capital raised, exhibits lower variation, ranging from 0.00 to 28.15% with a mean of 5.80%. A closer analysis of corporate bond issuance shows that the market is dominated by the issuance of bonds by financial intermediaries. The variable *Corporate bond issuance of financial sector* ranges from 0.004% to 22.97% with a mean of 6.01%, whereas the variable *Corporate bond issuance of non-financial companies* ranges from 0.007% to 8.833% with a mean of 2.29%. The independent variables also exhibit high cross-sectional variation, confirming the different economic, financial, and institutional frameworks among the countries in our sample.

[Table 1]

Table 2 presents a matrix of the pairwise correlation between the explanatory variables. We examine the correlation between the dependent variables and the control

variables but do not report the results for brevity⁴. The descriptive statistics are consistent with the literature showing that more developed countries with stronger institutional frameworks have more developed financial systems, including corporate bond markets. As expected, some proxies for a country's economic development are highly correlated. Similarly, the variables presenting the institutional framework in a country are highly correlated. Hence, in the regressions, we use these variables separately.

[Table 2]

4 Methodology and results

4.1 Methodology

We estimate all equations using the random-effects model. Our regression takes the following form:

$$CB_{i,t} = \alpha_1 + \beta_1 E_{i,t} + \beta_2 X_{i,t} + \beta_3 Y_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where $CB_{i,t}$ is one of the variables representing the development of the domestic corporate bond market in country i and year t ; $E_{i,t}$ denotes the set of proxy variables for a country's economic condition; $X_{i,t}$ denotes a vector of conditioning information that controls for the financial system, banking sector, and institutional factors; $Y_{i,t}$ is a set of dummy variables for each year t , α_1 is the intercept term; β_n is the coefficient vector of estimated parameters, and $\varepsilon_{i,t}$ is the error term.

We choose a random-effects model as its estimates are more efficient than pooled ordinary least square estimates and assume that country effects are uncorrelated with the regressors, whereas fixed-effects models allow country effects to be correlated with the regressors. In fact, fixed-effects estimation requires significant within-group variations in the independent variable to generate a consistent and efficient estimator (Wooldridge, 2002). Another advantage of the random-effects model is that it allows the user to control for unobserved heterogeneity at the cluster level. Additionally, random-effects panel estimators let us estimate the effect of variables such as institutional quality, which are constant across countries over time. All regressions, however, include year dummies to control for changes in the corporate bond markets associated with

⁴ The results are available upon request.

macroeconomic variables or any other factors that are common across countries over time.

We follow Samoui et al. (2017) and employ a groupwise regression model whereby each group is composed of a set of variables related to an explanatory feature. In the following subsections, the explanatory features are macroeconomic determinants and then we add the financial system and banking sector characteristics, and finally, we control for the quality of a country's institutions. We add the additional control variables independently, which allows us to deal with the problem of relatively high collinearity of the variables. In Section 6, we do a horse race regression and report its results with the significant variables, which are then used in the groupwise regression models.

4.2 Economic determinants

Based on findings from the literature, we expect the macroeconomic situation of the country to determine the growth of the local corporate bond market. The results of the random-effects estimations are presented in Table 3. In columns (1) and (2), the explanatory variable is the ratio of the value of corporate bonds outstanding to GDP, whereas the control variables—GDP per capita and openness—are employed interchangeably. In the next two columns, we regress the ratio of the value of corporate bonds issued to GDP on the macroeconomic control variables. We then repeat the regressions, using as explanatory variables ratios of the value of bonds issued by both non-financial and financial companies to GDP. The results are presented in Table 3 in columns 4–5 and 6–7, respectively.

We find weak evidence that better economic performance contributes to the development of the corporate bond markets in terms of market size. The coefficient of the inflation variable enters negatively and is significant, but only in the regression in which the dependent variable is the total value of bonds outstanding. Park (2017) suggests that low inflation may be connected with effective monetary policy, which encourages corporate bond issues. Similarly, we find that the proxies for a country's openness are positively related to the market size and the value of corporate bond issues by non-financial entities, but only the latter relationship is significant at the 5% level.

In line with Bhattacharyay (2013), we find weak evidence that the size of the economy or exchange rate variability determines the development of the corporate bond

markets. The coefficient of GDP and GDP per capita is positive, yet insignificant in almost all the specifications. GDP per capita is positive only in the specifications in which the dependent variable is the issuance of corporate bonds by financial institution.

More importantly, we find that the coefficient of the dummy variable GF crisis is positive and statistically significant in almost all the specifications. Thus, the results indicate that the bond market may have acted as a spare tire during the financial crisis of 2008. In Asia, however, the banks were not as strongly affected by the financial crisis as banks in the US or Europe. We examine more closely the impact of the financial system and banking sector on the development of the corporate bond markets in the next subsection.

We find that most of the coefficients remain stable and do not change their signs across all the specifications. However, we find some variation across the results when the explained variables are corporate bonds outstanding and the market value of debt issued by corporations. In addition, the results document that different factors determine the development of the issue of corporate bonds by financial institutions and non-financial corporations. It is worth noting that, for non-financial corporations, bond maturity does not determine issue volume. The coefficient of the variable maturity is insignificant in all specifications.

[Table 3]

4.3 *Financial system and banking sector*

Following Eichengreen and Luengnaruemitchai (2004) and Bhattacharyay (2013), we include additional variables that may determine the development of the Asian corporate bond markets. We assume that macroeconomic performance may still play an important role in shaping the development of corporate bond markets across countries. Hence, in all the following specifications, we control for the macroeconomic characteristics of countries as in the baseline model in Table 3. Once again, we use GDP per capita and openness interchangeably in the regression. In all specifications, the coefficients of the economic variables remain mostly unchanged; however, for brevity's sake, we do not present them in Tables 4 and 5.

In Panel A of Table 4, we include the regression variables to control for the country's financial system development. In line with our expectations, we find that stock market development is positively associated with corporate bond market

development. The coefficient of market capitalization is positive but only significant in three of the eight specifications. The volatility of the market is negatively related to the development of the bond market, yet the coefficient is insignificant in all the specifications.

In all specifications, we find that the coefficient of the variable public debt is negatively related to the value of corporate bonds outstanding and to the issue of corporate bonds. The coefficient is highly significant in most specifications. Thus, the results support the hypothesis that government debt may crowd out private debt. The results also indicate that the development of corporate bond markets is strongly influenced by demand. The coefficient of the variable pension funds is positively and significantly related to the value of corporate bonds outstanding and the value of corporate bond issues by non-financial companies.

In Panel B of Table 4, we employ variables controlling for banking sector development such as bank loans, which can be a direct substitute for corporate bonds. We find that the sizes of domestic bank credit and bank concentration are positively related to the value of corporate bonds outstanding and the value of corporate bond issues. The coefficients of bank credit are highly significant in all specifications. Meanwhile, the coefficient of concentration is significant in almost all the specifications in which the dependent variable is the value of corporate bond issues. These results are in line with Eichengreen and Luengnaruemitchai (2004), who report a positive relationship between the level of domestic credit, bank concentration, and the size of the corporate bond market. Park (2017) argues that the positive coefficient of bank lending suggests an increase in demand for debt financing and hence, is positive for local currency bond issuance. Hence, our results may indicate that financial institutions issue bonds to provide loans to non-financial institutions. Consequently, banks may directly compete and crowd out non-financial companies from the corporate bond market, while simultaneously offering bank loans as a substitute. Indeed, we assume that mainly large banks can crowd out smaller companies, thus explaining the significant coefficient of bank concentration found in some specifications. Beck et al. (2006), however, document that crises are less likely in economies with more concentrated banking systems, and this may encourage the development of corporate bond markets.

We find that the variables bank profitability, bank spread, and bank crisis are not statistically significant. Consequently, we do not find support for the substitution effect

reported by Becker and Ivashina (2014) between bank loans and bonds of non-financial companies when banks perform poorly. It should be noted, however, that the banking crisis dummy covers the systematic banking crises mostly prior to any government effort to develop corporate bond markets in Asia. Similarly, as Table 3 shows, we find that the coefficient of the variable GF crisis is positive and significant in most of the regressions. Hence, the results suggest, once again, that nowadays, corporate bond markets might act as a spare tire in Asia during periods of financial crisis.

[Table 4]

4.4 Institutional quality

La Porta et al.'s (2006) results suggest that a country's legal system determines the development of its stock market. Gu and Kowalewski (2016) show that creditor rights and institutional quality determine the development of the corporate bond market relative to the equity market. In addition, Park (2017) finds that in Asia, in addition to economic development, countries with stronger institutions have larger domestic corporate bond markets in terms of share of GDP. Thus, in the corresponding regression, we control for institutional quality in Asian countries. We run separate regressions for the different aspects of institutional quality because our proxies for institutional quality are strongly correlated with each other.

In Panel A of Table 5, we employ a proxy for the level of protection of creditors and a dummy variable that takes the value of 1 if a public registry exists in a country and 0 otherwise. In all regressions, the coefficient of creditor rights is positive and significant at least at the 5% level. The results are in line with those of Gu and Kowalewski (2016) and confirm the importance of the level of creditor rights in the development of the corporate markets. In contrast, the coefficient of public registry is negative in almost all the specifications. In addition, the coefficient of public registry is statistically significant in the regressions in which the dependent variable is the total issuance value of corporate bonds as well the issuance value of bonds by financial institutions. These results contradict the findings of Djankov et al. (2007), who report that the ratio of private credit to GDP rises following either improvements in creditor rights or the introduction of credit registries. One of the explanations for the results is the low variation of the variable, as public registries are present in all the countries by the end of the sample period. Moreover, Gu and Kowalewski (2016) find that

information sharing is important only in countries characterized by high investor protection. Consequently, our proxy may indicate the development of corporate bond markets in countries characterized by low-quality institutions in the past.

In Panel B of Table 5, we present the results controlling for the quality of regulations. In line with previous findings in the literature, the coefficient is positive but insignificant in almost all specifications. Thus, the results indicate that governments that had the ability to encourage the development of the private sector had only a weak impact on the development of the Asian corporate bond markets. A possible explanation for this result is the relatively strong initial role of the private sector in some Asian countries in our sample, especially in Singapore, Hong Kong, and Japan (in contrast to China). Hence, further government policy changes later on may not strongly affect private sector development, and consequently, the corporate bond markets.

In Panel C of Table 5, we employ a variable that controls for contract enforcement. Djankov et al. (2008) document that a low level of contract enforcement is correlated with underdeveloped debt markets. Our results support the idea that inefficiency in contract enforcement discourages lending. The coefficient of contract enforcement is negatively related to the size of the corporate bond markets, and it is statistically significant at least at 5% level. Similarly, the coefficient of contract enforcement is negatively related to bond issuance and is statistically significant at the 1% level in almost all the specifications.

[Table 5]

5 What drives the development of the corporate bond markets?

Table 6 presents the results of a horse race regression against economic development, financial system development, banking sector, and institutional quality. In the next regression, we employ only the significant variables from the previous regression. Nevertheless, the results must be interpreted with caution owing to the relatively high and significant collinearity among some of the explanatory variables.

The results confirm the ambiguous impact of the economic variables on the corporate bond markets. In regards to the size of a given corporate bond market and issuance value of bonds by non-financial companies, the coefficients of GDP are negative and significant in most of the specifications at the 1% level. In line with

previous results, we find only weak evidence that exchange volatility or inflation has an impact on the development of the corporate bond markets in Asia.

More importantly, we again find that the coefficient of the variable GF crisis is positively related to the development of the corporate bond markets and is statistically significant. Thus, our results document that the issuance value of corporate bonds as well the value of outstanding corporate bonds increased in Asia during the financial crisis of 2008. Interestingly, the coefficient of the variable GF crisis is larger when the dependent variable is the issuance value of bonds by financial institutions instead of non-financial institutions. One explanation could be that during the financial crisis of 2008, it was easier for financial institutions in Asia to raise funds in the debt market than in the equity market.

Indeed, we find a strong and negative relationship between the development of the equity markets and the corporate bond markets. In all specifications, the coefficient of market capitalization is negatively related to the development of the corporate bond markets and significant when the dependent variables are issuance value of bonds by both financial and non-financial institutions. Although at first we may hypothesize that the equity markets are a substitute for the debt markets, we nevertheless find that the coefficient of domestic credit is positive and significant in almost all the specifications, at least at the 1% level. Thus, our results do not support the hypothesis that domestic credit can be a substitute for corporate debt in the long term. Moreover, in all the specifications, the coefficient of public debt is negative, though insignificant, in most of them. Hence, we do not find strong support for the aforementioned notion that public debt is crowding out corporate bonds in Asia.

Interestingly, the coefficient of bank concentration is negative and significant in the specification for the issuance value of corporate bonds by financial institutions, while it is positive and statistically significant for the issuance value of corporate bonds by non-financial institutions. This may be explained by arguing that highly concentrated banking markets are less prone to financial crisis (Beck et al., 2006), which may benefit the development of the corporate bond markets for non-financial institutions. Nevertheless, our results indicate that in less concentrated banking markets, corporate bond markets for financial institutions are more likely to develop, which could be the result of higher competition for funds among banks. This is consistent with the fact that banks play a crucial role in organizing and providing services in the process of bond

issuance, acting as dealers and market makers (Eichengreen and Luengnaruemitchai, 2004). Potential competition between those two financing sources, that is, banking loans and corporate bonds, are characterized in East Asia by interlinkages and complementarities between traditional bank lending and corporate bonds.

Lastly, in line with previous results, the coefficients of creditor rights are positive and significant in almost all specifications. Meanwhile, the coefficient of enforcement is again negative, but insignificant in all specifications. We interpret this as indirect confirmation of the finding of Djankov et al. (2007), who document that legal creditor rights are quantitatively important determinants of private credit. We assume that in countries with high creditor rights, banks finance loans by issuing corporate bonds, which would explain the positive correlation between domestic credit and issuance value of corporate bonds. Our hypothesis is strengthened by the fact that the coefficient of creditor rights is positive and statically significant at the 1% level for the case where the dependent variable is issuance value of bonds by financial corporations. Indeed, we believe that an increase in the issuance value of the bonds by financial institutions may positively affect the development of the corporate bond market for non-financial institutions. A similar situation was observed in Japan, where financial liberalization aimed at developing the government bond market induced the growth of the corporate bond market (Abiad and Mody, 2005). Consequently, we assume that the rapid development of financial institutions induced the development of non-financial corporate bond markets. This view is strengthened by our results presenting slightly different determinants for the issuance of bonds by financial and non-financial corporations.

5.1 Robustness check

To check the robustness of our main results, we conduct a wide array of additional analyses; however, for brevity, we do not report all of them.⁵ First, we check the consistency of the results using different estimation techniques. We follow Eichengreen and Luengnaruemitchai (2004) and Samaoui et al. (2017), and estimate all equations using the panel generalized least squares and system GMM methodology. We find that the coefficients of the variables of interest do not change materially. Employing the GMM procedure allows us to tackle the problem of endogeneity among

⁵These robustness results are available on request.

the explanatory variables. We decide, however, not to use it as our main methodology as our sample is relatively small, which may lead to biased results even when we do the estimation using small-sample correction (Windmeijer, 2005; Roodman, 2009).

Next, we estimated the equations using the fixed-effects method, which allows us to analyze the effects of within-country variation on corporate market development. The results are shown in Table A.2 in the Appendix, and in general, they are in line with the random-effects estimations presented in Table 6. We find, however, that when the dependent variable is the value of corporate bond issues, the coefficients of stock market capitalization and public debt are negative as in Table 6, yet now statistically significant at the 1% level. It indicates that the corporate bond markets developed when the countries' equity market declined. In our opinion, it shows that the corporate bond markets may act as a spare tire during crisis periods. At the same, however, we find that an increase in the value of public debt crowds out the corporate debt. This result indicates that the government needs to be especially careful how it finances its public debt, which normally increases dramatically during crises. In contrast, we find that the coefficient of creditor rights is now insignificant. Our findings confirm the results of Djankov et al. (2007), who documents that countries' level of creditor protection explains the development of its debt market. They also find, however, that credit rights are very stable over time, contrary to the convergence hypothesis.

Second, we change the set of explanatory variables and add variables for country real GDP growth, current account balance, and country credit rating. The results are presented in Table A.3 in the Appendix. We find that including these variables does not affect either the significance level or the sign of the estimated coefficients. The coefficient of the GF crisis variable remains significant in the specification for the total value of outstanding and issue value of corporate bonds, at least at the 5% level.

Third, we divide the countries in the sample into two groups based on the gap in the current account, which we calculate as the difference between gross domestic savings and gross capital formation to GDP. On one hand, Sachs (1981) emphasizes the intertemporal nature of the current account, especially in developed economies. He argues that to an extent, higher current account deficits reflect new investment opportunities, and there is no reason to be concerned about them. On the other hand, research shows that countries with current account deficits rely more on the international markets and thus, are more prone to international shock transmissions

(Frankel and Rose, 1996). The results are presented in Table A.4 in the Appendix. In the first column, we present countries with current account surpluses, and in the second column, countries with current account deficits. We find that the results for the subsample are mostly in line with our main results. However, a striking difference is that for the subsample of countries with current account deficits, the coefficients of GDP are now negative and statistically significant at the 1% level in all the specifications. Hence, the results indicate that the corporate markets were less likely to develop in developing countries with current account deficits.

In line with previous results, we find that the coefficient of GF crisis is positively related to the total value of outstanding and issue value of corporate bonds, and is highly significant. Interestingly, we find that in countries with current account surplus, the coefficient is statistically significant when the dependent variable is issue value of corporate bonds by non-financial corporations. Moreover, we find that the GF crisis coefficient is significant in deficit countries, but not when the dependent variable is issue value of corporate bonds by financial institutions. Consequently, the results indicate that financial institutions were able to refinance their debt using the bond markets during the financial crisis of 2008, but only in countries with high domestic savings.

Lastly, we divide the sample into developing and developed countries using the level of GDP per capita as the factor to distinguish the two groups. We use a threshold of 12,000 USD to classify a country as a developed economy. Using the two separate samples, we again compute the baseline regressions; the results are shown in Table A.5 in the Appendix. The first column shows the results for developed countries, and the second column for developing economies. Once again, we find that the results of the robustness test lead to essentially the same results as those in Table 6.

Finally, the results of the robustness test using different methods, variables, and subsamples confirm our main results. However, our empirical analysis has limitations. The data for our study are available only for a short period, which prevents us from applying a causality test, such as the Granger test. Moreover, our sample is relatively small, and its size is further reduced when we perform the additional tests described above. Consequently, although we interpret our results as a causal relationship, we are aware that we have not precisely tested the strength and direction of the relationship.

6 Conclusions

In the aftermath of the Asian crisis of 1997, the role of corporate bond markets received increased attention. A common view was that the development of debt markets might mitigate the adverse impact of financial crises in the future. The reasoning is that corporate bond markets can provide an alternative source of financing if other financing channels, such as bank financing, dry up during a financial crisis. This view was shared by Asian policymakers, who promoted the development of private debt markets issued in local currencies as part of the response to the Asian crisis of 1997. Since then, various initiatives have been undertaken, and corporate bond markets have grown dynamically in the Asian region. Nevertheless, their growth has been mixed.

In this study, we attempt to shed light on the drivers behind the development of the corporate bond markets of ten Asian countries in recent years. We analyze different factors associated with the development of these markets, and confirm the importance of economic performance and institutional quality for the development of corporate bond markets in Asia. We find that stronger creditor rights and quality of regulations are associated with deeper local bond markets in terms of size and total value of issuance. In countries with better creditor rights, more corporate bonds are issued in terms of value. Moreover, we find a positive association between bank credit growth and corporate bond market issuance value. Burger and Warnock (2006) argue that the necessary conditions for bond market development are very similar to those that foster development of the banking system. We argue further that dynamic growth in bank lending can imply an increase in the issuance value of bonds by financial institutions, which may lead to the growth of the corporate bond market in terms of size. Hence, we theorize that the growth of the financial bond markets may positively influence corporate bond market development. We find, however, no evidence that bank loans may be a substitute for corporate bonds. Indeed, our results indicate that good performance by banks is positively related to the value of issuance by non-financial corporations. Hence, our results indicate that the banking sector and corporate bond markets for non-financial companies develop simultaneously. One interpretation of the results is that the existence of a sound banking sector is a significantly more important condition to foster corporate bond market development than competition. This implication results from the major role banks play in organizing and providing services in the process of bond issuance, acting as dealers and market makers.

In contrast, we find that an increase of the government bond market has a negative impact on the market and issue value of corporate bonds in Asia. Thus, the supply side may strongly determine the structure of bond markets. However, we also find that the demand side plays an important role in explaining the growth of corporate bond markets. Our results show a positive association between the assets of pension funds and the market and issue value of corporate bonds.

More importantly, we find that the bond markets were an important spare tire in Asia during the financial crisis of 2008. We observe a significant increase in the outstanding value and the issuance of corporate bonds during the crisis period. The results of the study are robust and do not change when the regression is altered. Meanwhile, we find no evidence that the corporate bond markets provided an offset to reductions in bank lending during previous systematic banking crises in the Asian economies at the country level. We interpret our results to mean that the countries developed the necessary infrastructure during the last two decades, and nowadays, most Asian countries have mixed financial systems. More importantly, the existence of a developed corporate bond market may be one reason that Asian countries were not strongly affected by the global financial crisis of 2008.

The results are in line with Levine et al. (2016), who show that in countries with stronger shareholder protection laws, firms increase the volume of equity issuances in response to systematic banking crises. Hence, Levine et al.'s (2016) results show that equity markets may ameliorate the adverse effects of banking crises by providing alternative financing. Meanwhile, we argue that bond markets may also help mitigate the negative impact of a financial crisis. In our view, the improvement of the banking sector—together with the other factors mentioned above—opened the possibility of corporate bond market development, which in turn may act as an additional, supportive source of debt financing for the economy, but only during periods of crisis or economic downturn. In Asia, over the long term, those two financing channels had been developing simultaneously.

The development of the corporate bond markets may provide a sustainable spare tire during a crisis. However, the questions of how and to what extent the corporate bond markets would mitigate the effects of a banking crisis remain unanswered, and we leave them for further research.

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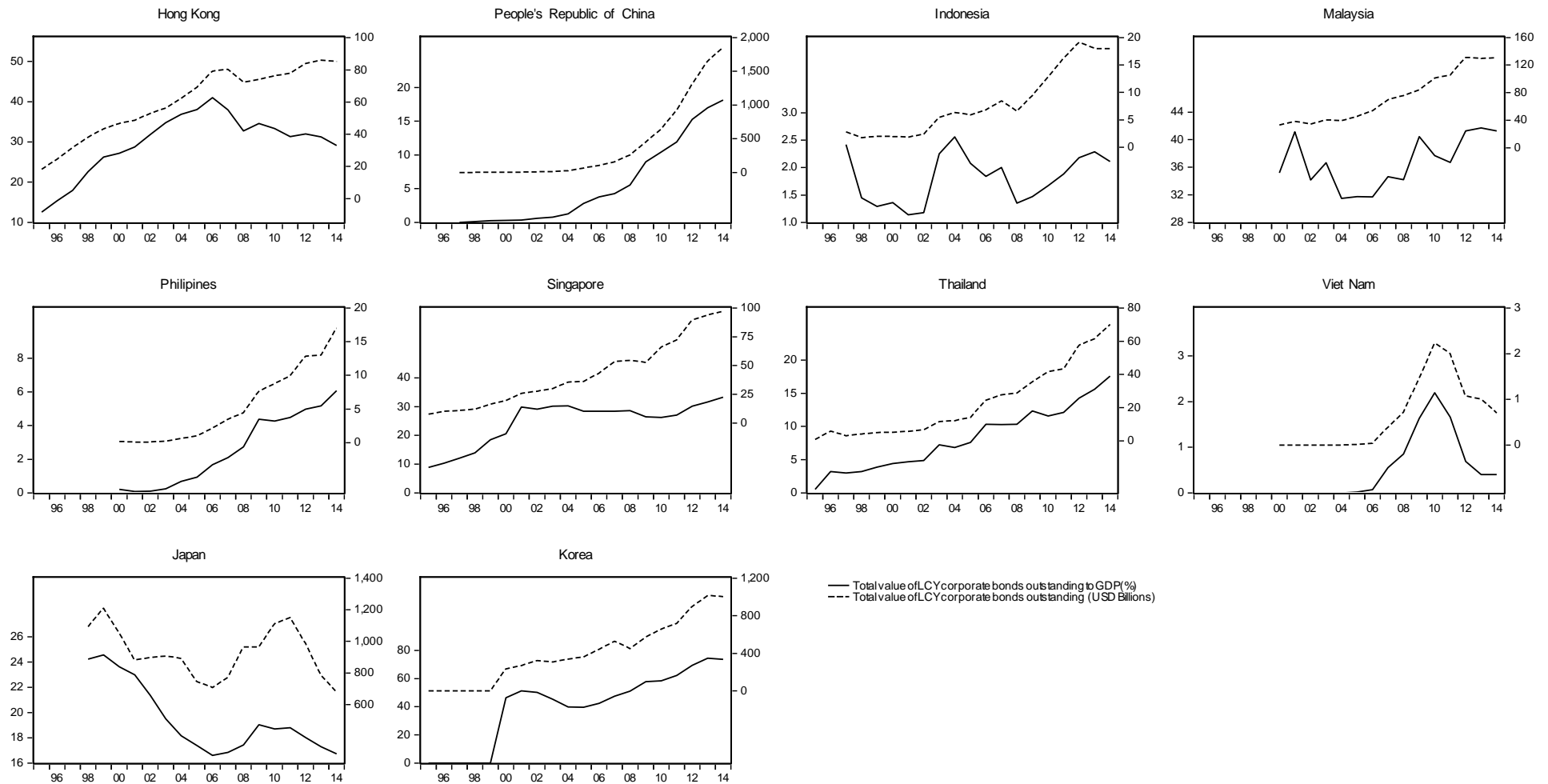
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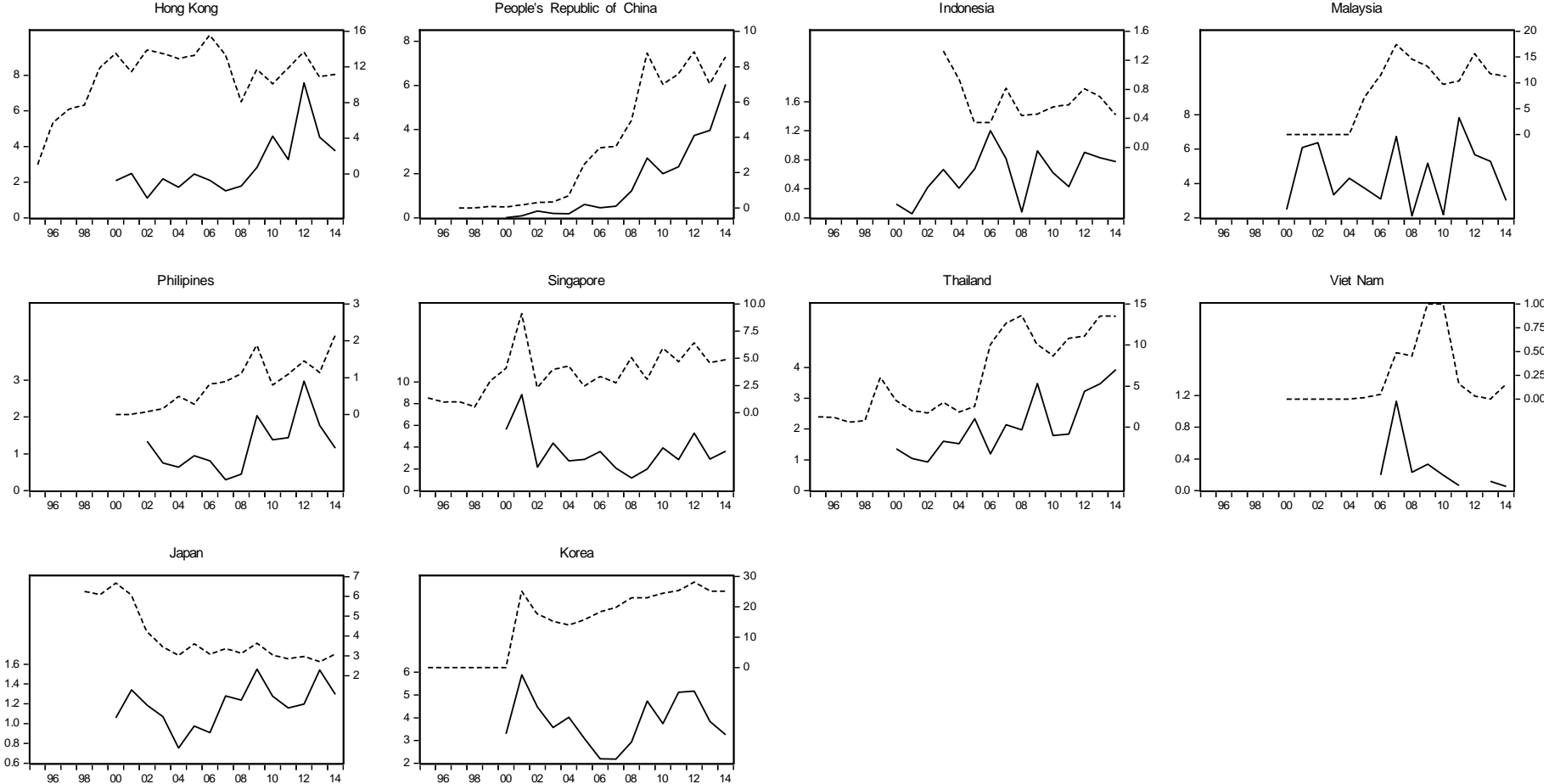
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Figure 1 Amount of corporate bonds value outstanding to GDP (in %)



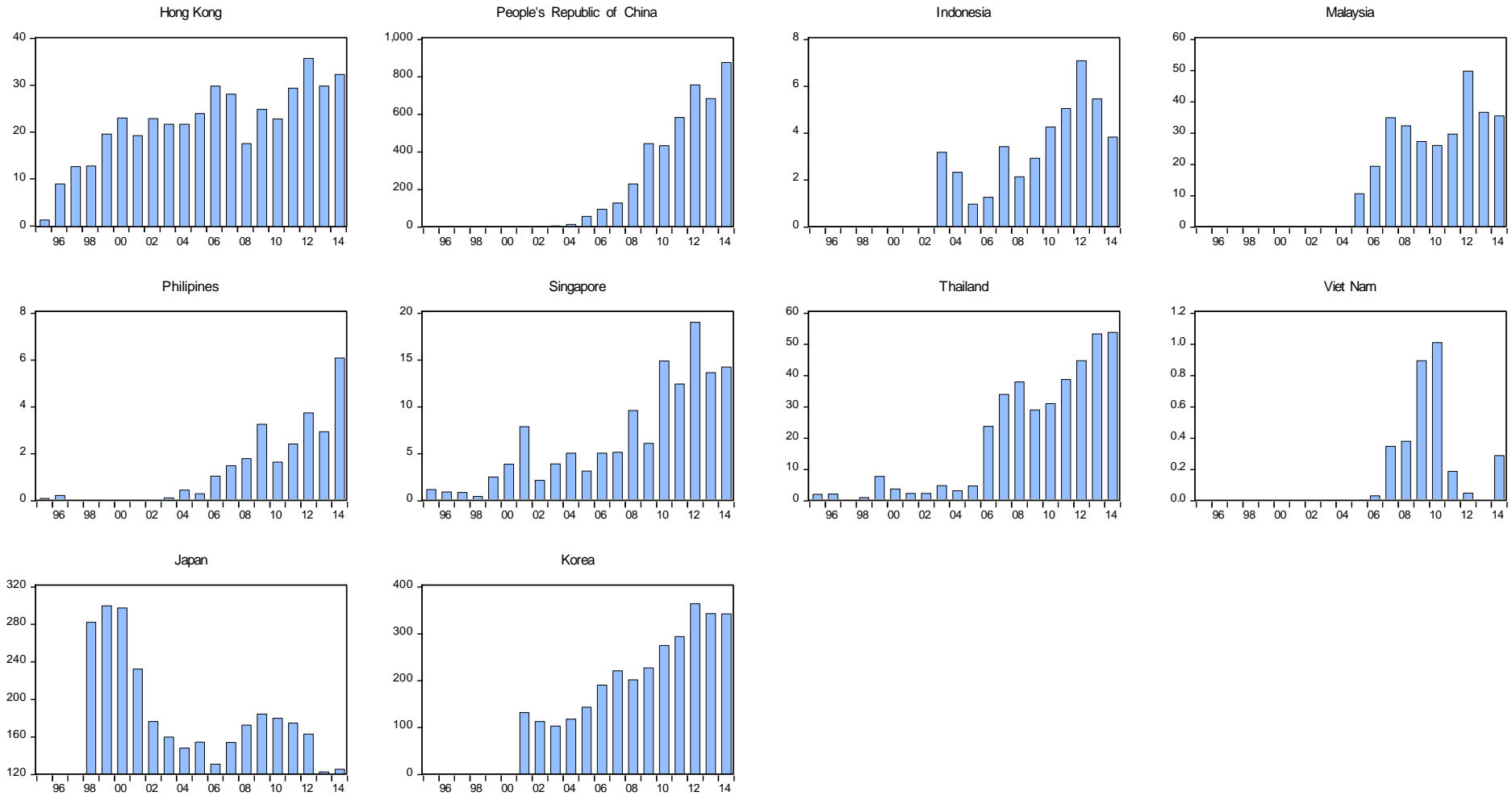
Source: AsianBondsOnline

Figure 2 Corporate bonds annual issuance value outstanding to GDP (in %)



— Corporate bonds annual issuance value with outbonds issued by financial institutions to GDP in % (source: World Bank)
 - - - Corporate bonds annual issuance value to GDP in % (source: AsianBondsOnline)

Figure 3 Total issuance of corporate bonds in USD billions in the years 1995-2014



Source: AsianBondsOnline

Table 1. Descriptive statistics

Variables	N	Mean	Std dev	Min	Max
Corporate bond outstanding	178	17.55	17.31	0	74.53
Corporate bond issuance	172	5.802	6.644	0	28.15
Corporate bond issuance (financial sector)	108	6.01	5.986	0.004	22.97
Corporate bond issuance (non-financial sector)	142	2.29	1.838	0.007	8.833
Maturity	142	6.756	1.987	2.727	13.17
GDP	200	26.78	1.366	24.50	29.75
GDP per capita	200	14,914	15,808	581	52,244
Openness	200	75.1	62.75	9.053	230.3
Exchange rate	190	0.0275	0.0378	0	0.252
Inflation	199	3.851	5.437	-4.023	58.39
GF crisis	200	0.1	0.301	0	1
Market cap	191	132.5	205.5	0.409	1,086
Market vol.	187	23.68	9.412	7.772	68.02
Public debt	175	34.61	38.42	0.429	190.8
Pension funds	119	21.2	20.62	0.305	61.94
Bank credit	200	96.96	46.71	18.16	233.4
Concentration	184	64.4	20.6	31.76	100
ROA	190	0.783	2.214	-16.44	6.493
Interest rate spread	197	3.477	1.47	0.167	7.681
Banking crisis	170	0.153	0.361	0	1
Creditors rights	200	2.325	0.918	1	4
Public registry	200	0.5	0.501	0	1
Regulations	160	0.522	0.869	-0.781	2.247
Enforcement	200	304.4	150.1	69	570

Table 2. **Pairwise correlation of explanatory variables**

	GDP	Gpc	O	ER	CPI	GC	MC	MV	PD	PF	BC	ROA	C	BS	BC	CR	PR	R
GDP	1																	
GDP per capita	0.05	1																
Openness	-0.51*	0.71*	1															
Exchange rate	0.08	-0.11	-0.23*	1														
Inflation	-0.16*	-0.29*	-0.12	0.36*	1													
GF crisis	0.05	0.06	0.03	0.11	0.05	1												
Market cap.	-0.23*	0.56*	0.70*	-0.23*	-0.14*	0.04	1											
Volatility	0.03	-0.23*	-0.14	0.11	0.23*	0.29*	-0.08	1										
Public debt	0.49*	0.30*	-0.23*	-0.01	-0.25*	0.06	-0.08	-0.16*	1									
Pension funds	-0.31*	0.52*	0.61*	-0.19*	-0.35*	0.01	0.30*	-0.35*	0.19*	1								
Bank credit	0.24*	0.49*	0.39*	-0.13	-0.31*	-0.02	0.52*	-0.02	0.08	0.29*	1							
ROA	-0.06	0.07	0.11	-0.43*	-0.29*	0.06	0.10	-0.38*	-0.03	-0.03	-0.13	1						
Concentration	-0.32*	0.29*	0.45*	-0.15*	-0.17*	-0.06	0.17*	-0.12	-0.29*	0.41*	0.07	0.01	1					
Bank spread	-0.48*	0.03	0.40*	-0.13	0.05	0.04	0.29*	-0.05	-0.44*	-0.03	-0.24*	0.24*	0.13	1				
Banking crisis	0.03	-0.20*	-0.20*	0.57*	0.19*	-0.16*	-0.17*	0.27*	-0.01	-0.07	0.01	-0.50*	-0.11	-0.07	1			
Creditors rights	-0.03	0.61*	0.62*	-0.05	-0.21*	-0.01	0.62*	-0.03	-0.22*	0.51*	0.63*	-0.05	0.28*	-0.06	-0.15*	1		
Public registry	0.37*	-0.38*	-0.45*	0.02	0.15*	0.00	-0.32*	-0.04	0.32*	0.14	-0.15*	0.05	-0.28*	-0.21*	0.07	-0.34*	1	
Regulations	-0.04	0.88*	0.72*	-0.13	-0.35*	-0.01	0.63*	-0.13	0.23*	0.60*	0.59*	-0.07	0.31*	-0.02	-0.09	0.78*	-0.52*	1
Enforcement	0.03	-0.60*	-0.54*	0.22*	0.33*	0.00	-0.29*	-0.02	0.18*	-0.33*	-0.47*	-0.07	-0.55*	0.18*	0.23*	-0.57*	0.53*	-0.65*

*Indicates statistical significance at 5% level.

Table 3. Corporate bond market and economic development

This table presents coefficients from random effects regressions models of corporate bond outstanding value and issue value to GDP on economic control variables. Year dummies and constants are not shown for brevity. Variables definitions are in Appendix in Table A1. Full results are available from the authors upon request. Robust standard errors are presented in parentheses, and ***, **, and * denote statistical significance at 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Corporate bond				issuance			
	outstanding		total		non-financial		financial	
GDP	3.390**	4.675	-0.324	0.465	0.109	0.393	-0.767	-1.221
	(1.547)	(3.083)	(0.976)	(0.981)	(0.296)	(0.315)	(0.902)	(0.964)
GDP per capita	0.001		0.000		0.000		0.000	
	(0.001)		(0.000)		(0.000)		(0.000)	
Exchange rate	-0.878	0.926	9.649	10.53	-3.257	-2.988	35.13	21.10
	(30.71)	(25.13)	(34.06)	(20.39)	(5.040)	(5.197)	(76.67)	(73.74)
Inflation	0.075	0.0327	-0.602***	-0.510**	0.0632	0.0471	-0.569**	-0.566**
	(0.111)	(0.145)	(0.182)	(0.215)	(0.053)	(0.032)	(0.234)	(0.243)
Openness		0.0768		0.021		0.012**		-0.012
		(0.051)		(0.024)		(0.005)		(0.028)
GF crisis	19.93***	21.40**	4.797***	6.021***	0.845	0.726	2.223	2.417
	(7.340)	(10.11)	(1.666)	(1.944)	(0.618)	(0.689)	(2.523)	(2.743)
Maturity					0.008	0.010		
					(0.116)	(0.116)		
Observations	168	168	162	162	132	132	99	99
R ² within	0.480	0.451	0.367	0.385	0.312	0.319	0.174	0.172
R ² between	0.171	0.108	0.088	0.093	0.468	0.194	0.094	0.085
R ² overall	0.248	0.201	0.209	0.217	0.055	0.236	0.113	0.111

Table 4. Corporate bond market and financial system development

This table presents coefficients from random effects model regressions of corporate bond outstanding value and issue value to GDP on financial system (Panel A) and banking sector (Panel B) control variables. All of the regressions include all variables as specified in Table 3. The explanatory variables GDP per capita and openness are used in the first and second column, respectively. Year dummies and constants are not shown to save space. Variables definitions are in Appendix in Table A1. Full results are available from the authors upon request. Robust standard errors are presented in parentheses, and ***, **, and * denote statistical significance at 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Corporate bond				issuance			
	outstanding		total		non-financial		Financial	
Market cap.	0.004 (0.022)	0.026*** (0.009)	0.001 (0.010)	0.011*** (0.004)	-0.000 (0.001)	0.000 (0.001)	0.002 (0.009)	0.010*** (0.003)
Volatility	-0.187 (0.788)	-0.214 (0.561)	0.104 (0.219)	-0.094 (0.204)	-0.056 (0.079)	0.0247 (0.044)	0.159 (0.283)	-0.106 (0.141)
Public debt	-0.163 (0.180)	-0.216* (0.129)	-0.0929 (0.0693)	-0.118*** (0.043)	-0.010 (0.010)	-0.022*** (0.006)	-0.098* (0.058)	-0.099*** (0.038)
Pension funds		0.378*** (0.130)		0.025 (0.033)		0.068*** (0.019)		-0.019 (0.047)
Observations	147	108	141	107	123	105	93	84
R ² within	0.427	0.202	0.386	0.259	0.146	0.242	0.187	0.243
R ² between	0.393	0.610	0.241	0.675	0.577	0.845	0.460	0.567
R ² overall	0.411	0.433	0.325	0.439	0.348	0.544	0.301	0.428
Bank credit	0.169*** (0.047)	0.144** (0.060)	0.0785*** (0.020)	0.0997*** (0.024)	0.0125** (0.006)	0.010 (0.007)	0.101*** (0.036)	0.146*** (0.042)
ROA	0.625 (0.413)	0.525 (0.432)	0.297 (0.241)	0.444 (0.281)	0.529 (0.415)	0.510 (0.418)	0.416 (1.572)	0.482 (1.475)
Concentration	0.197**	0.135	0.045	0.073**	0.023***	0.020**	0.0258	0.0642***

	(0.082)	(0.107)	(0.039)	(0.037)	(0.008)	(0.009)	(0.0326)	(0.0244)
Bank spread	-1.866	-3.226	-0.288	0.174	-0.285	-0.348	-0.547	0.592
	(2.164)	(2.058)	(0.747)	(0.598)	(0.247)	(0.229)	(0.886)	(0.666)
Bank crisis	-2.298	-2.100	0.703	0.425	-1.300	-1.266	0.962	0.393
	(5.048)	(5.620)	(1.739)	(1.655)	(1.070)	(1.076)	(3.255)	(2.674)
Observations	137	137	132	132	108	108	80	80
R ² within	0.481	0.435	0.461	0.488	0.099	0.100	0.078	0.105
R ² between	0.748	0.745	0.581	0.616	0.774	0.772	0.679	0.798
R ² overall	0.677	0.652	0.520	0.554	0.484	0.485	0.476	0.561

Table 5. Corporate bond market and institutional development

This table presents coefficients from random effects model regressions of corporate bond outstanding value and issue value to GDP on variables proxying for creditor rights (Panel A), regulatory quality (Panel B), and enforcement (Panel C). All of the regressions include all variables as specified in Table 3. The explanatory variables GDP per capita and openness are used in the first and second column, respectively. Year dummies and constants are not shown for brevity. Variables definitions are in Appendix in Table A1. Full results are available from the authors upon request. Robust standard errors are presented in parentheses, and ***, **, and * denote statistical significance at 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Corporate bond outstanding				issuance			
			total	non-financial		financial		
Creditor rights	12.17*** (3.692)	15.28*** (5.256)	4.164*** (1.076)	5.871*** (1.263)	1.039*** (0.399)	1.153** (0.565)	5.234*** (1.424)	7.509*** (1.120)
Public registry	-2.779 (8.582)	-4.040 (7.617)	-4.349* (2.605)	-4.341** (1.982)	0.0550 (0.917)	0.036 (0.868)	-5.127* (3.104)	-5.438*** (1.398)
Observations	168	168	162	162	132	132	99	99
R ² within	0.466	0.439	0.401	0.403	0.234	0.226	0.086	0.066
R ² between	0.743	0.742	0.686	0.803	0.696	0.709	0.680	0.886
R ² overall	0.647	0.635	0.545	0.610	0.478	0.481	0.558	0.714
Regulations	9.867 (8.361)	10.74 (9.813)	4.467 (3.105)	4.027 (3.739)	1.285** (0.605)	0.613 (0.436)	11.55** (4.546)	3.931 (4.108)
Observations	141	141	138	138	124	124	93	93
R ² within	0.478	0.475	0.414	0.425	0.372	0.388	0.045	0.127
R ² between	0.411	0.392	0.358	0.247	0.327	0.218	0.631	0.223
R ² overall	0.421	0.405	0.365	0.308	0.313	0.252	0.407	0.206
Enforcement	-0.051*** (0.019)	-0.062** (0.028)	-0.022* (0.012)	-0.025** (0.012)	-0.008*** (0.002)	-0.006*** (0.002)	-0.024* (0.014)	-0.030** (0.012)
Observations	168	168	162	162	132	132	99	99

R^2 within	0.475	0.443	0.399	0.412	0.313	0.305	0.166	0.142
R^2 between	0.463	0.511	0.416	0.409	0.456	0.545	0.404	0.428
R^2 overall	0.474	0.498	0.385	0.392	0.406	0.446	0.367	0.439

Table 6. Determinants of the corporate bond market

This table presents coefficients from random effects model regressions of corporate bond outstanding value and issue value to GDP on economic, financial and institutional control variables. The explanatory variables creditor rights and enforcement are used in the first and second column, respectively. Year dummies and constants are not shown for brevity. Variables definitions are in Appendix in Table A1. Robust standard errors are presented in parentheses, and ***, **, and * denote statistical significance at 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Corporate bond		total		issuance			
	outstanding				non-financial		financial	
GDP	-2.328 (2.082)	-3.515 (3.009)	-0.498 (0.797)	-0.833 (0.927)	-0.686*** (0.150)	-0.739*** (0.251)	0.085 (0.683)	-0.697 (0.825)
Exchange rate	-13.560 (51.90)	56.630 (53.36)	15.590 (27.44)	23.500 (27.33)	-10.170 (6.859)	-4.093 (7.688)	110.600 (80.21)	152.4* (84.45)
Inflation	0.253 (0.182)	0.334 (0.292)	-0.383* (0.214)	-0.276 (0.416)	0.146 (0.094)	0.160** (0.077)	-0.284 (0.403)	-0.996** (0.476)
GF crisis	26.06*** (5.452)	21.14*** (6.529)	8.969*** (2.036)	8.519*** (3.118)	1.239 (0.761)	1.327 (0.833)	5.620*** (1.630)	6.736*** (2.340)
Market cap.	-0.023 (0.017)	-0.001 (0.015)	-0.009 (0.006)	-0.005 (0.004)	-0.004*** (0.001)	-0.003** (0.001)	-0.015** (0.007)	-0.006 (0.004)
Public debt	0.104* (0.062)	0.093 (0.073)	-0.032 (0.0254)	-0.031 (0.0264)	0.0107** (0.005)	0.0102** (0.00489)	-0.0511** (0.0206)	-0.0627** (0.030)
Bank credit	0.139* (0.077)	0.198** (0.085)	0.0774*** (0.0201)	0.0955*** (0.0198)	0.0233*** (0.005)	0.028*** (0.010)	0.113*** (0.036)	0.129** (0.052)
Concentration	0.040 (0.065)	0.001 (0.115)	-0.028 (0.042)	-0.041 (0.063)	0.0124* (0.006)	0.012* (0.007)	-0.112** (0.046)	-0.059 (0.063)
Creditor rights	12.74** (5.325)		2.738 (1.950)		0.662* (0.351)		5.743** (2.634)	

Enforcement		-0.042 (0.030)		-0.010 (0.015)		-0.002 (0.002)		-0.006 (0.013)
Observations	142	142	136	136	118	118	88	88
R ² within	0.491	0.554	0.568	0.565	0.196	0.214	0.322	0.299
R ² between	0.809	0.696	0.616	0.587	0.935	0.881	0.805	0.677
R ² overall	0.706	0.647	0.581	0.560	0.598	0.577	0.648	0.538

Appendix

Table A.1 Definitions of the main variables

Variable	Definition	Source
Corporate bond outstanding	Value of corporate bond market outstanding to GDP	Asian Bonds Online
Corporate bond issuance	Value of total issuance of corporate bonds to GDP	Asian Bonds Online
Corporate bond issuance of financial institutions	Value of total issuance of corporate bonds by financial institutions to GDP	own calculation
Corporate bond issuance of non-financial institutions	Value of total issuance of corporate bonds by non- financial institutions to GDP	
GDP	Logarithm of gross national product in constant 2010 in billions US dollars	World Bank
GDP per capita	Gross national product per capita in constant 2010 in US dollars	
Openness	Export of goods and services to GDP	Asia
Exchange rate	Standard deviation of the 12 monthly exchange rates over 1- year period	Regional Integration Center
Inflation	Annual growth rate of consumer price index	
GF crisis	A dummy variable that equals 1 for the years 2008-20009 and 0 otherwise.	
Market cap	Total value of listed shares to GDP	
Volatility	Average of the 360-day volatility of the national stock market index.	
Public debt	Total amount of domestic public debt securities (amount outstanding) issued in domestic markets as a share of GDP.	World Bank
Pension funds	Assets of pension funds to GDP. Any plan, fund, or scheme that provides retirement income.	
Bank credit	Private credit by deposit money banks to GDP.	
ROA	Commercial banks' pre-tax income to yearly averaged total assets.	
Concentration	Ratio of the five largest banks' assets to total banking assets.	

Bank spread	Difference between the lending rate and deposit rate. The lending rate is the rate charged by banks on loans to the private sector, and the deposit interest rate is the rate offered by commercial banks on three-month deposits.	
Banking crisis	Dummy variable that equals 1 during a severe systematic banking crisis and zero otherwise.	
Creditors rights	Index aggregating creditor rights. The index ranges from 0 (weakest creditor rights) to 4 (strongest creditor rights)	Djankov, Mcliesh, and Shleifer (2007)
Enforcement	Number of days to resolve a payment dispute through courts.	
Public registry	Dummy variable that equals 1 if a public credit registry operates in the country and 0 otherwise.	
Regulations	Index for regulatory quality that captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development, ranging from 0 to 100.	World Bank

Table A.2 Robustness of the determinants of the corporate bond market

This table presents coefficients from fixed effects model regressions of corporate bond outstanding value and issue value to GDP on economic, financial and institutional control variables. The explanatory variables creditor rights and enforcement are used in the first and second column, respectively. Year dummies and constants are not shown for brevity. Variables definitions are in Appendix in Table A1. Robust standard errors are presented in parentheses, and ***, **, and * denote statistical significance at 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Corporate bond		total		issuance			
	outstanding				non-financial	financial		
GDP	-7.552 (6.741)	-7.267 (6.785)	-8.154** (3.689)	-8.219** (3.694)	3.324** (1.487)	3.413** (1.491)	-2.561 (3.456)	-2.665 (3.423)
Exchange rate	-28.740 (27.45)	-9.891 (24.91)	-7.166 (15.50)	-13.760 (14.40)	-8.390 (8.495)	-7.640 (8.509)	-1.041 (32.92)	-3.248 (32.28)
Inflation	0.254* (0.145)	0.172 (0.137)	-0.374* (0.206)	-0.366* (0.206)	0.013 (0.078)	0.009 (0.078)	-0.159 (0.306)	-0.153 (0.304)
GF crisis	32.58*** (6.502)	29.17*** (6.180)	16.21*** (3.791)	17.39*** (3.654)	-0.823 (0.967)	-0.874 (0.970)	7.723*** (2.758)	7.802*** (2.732)
Market cap.	-0.010* (0.006)	-0.009 (0.006)	-0.014*** (0.003)	-0.014*** (0.003)	0.001 (0.001)	0.001 (0.001)	-0.014*** (0.004)	-0.014*** (0.003)
Public debt	-0.089 (0.073)	-0.049 (0.069)	-0.120*** (0.040)	-0.135*** (0.038)	0.011 (0.016)	0.021 (0.014)	-0.098** (0.039)	-0.105*** (0.035)
Bank credit	0.242*** (0.033)	0.259*** (0.032)	0.107*** (0.017)	0.101*** (0.016)	0.016 (0.011)	0.010 (0.010)	0.039 (0.029)	0.044* (0.026)
Concentration	-0.033 (0.042)	-0.022 (0.042)	0.026 (0.022)	0.022 (0.021)	-0.002 (0.008)	-0.003 (0.008)	-0.031 (0.023)	-0.030 (0.023)
Creditor rights	6.286 (3.965)		-2.358 (2.066)		1.610 (1.233)		-1.212 (2.832)	

Observations	142	142	136	136	118	118	88	88
R ² within	0.667	0.660	0.670	0.665	0.340	0.328	0.567	0.566
R ² between	0.358	0.278	0.021	0.060	0.014	0.114	0.001	0.031
R ² overall	0.415	0.388	0.090	0.116	0.005	0.054	0.075	0.125

Table A.3 Sensitivity analysis for the determinants of the corporate bond market

This table presents coefficients from random effects regressions of corporate bond outstanding value and issue value to GDP on economic, financial and institutional control variables. In the first column we employ additionally the variables Growth that represents country's economic real growth and Balance that shows the country's current account. In the second column we employ Country rating, which is defined as the worst credit rating of a country in a given year. The remaining variables definitions are in Appendix in Table A1. Year dummies and constants are not shown to save space. Full results are available from the authors upon request. Robust standard errors are presented in parentheses, and ***, **, and * denote statistical significance at 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Corporate bond				issuance			
	outstanding		total		non-financial		financial	
GDP	-1.459 (2.505)	-0.522 (0.792)	-1.459 (2.505)	-2.194 (2.193)	-0.520** (0.211)	-0.574*** (0.170)	0.110 (0.882)	-0.383 (0.784)
Growth	-63.42 (72.56)		-63.42 (72.56)		-5.891 (5.256)		-66.85* (35.15)	
Balance	11.840 (27.80)		11.840 (27.80)		3.223 (2.723)		-25.93* (13.24)	
Inflation	0.084 (0.214)		0.084 (0.214)		0.110 (0.0875)		-0.270 (0.248)	
Country rating		0.173 (0.296)		-0.051 (0.498)		-0.030 (0.0584)		0.561 (0.350)
GF crisis	18.87*** (7.089)	10.10*** (3.340)	18.87*** (7.089)	25.52*** (4.817)	0.887 (0.730)	1.236 (0.837)	1.126 (2.542)	5.363*** (1.560)
Market cap.	-0.023 (0.0171)	-0.010 (0.00661)	-0.023 (0.0171)	-0.023 (0.0174)	-0.004*** (0.001)	-0.0037*** (0.001)	-0.014** (0.006)	-0.016** (0.007)
Public debt	0.057 (0.086)	-0.014 (0.025)	0.057 (0.086)	0.086 (0.066)	0.002 (0.006)	0.002 (0.004)	-0.0610** (0.027)	-0.007 (0.021)
Bank credit	0.140**	0.0933***	0.140**	0.132*	0.0256***	0.0188***	0.0672***	0.122***

	(0.071)	(0.023)	(0.071)	(0.075)	(0.007)	(0.007)	(0.023)	(0.029)
Concentration	0.063	-0.014	0.063	0.051	0.010	0.010	-0.044	-0.0749**
	(0.056)	(0.040)	(0.056)	(0.068)	(0.007)	(0.006)	(0.0385)	(0.030)
Creditor rights	12.27**	2.914	12.27**	12.80**	0.433	0.570	5.242**	5.409**
	(5.449)	(2.040)	(5.449)	(5.211)	(0.371)	(0.356)	(2.397)	(2.631)
Observations	148	144	148	150	126	126	95	95
R ² within	0.504	0.543	0.504	0.497	0.193	0.182	0.273	0.244
R ² between	0.810	0.614	0.810	0.794	0.928	0.910	0.881	0.752
R ² overall	0.709	0.568	0.709	0.696	0.568	0.557	0.691	0.598

Table A.4 The impact of current account deficit on corporate bond market size and issuance

This table presents coefficients from random effects regressions of corporate bond outstanding value and issue value to GDP on economic, financial and institutional control variables. The first column show the results for countries with a current account surplus, while the second columns show countries current account deficit. Year dummies and constants are not shown for brevity. Variables definitions are in Appendix in Table A1. Full results are available from the authors upon request. Robust standard errors are presented in parentheses, and ***, **, and * denote statistical significance at 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Corporate bond				issuance			
	outstanding		total		non-financial		financial	
GDP	2.564 (2.169)	-10.80*** (3.900)	0.167 (1.507)	-5.261*** (0.687)	-0.279 (0.179)	-0.789*** (0.128)	-0.618 (1.445)	-6.020*** (1.659)
Exchange rate	-25.410 (44.88)	-52.780 (33.66)	6.176 (26.60)	23.750 (25.28)	-13.10** (5.352)	-10.23*** (0.845)	47.540 (96.37)	17.580 (21.49)
Inflation	0.383 (0.249)	0.349 (0.220)	-0.437* (0.234)	0.114 (0.141)	0.123*** (0.0456)	0.028 (0.0735)	0.553 (0.457)	-0.582 (0.416)
GF crisis	21.18*** (8.022)	32.34*** (6.230)	12.20*** (2.637)	11.46*** (0.250)	0.600 (1.139)	0.651* (0.358)	9.919*** (2.952)	-5.962 (9.825)
Market cap.	-0.032* (0.019)	0.201** (0.085)	-0.019** (0.008)	0.0506** (0.021)	-0.003** (0.002)	0.021*** (0.005)	-0.028*** (0.008)	0.075 (0.097)
Public debt	0.565*** (0.090)	0.058 (0.046)	-0.053 (0.109)	0.002 (0.008)	0.062** (0.027)	0.003 (0.002)	-0.189* (0.105)	0.011 (0.037)
Bank credit	0.082 (0.053)	0.323*** (0.055)	0.0738*** (0.019)	0.164*** (0.016)	0.0163*** (0.005)	0.0142*** (0.005)	0.129*** (0.034)	0.077 (0.062)
Concentration	-0.120 (0.077)	-0.166 (0.141)	-0.077 (0.058)	-0.075** (0.037)	0.002 (0.011)	-0.002 (0.004)	-0.125** (0.052)	-0.126** (0.057)
Creditor rights	24.74*** (6.436)	19.20*** (4.687)	7.503** (3.508)	6.627*** (0.366)	1.037** (0.453)	1.118*** (0.296)	9.606*** (3.007)	10.00*** (3.573)

Observations	113	59	107	53	91	50	71	29
R ² within	0.582	0.868	0.630	0.942	0.235	0.460	0.467	0.956
R ² between	0.951	1.000	0.752	1.000	0.979	0.999	0.931	1.000
R ² overall	0.821	0.941	0.668	0.967	0.626	0.881	0.735	0.994

Table A.5 Determinants of the corporate bond market in developed and emerging economies

This table presents coefficients from random effects regressions of corporate bond outstanding and issue to GDP on economic, financial and institutional control variables. The first column show the results for developed countries, while the second column for developing countries. The regressions control for year effects, which are not reported for brevity. Robust standard errors are presented in parentheses, and ***, **, and * denote statistical significance at 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Corporate bond		total		issuance			
	outstanding				non-financial		financial	
GDP	4.170*** (1.463)	-0.689 (0.650)	3.402*** (0.181)	-2.134* (1.132)	-0.663 (0.445)	-0.368** (0.179)	5.099*** (1.002)	-2.840*** (0.626)
Exchange rate	-54.850 (45.89)	-50.69*** (14.88)	-14.21* (8.208)	-38.65* (20.65)	35.92** (17.53)	-9.198* (4.777)	69.830 (78.67)	-100.6** (48.89)
Inflation	-0.691 (0.921)	0.272*** (0.0517)	-0.564*** (0.101)	-0.300 (0.289)	0.418** (0.179)	0.106*** (0.032)	-0.805* (0.467)	0.268 (0.287)
GF crisis	34.38*** (11.02)	17.20*** (1.841)	10.70** (4.875)	12.98*** (4.596)	-1.152 (2.093)	1.857*** (0.464)	6.357*** (2.405)	8.437*** (1.327)
Market cap.	-0.028** (0.013)	0.108** (0.0468)	-0.014*** (0.006)	-0.096** (0.048)	-0.002 (0.003)	0.010 (0.010)	-0.012* (0.007)	-0.052*** (0.020)
Public debt	-0.285*** (0.056)	0.366*** (0.0589)	-0.143*** (0.030)	0.115 (0.130)	0.005 (0.020)	0.0314*** (0.011)	-0.152*** (0.031)	-0.135* (0.082)
Bank credit	0.158*** (0.035)	0.0285** (0.0139)	0.0843*** (0.029)	0.0727*** (0.020)	0.010 (0.011)	0.0146*** (0.00379)	0.0862** (0.0387)	0.064*** (0.006)
Concentration	-0.080 (0.0825)	0.045 (0.0379)	-0.070*** (0.027)	0.034 (0.038)	-0.008 (0.021)	0.008 (0.011)	-0.057 (0.059)	-0.021 (0.023)
Creditor rights	1.930 (5.026)	9.904*** (1.324)	4.194*** (1.554)	3.879** (1.530)	0.658 (1.234)	0.651** (0.289)	5.948*** (1.214)	4.671*** (0.494)

Observations	63	79	63	73	49	69	44	44
R ² within	0.780	0.612	0.800	0.690	0.403	0.474	0.545	0.733
R ² between	0.977	0.999	0.990	0.975	0.981	0.999	0.999	1.000
R ² overall	0.814	0.965	0.869	0.782	0.658	0.797	0.910	0.843
