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Debt specialization and diversification: International evidence

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HIGHLIGHTS

- There is a strong size-related U-shape with respect to US firms' use of bond financing.
- Less developed Asian markets do not display such a U-shape.
- These contrasting findings are largely due to differences in financial development.
- Total debt largely determines whether firms specialize in one form of debt only.
- Firms prefer to diversify their funding sources when leverage is high.

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ABSTRACT

We study empirically firms' choices for debt financing, emphasizing the extensive and intensive margins of a firm's bond financing ratio: the ratio of bond debt, both publicly traded and privately placed, to the sum of its loan and bond debt. The large data sample includes firms located in the US and nine Asian emerging markets, with total debt levels ranging from very large (billions of dollars) to small (less than a million dollars). The surprising results include a strong nonmonotonic relation between total debt and the bond financing ratio for US firms, contrasted with a largely monotonic relation for firms located in emerging markets. We also show that highly leveraged firms tend to borrow through both loans and bonds, indicating a preference for funding diversification.

Why do some firms borrow using only revolving credit facilities, while others borrow exclusively through privately-placed bonds? Why does bank debt comprise 90 % of some firms' debt, while publicly-traded bonds comprise 90 % of other firms' debt? We add to the large literature that asks these and similar questions.

The new evidence we uncover is largely attributable to our choice of data. The sample consists of roughly 200,000 firm-year observations from 2004 through 2023 for firms located in the US and in nine Asian countries with emerging financial markets. Levels of financial development vary widely across these countries. Unlike previous research, we study the debt composition of both very large and very small borrowers, those with total debt exceeding $10B as well as those with total debt below $1MM.

We use these data to examine how firms choose between borrowing through loan facilities and borrowing through bonds. A few decades ago in the US, the label "bank debt" was interchangeable with loan facilities, and in countries with less-developed markets that phrase still applies. Loan facilities include all revolving credit facilities and term loans, regardless of the lender (i.e., including commercial banks and shadow banks). Bond debt includes both straight and convertible bonds that are either publicly traded or

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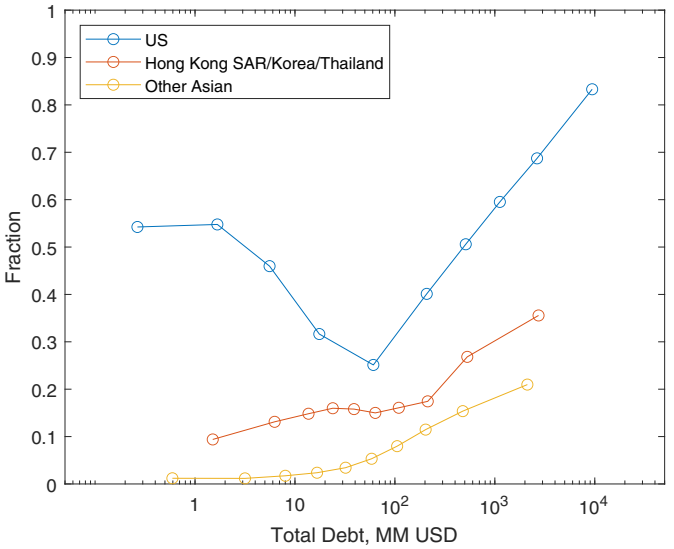

Fig. 1. Bond financing relative to loan financing, 2004 through 2023. For a given region, firms with publicly-traded equity and either loan debt, bond debt, or both are sorted into ten groups based on their total debt. The bond category includes both publicly traded and privately placed bonds. The figure displays means, across firms in each group, of bond debt relative to the sum of loan and bond debt. Values on the horizontal axis are median levels of debt for each decile, expressed in 2023 dollars.

privately placed. We summarize a firm's choice between these two types of instruments with its "bond financing ratio," defined as the ratio of the firm's bond debt to the sum of its loan and bond debt.

Fig. 1 illustrates the value of our heterogeneous data sample. Observations of bond financing ratios for US firms are sorted into ten groups based on total debt (2023 dollars). We perform the same sort for firms in Hong Kong SAR, Korea, and Thailand, and again for firms in six Asian countries with less-developed financial markets.[1] Section 3 explains why we sort firms using these three country groups. The figure displays the mean bond financing ratio for the observations in each decile.

The positive relation between total debt and the mean bond financing ratio on the right side of the figure is well-known and is consistent with standard asymmetric information theories of corporate finance. However, the wide range of total debt reveals a previously-unknown property: a strong U-shaped relation for U.S. firms. The average bond financing ratio is lowest for firms with around $10MM to $100MM in debt. Firms with $1MM or less total debt have bond financing ratios similar to firms with $1B in total debt. For most Asian countries, the share of bond debt monotonically increases in total debt. In between are firms in the more financially-advanced Asian markets of Hong Kong SAR, Korea, and Thailand.

Theories building on Diamond (1991) and Rajan (1992) imply that the bond financing ratio is a rough measure of the firm's reliance on debt with less intense lender monitoring. Therefore, firms with an observably high probability of default, as well as firms that are relatively easy to monitor, are more likely to have lower ratios. A simple interpretation of the right side of Fig. 1 is that firms with substantial debt are necessarily large firms, and large firms are less likely to default than small firms. Thus they use more bond debt. At least at first blush, it is difficult to reconcile this logic with the figure's left side.

We use our data sample to reexamine the empirical evidence for such theories. Following the spirit of Rauh and Sufi (2010) and Colla, Ippolito, and Li (2013), we distinguish between debt specialization and diversification. How likely is a firm to use only one of these types of debt, and if so, which one? For firms that diversify their financing by using both types of debt, what determines the relative amount of bond debt? Existing research considering such questions, such as Rauh and Sufi (2010) and Colla et al. (2013), limits the analysis to US firms. Research on cross-country comparisons of corporate financing such as Rajan and Zingales (1995) and Booth, Aivazian, Demirguc-Kunt, and Maksimovic (2001) does not examine the breakdown between bond and loan financing. None of this research studies firms with an extremely wide cross-sectional variation in debt levels.

We fill in these gaps in the literature and arrive at two surprising conclusions. First, a firm's total debt level plays the dominant role at the extensive margin (the firm's decision to specialize in one form of debt). Consider, for example, the probability that a firm has only loan debt, conditioned on the firm's total debt and other variables associated with credit quality and asymmetric information. Depending on the specification, total debt explains between 85 % and 97 % of the fitted variation in this probability. Other firm characteristics associated with asymmetric information are either economically unimportant or are related to the bond/loan choice in ways inconsistent with asymmetric information theories.

Second, firms exhibit a preference to diversify their funding sources when their debt burdens are relatively high. In other words, fixing the amount of debt, higher leverage lowers both the probability that the firm has only loan debt and the probability that the

[1] For ease of communication we occasionally refer to all these as countries, although Hong Kong is a Special Administrative Region (SAR) of China.

firm has only bond debt. For example, if the conditional probability that a firm has only *loan* debt is 0.5, a one standard deviation increase in leverage lowers this probability to about 0.44. If the conditional probability that a firm has only *bond* debt is 0.5, a one standard deviation increase in leverage lowers this probability to about 0.35.

Our view is that market segmentation largely drives the extensive margin. Firms that borrow less money have fewer choices and greater costs of searching for financing, regardless of their credit quality. Supporting evidence comes from an analysis of Asian firms' bond financing ratios. These ratios are regressed on indices measuring countries' financial development and institutional governance (e.g., regulatory quality and the control of corruption). Almost all of the cross-country explanatory power is in a measure of households' access to the banking sector, which we interpret as a proxy for the level of a country's financial sophistication.

We find that implications of asymmetric information theories are consistent with some behavior at the intensive margin. Conditional on a firm borrowing both through loans and bonds, higher leverage, and thus higher credit risk, corresponds to a smaller fraction of bond debt. Among those firms with bond debt, higher leverage, lower revenue, and lower profits all correspond to a greater likelihood of that some of this bond debt is convertible. We also find that in the US, firms with lower credit quality and higher demand for financial flexibility (proxied by accounts payable) have lower average debt maturities. However, these firms do not have lower debt maturities because they use more loans rather than bonds. Instead, they have lower debt maturities because the maturities of their bonds are lower. For firms outside of the US, typical maturities of both bond and loan debt are short regardless of credit quality.

The paper is organized as follows. Section 1 reviews the relevant literature. Section 2 describes the data we use. Section 3 looks at firm financing choices across countries, and uses country-level measures to explain this variation. Section 4 explores the determinants of a firm's choice to specialize in one form of debt—the extensive margin. Section 5 explores the intensive margin, including debt maturities. Concluding comments are in the final section.

1. The state of the literature

Firms borrow by establishing loan facilities and by issuing bonds. We study firms' choices of borrowing mechanisms. Because there are firms in our sample that borrow less than $1 million and firms that borrow more than $10 billion, both the underlying range of debt financing mechanisms and the relevant literature that discusses them are broad. This section describes the range of debt markets and what we know about the intensity of lender monitoring.

Before getting into the details, we note that our empirical approach that distinguishes among debt instruments (loan facilities versus bonds) takes a slightly different perspective from much of the earlier literature, which distinguishes among types of lenders.[2] We do this because our data only cover different types of debt instruments, not which kind of lenders provide the financing. In practice this difference is not large because differences among borrowing mechanisms are closely tied to differences among the lenders.

1.1. An outline of the debt markets

Loan facilities include lines of credit and term loans. In the US, most financing for small businesses, and a substantial amount of all business lending, is done through lines of credit.[3] Large firms often borrow using syndicated loan packages that bundle multiple lending facilities. For example, a syndicated loan might include a 364-day credit line, a longer-term revolving line of credit, and one or more term loans. Term loans have a fixed loan amount and maturity. A small firm typically relies on a single lender for credit lines and term loans.[4]

Lenders for loan facilities are concentrated, avoiding the free-rider problem of diffuse creditors described in Diamond (1984). Loan facilities involve substantial monitoring and renegotiation. For example, Roberts and Sufi (2009) estimate that nearly all loan facilities are renegotiated prior to maturity. Covenants play an important role in monitoring. Sufi (2009) documents that banks tend to restrict access to existing lines of credit when covenants are violated.

Bonds account for most of the aggregate debt financing for US nonfinancial firms.[5] Corporations outside of the US rely more heavily on loan facilities. Chui, Fender, and Sushko (2014) report that among a selection of emerging market economies, bonds on average make up less than a third of corporate sector debt in those economies. This is in line with the debt composition in our sample of firms in nine Asian economies. At the end of fiscal year 2023, Asian firms in our sample had $1.6 trillion of bond debt and $4.4 trillion of loan debt.

Bonds, like term loans, have a fixed amount and maturity. Privately-placed bonds are sold directly to a single lender or a small group of lenders, while publicly-traded bonds are sold to decentralized arm's-length investors. The "private" in private placements limits our ability to study how these instruments are negotiated and placed. Private placements of bonds sold by large borrowers typically use financial intermediaries, primarily commercial and investment banks, to match borrowers with institutional lenders such as insurance companies and pension funds. Since intermediaries advertise their matching success, vendors can collect information on the transactions and make data available on platforms such as DealScan. This part of the private placement market is best known to academics. Much research follows the comprehensive survey of Carey, Prowse, Rea, and Udell (1993) by applying the term

[2] Examples include Carey, Post, and Sharpe (1998), who study corporate loan specialization by banks and by finance companies (using logit models), and Chernenko, Erel, and Prilmeier (2022) who use linear probability models to study the role of nonbank financial intermediaries in providing funding for middle-market firms.

[3] Sufi (2009) estimates that three-quarters of publicly-traded US firms have lines of credit, accounting for more than a quarter of all their debt. Using a comprehensive sample of originated debt agreements, Bradley and Roberts (2015) report 60 % are revolving lines of credit and 24 % are term loans.

[4] Berger and Udell (1998) report that only around one-third of small US firms with loans from financial institutions have borrowed from more than one institution.

[5] From Table L.103 of the 2024Q2 Flow of Funds, nonfinancial corporate bond liabilities totaled about $7.6 trillion and loan liabilities totaled about $5.4 trillion.

"private placement market" exclusively to this intermediated market, or somewhat more broadly to the private placements reported on DealScan or similar platforms. We note exceptions below.

This earlier research establishes that from the perspective of monitoring, privately-placed bonds lie between loan facilities and publicly-traded bonds. Kwan and Carleton (2010) examine all bonds placed with a large life insurance company over a ten-year period. They report that privately-placed bonds have tighter covenant restrictions than publicly-traded bonds. Carey et al. (1993) state that relative to loan facilities, privately-placed bonds are renegotiated less frequently and are monitored less intensively. In addition, privately-placed bonds are typically much more structured than either term loans or publicly-traded bonds. For example, in the sample of Kwan and Carleton (2010), make-whole call provisions are much more common among privately-placed bonds than publicly-traded bonds. They are also more likely to be secured and have embedded puts.

In developed capital markets such as the US, there are debt instruments that blur the lines among publicly-traded bonds, intermediated privately-placed bonds, and term loans. Two prominent examples are Rule 144 A bonds and cov-lite loans. Corporate bonds issued using SEC Rule 144 A are privately-placed bonds that can subsequently be registered for public trading. Fenn (2000) explains that the 144 A market is used primarily by issuers of high-yield bonds who subsequently register the debt. Therefore these bonds are both privately placed and publicly traded, and structured like bonds that are originally issued on the public market. Cov-lite loans are term loans with substantially weaker covenant enforcement than standard term loans. Becker and Ivashina (2016) explain why cov-lite can be viewed as substitutes for high-yield bonds. Prilmeier and Stulz (2020) argue that privately-held firms use cov-lite loans rather than bonds to escape SEC registration requirements.

Individual transactions in this intermediated private placement market range from around $50 million to over $1 billion, and average about $300 million.[6] Many firms do not carry this much debt. As we discuss in detail in our empirical analysis, almost half of the US firms in our sample have total debt exceeding zero and less than $50 million. These firms do not use the intermediated private placement market.

One debt market for such firms is direct lending by nonbank institutional investors. An investment vehicle, such as a private credit closed-end fund, raises funds from institutional investors and lends the proceeds to small and mid-sized companies. Munday, Hu, True, and Zhang (2018) provide an overview of the market. The debt can be structured as a loan facility or a security (a bond), and can be combined with convertibility features. The term "mezzanine finance" is typically used to describe the subset of this market in which small and mid-sized firms sell convertible bonds to private credit funds.

Little transaction-level data exists for the direct lending market. According to survey evidence in Alternative Credit Council (2018), a typical transaction size is around $60 million. The survey also reveals that most of the investment vehicles are based in the US and Europe, with only a small presence in Asia. Loumioti (2022) studies a sample of about 750 transactions with an average size of roughly $100 million. The data are from a vendor that specializes in extensions of credit made by private credit funds. Chernenko, Erel, and Prilmeier (2022) hand-collect data on debt agreements in SEC filings for mid-size firms. The mean transaction size in their sample is $74 million.

Although these transactions are smaller than the average intermediated private placement, they still dwarf the total debt of many firms. In our sample, nearly 30 % of the US firms have total debt less than $5 million. Naturally, these firms tend to be very small. The private placement market for these firms is informal, and research is scant. Examples of private placements of bonds for these firms include promissory notes sold to wealthy individuals and convertible bonds sold to small institutional investors.

1.2. Linking firms' characteristics to financing

Researchers explain financing choices of firms with an abundant collection of theories. Much of this research explores the choice between publicly-traded bonds and all other forms of debt financing. This literature does not (and cannot) distinguish the choice of debt instrument from the choice of lender. On the other side of public bonds are near-atomistic arm's-length investors, and on the other side of all other forms of debt financing are private lending specialists.

Two key determinants of this binary choice are the magnitude of a firm's observable credit risk and the opacity of the firm's financial activities. As emphasized by Diamond (1991) and Rajan (1992), the activities of lending specialists create direct and indirect costs. Since debt of firms with low default risk is informationally-insensitive, observably low-risk firms choose to avoid paying these costs by borrowing from decentralized investors. However, firms that are observably high risk may not benefit sufficiently from screening and monitoring, and thus, they might also borrow from decentralized investors (if they can borrow at all).

Private lenders face capital constraints that do not bind for decentralized investors. Thus large firms are more likely to borrow from public markets. Blackwell and Kidwell (1988) note that fixed costs of debt issuance in public markets induce small firms to borrow from private firms. Fama (1985) points out that since firm size is correlated with information asymmetry, large firms (less private information, higher observable credit quality) are more likely to borrow from decentralized markets than small firms.[7]

Lines of credit, term loans, and privately-placed bonds (aside from 144 A bonds) are all negotiated with specialized lenders. A large and growing literature examines variation across lenders without necessarily tying that variation to specific types of debt instruments. Much of the existing literature focuses on loan facilities. Outside of developed financial markets, the lenders behind these facilities are almost all commercial banks. Jimborean (2018) reports that around 80 % of total credit to the private non-financial sector in emerging markets is made up of domestic bank credit. Therefore research concentrates on US and European markets.

[6] See, e.g., the numbers reported in Sifma (2019) and Voya (2020).

[7] The literature linking financial market access to firm size dates to the 1940s. See, e.g., the references in Fazzari, Hubbard, and Petersen (1988).

One driver of lender variation for loan facilities is risk. Carey, Post, and Sharpe (1998) find that as borrower probability of default increases, the likelihood increases that the lender is a finance company rather than a commercial bank. Carey et al. (1998) suggest that bank capital regulations might drive this result. Similarly, Irani, Iyer, Meisenzahl, and Peydró (2020) attribute the growing role of nonbanks in the loan market after the financial crisis to the effect of bank capital requirements. By contrast, Kashyap, Rajan, and Stein (2002) and Gatev and Strahan (2006, 2009) argue that commercial banks dominate the market for lines of credit because they are better equipped than nonbanks to handle the associated liquidity risk.

Other research studies the type of lender without distinguishing between loan facilities and privately-placed bonds. Using financial statements of US firms, Johnson (1997) introduces a now-standard decomposition of lenders into commercial banks, other private lenders, and arm's-length investors. He concludes that borrower characteristics are strong predictors of the type of private lender. In particular, larger firms use more public bond financing, and less financing from both commercial banks and other private lenders. Denis and Mihov (2003) study new issuances rather than levels, examining a sample of firms that are relatively large. They conclude that firms with low credit risk borrow from the public, firms with medium credit risk borrow from commercial banks, and firms with high credit risk borrow from other private lenders. Arena (2011) argues that their treatment of 144 A bonds drives their result. He studies similar data and concludes that the firms with high credit risk are primarily borrowing through 144 A bonds.

Loumioti (2022) and Chernenko et al. (2022) examine lending to middle-market firms. Both find that firms that borrow from commercial banks are financially stronger than firms that borrow from nonbanks. Loumioti (2022) presents evidence that bank regulatory constraints drive part of this result. More importantly for our purposes, both papers also study properties of the debt instruments. They find that nonbank lenders rely less heavily on covenants and more heavily on warrants, presumably to align the borrower's and lender's incentives. Thus their evidence suggests that among middle-market borrowers, lower-quality firms are more likely to use privately-placed bonds than are higher-quality firms.

2. Firm-level data

We focus on the fraction of a firm's debt financing that is in the form of bonds rather than loans. For firm i in year t, this "bond financing ratio" is

$$R_{i,t} \equiv \frac{\text{Bond Debt}_{i,t}}{\text{Loan Debt}_{i,t} + \text{Bond Debt}_{i,t}}. \tag{1}$$

We therefore require firm-level observations of loan and bond debt obligations rather than simply their sum as reported in, say, Compustat. We also require international coverage of emerging markets.

2.1. Loan and bond data

The S&P Capital IQ Premium Financials database contains the relevant disaggregated debt information. Capital IQ data are from financial statements (income, balance, and cash flows) filed by firms with local regulators. Financial statements data are harmonized by Capital IQ, making it possible to compare data reported under different accounting standards. Data for subsidiaries are consolidated with parents.

We use fiscal-year data for firms in the United States, as well as in the emerging market economies (EMEs) of China, Hong Kong SAR, India, Indonesia, Korea, Malaysia, the Philippines, Singapore, and Thailand. Three motivations drive our regional choice. First, Asia has arguably the most advanced and dynamic corporate bond markets among emerging market regions. For example, across 23 major EMEs, the share of outstanding corporate bonds issued by firms in the nine Asian markets we study rose from 56 % in 2004 to 78 % in 2020.[8] Second, as we document in the empirical analysis, financial development varies widely across these Asian markets. This allows us to contrast the financing behavior of firms operating in the highly advanced financial market of the US with firms operating in a variety of emerging markets. Third, we (the authors) have market contacts that give us some insight into the structure and evolution of Asian debt markets.

Since we study the choice between loan and bond financing, we include only those firm-years in which the firm has debt either in the form of loan facilities or bonds. We exclude financial firms and firms that do not have publicly-traded equity. Capital IQ's coverage of the relevant financial statement information is much less complete prior to 2003 than after, thus our sample includes fiscal years from 2004 through 2023. The Internet Appendix contains details about the dataset and our methods for excluding suspicious observations.

We convert all local currency amounts to US dollars using the prevailing exchange rate on the financial statement date. We use the Consumer Price Index (CPI) to convert the current dollars to 2023:12 dollars.

Since measures of loan and bond debt are central to our analysis, it is important to understand how Capital IQ constructs and reports them. Recall that total debt is composed primarily of four types of borrowing. Firms can borrow money through loan facilities, they can issue short-term securities (original maturities less than a year) such as commercial paper, they can issue longer-term securities which are typically described as either notes or bonds, and they can enter into capital leases. Total debt is reported on the balance sheet, while breakdowns by debt type are reported in the notes to financial statements.

[8] This calculation is based on disaggregated data from Dealogic used in Avdjiev, Burger, and Hardy (2024). We thank Bryan Hardy for making these data available to us.

Capital IQ collects whatever details a firm provides about its debt composition. Actual drawdowns on lines of credit are used rather than the size of the facilities. The dataset includes flags identifying the notes and bonds as convertible, exchangeable, senior, subordinated, and secured. These flags are all based on information provided in the text of the firm's financial statements.

Capital IQ sums the debt from reported loan facilities and labels this sum as bank debt. This is our measure of a firm's debt through loan facilities. Capital IQ also sums the debt from senior bonds, and separately sums the debt from subordinated bonds. We add these sums together to produce our measure of bond debt.

There are limitations to the data, including inconsistencies between balance sheet information and more granular breakdowns of debt. In some cases, the detail provided by a firm in the text of its financial statements cannot be reconciled with the firm's reported total debt on its balance sheet. For example, a firm's year-t financial statements might report $5 million in total debt on its balance sheet, while the statement's notes might report only that the firm in year $t-1$ issued $3 million in 5 % secured bonds and $2.5 million in 7 % unsecured bonds. Presumably the firm has paid down some of this debt between years $t-1$ and t, but the notes do not mention it. Capital IQ will report $5 million in total debt, $5.5 million in bond debt, and since no loans are mentioned, leave blank the field for bank debt.

Firms often report more detail about a debt instrument the first time the instrument appears in the firm's financial statements. Capital IQ carries this detail forward to populate future firm-year records if subsequent financial statements provide less-detailed information. Unfortunately, sometimes this procedure results in double (or even triple) counting by Capital IQ. A small discrepancy in how a particular debt instrument is reported in the financial statements of years $t-1$ and t sometimes results in the instrument appearing twice in year t's debt breakdown.

Accounting complexities often create small wedges between the value on the balance sheet of a debt instrument and the value reported in Capital IQ's disaggregated components. For example, sometimes unamortized debt issuance costs are included in one category but not the other. From the perspective of Capital IQ, this is a feature rather than a bug. Other discrepancies arise because of apparent errors in a firm's financial statements. For example, occasionally the text in a firm's financial statement will describe a debt instrument, yet this debt instrument is not included in the debt on the firm's balance sheet. Capital IQ nonetheless reports the instrument in its detailed breakdown of the firm's debt.

A simple, somewhat crude way to judge the magnitude of these discrepancies is to compare the sum of loan and bond debt reported by Capital IQ to the total debt on the balance sheet. Table A1 in the Internet Appendix reports statistics for this ratio for the roughly 230,000 firm-year observations from 2004 through 2023. Over 13 % of the observations have a ratio greater than one. Although at first glance this statistic suggests substantial measurement error throughout the dataset, the table reports that less than half of these high-ratio observations exceed 1.02. In our empirical work we exclude all firm-year observations for which this ratio exceeds 1.02, to reduce contamination from measurement error.

Some of our empirical analysis emphasizes the role of convertible bonds in firms' capital structures. Capital IQ reports the sum of a firm's convertible bond debt. However, another "feature" of the dataset is that this sum does not include all of a firm's bonds that are convertible. We use the instrument-level data in Capital IQ to construct our own sum of a firm's convertible bond debt, replacing the one provided by Capital IQ. We use this sum only to determine whether the firm has any convertible bond debt.

2.2. Other firm-level data

We gather other data from Capital IQ. A large literature explains a firm's capital structure using firm characteristics. Our analysis across developed and emerging markets, as well as large and small firms, prevents us from closely following techniques developed in earlier research that are appropriate for large firms and/or developed financial markets. We do not use stock returns to construct proxies for either credit quality or asymmetric information because the vast majority of firms in our sample do not have actively traded stock. For example, the sample includes pink sheet stocks in the US and B Group stocks listed on India's Bombay Stock Exchange (BSE). Less than 30 % of the firm-year observations for the US have a credit rating from either Moody's or S&P, and very few of these credit ratings are available for firms in the bottom half of the size distribution (measured by market equity plus book debt). Only a handful of observations for firms outside of the US have credit ratings.

Moreover, we do not have analysts' earnings forecasts for the firms, nor do we have ages of firms. Information in financial statements is more limited for firms outside of the US than for those in the US. We do not observe equity issuance or dividends, so we cannot examine equity financing. For most of the firms we cannot calculate either EBITDA or interest coverage as proxies for observable credit quality, nor can we use expenditures on research and development as a proxy for the difficulty of monitoring a firm's financial health.

2.2.1. Proxies for financing requirements and credit quality

A firm's choice of bond financing in year t depends on its year-t financing requirements. We use a firm's total debt in year t to measure the level of its funding requirements and its year-t leverage to measure its relative funding requirements. Leverage is total debt on a firm's balance sheet divided by market assets. Market assets are defined as the market capitalization of equity plus book value of liabilities (i.e., book value of assets minus book value of equities).[9]

[9] We use market capitalization of equity plus book value of liabilities to measure total assets because this is one of the most common ways in corporate finance to measure firm value.

Loan facilities, especially lines of credit, are typically viewed as more flexible forms of financing than bonds. Components of a firm's net working capital (NWC) convey information about the desire for flexibility. After exploring empirically the three key components of net working capital (accounts receivable, accounts payable, and inventories), we concluded that the ratio of accounts payable to market assets summarized this information. We use the mean, from years $t-5$ to $t-1$ of this ratio as a proxy for the desire for flexibility. Variables such as the standard deviation of NWC relative to assets, the ratios of NWC to either assets or sales, and the ratios of the absolute value of NWC to either assets or sales contain little additional information.

Of course, total debt and leverage both convey information about a firm's financial health beyond just the firm's financing requirements. Total debt is highly correlated with firm size. Both firm size and leverage are closely tied to both observable credit quality and monitoring difficulty. Larger firms are less likely to default than smaller firms, and are less opaque than smaller firms. Activities of larger firms are easier for outsiders to observe. All else equal, greater leverage corresponds to a greater likelihood of default. We next discuss additional proxies for monitoring effectiveness and credit risk.

2.2.2. Additional proxies for monitoring effectiveness

Firm-level observables related to credit quality are also typically associated with monitoring effectiveness. Effective monitoring requires that lenders determine when a firm gets into financial difficulty. The higher a firm's baseline level of revenue and net income, the easier the lender's job becomes. If a firm's revenue and profitability are consistently low—say, a firm's line of business consists of developing a new biomedical product that is not yet on the market—lenders cannot rely on declining revenue or profitability as measures of financial difficulty.

The above logic suggests that firms with higher average revenue and profitability are more likely to use bank loans, taking advantage of banks' ability to monitor. However, holding all else equal, such firms will have higher credit quality than firms with lower average revenue and profitability. Thus these firms are less in need of monitoring, and we cannot *a priori* sign the relation between revenue (or profitability) and the composition of a firm's debt.

Similar logic applies to the level of a firm's tangible assets. Monitoring is also more effective when a firm's assets are primarily tangible, and thus more valuable as collateral. High tangibility corresponds to better monitoring and lower credit risk. Again, we cannot *a priori* sign the relation between tangibility and debt composition.

We use three proxies for monitoring effectiveness. They are averages, over the past five years, of revenue to market assets and net income to market assets, and the ratio of property, plant, and equipment (PPE) to market assets. In preliminary empirical work, we considered a variety of other variables plausibly related to either credit quality or monitoring effectiveness. None had substantial incremental explanatory power for the financing choices of firms. These include the standard deviation of net income to assets, the level of intangibles to assets, and the market to book ratio.

We make no claim that the variables we include in our empirical analysis are more "fundamental" in any sense than those that we exclude. We take the perspective that some underlying latent factors summarize credit quality and monitoring effectiveness, and observed firm-level characteristics are more or less correlated with these underlying factors.

3. A country-level perspective

As previously discussed in the context of Fig. 1, firms in some countries, such as the US, are much heavier users of bond debt than firms in other countries. This section provides more detail and argues that the variation apparent in Fig. 1 is predominantly associated with the general level of financial sophistication in a country, as proxied by household access to banks.

3.1. Country-level summary statistics

Table 1 provides a country-level summary of firm-level observations of market assets (market equity plus book debt), leverage, the bond financing ratio, and an additional debt ratio for the sample spanning 2004 through 2023. Firm size, as measured by market assets, varies widely across and within markets. Only China, which has particularly restrictive listing requirements for publicly-traded firms, does not have a substantial number of firms with less than $100 million in market assets (2023 dollars). The smallest firms are in India and the United States, and of course the largest are in the United States.

Leverage, defined as total debt relative to market assets, also varies widely. Its average within a given market is lowest for Chinese firms (mean of 0.16) and highest for Indian firms (0.32). Aside from China, the 90th percentile of market leverage in each market is at least 0.5. Recall that firms with zero leverage are not in the sample. Almost all of this debt is either in the form of loans or bond debt. (Recall these forms of debt exclude commercial paper and capital leases.) The rows labeled "Loan + Bond Ratio" refer to the ratio of these two components to total debt. This ratio is in the neighborhood of 0.85 to 0.95 for most firms.

The table documents the well-known fact that US firms rely much more heavily on bond financing than do Asian firms. More than a quarter of US firm-years have only bond debt. By contrast, the typical Asian publicly-traded firm has debt only through loan facilities. The median bond financing ratio in the US is almost 0.6, while for every Asian country, median bond financing is zero. More than three-fourths of the firms in each of China, India, Malaysia, and Singapore use only loan facilities.

3.2. Determinants of country level variation

The discussion below provides a standard overview of sources of cross-country variation in financing. It also describes how we incorporate cross-country variation in the empirical analysis of Section 4.

Table 1
Summary statistics, 2004–2023.

Market	Number of firm-years	Statistic	Mean	Percentiles				
				10	25	50	75	90
China	43,188	Market Assets	5074	401	727	1435	3342	8.442
		Leverage	0.16	0.01	0.04	0.11	0.24	0.38
		Loan + Bond Ratio	0.94	0.81	0.95	1.00	1.00	1.00
		Bond Financing Ratio	0.09	0.00	0.00	0.00	0.00	0.35
Hong Kong SAR	13,362	Market Assets	3681	46	108	306	1161	5219
		Leverage	0.25	0.03	0.09	0.21	0.39	0.53
		Loan + Bond Ratio	0.89	0.61	0.91	0.99	1.00	1.00
		Bond Financing Ratio	0.15	0.00	0.00	0.00	0.14	0.71
India	41,131	Market Assets	1004	5	14	54	269	1282
		Leverage	0.32	0.03	0.12	0.30	0.49	0.66
		Loan + Bond Ratio	0.81	0.39	0.72	0.92	1.00	1.00
		Bond Financing Ratio	0.04	0.00	0.00	0.00	0.00	0.10
Indonesia	5183	Market Assets	1278	27	70	247	905	2850
		Leverage	0.28	0.03	0.10	0.24	0.42	0.58
		Loan + Bond Ratio	0.92	0.75	0.94	1.00	1.00	1.00
		Bond Financing Ratio	0.12	0.00	0.00	0.00	0.03	0.54
Malaysia	13,127	Market Assets	851	23	46	119	373	1385
		Leverage	0.26	0.03	0.10	0.23	0.40	0.54
		Loan + Bond Ratio	0.89	0.64	0.87	0.97	1.00	1.00
		Bond Financing Ratio	0.08	0.00	0.00	0.00	0.00	0.36
Philippines	2492	Market Assets	2511	31	92	321	1657	7198
		Leverage	0.24	0.03	0.08	0.21	0.35	0.52
		Loan + Bond Ratio	0.86	0.47	0.85	0.99	1.00	1.00
		Bond Financing Ratio	0.13	0.00	0.00	0.00	0.13	0.55
Singapore	7343	Market Assets	1445	29	61	161	664	2814
		Leverage	0.26	0.04	0.10	0.23	0.39	0.55
		Loan + Bond Ratio	0.88	0.61	0.86	0.98	1.00	1.00
		Bond Financing Ratio	0.07	0.00	0.00	0.00	0.00	0.29
Korea	18,850	Market Assets	2549	66	116	258	795	3372
		Leverage	0.26	0.03	0.10	0.23	0.40	0.54
		Loan + Bond Ratio	0.90	0.66	0.92	1.00	1.00	1.00
		Bond Financing Ratio	0.19	0.00	0.00	0.00	0.31	0.68
Thailand	7422	Market Assets	1388	35	71	193	677	2383
		Leverage	0.26	0.03	0.10	0.24	0.40	0.55
		Loan + Bond Ratio	0.89	0.62	0.91	0.99	1.00	1.00
		Bond Financing Ratio	0.19	0.00	0.00	0.00	0.34	0.71
United States	62,205	Market Assets	11,506	12	60	836	5417	20,704
		Leverage	0.23	0.02	0.07	0.18	0.33	0.50
		Loan + Bond Ratio	0.90	0.68	0.90	0.99	1.00	1.00
		Bond Financing Ratio	0.51	0.00	0.00	0.58	1.00	1.00

The sample consists of yearly observations of nonfinancial firms with publicly-traded equity and either loan debt, bond debt, or both. These statistics combine all observations for fiscal years 2004 through 2023. Market assets, defined as the sum of stock market capitalization and total liabilities, are in millions of 2023 US dollars (CPI adjusted). Loan + Bond Ratio is the sum of loan debt and bond debt divided by total debt. Leverage is total debt divided by market assets. The bond financing ratio for a firm is the ratio of the firm's bond debt to the sum of the firm's loan debt and bond debt.

Cross-country differences in financial infrastructure are closely correlated with firms' financing choices. In most of the Asian economies that we study, markets for publicly-traded corporate bonds are in the early stages of development. An exception is Korea, which has a sizeable and well-developed corporate public bond market driven by its large exporters and financial firms. In addition, the trading centers of Hong Kong SAR and Singapore have robust markets used for financing by large multinational firms.

According to our market sources, the private bond market in Asia has seen some growth in recent years but still remains very limited. Moreover, most of the growth in this sector has taken place in the more developed markets (Hong Kong SAR, Singapore, Korea) where private bond issuance can account for 10 %–15 % of total bond issuance volumes. Typical investors in the private bond market include life insurers, asset managers and specialized investors.

Thus not surprisingly, market participants confirmed for us that small Asian firms almost exclusively rely on banks for financing. As they grow, they tend to progress from typical bank facilities such as overdrafts to syndicated loans and finally to public bond financing. An Asian firm with an annual turnover of around half a billion dollars would be a typical candidate to start looking at public bond financing.

Of course, differences in bond market infrastructure do not spring out of nowhere. Economic environments of countries differ along many dimensions that affect firms' financing decisions. The literature review of Fan, Wei, and Xu (2011) groups these differences at the country-institution level (i.e., laws, government regulations, social culture), the markets level (i.e., financial intermediaries, primary and secondary trading), and the firm level (i.e., corporate governance and ownership structures).

Table 2
Bond financing, financial development, and governance.

Explanatory variable	Regression			
	[1]	[2]	[3]	[4]
Constant	0.100***	0.100***	0.100***	0.100***
	(0.003)	(0.003)	(0.003)	(0.003)
Fin. institution depth	0.002			
	(0.010)			
Fin. institution access	0.038***		0.037***	0.048***
	(0.004)		(0.004)	(0.003)
Fin. institution efficiency	−0.004			
	(0.003)			
Fin. market depth	−0.016**		−0.013***	
	(0.006)		(0.003)	
Fin. market access	0.024***		0.032***	
	(0.007)		(0.007)	
Fin. market efficiency	0.010***		0.008***	
	(0.003)		(0.003)	
Voice/accountability		0.000		
		(0.003)		
General governance quality		0.027***	−0.008	
		(0.003)	(0.007)	
R^2	0.049	0.014	0.049	0.044

The sample consists of yearly observations of nonfinancial firms with publicly-traded equity and either bond debt, loan debt, or both. The firms are located in any of nine Asian countries. Annual indices of the countries' financial development and governance, from the IMF and the World Bank respectively, are described in the text. The indices are standardized to zero mean and unit variance. The table reports results from regressing firm-year ratios of bond debt to the sum of bond and loan debt on the corresponding country-level indices. The sample period is 2004 through 2021, with 136,602 firm-year observations. The text discusses calculation of the standard errors. Two and three asterisks denote statistical significance at two-sided 5 % and 1 % levels respectively.

We explore the relation between bond financing ratios and country-level measures of financial development and governance. Our analysis is on the spirit of Beck, Demirguc-Kunt, Laeven, and Maksimovic (2006), who regress firms' self-reported obstacles to financing on country-level governance indices. Six financial market development indices are from the International Monetary Fund (IMF), described in detail by Svirydzenka (2016). Six governance indices are from the World Bank, described in detail by Kaufmann, Kraay, and Mastruzzi (2010). All indices are annual values. The IMF indices range from zero to one, while the World Bank indices are standardized to approximately zero mean and unit variance. The IMF data end in 2021 and the World Bank data end in 2022.

Since we have only ten countries and twelve indices, some judicious data-pruning is in order. Across our ten countries, five of the six World Bank governance indices are very highly correlated.[10] We therefore compress these five indices, using the mean index value of "Political Stability and Absence of Violence/Terrorism," "Government Effectiveness," "Regulatory Quality," "Rule of Law," and "Control of Corruption." (Recall the indices have equal scales.) "Voice and Accountability" is the other governance index.

We regress the bond financing ratio $R_{i,t}$ as defined in (1) on development and governance indices for the firm's country and year. We exclude US firms because otherwise the parameter estimates are driven entirely by the large gaps between US and Asian firms in both bond financing ratios and financial development. Instead, we ask the coefficients to explain variations in bond financing ratios across Asian countries. This is a more difficult challenge. (Including US firms produces R^2s exceeding 0.25, rather than the substantially smaller R^2s reported below.)

Statistical inference must recognize that a firm in our sample in, say, 2015, is also likely to be in our sample both before and after 2015. Therefore the assumption of independent draws is untenable. We use an ad hoc method to correct for this dependence by first calculating the covariance matrix of parameter estimates as if the observations were independent. We then multiply this matrix by the number of years, which is 18 for these regressions. Standard errors for all of the regressions estimated in the paper are adjusted using the same technique. Our adjustment would be exact if, for a total number of firm-year observations N from 2004 through 2021, our sample consisted of observations of $N/18$ firms sampled in each of the 18 years, where firm-year observations are independent across firms and perfectly correlated for a single firm across time.

Results for four different combinations of indices are in Table 2. The explanatory variables are all normalized to mean zero and variance one to simplify interpretation of the estimated coefficients. Broadly speaking, the evidence indicates that bond financing ratios are higher in countries with greater financial access for both households and typical (i.e., not the largest) firms.

Regression [1] includes only financial development indices. The largest coefficient is on "Financial institution access." The IMF measures this by combining the number of bank branches and the number of ATMs per 100,000 adults. A one standard deviation

[10] Details are in the Internet Appendix.

increase in the index corresponds to an increase in the bond financing ratio of 3.8 percentage points. At first glance it might appear odd that greater banking activity corresponds to a smaller share of loans in firm financing. But this index is primarily about household access to financial institutions, and thus indirectly a measure of a country's average financial sophistication.

The next largest coefficient is on "Financial markets access," which combines the fraction of stock market capitalization outside of the top 10 companies and the total number of issuers of debt across nonfinancial and financial corporations. This index roughly measures access of small and medium-sized firms to financial institutions.

The other financial development indices used in Regression [1] primarily measure aggregate levels, such as total pension fund assets, total government debt, total debt of financial corporations, and total debt of nonfinancial corporations (all scaled by GDP). They also measure stock market capitalization and trading volume. The coefficient point estimates are all economically small, two have the wrong sign, and two are statistically indistinguishable from zero.

The weak relevance of aggregate financial development is perhaps surprising. Policymakers focus much attention on developing the infrastructure of primary and secondary bond markets. For example, Chan, Chui, Packer, and Remolona (2011) discuss how primary corporate bond markets in Asia can benefit from the development of active secondary markets. Amstad, Kong, Packer, and Remolona (2016) evaluate the state of Asian markets for publicly-traded corporate bonds and discuss proposed initiatives to improve them. Yet even in the US, relatively few firms have credit requirements sufficiently large to turn to public debt markets. For the typical firm in Asia, access to bond financing requires a private bond market.

Regression [2] in Table 2 includes only governance indicators. The average of five indices, labeled "General governance quality," is strongly positively associated with the bond financing ratio. A one standard deviation increase in the index corresponds to an increase in the bond financing ratio of 2.7 percentage points. Qualitatively, this result aligns with Beck, Demirguc-Kunt, Laeven, and Maksimovic (2006), who find that the same governance data help explain variations in firms' self-reported obstacles to financing.

The explanatory variables in Regression [3] are all the indices with estimated coefficients in either Regression [1] or Regression [2] that differ statistically from zero. The estimated coefficients show that the financial development indices largely capture the information in the general governance quality index. The insignificance of the governance index is not surprising. Higher-quality governance does not, by itself, allow firms to more easily sell bonds. Instead, it encourages the expansion of financial infrastructure, providing more access to households and firms. Greater access leads to greater bond financing by small and medium-sized firms.

We use these regression results to rank countries by their implied bond financing ratios. Since there are no firm-specific variables in these regressions, their fitted values are identical for all firms in a given country. Therefore the regression produces country-level fitted values of the bond financing ratio (1) year-by-year from 2004 through 2021. We average these yearly estimates country-by-country. The three countries with the highest yearly averages are Korea, Thailand, and Hong Kong SAR. This ranking matches the ranking of sample mean firm-year bond financing ratios reported in Table 1.

Regression [4] uses only the financial institution access index. The table's final row shows that this single variable, with an R^2 of 0.044, accounts for much of the R^2 of 0.049 associated with the set of five indexes used in Regression [3]. The mean annual values of this index over the 2004 through 2021 sample range from about 0.19 (both Philippines and India) to 0.7 (Korea). Recall that the US is not included in this sample. Its corresponding time series mean is a little less than 0.9.

3.3. From the country level to the firm level

The flavor of the above discussion is that governance affects infrastructure which affects financing. Reality is more complicated because governance and infrastructure affect other firm characteristics. Booth, Aivazian, Demirguc-Kunt, and Maksimovic (2001) discuss how cross-country differences in capital structure can be driven by country-level differences across firms in the tangibility of assets, volatility of returns on assets, and growth opportunities.

The next section uses firm-level variables to explain variations across firms in their bond financing ratios. We control for country-level differences primarily by estimating regressions for three groups of countries: the US, the three Asian markets of Korea, Thailand, and Hong Kong SAR, and the remaining six Asian countries. The split among Asian countries is based on the results of this section. The first three markets have both the highest sample mean bond financing ratios and the highest levels of relevant financial development. We also explore pooling firms across all Asian countries, using the financial institution access index to capture differences in development across the countries.

To simplify language, we sometimes refer to Korea, Thailand, and Hong Kong SAR as the 'advanced' Asian countries. This should be interpreted narrowly, referring only to the bond market for local firms.

4. Debt specialization

What firm-level properties explain differences across firms in their use of loans and bonds? We roughly follow Rajan and Zingales (1995), who take a reduced-form approach to explaining cross-firm variation in total leverage. The bond financing ratio defined in (1) is inversely related to the intensity of monitoring of a firm's debt. As the literature summarized in Section 1 explains, the monitoring intensity of both loan facilities and bond debt varies across firms. Large, well-capitalized firms face low monitoring with syndicated loans, especially those sold to institutional investors. They face effectively no monitoring with their publicly-traded bonds. By contrast, small, opaque firms are monitored by holders of their privately-issued bonds and aggressively monitored by banks that supply their lines of credit. Yet for any given firm, the numerator in (1) represents less-monitored debt relative to its overall debt.

In Rajan and Zingales (1995), leverage for firm i at time t is specified as an affine function of firm characteristics,

$$\text{Leverage}_{i,t} = \beta_0 + \beta_1' s_{i,t} + e_{i,t}, \tag{2}$$

where $s_{i,t}$ is the vector of characteristics. An important difference between leverage and the bond financing ratio is that the latter is often either zero or one. Thus we can fruitfully investigate both the choice to specialize—use a single type of debt—and the choice of bond financing ratio when using both loans and bonds. Both Rauh and Sufi (2010) and Colla et al. (2013) study debt specialization, although they take a much more disaggregated approach to debt composition than we do.

The relevant decomposition of the bond financing ratio into specialization and diversification terms is

$$E\left(R_{i,t}|s_{i,t}\right) \equiv \Pr\left(R_{i,t}=0|s_{i,t}\right)\cdot 0 + \Pr\left(R_{i,t}=1|s_{i,t}\right)\cdot 1 + \left(1-\Pr\left(R_{i,t}=0|s_{i,t}\right)-\Pr\left(R_{i,t}=1|s_{i,t}\right)\right) E\left(R_{i,t}|s_{i,t}, 0<R_{i,t}<1\right). \quad (3)$$

The decomposition of (3) distinguishes among the cases of all loan debt, all bond debt, and a combination of the two.

Theories of debt choice imply that the bond financing ratio depends on the magnitude of the firm's financing needs, the firm's observable credit quality, the ability of lenders to monitor the firm, and firm's desire for financial flexibility. As with all of the empirical work that studies these determinants, our choice of proxies is constrained by available data.

4.1. A bird's eye look at debt specialization

Much of the analysis to follow focuses on the relation between a firm's total amount of debt and its choice of financing. Fig. 2 provides some visual detail. We separate firm-years into four types based on their financing. The first three involve some type of debt specialization. One consists of firm-years that have loan debt and no bond debt. We refer to these as "only loan debt" observations, a label that ignores any debt these firms might have that is neither loans nor bonds. We split the firms that have no loan debt into two types. One has only nonconvertible bond debt. The other has some bond debt that the database flags as either convertible or exchangeable. The fourth type of firm-year uses diversified financing. These observations have both loan debt and bond debt.

Recall from Section 3.2 that we sort firms into those in the US, those in advanced Asian countries (Hong Kong SAR, Korea, Thailand), and those in other Asian countries (China, India, Indonesia, Malaysia, Philippines, Singapore). For each group, we sort the firm-year observations from 2004 through 2023 into ten bins by deciles of total debt. Within each decile, we calculate the fractions of firm-years that are in each of the four types described in the previous paragraph. Fig. 2 displays, for each country group and decile bin, these fractions. The clearest message conveyed by Fig. 2 is that financing patterns in the US differ widely, both across debt levels in the US and from the other geographic regions.

In both Asian groups, the fraction of firms that use entirely loan financing decreases monotonically with total firm debt. This pattern is roughly compatible with theories of debt choice in Hackbarth, Hennessy and Leland (2007) and Becker and Josephson (2016). They develop models in which most firms borrow from banks. Bank debt allows firms to take advantage of the monitoring and more flexible renegotiation associated with loan facilities. Since public debt markets are deeper than banks' pockets, firms with substantial financing requirements also borrow using bonds. In these theories the level of debt at which a firm switches from all-loan financing to a mix of loans and bonds depends on the value to the borrower of monitoring and renegotiation, as well as the borrower's bargaining power.

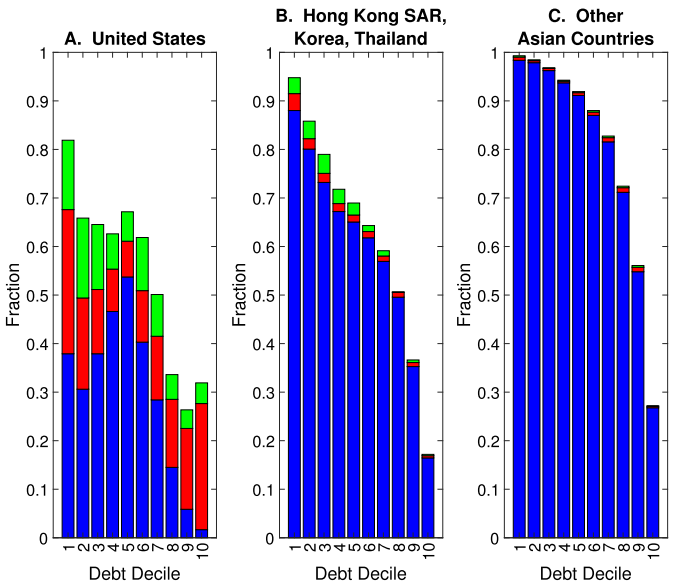

Fig. 2. Fractions of firms that use a single type of debt financing, 2004 through 2023. For a given region, firms with publicly-traded equity and either loan debt, bond debt, or both, are sorted into ten groups based on their total debt (1 = smallest). Blue columns are the fractions of firms that use only loan debt, red columns are the fractions that use only nonconvertible bond debt, and green columns are the fractions that use only bond debt, of which some is convertible. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Yet not all of the patterns in Fig. 2 are consistent with this type of story. For both Asian groups, firms with the smallest amount of debt are more likely to borrow exclusively through bonds than are firms with substantially more debt. This pattern is clear for the more advanced Asian countries. Only a keen eye will detect that it also holds for the other Asian countries. More strikingly, these theories appear to have nothing in common with the financing patterns in Fig. 2 for US firms. In the US, the fraction of firms that use only loans reaches a high of 50 % at about the fifth decile of total debt. The fraction is close to zero for the largest debt levels and around 30 %–40 % for very small debt levels.

4.2. Debt specialization versus diversification

Here we argue that the choices of firms to specialize in one form of debt are largely driven by size-based market segmentation and firms' desire to diversify funding sources when their debt burdens are relatively high. Asymmetric information concerns play a small role. Market segmentation is created by costs of market participation, such as the fixed costs of issuing publicly-traded bonds and the search costs of locating a few institutional investors to collectively lend $100 million in the form of a syndicated loan or privately-placed bonds.

Three empirical observations support our argument. First, firms' choices to finance with loans and/or bonds are closely associated with their amount of debt, and in ways that are consistent with market segmentation. Second, firms with relatively high levels of debt financing (i.e., high leverage) tend to avoid specializing in either form of debt. Third, observable measures of credit quality and monitoring effectiveness explain relatively little of the variation in firms' financing choices, at least in ways consistent with asymmetric information logic.

We follow the decomposition of a firm's bond financing (3) by specifying a logistic regression for the probability that a firm has only loans (thus no bonds), another logistic regression for the probability that a firm has only bonds (thus no loans), and an ordinary least-squares regression for the fraction of a firm's debt that is in the form of bonds, conditional on the firm having some loans and some bonds. This section focuses on the logistic regressions.

4.2.1. The decision to use only loan financing

We first consider why firms choose to borrow only in the form of loans rather than bonds. Recall from definition (1) the bond financing ratio for firm-year i,t, $R_{i,t}$. A logistic regression, evaluating the probability that a firm has no bond debt, is

$$\log\left(\frac{\Pr(R_{i,t}=0|s_{i,t};\beta_0,\beta_1)}{\Pr(R_{i,t}>0|s_{i,t};\beta_0,\beta_1)}\right)=\beta_0+\beta_1' s_{i,t}, \tag{4}$$

where $s_{i,t}$ is a vector of variables we use to interpret firms' financing choices.

We know from Fig. 2 that a firm's total debt is closely associated with the probability that the firm has only loans rather than bonds, and that this relation is not necessarily monotonic. Therefore $s_{i,t}$ includes a nonlinear specification of debt. Denote the log of total debt for firm-year i,t as $d_{i,t}$. Define

$$\tilde{d}_{i,t}\equiv d_{i,t}-\overline{d_{i,t}}, \tag{5}$$

where the sample mean is across all firm-year observations of log debt used in the regression. The first through third powers of demeaned log debt are in $s_{i,t}$.

Denote market assets (book debt plus market equity) for firm-year i,t as $MA_{i,t}$. Denote accounts payable as $AP_{i,t}$, revenue as $REV_{i,t}$, net income as $NI_{i,t}$, and property, plant, and equipment as $PPE_{i,t}$. The complete vector of explanatory variables is

$$\begin{aligned} s_{i,t}=\Bigg(&\tilde{d}_{i,t}\quad \tilde{d}_{i,t}^2\quad \tilde{d}_{i,t}^3\quad \frac{D_{i,t}}{MA_{i,t}}\quad \frac{1}{5}\sum_{h=1}^{5}\frac{AP_{i,t-h}}{MA_{i,t-h}}\cdots\\ &\frac{1}{5}\sum_{h=1}^{5}\frac{REV_{i,t-h}}{MA_{i,t-h}}\quad \frac{1}{5}\sum_{h=1}^{5}\frac{NI_{i,t-h}}{MA_{i,t-h}}\quad \frac{PPE_{i,t}}{MA_{i,t}}\Bigg)'. \end{aligned} \tag{6}$$

All of the explanatory variables are winsorized at the 1st and 99th percentiles. The final five variables (i.e., other than powers of demeaned debt levels) are standardized to mean zero and unit variance.

Debt market segmentation is connected to a country's overall financial development. We first explore connections between debt specialization and a country's financial development. Following Section 3.2, we sort firms into those in the US, those in advanced Asian countries, and those in less-advanced Asian countries. Regression (4) is estimated separately on the US panel, on pooled panels of Hong Kong SAR, Korea, and Thailand, and on pooled panels of the other Asian countries. Later in this section we put more structure on the role of financial development.

Parameter estimates for (4) are reported in Table 3. Standard errors are adjusted as described in Section 3.2. We draw three main conclusions from the results. First, a firm's total debt level is the primary driver of the firm's decision to use any bond debt. Second, firms that are easier for lenders to monitor (as measured by proxies for monitoring effectiveness) are more likely to use only loan financing. Third, firms with higher leverage are *less* likely to use only loan financing. This economically strong relation is inconsistent with theories of Hackbarth et al. (2007) and Becker and Josephson (2016) that draw a connection from high leverage to high default risk to a greater preference for loan financing. We discuss these conclusions in turn.

The amount of debt largely determines whether a firm chooses to use only loan debt rather than some bond debt. Other explanatory variables take a back seat. This is not immediately obvious from the estimated parameters in Table 3, thus we summarize the

Table 3
The decision to use only loan financing.

Explanatory variable	United States (42,059 obs)	More advanced Asian markets (26,679 obs)	Less advanced Asian markets (75,401 obs)
Constant	−0.469***	0.571***	2.123***
	(0.083)	(0.078)	(0.073)
Demeaned debt	−0.500***	−0.437***	−0.702***
	(0.040)	(0.066)	(0.050)
(Demeaned debt)^2	−0.146***	−0.029**	−0.039***
	(0.019)	(0.013)	(0.010)
(Demeaned debt)^3	−0.011***	−0.004	0.004
	(0.003)	(0.004)	(0.003)
Leverage	−0.249***	−0.208**	−0.277***
	(0.069)	(0.083)	(0.060)
Average accounts payable/assets	−0.174**	−0.011	0.085
	(0.074)	(0.085)	(0.068)
Average revenue/assets	0.177**	0.120	0.293***
	(0.072)	(0.089)	(0.082)
Average profit/assets	0.196***	0.450***	−0.065
	(0.059)	(0.070)	(0.063)
Property, plant, and equipment/assets	0.051	0.188***	0.101*
	(0.064)	(0.071)	(0.057)

The sample consists of yearly observations of nonfinancial firms with publicly-traded equity and loan debt. Logistic regressions specify the probability that the firm has only loan debt, relative to the probability that the firm has some bond debt. The table reports parameter estimates with standard errors in parentheses. Positive coefficients imply that higher values of the explanatory variable correspond to a higher probability that the firm has only loan debt. The text discusses calculation of the standard errors. "Demeaned debt" equals the firm-year log total debt less the mean log debt across all firm-year observations for the given geographic region. All explanatory variables are winsorized at their 1st and 99th percentiles. All but the debt level variables are normalized to mean zero and variance one. The sample period is 2004 through 2023. One, two, and three asterisks denote statistical significance at two-sided 10 %, 5 %, and 1 % levels respectively.

information in two other ways. First, we decompose the total sample variance of the regression (4) fitted values into a component attributable to the powers of demeaned log-debt, a component attributable to all other variables, and their covariance. Second, we calculate estimate-implied probabilities that a firm has some bond debt conditional on given levels of total debt. This exercise varies the firm's debt level while holding all other firm-level variables at their sample means. Details of both calculations are in the Internet Appendix.

Panel A of Table 5 reports the variance decomposition. For the groups of Asian countries, variation in debt levels explains over 75 % of the variance in fitted log probabilities. The corresponding fraction for the US market is more than 96 %. Fig. 3 displays fitted probabilities that a firm has some bond financing, rather than all-loan financing. It also displays plus/minus two standard error bounds on these fitted probabilities. The convex relation between probabilities and debt levels for US firms is consistent with the convex relation in Fig. 1 between bond financing ratios and debt levels for US firms. US firms on the right side of Fig. 3 sell bonds in public bond markets. US firms on the left side—at least those that issue bonds—sell these bonds to either wealthy individuals or to funds that specialize in purchasing bonds of small companies.

Market segmentation is the simplest explanation for the importance of total debt. Asian firms that borrow substantial amounts of money are able to use public bond markets. Access to these public bond markets dries up for firms borrowing smaller amounts. Hong Kong SAR, Korea, and Thailand have better-developed capital markets. Thus fixing the amount of debt, a firm in one of these regions is more likely to use the public bond market than is a firm in another Asian market. Firms shut out of this market must turn to the loan market because markets for privately-placed bonds are limited.

Market segmentation also exists in the US, but some type of bond market is available for all firms, regardless of their total debt. US firms that borrow substantial amounts of money use low-cost public bond markets. Firms that borrow less money are locked out of public bond markets. They can, however, issue bonds that are privately placed with large financial institutions. Firms can choose to issue bonds that are convertible into equity. The firms that borrow only a few million dollars can also place convertible and nonconvertible bonds privately, although not with large institutions.

As discussed in Section 2.2.2, lenders are better able to monitor firms when those firms have higher average revenues and profits. Monitoring is also more effective when firms have more tangible assets. However, higher revenues, profits, and tangible assets also correspond to lower credit risk. Therefore theory cannot sign these variables. Estimates in Table 3 reveal that higher values of these variables correspond to higher probabilities that firms use only loan financing. The details are mixed, although the overall message is clear. For example, average revenue and profits are most important for the financing choices of US firms, while average profits and PPE matter more for the financing choices of firms in more advanced Asian countries.

Table 4
Household financial access and loan-only financing.

Explanatory variable	2004–2021 (89,960 obs)	2004–2012 (29,632 obs)	2013–2021 (60,328 obs)
Constant	1.546***	1.587***	1.577***
	(0.049)	(0.059)	(0.046)
Access index	−0.584***	−0.561***	−0.662***
	(0.046)	(0.055)	(0.041)
Demeaned debt	−0.647***	−0.626***	−0.679***
	(0.025)	(0.031)	(0.023)
Debt x Access	0.109***	0.041	0.148***
	(0.023)	(0.028)	(0.021)
Leverage	−0.249***	−0.182***	−0.280***
	(0.047)	(0.056)	(0.043)
Average accounts payable/assets	0.119**	−0.005	0.166***
	(0.053)	(0.065)	(0.046)
Average revenue/assets	0.087	0.217***	0.070
	(0.057)	(0.071)	(0.051)
Average profit/assets	0.258***	0.239***	0.279***
	(0.043)	(0.053)	(0.038)
Property, plant, and equipment/assets	0.105**	0.083	0.139***
	(0.044)	(0.052)	(0.039)

The sample consists of yearly observations of nonfinancial firms in with publicly-traded equity and loan debt across nine Asian countries. Logistic regressions specify the probability that a firm has only loan debt, relative to the probability that the firm has some bond debt. The probability depends on firm-level variables as well as the country's level of household access to the banking sector, as measured by an annual IMF Index. "Demeaned debt" equals the firm-year log total debt less the mean log debt across all firm-year observations. "Debt x Access" is the product of demeaned debt and the financial access index. The table reports parameter estimates with standard errors in parentheses. Positive coefficients imply that higher values of the explanatory variable correspond to a higher probability that the firm has only loan debt. The text discusses calculation of the standard errors. All explanatory variables are winsorized at their 1st and 99th percentiles. Non-debt variables, including the banking access index, are normalized to mean zero and variance one. One, two, and three asterisks denote statistical significance at two-sided 10 %, 5 %, and 1 % levels respectively.

Table 5
Variance decompositions of determinants of loan-only financing.

Panel A. Debt levels, 2004 through 2023			
Region	I. Cubic function of debt level	II. All other Variables	III. Twice Cov(I,II)
U.S.	0.966	0.030	0.004
Hong Kong SAR/Korea/Thailand	0.764	0.191	0.044
Other Asian	0.774	0.051	0.175
Panel B. Debt Levels and household financial access for Asian countries			
Sample	I. Debt level and Development index	II. All other Variables	III. Twice Cov(I,II)
2004 – 2021	0.858	0.049	0.093
2004 – 2012	0.861	0.058	0.081
2013 – 2021	0.863	0.047	0.090

Panel A reports variance decompositions of fitted values for the logistic regressions estimated in Table 3. The contribution of the cubic function of debt is separated from the contribution of all other variables. These regressions are estimated separately for US firms, firms in Hong Kong SAR, Korea, or Thailand, and firms in other Asian markets. Panel B reports variance compositions of fitted values for the logistic regressions estimated in Table 4. These regressions include firms in all of the Asian markets and exclude US firms. The contribution of the level of debt, the household financial access index, and their interaction term are separated from the contribution of all other variables. The variance components sum to one by construction.

To get a sense of the economic significance, consider a firm in the US with a 0.5 probability of only loan debt. Using the point estimates in Table 3, a one standard deviation increase in average profits/assets raises this probability to about 0.55.[11] The largest of the coefficients on profits/assets in Table 3 (0.45, for more advanced Asian countries) implies an increase in this probability to about 0.61. These are substantial increases in the probability of only loan debt, but they are much smaller than the overall variation owing to total debt that is displayed in Fig. 3.

[11] The linear approximation of the change is $\Pr(R_d = 0)\Pr(R_d > 0)$ multiplied by the relevant coefficient in Table 3.

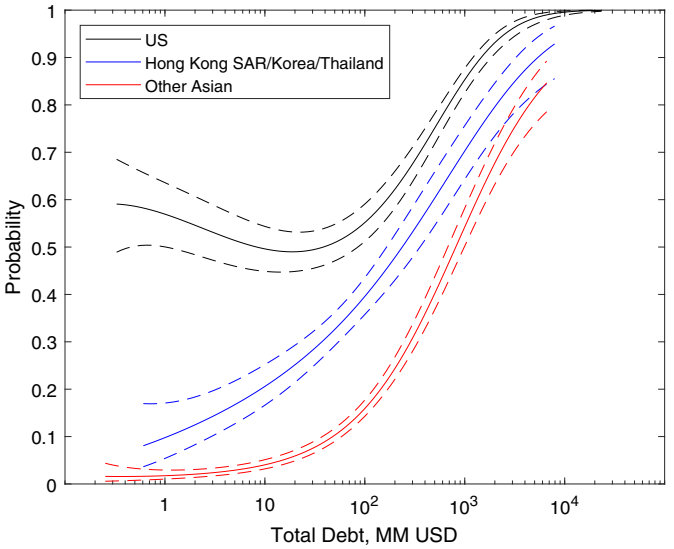

Fig. 3. Estimated relation between the probability of nonzero bond financing and overall debt level, 2004 through 2023. Logistic regressions use cubic functions of total debt, as well as other firm-level variables, to specify the probability that a firm with debt uses any bond debt. The figure plots fitted values of this probability for varying levels of total debt, fixing other firm-level variables to their means. Parameters are estimated separately for firms in three geographic regions.

The estimates on leverage are perhaps the most interesting results in Table 3. Higher leverage *lowers* the probability that a firm has only loan debt. This evidence is surprising because low leverage goes hand-in-hand with high credit quality.[12] The asymmetric information literature says that firms with high credit quality find it cheaper to use arm's length financing (bonds) than do firms with low credit quality. The quantitative effect of leverage is similar across all three groups of countries. For a firm with an initial probability of only loan debt of 0.5, a one standard deviation increase in leverage lowers the probability to about 0.44.

Instead, the results of Table 3 are consistent with a preference for debt diversification. Firms which are relatively heavy users of debt financing (i.e., high leverage) prefer to borrow from both bond and loan markets. An inverse relationship between leverage and bond use shows up at the intensive margin, as we will see below. At the extensive margin studied in Table 3, the relationship is positive.

The desire for financial flexibility, as proxied by a firm's accounts payable, is not closely linked to the likelihood that a firm uses only loan debt. More precisely, the relation is negative for US firms and approximately zero for firms in either group of Asian countries. Similar weak relations appear in other results in this section that link the desire for flexibility to the bond/loan choice. We argue in Section 5 that the desire for financial flexibility is reflected primarily in debt maturity rather than in debt composition.

By comparing the three sets of results in Table 3, we can examine how a firm's financing decisions depend on the firm's location. We now put more structure on the role of a country's financial development. Recall the results discussed in Section 3.2 linking cross-country variation in bond financing ratios to financial development and country-level governance. The financial institutions access index accounts for the bulk of the explanatory power of indexes measuring financial access and governance. This measure proxies for household financial access (number of bank branches and ATMs).

We combine the panels of all nine Asian countries for a single logistic regression. Denote the household access index value for firm i at year t as $FIN_{i,t}$. This variable is the same for all firms in the same country at year t. This variable is normalized to mean zero and unit variance. The vector of explanatory variables for the logistic regression is

$$s_{i,t} = \left(FIN_{i,t} \quad \tilde{d}_{i,t} \quad (FIN_{i,t} \times \tilde{d}_{i,t}) \quad \frac{D_{i,t}}{MA_{i,t}} \quad \frac{1}{5}\sum_{h=1}^{5} \frac{AP_{i,t-h}}{MA_{i,t-h}} \ldots \right.$$
$$\left. \frac{1}{5}\sum_{h=1}^{5} \frac{REV_{i,t-h}}{MA_{i,t-h}} \quad \frac{1}{5}\sum_{h=1}^{5} \frac{NI_{i,t-h}}{MA_{i,t-h}} \quad \frac{PPE_{i,t}}{MA_{i,t}} \right)'. \tag{7}$$

The squared and cubed total debt terms that appear in (6) are dropped in (7). Table 3 shows that these terms are much more important for the US than for the Asian countries. Standard errors on point estimates use the same adjustment employed for estimates of (4).

Table 4 displays results for the entire time period (recall the financial access index ends in 2021) and both halves of the full sample. The results confirm the relevance of a country's household financial access to a firm's financing choice. For example, consider a firm

[12] Map credit ratings numerically as Aaa = 1, Aa1 = 2, Aa2 = 3, and so on. For the US firm-years in our sample with credit ratings, the correlation between leverage and the numerical mapping is 0.54.

in India with a mean debt level and a 0.5 probability of only loan debt. Using the full-sample point estimates, an otherwise equivalent firm in Korea will have a probability of only loan debt of 0.15.[13]

The level of household financial access also affects the relationship between a firm's total amount of debt and the firm's choice of debt specialization. For example, consider two firms with equal firm-level ratios in (6), but one firm has twice the total debt of the other. Assume the firm with more debt has a 0.5 probability of only loan debt. If the firms are in India, the firm with less debt has a probability of only loan debt equal to 0.63. If the firms are in Korea, the firm with less debt has a probability of only loan debt equal to 0.58. The greater the country's household financial access, the less that variations in total debt matter for the decision to use only loans.

In combination, the household financial access of the country in which a firm is located and the total debt level of the firm explain the bulk of variation in the logistic regression's fitted values. The evidence is in Panel B of Table 5. Over 85 % of the total variance of fitted values is attributable to financial development and the debt level. This variance decomposition is almost identical in the first and second halves of the sample. More broadly, Table 4 shows that none of the main results discussed here are sensitive to the sample period.

From a policy perspective, these results suggest that firms in Asia – especially small and medium-sized ones – could potentially see large benefits if authorities were to implement policies that could reduce market segmentation. The evidence from the US market shows that such firms clearly see value in being able to use both bonds and loans for their financing. International initiatives, such as the ASEAN + 3 Asian Bond Market Initiative (ABMI), show that policymakers are aware of the importance of developing local corporate bond markets (see (Amstad et al., 2016)).[14]

4.3. The decision to use only bond financing

The counterpart of logistic regression (4) is the probability that a firm with some bond debt has *only* bond debt. This regression is

$$\log\left(\frac{\Pr(R_{i,t}=1|s_{i,t};\beta_0,\beta_1)}{\Pr(0<R_{i,t}<1|s_{i,t};\beta_0,\beta_1)}\right)=\beta_0+\beta_1' s_{i,t}. \tag{8}$$

Firms in the US are much more likely to use bond-only financing than firms in Asian countries. Of those firms with bond debt, 32 % of US firms do not also borrow in the loan market. The corresponding fraction for firms in Hong Kong SAR, Korea, and Thailand is less than 7 %, falling to 3 % for firms in other Asian countries. We report estimates of (8) only for US firms because there is not enough information in the samples for the Asian firms. Standard errors on point estimates use the same adjustment employed for estimates of (4).

Column I of Table 6 reports estimation results. We highlight differences and similarities with estimates of (4) in Table 3. Here, a firm's total amount of debt has little relation to the decision to use only bond debt, in contrast with the decision to use only loan debt.[15] This difference points to the importance of market segmentation in bond markets rather than loan markets. Regression (8) is estimated only for firms that have bond debt. These firms can easily borrow in the loan market regardless of the amount they want to borrow.

Higher leverage lowers the probability that a firm has only bond debt. The point estimate in Column I implies that for a firm with an initial probability of only bond debt of 0.5, a one standard deviation increase in leverage lowers this probability to 0.35. As discussed in the context of (4), this sign is consistent with two different mechanisms. First, higher leverage corresponds to greater credit risk, leading firms to borrow more from lenders that put more effort into monitoring. Second, firms that are relatively heavy users of debt prefer diversified funding sources. The results in Column I cannot distinguish between these stories.

Other parameter estimates in Column I confirm the relevance of monitoring. Firms that are easier to monitor (higher profits, higher PPE) are more likely to have some loan debt, similar to the results for loan-only firms in Table 3. Higher average accounts payable also corresponds to a greater likelihood of some loan debt. A natural interpretation is that such firms prefer the greater financial flexibility of loan debt. However recall from Table 3 that higher accounts payable for US firms corresponds to a greater likelihood of some bond debt. Therefore for US firms, a greater desire for financial flexibility corresponds to a greater use of diversified financing.

As discussed both here and in the context of the logistic regression (4), theories can justify either sign of the coefficients on many of the observables in the explanatory vector (6). A firm's choice to issue convertible debt provides a cleaner setting to study the role of credit risk in the choice of financing. Convertible and nonconvertible debt do not differ in monitoring. However, the decision to issue convertible debt sends a positive signal about the issuing firm's probability of future default. Sending this signal is more valuable when credit risk is observably higher. Define $C_{i,t}$ as the ratio of firm i's convertible bond debt to its total bond debt. The final logistic regression estimated here is

$$\log\left(\frac{\Pr(R_{i,t}>0\ \&\ C_{i,t}=0|s_{i,t};\beta_0,\beta_1)}{\Pr(R_{i,t}>0\ \&\ C_{i,t}>0|s_{i,t};\beta_0,\beta_1)}\right)=\beta_0+\beta_1' s_{i,t}. \tag{9}$$

[13] The math is in the Internet Appendix.

[14] ASEAN + 3 refers to the Association of Southeast Asian Nations (ASEAN), plus China, Japan and Korea. ABMI focuses on market infrastructure enhancements, promoting local-currency bond markets (both issuance and demand), and strengthening the regulatory framework.

[15] A variance decomposition, not reported in any table, attributes less than 7 % of the total variance of fitted values of (8) to powers of total debt.

Table 6
Bond financing decisions.

Explanatory variable	I. United States (30,107 obs)	II. United States (30,107 obs)	III. More advanced Asian markets (11,044 obs)
Constant	−1.038***	1.058***	0.704***
	(0.083)	(0.091)	(0.124)
Demeaned debt	0.043	0.088*	0.392***
	(0.042)	(0.046)	(0.092)
(Demeaned debt)^2	0.018**	0.033***	0.006
	(0.008)	(0.011)	(0.017)
(Demeaned debt)^3	−0.001	−0.001	−0.018***
	(0.002)	(0.002)	(0.006)
Leverage	−0.626***	−0.196***	−0.130
	(0.081)	(0.072)	(0.116)
Average accounts payable/assets	−0.244***	−0.106	−0.064
	(0.089)	(0.090)	(0.128)
Average revenue/assets	−0.043	0.296***	0.190
	(0.090)	(0.100)	(0.135)
Average profit/assets	−0.244***	0.568***	0.389***
	(0.074)	(0.082)	(0.112)
Property, plant, and equipment/assets	−0.127*	0.490***	0.123
	(0.072)	(0.084)	(0.107)

The sample consists of yearly observations of nonfinancial firms with publicly-traded equity and bond debt. One logistic regression (column I) specifies the probability that a firm has only bond debt, relative to the probability that the firm has both loan and bond debt. Another (columns II and III) specifies the probability that a firm with bond debt has no convertible bonds, relative to the probability that it has some convertible bonds. Positive coefficients imply that higher values of the explanatory variable correspond to a higher probability of the first probability. The text discusses calculation of the standard errors. "Demeaned debt" equals the firm-year log total debt less the mean log debt across all firm-year observations. All explanatory variables are winsorized at their 1st and 99th percentiles. All but the debt variables are normalized to mean zero and variance one. One, two, and three asterisks denote statistical significance at two-sided 10 %, 5 %, and 1 % levels respectively.

For the US sample, 23 % of firm-year observations with bond debt have some convertible bond debt. Convertible bond debt is more widely used in Hong Kong SAR, Korea, and Thailand (relative to the overall use of bonds); the corresponding fraction is 34 %. We report results only for these two samples because there is not enough information in the sample of other Asian firms to test any interesting hypotheses.

Columns II and III of Table 6 contain the results for the US and advanced Asian countries respectively. A brief summary suffices. For both regions, smaller debt levels and higher leverage correspond to a greater likelihood of using some convertible debt. In combination, this evidence is similar to evidence in Loumioti (2022) and Chernenko et al. (2022), noted in Section 1.2, that low-quality middle-market firms tend to borrow from non-banks in the form of structures with substantial covenants and warrants. Among US firms, those with higher average revenue, profits, and higher PPE are less likely to use convertible bonds. The point estimates for firms in advanced Asian countries point in the same direction, although the standard errors are too large to draw statistically reliable results, with the exception of profits.

5. Debt quantities and maturities

Recall (3) decomposes a firm's bond financing ratio into the firm's probabilities of debt specialization using loans and bonds and the expected bond financing ratio for firms with diversified debt financing. This section investigates conditioning information for this latter expectation. We document a substantial difference between the determinants of bond issuance by US firms and those of Asian firms. The section also studies debt maturities. We conclude that for US firms, financial flexibility is largely achieved by reducing maturities of bonds, not switching from bonds to loans.

5.1. Financing choices by firms with both bonds and loans

For those firms that are not at a corner solution for borrowing—they borrow both using bonds and loans—what determines their debt composition? The estimated regression is

$$R_{i,t} = \beta_0 + \beta_1' s_{i,t} + \epsilon_{i,t} \tag{10}$$

where the set of explanatory variables is (6). All firm-year observations satisfy $0 < R_{i,t} < 1$. Standard errors on point estimates use the same adjustment employed for estimates of (4).

Parameter estimates are reported in Table 7. When interpreting these coefficients, keep in mind that all of these firms have some bond debt and some loans. The most striking result in the table is the wide gap between US and Asian firms in the sensitivity of bond financing to total debt. Fig. 4 provides a visual interpretation of the point estimates on the cubic function of debt. The largest borrowers in the US rely heavily on bonds, with 70 % and more of their total debt in the form of bonds. A typical firm in the US with

Table 7
Bond/loan choices of firms with diversified financing.

Explanatory variable	United States (20,528 obs)	More advanced Asian markets (10,304 obs)	Less advanced Asian markets (16,253 obs)
Constant	0.5657***	0.3595***	0.3170***
	(0.0119)	(0.0157)	(0.0101)
Demeaned debt	0.0818***	0.0214*	−0.0266***
	(0.0076)	(0.0115)	(0.0092)
(Demeaned debt)^2	0.0031***	0.0063**	0.0009
	(0.0011)	(0.0027)	(0.0019)
(Demeaned debt)^3	−0.0011***	−0.0007	0.0014*
	(0.0004)	(0.0010)	(0.0009)
Leverage	−0.0459***	−0.0390***	−0.0416***
	(0.0105)	(0.0144)	(0.0106)
Average accounts payable/assets	0.0160	−0.0412**	−0.0262**
	(0.0121)	(0.0162)	(0.0105)
Average revenue/assets	−0.0372***	0.0084	−0.0189**
	(0.0129)	(0.0163)	(0.0096)
Average profit/assets	−0.0482***	−0.0233	0.0158
	(0.0121)	(0.0145)	(0.0105)
Property, plant, and equipment/assets	0.0105	−0.0219*	−0.0145
	(0.0098)	(0.0128)	(0.0091)

The sample consists of yearly observations of nonfinancial firms with publicly-traded equity and both bond and loan debt. The ratio of bond debt to the sum of bond and loan debt is regressed on firm-level variables. The table reports parameter estimates with standard errors in parentheses. The text discusses calculation of the standard errors. "Demeaned debt" equals the firm-year log total debt less the mean log debt across all firm-year observations for the given geographic region. All explanatory variables are winsorized at their 1st and 99th percentiles. All but the debt variables are normalized to mean zero and variance one. The sample period is 2004 through 2023. One, two, and three asterisks denote statistical significance at two-sided 10 %, 5 %, and 1 % levels respectively.

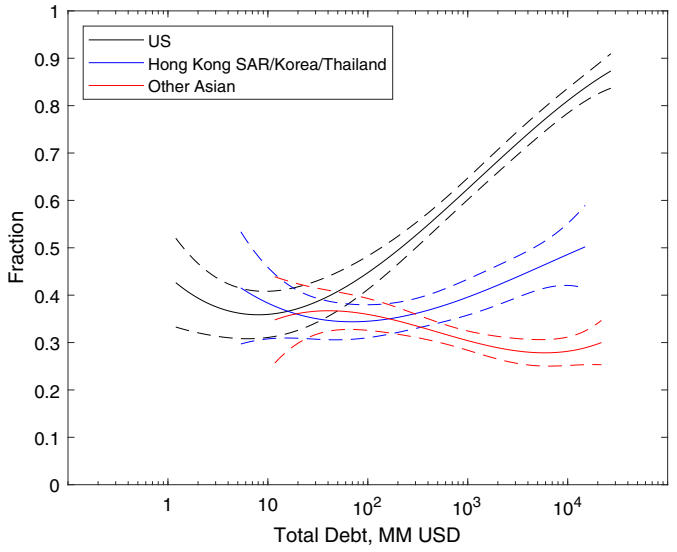

Fig. 4. Estimated relation between bond financing and overall debt level, for firms with both loan and bond debt, 2004 through 2023. Regressions use cubic functions of total debt, as well as other firm-level variables, to specify the ratio of a firm's bond debt to its total debt. The sample includes only firms with both bond and loan debt. The figure plots fitted values of this fraction for varying levels of total debt, fixing other firm-level variables to their means. Parameters are estimated separately for firms in three geographic regions.

a much smaller debt level—say, $10MM to $100MM—borrows around 40 %–50 % in the form of bonds. By contrast, for the typical Asian firm that borrows in both bond and loan markets, bond financing accounts for less than half of total debt, regardless of the firm's level of total debt.

We do not have a good explanation for this substantial regional difference. Since all of these firms have bond debt, these results are unlikely to be driven by aspects of market segmentation. Firms with little debt are usually small firms, which have larger asymmetric information problems than large firms. That logic is consistent with the US point estimates (smaller firms borrow relatively more in

the form of loans), but not with the point estimates for the Asian countries. Perhaps the public bond market in the US is particularly efficient for firms with total debt of at least $1B.

The results for US firms suggest that the benefits of bond financing become more valuable for firms as debt levels rise. From a financial management perspective, this suggests that large Asian firms may be able to extract value by relying more on bond debt and less on banks than they currently do.

Table 7 shows that across all country groups, high leverage corresponds to a smaller fraction of bond debt. The estimated coefficients are similar; a one standard deviation increase in the leverage ratio corresponds to a decline in the bond/(bond + loan) ratio of between 4.0 and 4.5 percentage points. This evidence is consistent with the debt decomposition literature dating back to Johnson (1997), in which lower observable credit quality corresponds to less use of bonds relative to loans.

The remaining results in Table 7 are a muddle. In the US, higher average revenue and profits are associated with less bond debt relative to loan debt. Across the two groups of Asian countries, higher accounts payable is associated with less bond debt relative to loan debt. However, none of the parameter estimates on variables associated with monitoring have the same sign across the three regional groups.

5.2. Maturity choice

Firms prefer to match the horizon of their financing needs with the horizon of their debt. Those firms with short-run financing needs (say, small firms and firms with high accounts payable) prefer short maturities, while firms with long-run financing needs (say, very large firms and firms with high PPE) prefer long maturities. In the US, publicly-traded bonds are generally long-maturity instruments. Initial maturities of ten years or more are common. By contrast, revolving loan facilities are commonly used for short-term borrowing, and term loans from financial institutions typically have shorter maturities than publicly-traded bonds.

This reasoning suggests that firms with a greater desire for financial flexibility (high accounts payable, low PPE) prefer loan debt to bond debt. Yet robust evidence for this relationship is difficult to find in the results presented throughout this paper. In this section we argue that US firms choose the maturity of their bond debt to reflect their desire for financial flexibility, rather than adjust the share of their financing through bonds.

Capital IQ data include issue dates and original maturities of a firm's bonds and term loans that are reported in the firm's financial statements. We construct for firm i in year t the dollar-weighted average remaining maturity of the firm's reported debt instruments at t, the weighted average remaining maturity of the firm's reported bonds, and the weighted average remaining maturity of the firm's term loans. Maturities are measured in years.

We use regressions of the form

$$M^{\tau}_{i,t} = \beta_0 + \beta_1' s_{i,t} + \epsilon_{i,t}, \qquad \tau \in \{\text{all, bonds, term loans}\}, \tag{11}$$

Table 8
Determinants of debt maturity for U.S. firms.

Explanatory variable	Debt maturity (39,655 obs)	Bond maturity (27,905 obs)	Term Loan maturity (19,330 obs)
Constant	5.549***	6.882***	4.934***
	(0.142)	(0.216)	(0.169)
Demeaned debt	0.600***	0.759***	0.037
	(0.066)	(0.092)	(0.090)
(Demeaned debt)^2	0.104***	0.105***	0.005
	(0.017)	(0.027)	(0.018)
(Demeaned debt)^3	0.013***	0.013***	0.005
	(0.003)	(0.005)	(0.005)
Leverage	−0.685***	−0.890***	−0.033
	(0.121)	(0.170)	(0.161)
Average accounts payable/assets	−0.198**	−0.254**	−0.154
	(0.081)	(0.118)	(0.115)
Average profit/assets	0.324***	0.484***	0.304**
	(0.098)	(0.141)	(0.150)
Property, plant, and equipment/assets	0.826***	1.062***	0.610***
	(0.118)	(0.169)	(0.153)

The sample consists of yearly observations of nonfinancial U.S. firms with publicly-traded equity and both bond and loan debt. For each firm-year, average debt maturity is the dollar-weighted average of remaining maturities of all debt instruments for which the original maturity is available. Similarly, average bond (term loan) maturity is the weighted average of remaining maturities of all bonds (term loans) for which the original maturity is available. These average maturities are regressed on firm-level variables. The table reports parameter estimates with standard errors in parentheses. The text discusses calculation of the standard errors. "Demeaned debt" equals the firm-year log total debt less the mean log debt across all firm-year observations. All explanatory variables are winsorized at their 1st and 99th percentiles. All but the debt variables are normalized to mean zero and variance one. The sample period is 2004 through 2023. One, two, and three asterisks denote statistical significance at two-sided 10 %, 5 %, and 1 % levels respectively.

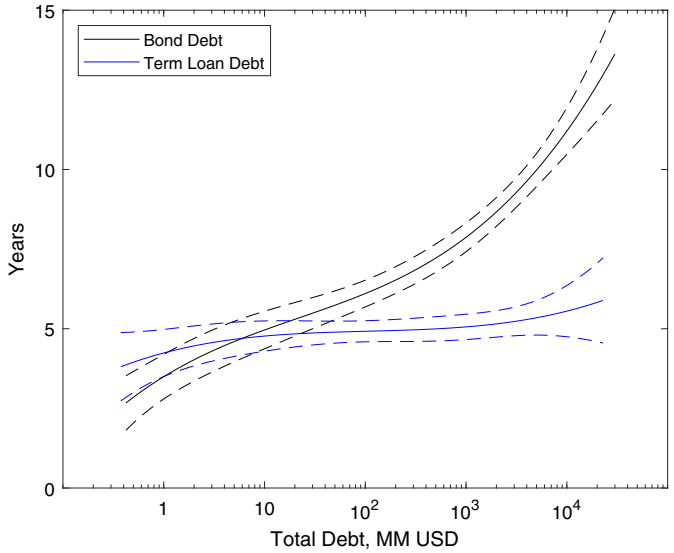

Fig. 5. Estimated relation between average debt maturity and overall debt level for U.S. firms, 2004 through 2023. Regressions use cubic functions of total debt, as well as other firm-level variables, to explain the average remaining maturity of a U.S. firm's debt. Separate regressions estimate the relation for bond debt and term loan debt. The figure plots fitted values of maturities for varying levels of total debt, fixing other firm-level variables to their means.

estimating them separately for each type τ. The initial set of explanatory variables is the same as used in previous regressions, listed in (6). We report results for a slightly restricted set of explanatory variables that excludes revenue/assets. The explanatory power of revenue/assets and net income/assets is difficult to disentangle.

Table 8 contains results for US firms. It documents a very strong positive relation between a firm's total amount of debt and average remaining maturity. The sign is consistent with the idea that smaller firms prefer more flexible financing. However, the relation is not driven primarily by a change in the composition of debt. Instead, it is driven by a change in the average maturity of bond debt. (Average term loan maturity is unrelated to total debt.)

Visual evidence is in Fig. 5, which plots the relation between bond maturity and total debt, as well as the relation between term loan maturity and total debt. It is constructed following the procedure of Figs. 3 and 4. Across all firm-years in the sample used to estimate (11), the mean remaining bond (term loan) maturity is about 7.6 (4.9) years. The figure shows that for total debt in the neighborhood of $1B, average bond maturity is about 10 years. For total debt in the neighborhood of $10MM, average bond maturity is about 5 years—the same as average term loan maturity.

The other parameter estimates in Table 8 support the view that firms that prefer financial flexibility issue shorter-maturity debt in the bond market. Average bond maturity declines with higher leverage and higher average accounts payable. According to the point estimates, a one standard deviation increase in leverage (accounts payable) lowers average bond maturity by 10.7 (3.0) months. Average term loan maturity is unrelated to either variable. Average maturity is also closely related to a firm's ratio of PPE/assets, both for bonds and term loans. A one standard deviation increase in the PPE ratio increases average bond (term loan) maturity by 12.7 (7.3) months. Higher average profitability is also associated with higher bond and term loan maturity.

We also estimate (11) for firms in more advanced Asian countries and firms in less advanced Asian countries. The results (both tables and figures) are in the Internet Appendix because they are not particularly interesting. Maturities of both bonds and term loans are shorter for firms in these countries than for firms in the US, and similar across bonds and term loans. Across firm-years used to estimate (11) for advanced Asian countries, bonds and term loans have approximately the same mean remaining maturity of 3.4 years. Corresponding means for the firm-year observations of less-developed Asian countries are 3.7 years for bonds and 4.0 years for term loans.

6. Concluding comments

Armed with a data set that spans a large, diverse set of corporate borrowers and regions, we draw some surprising conclusions about firms' choices to use loan facilities and bonds.

First, a firm's decision to borrow only through loan facilities is largely driven by the amount of money the firm borrows. Firm characteristics usually associated with the magnitude of asymmetric information are largely irrelevant. We view market segmentation as the most plausible explanation. In the US, some firms can have $1B in (public) bond debt; others can have $1MM in (private) bond debt. The wide availability of bond debt at these extremes allows for both the largest and smallest borrowers to rely on bonds for more than half of their financing. By contrast, countries with low levels of financial development do not have a robust private bond market. In these countries, firms borrowing only a few million dollars do so almost exclusively through loan facilities.

We uncover a nuanced relationship between firm leverage and the choice of financing. Firms with high leverage tend to borrow both through loans and bonds. This pattern holds across countries with varying levels of financial development. Put differently, higher leverage corresponds to a lower probability of borrowing only through loans, a fact that is difficult to reconcile with standard theories of asymmetric information. We interpret this pattern as a firm's preference to have diversified sources of financing when their debt obligation is relatively large. The data also reveal that conditional on a firm having both loan and bond debt, higher leverage corresponds to relatively more loan debt. This pattern is consistent with theories that link observably low credit quality to more intensive monitoring by lenders.

The rich dataset reveals some other patterns for which we have no simple explanations. For example, conditional on a firm having both loan and bond debt, greater total borrowing corresponds to relatively more bond debt for US firms. Any explanation for that fact needs to be consistent with the fact that this relationship is largely absent for firms in the emerging markets we study. We defer exploring possible interpretations to future work.

CRediT authorship contribution statement

Gregory R. Duffee: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Peter Hördahl:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at doi:10.1016/j.jimonfin.2025.103389.

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