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Corporate foreign bond issuance and interfirm loans in China

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Abstract

This paper uses firm-level data to document and analyze international bond issuance by Chinese non-financial corporations and the use of the proceeds of issuance. We find that dollar issuance is positively correlated with the differential between domestic and foreign interest rates. This interest rate differential increases the likelihood of dollar bond issuance by risky firms and decreases the likelihood of dollar bond issuance of exporters and profitable firms. Moreover, and most strikingly, we find that risky firms do more inter-firm lending than non-risky firms and that this lending rose significantly after the regulatory shock of 2008-09, when the authorities sought to restrict the financial activities of risky firms. Risky firms try to boost profitability by engaging in speculative activities that mimic the behavior of financial institutions while escaping prudential regulation that limits risk-taking by financial firms.

Keywords: China, bond markets in emerging markets, carry trade, shadow banking

JEL Codes: F34, F32, G15, G30

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1 Introduction

The aftermath of the Global Financial Crisis was associated with a surge in foreign borrowing by emerging market nationals. Over 2007-2016, outstanding international bonds issued by nationals of developing countries increased from \$1.1 trillion to over \$3.1 trillion. Annual gross issuances, which stood at about \$285 billion in 2007, surpassed \$820 billion in 2016. Non-financial corporations played a key role in this surge in international bond issuances.¹ There are concerns that when advanced economies will start increasing interest rates, foreign currency debt could become a threat to financial stability in emerging market (EM) countries (Acharya and Steffen (2015); Alfaro, Asis, Chari, and Panizza (2017); Elekdag, Alter, Arregui, Ichiue, Khadarina, Kikkawa, Kumarapathy, Narita, and Zhang (2015)).

China was a key player in this recent increase in bond issuance. International Bonds issued by Chinese nationals represented 3.5 percent of total outstanding international bonds issued by EM nationals in 2007 and are now more than 20 percent of the total (the dollar amount of outstanding bonds went from \$20 billion in 2007 to \$823 billion at the end of 2016). In 2007, total issuances of international bonds by Chinese nationals were 5 percent of total issuances by EM nationals, while in 2016 total issuances of international bonds by Chinese nationals were close to 40 percent of total issuances (the dollar value went from \$3 billion to \$237 billion). Outstanding international bonds issued by Chinese non-financial corporations increased from \$9 billion in 2007 (3% of total outstanding international bonds issued by EM nationals non-financial corporations) to \$534 billion in 2016 (65% of total outstanding international bonds issued by EM nationals non-financial corporations). The share of these bonds denominated in US dollars increased from 66 percent in 2007 to 85 percent in 2016.

This paper uses bond-level and firm-level data to document the main patterns of inter-

¹The stock of outstanding international bonds issued by non-financial corporations increased from \$355 billion (32% of total outstanding bonds) to \$1.25 trillion in 2016 (40% of the total). The large majority of these bonds are denominated in US dollars and the share of dollar denominated bonds has increased from 79% (90 percent if we also include bonds denominated in euro) in 2007 to 83% (92% including bonds denominated in euro) in 2016.

national bond issuances by Chinese non-financial corporations. We find that the pattern of borrowing and the use of borrowed funds differed considerably between safe firms on the one hand, and risky firms on the other. In particular, the latter engaged in carry trade borrowing: acting like financial institutions. This is a form of “shadow banking” which has so far escaped attention in the study of Chinese financial intermediation. We start by analyzing the drivers of bond issuance and then describe how bond issuers use the proceeds. We show that, as expected, dollar bond issuances are positively correlated with firm size and leverage. We also find that there is no correlation between firm profitability and the likelihood to issue dollar bonds. Firms that belong to risky economic sectors, however, are more likely to issue dollar bonds. Surprisingly, we find that exporters (i.e., firms that have a natural hedge against currency fluctuations) are less likely to issue dollar-denominated bonds. Dollar issuances are positively correlated with the differential between domestic and foreign interest rates. This interest rate differential increases the likelihood of dollar bond issuances by risky firms and decreases the likelihood of dollar bond issuances by exporters and profitable firms. Our findings are not in line with the hypothesis that firms choose their liability structure to minimize jointly funding cost and currency risk. Hence, we conjecture that firms with limited profit opportunities borrow abroad to generate financial profits through carry trade activities.

When we explore how firms use the proceeds from dollar bond issuances, we find that issuers of dollar bonds have lower investment rates, hold more cash, and are more likely to lend to other firms. Next, we compare the behavior of safe firms with that of risky firms and find that the correlation between dollar bond issuances and inter-firm lending holds only for the latter group (see also, He, Lu, and Ongena (2016); Jiang, Lee, and Yue (2010)). These findings are consistent with the hypothesis that safe and profitable firms with good investment projects do not borrow much abroad. When they do so, they use the proceeds to finance investment projects. Riskier firms, instead, try to boost profitability by engaging in speculative activities that mimic the behavior of financial institutions while escaping prudential regulation that limits

risk-taking by highly-leveraged financial firms. This is a form of ‘shadow banking’. We conclude by showing that the surge in dollar borrowing by risky non-financial corporations could have resulted from regulatory decisions which intended to limit their risk-taking by limiting their access to domestic funds. Instead, it drove them to borrow abroad.

The paper is related to several strands of the literature spanning financial depth and corporate financial structure, the credit cycle, and systemic macroeconomic financial risks. As Shin and Zhao (2013), we build on the corporate finance literature suggesting that firms normally use internal sources to finance projects or operations and seek outside funds only after internal funds are exhausted (Mayer, Sussman *et al.* (2004)). This ”pecking order” implies that in non-financial corporations, liabilities and liquid financial assets should be negatively correlated. This is the opposite of what happens for financial intermediaries that borrow to lend. One important paper in this line of research is Bruno and Shin (2017). These authors study the determinants of foreign bond issuances and find that they are driven by carry trade activities in emerging market countries but not in advanced economies. Caballero, Panizza, and Powell (2016) show that this result is driven by the presence of capital controls which give lightly regulated non-financial corporations a comparative advantage in moving funds across borders (see also Shin and Zhao (2013) and Gruić, Upper, and Villar (2014)). In the Chinese context, using bond issuance from the SDC database and firm-level data from Worldscope, Frank and Shen (2016) study the relationship between dollar bond issues and Chinese firms’ leverage and investment decisions between 2000-2015. Their results show little evidence, however, of the carry trade activities we see elsewhere.

The paper also relates to the literature on incomplete financial markets. Large EM-based financial corporations have better access to capital markets than smaller firms with which they have relationships. These large corporations may act as bankers for smaller firms by using the informational advantage that come from their business relationships. Because of the characteristics of the Chinese financial system, our paper is also related to the literature on the

links between international bond issuances and capital controls (Shin and Zhao (2013); Gruic *et al.* (2014); Caballero *et al.* (2016); Acharya and Vij (2016)).

Finally, our work is related to the growing literature on the development of Chinese capital markets and on the unintended consequences of the Chinese fiscal stimulus (Bai, Hsieh, and Song (2016); Huang, Pagano, and Panizza (2016); Cong, Gao, Ponticelli, and Yang (2017); Allen, Qian, Tu, and Yu (2017); Acharya and Vij (2016); Chen, Ren, and Zha (2016); Brunnermeier, Sockin, and Xiong (2017); Gao, Ru, and Tang (2017)).

The rest of the paper is organized as follows: Section 2 describes our data; Section 3 studies the drivers of bond issuance; Section 4 describes the use of the proceeds; Section 5 explores firm heterogeneity; Section 6 studies the relationship between inter-firm loans and a set of prudential policies that tightened access to domestic credit for firms that operate in risky sectors; Section 7 concludes.

2 Foreign currency bond issuances in China

From a global perspective, there was overwhelming dollar liquidity after the 2008 financial crisis, as suggested by the low borrowing cost on dollars. The Chinese government bond yield surpassed the US Treasury bill yield in 2008 for the first time in the 21st century.² The government bond interest rate then transmitted to the corporate bond market, where the corporate bond yield spread between US and China converged dramatically by almost 5 percentage points.

China reacted to the global financial crisis with a massive fiscal stimulus. In November 2008, the government announced a package worth 4 trillion Yuan (approximately USD 590 billion). The plan was implemented immediately. Most of the funds were channeled through local governments and funded with bank loans (Bai *et al.* (2016) estimate that about 90 percent of local government investment was financed with bank loans in 2009). This policy action tightened the credit conditions faced by private firms (Huang *et al.* (2016)) and led to a rise in the

²See Figure A1 in the Appendix.

shadow lending rate (Wenzhou rate) faced by Chinese firms, which increased from approximately 13 percent in the winter of 2009-2010 to nearly 21 percent in mid-2011 (Figure 1). The shadow rate decreased again in late 2011, but at 15 percent in 2016 it remained well above its pre-global financial crisis level of 10-11 percent. The regulated official lending rate, instead, did not change.

This period was also characterized by a set of regulatory reforms that tightened access to credit for firms that belong to economic sectors deemed to be “risky” or characterized by excess capacity. In a classic case of regulatory arbitrage, these policies contributed to the rapid growth of the Chinese shadow banking system (Chen *et al.* (2016)) and to the spike in the shadow lending rate documented above.

The increase in the shadow lending rate was soon followed by a sudden jump in the issuance of international foreign currency denominated bonds by Chinese non-financial firms. The stock of outstanding bonds increased from \$49 billion in early 2011 to \$86 billion at the end of 2012 and exceeded \$534 billion in 2016Q4. Approximately 90% of these bonds are denominated in US dollars, see Figure 1.

But the official data seem to underestimate the growth of foreign currency debt.³ In this paper, we go beyond aggregate data and conduct a detailed analysis of the drivers of bond issuance by Chinese non-financial corporations. We shall see that firms that issue dollar bonds are more likely to become lenders in the shadow banking system.

2.1 Data

We study the drivers and consequences of dollar bonds issuance by merging bond-level data from Dealogic with firm-level data from China Stock Market & Accounting Research (CSMAR).

As a first step, we collect information on all bonds issued by Chinese nationals over the

³We compared our foreign currency bond outstanding from Dealogic with that of BIS and the official foreign currency debt. State Administration of Foreign Exchange (SAFE) discloses the exposure to foreign currency debt until 2014. Later, the definition has been changed to foreign claims on China which is a broader concept. The comparison shows that the growth rate of foreign currency debt from Dealogic follows the BIS data trend, but outpaced the official foreign currency debt growth (see Figure A2 in the Appendix). Given that the foreign currency loans were also growing, our data imply that the official data might underestimate the level and the growth of the foreign currency debt.

period 2005-15. The focus on nationals rather than residents is important because over 2009-15 there was a massive increase in international bond issuance by non-resident Chinese nationals (see Figure 2A, and also Shin and Zhao (2013) and Gruić *et al.* (2014)). Our bond-level data contain 25,123 observations and include domestic and international issuances in all currencies by all types of issuers. Dealogic data for international issuance by Chinese nationals match the aggregate data published by the Bank for International Settlements (Figure 2B).

Total bond issuances (domestic and international) increased from \$425 billion in 2008, to about \$1 trillion in 2010, and then reached \$1.5 trillion in 2016 (Top panel of Figure 3). As we focus on non-financial sector listed firms, we exclude from our dataset all bonds issued by financial institutions and the central government (8,394 bonds) and all bonds issued by non-listed corporations (12,008 bonds). Finally, we also drop from the sample a small number of bonds (176 in total) which are issued in currencies different from the US dollar or the RMB.⁴ Our final sample consists of 4,454 bonds from 1,353 issuers. About 85 percent of these bonds are denominated in RMB and the remaining 15 percent (557 bonds and 238 issuers) are denominated in US dollars.

Our data show that bond issuances by Chinese non-financial corporations remained well below \$200 billion until 2010 and then started increasing rapidly in 2012 and surpassed \$900 billion in 2016 (Figure 3). Dollar issuances also increased rapidly from \$9 billion in 2008 to over \$230 billion in 2016. The total number of bonds issued by non-financial corporations increased from 100 in 2007 (9 of these bonds were denominated in US dollars) to 4,110 in 2016 (165 of these bonds were denominated in US dollars).

Next, we collect firm-level information from CSMAR. We start with a total of nearly 60,000 observations and, after restricting our sample to listed non-financial and non-government sectors with complete data on revenues and inter-firm loans, we are left with approximately 32,815 observations covering 2,593 firms.

⁴We do this because we mostly focus on US dollar issuances. All our results are robust to keeping these 176 bonds issued in other currencies in the sample.

Finally, we manually match the bond-level and the firm-level data. We are able to recover information for most bond issuers, but there are 486 bonds (of which 78 are dollar-denominated bonds) for which we cannot find issuer data. Therefore, our final sample consists of 4,472 bonds (567 of these bonds are denominated in US dollars). About one-third of the firms in our sample have issued at least one bond, and 6 percent of the firms in our sample have issued dollar-denominated bonds.

The data summary is shown in the appendix Table A1.

3 Determinants of dollar bond issuance

We describe what types of firms issue international dollar-denominated bonds with a simple set of linear probability models.⁵ We use OLS to regress a dummy that takes a value of one if firm i issues a bond in year t over a set of firm characteristics, two proxies for carry trade opportunities, and the interaction between firm characteristics and carry trade opportunities. Some of our regressions also include year and firm-fixed effects.⁶

The set of firm characteristics includes profitability (proxied by return on assets, ROA), firm size (proxied by the log of total assets), leverage (total debt over assets), foreign exposure (proxied by exports over revenues), and a dummy variable that takes a value of one for firms that belong to sectors that China’s Ministry of Industry and Information Technology has defined as “risky”.⁷ The proxies for carry trade opportunities are the Bloomberg Carry Trade Performance Index (this index measures the 3-month return of borrowing in USD and investing in RMB) and the Wenzhou index of private lending interest rates in the Chinese shadow banking system.

We start by regressing the issuer dummy over firm characteristics and a set of year fixed effects (Table 1, column 1)⁸. Profitability is not correlated with the likelihood of issuing dollar

⁵Probit or logit estimates yield similar results.

⁶In all regressions, we winsorize the data at 2%.

⁷Risky sectors include real estate and other sectors which, according to China’s Ministry of Industry and Information Technology (CMIIT), are characterized by excessive capacity. We manually code the various sectors as risky using sectors CMIIT’s definition. Appendix A provides a full list of sectors classified as risky.

⁸In the online appendix, we show that our results are robust to using a panel logit model (Table A2).

bonds. But leverage and firm size are positively correlated with the likelihood of issuing dollar bonds (Bruno and Shin (2017) find similar results for their sample of emerging market countries, although in their regressions leverage is positive but not statistically significant). This is not surprising. Leveraged firms are more likely to seek different types of financial resources, and large firms can cover the fixed costs linked to issuing abroad. What is surprising is that firms with high foreign exposure (i.e., firms that have a natural hedge when they borrow in foreign currency) are less likely to issue dollar bonds, and firms in risky sectors (which often produce non-tradable goods) are more likely to issue dollar bonds. We return later to the second observation and its consequences.

Figure 4 plots the year fixed effects recovered from the regression of Column 1, Table 1 and shows that the trend in dollar bond issuances documented in the previous section is robust to controlling for firm characteristics. Moreover, the year fixed effects comove with the Bloomberg carry trade performance index and with the Wenzhou shadow interest rate. This correlation is also confirmed by columns 2 and 3 of Table 1 which replace the year fixed effects with these two proxies of carry trade opportunities and show that the potential for carry trade returns is positively correlated with dollar bond issuances.

The observed correlation between carry trade returns and dollar bond issuances could be spurious, driven by the fact the Chinese financial system began its slow internationalization process in a period of low and decreasing dollar interest rates. Alternatively, in the presence of deviations from uncovered interest parity, the large and growing difference between RMB and dollar rates could be the driver of dollar bond issuances. We explore these two explanations by interacting the demeaned carry trade (column 4) and shadow rate (column 5) indexes with firm characteristics. Formally, we estimate the following model:

$$ISSUER_{i,t} = X_{i,t}\Gamma + \tilde{c}'_t X_{i,t-1}\Psi + \delta\tilde{c}_t + \varepsilon_{i,t} \quad (1)$$

ISSUER is a dummy variable that takes value one if firm i issues a dollar bond in year t , $X_{i,t-1}$ is a matrix of firm characteristics, and \tilde{ct}_t is the demean carry trade (or shadow rate) index.⁹ We remove the mean from the index so that the coefficients of the non-interacted variables (the matrix Γ) measure the effect of firm characteristics when carry trade opportunities are at their mean value and the coefficients of the interacted variables (the matrix Ψ) measure how changes in carry trade opportunities affect the relationship between firm characteristics and the likelihood of issuing dollar bonds. Note that we do not remove the mean from the matrix of firm characteristics. Hence, δ has no natural interpretation as it measures the effect of the carry trade index when $X=0$. We also estimate versions of (1) which include firm and year fixed effects. With year fixed effects, we cannot estimate the parameter δ . But the fixed effects regressions estimate the within-firm and within-year relationship of the interactions between firm characteristics and the two measures of carry trade opportunities. Hence they are free of the spurious correlation problem mentioned above.

In columns 4 and 5 of Table 1, the coefficients of the non-interacted variables are close to those of columns 2 and 3. The main effects of the shadow rate and the carry trade return index are negative. As mentioned above, however, these coefficients have no natural interpretation because they measure the correlation between potential carry trade returns and dollar bond issuances when all other control variables are set equal to zero.

In the presence of large return differentials, dollar issuances can substantially reduce funding costs. This is a risky strategy, however, because a sudden dollar appreciation may lead to large losses through negative balance sheet effects. Exporters have a natural hedge against currency depreciation and, other things equal, are in a better position to exploit return differentials by issuing dollar bonds. The same applies to large and profitable firms which have a greater capacity to absorb losses brought about by negative balance sheet effects. The opposite should instead be true for more fragile firms that are either highly leveraged or belong to risky sectors.

⁹We define $\tilde{ct}_t = ct_t - \bar{ct}$, where ct_t is the carry trade index in year t and \bar{ct} is the average value of the carry trade index.

Our results do not support these priors. While we find that interest rate differentials increase the likelihood that large firms issue dollar bonds, the results for other firm characteristics are the opposite of what prudent debt management would suggest. We find that profitable firms and exporters are less likely to issue dollar bonds when carry trade returns are high, while leveraged and risky firms are more likely to issue dollar bonds in the presence of high carry trade returns. The last two columns of Table 1 show that these results for the interacted variables are robust to controlling for firm and year fixed effects.¹⁰

These results suggest that firms may not choose their liability structure to minimize jointly funding cost and exchange rate risk. Instead, firms with limited investment opportunities may borrow abroad not to finance investment projects, but to generate financial profits through carry trade activities. Alternatively, risky firms may borrow abroad to evade regulations that prevent them from tapping the domestic financial market. We now examine their uses of funds.

4 Use of proceeds

We now check what issuers do with the proceeds of dollar bond issuances. Financial frictions make external funds more expensive than internal funds and generate a “pecking order” for firm financing. Non-financial firms normally use internal sources to finance projects or operations and seek outside funds only when those are exhausted (Mayer *et al.* (2004)). Banks borrow to lend, and their balance sheets show a positive correlation between financial assets (mostly loans) and financial liabilities (deposits or other forms of debt for non-deposit taking financial institutions). Instead, non-financial corporations borrow to invest (or to finance current expenditure), and their debt liabilities should be negatively correlated with their liquid financial assets (Shin and Zhao (2013)).

As bonded debt tends to have longer maturity than the typical bank overdraft (the average maturity in our sample of dollar denominated bonds is 7 years), dollar bond issuances should be

¹⁰The only difference is that the main effect of ROA in column 7 becomes positive and statistically significant.

positively correlated with fixed investment. We test this hypothesis by estimating the following model:

$$\frac{CAPEX_{i,t}}{A_{i,t-1}} = \beta ISSUER_{i,t-1} + X_{i,t-1}\Gamma + \alpha_i + \tau_t + \varepsilon_{i,t} \quad (2)$$

where the dependent variable is investment in fixed assets over lagged total assets, *ISSUER* measures bond issuances in the previous year, *X* is a matrix of firm characteristics (profitability, proxied by ROA, leverage, and size), and α_i and τ_t are firm and year fixed effects.

We use three definitions of *ISSUER*: (i) a dummy variable that takes value one if the firm has issued in a given year (columns 1 and 2 of Table 2); (ii) bond issuances over revenues (columns 3 and 4); and (iii) outstanding bonds over revenues (column 5 and 6). Columns 1, 3, and 5 of Table 2 show that there is often a negative (the exception is column 1) but not statistically significant correlation between dollar bond issuance and investment in fixed assets.

Columns 2, 4, and 6 interact bond issuance with the carry trade index (as before, we remove the mean from the index). We find that the correlation between bond issuance and capital expenditure tends to be higher when there is a large differential between domestic and foreign interest rates. However, the coefficient is statistically significant only in one of the three regressions. We also conduct robustness check by scaling the variables with total assets (Table A3).

On average, listed Chinese non-financial firms do not issue dollar bonds to invest in fixed assets. Shin and Zhao (2013) and Bruno and Shin (2017) have argued that EM-based non-financial corporations often act like financial intermediaries and, instead of borrowing to invest, they borrow to lend. We test their hypothesis by regressing cash-in-hand (a measure of liquid financial assets) divided by lagged revenues over the same set of controls as in Equation (1).¹¹ Table 3 corroborates Shin and Zhao's (2013) result. USD bond issuers tend to hold more cash than non-issuers (columns 1, 3, and 5). The table also shows that the correlation between USD bond issuances and cash holdings becomes stronger when there is a large difference between

¹¹This is the same specification used by Shin and Zhao (2013).

domestic and dollar interest rates (columns 2, 4, and 6). The coefficients, however, are not always statistically significant. Results are robust if we scale the variables with total assets (Table A4).

It is not surprising that, in the Chinese context, the correlation between dollar bond issuances and cash holdings is not always statistically significant. Such a correlation would be strong if Chinese non-financial corporations tried to earn carry trade returns by borrowing in US dollars and depositing the money in the domestic financial system. This strategy is unlikely to maximize carry trade profit, however, because Chinese deposit rates are capped well below the market rate. A non-financial corporation that wants to maximize carry trade returns is more likely to lend to other firms, either directly or through entrusted loans (Allen *et al.* (2017)). Therefore, we replace cash-at-hand with inter-firm loans.¹² Table 4 shows that there is a positive and statistically significant correlation between dollar bond issuances and inter-firm loans (columns 1, 3 and 5). This correlation becomes particularly strong when there is a large differential between dollar and RMB rates (columns 2, 4, and 6). If we augment the models of Table 4 with issuances of bonds denominated in RMB, we find that only dollar bonds are robustly correlated with inter-firm loans (the correlation for RMB bond issuances is statistically significant in one of our six regressions). The interaction between bond issuances and carry trade returns is statistically significant only for dollar bond issuances (Table 5).

The regressions of columns 1 and 2 of Table 6 focus on the extensive margin (i.e., they differentiate between firms that issue and do not issue bonds). The regressions of columns 3-6, instead, mix the intensive and the extensive margins. Specifically, they assume that a given bond issuance has the same effect for firms that are issuing for the first time and for firms that were already issuing before. When we separate the two effects by jointly controlling for an issuer dummy and for the total amount issued in a given year (columns 1 and 2 of Table 6) or total outstanding amount (columns 3 and 4 of Table 6), we find that it is the intensive margin

¹²We use “other receivables” over revenues.

that matters. Firms that issue more dollar bonds or have a larger stock of outstanding dollar bonds tend to lend more to other firms. If we estimate the same models of Table 6 using capital expenditure as the dependent variable, we find that there is no statistically significant correlation between dollar bond issuances (extensive and intensive margin) and capital expenditure. Also, the interaction between the carry trade index and dollar bond issuances (both margins) is not statistically significant.¹³

On the other hand, domestic credit conditions also affect inter-firm loans. If the domestic unsecured interest rate is sufficiently higher than that in the international market, firms with access to the dollar bond market would invest the offshore money in the domestic market to earn a higher expected return. Table 7 shows how the dollar bond issuers take advantage of the domestic shadow rate to conduct inter-firm loans. We augment the interaction term between shadow rate and USD issuer indicators in column 1-3. The coefficients of the interaction terms are significantly positive, suggesting that a higher domestic shadow rate triggers the USD issuers to conduct more inter-firm loans. Columns 4-6 replace the shadow rate with a dummy variable that equals 1 if the shadow rate is above the median and 0 if below. The results are robust for all the three measurements of USD issuer.

In the literature, it is also common to standardize inter-firm loans with total assets. Table 8 reports similar results when the variables are scaled by total assets. Dollar bond issuers usually have more inter-firm loans than non-issuers, and the sensitivity of inter-firm loan to dollar bond issuances is stronger when the carry trade index is higher. Results for the control variables are the same as in the baseline regression.

We also estimate the same models of Table 5 by scaling the inter-firm loans and dollar bond issuances/outstanding with total assets. Table 9 reports the results, which are similar to those of Table 5.

¹³Full regression results available upon request.

5 Firm heterogeneity

In section 3, we showed that riskier and less profitable firms are more likely to issue dollar bonds when there are large potential returns from carry trade activities. The results in Table 10, which show that dollar bond issuances are negatively correlated with capital expenditure and positively correlated with cash holdings and inter-firm loans, are also consistent with the presence of carry trade activities.

We now check whether the correlation between dollar bond issuances and interfirm loans (our ‘smoking gun’ for carry trade activities) is stronger for riskier and less profitable firms. We start by estimating the baseline model of Table 6 (column 1) augmented with the interaction between the two issuer variables (intensive and extensive margin) and firm profitability proxied by returns on assets. As before, we find that inter-firms loans are positively correlated with bond issuance (Table 10, column 1). We also find, however, that the interaction term is negative and statistically significant, indicating that profitable firms that issue dollar bonds are less likely to engage in inter-firm lending activities.

Next, we interact dollar issuances with the risky sector dummy described above (column 2). For firms that do not belong to risky sectors, there is a negative correlation between dollar bond issuances and inter-firm loans, while the correlation is instead positive and statistically significant for firms that belong to risky sectors. The effect is also economically significant, as it suggests that risky firms lend more than 37% of US dollar bond proceedings to other firms.

Finally, we interact dollar bond issuance with Tobin’s Q (column 3) and, as in the case of profitability, we find that firms with high market-to-book value are less likely to onlend the proceedings of US dollar issuances.

The last three columns of Table 10 show that the results are robust to using outstanding dollar bonds instead of dollar bond issuances.

The results of Tables 1-10 can be summarized as follows: (i) Riskier firms are more likely

to issue dollar bonds, and they are more likely to do so when returns to carry trade are high; (ii) on average, firms that issue dollar bonds are less likely to invest in fixed capital and are more likely to lend to other firms; (iii) when we separate between safe and profitable firms and risky firms with low profitability, we find that the correlation between dollar bond issuance and inter-firm lending holds only for the latter group.

These findings paint a consistent picture in which safe and profitable firms with good investment projects do not borrow much abroad, and when they do so they use the funds to finance investment projects. Riskier firms, instead, try to boost profitability by engaging in speculative activities that mimic the behavior of financial institutions. They operate in the shadow banking system, escaping the various types of prudential regulation that limit risk taking by leveraged financial firms.

A natural reaction to this state of affairs is to propose regulating these firms, preventing them from taking too much risk. Regulation, however, is always complex. When it is not well implemented it can backfire. It is indeed possible that the rapid increase of dollar issuances by risky firms is the outcome of regulatory reforms aimed at limiting risk-taking by this type of firm.

6 The unintended consequences of prudential regulation: inter-firm lending

Worried about increasing corporate financial vulnerability, on December 22, 2009 the People's Bank of China, the China Banking Regulatory Commission, the China Securities Regulatory Commission, and the China Insurance Regulatory Commission jointly released a document titled *Guiding Opinions on Further Strengthening Financial Services With a View to Supporting the Adjustment and Rejuvenation of Some Key Industries and Restraining Excess Capacity in Other Industries* (PBC Document No.386 [2009]).¹⁴ The document stated that “in order to

¹⁴<http://www.pbc.gov.cn/english/130721/2872680/index.html>

serve the overall objective of supporting economic growth and restructuring the economy,” the People’s Bank of China will “enhance surveillance on credit structure,” and “effectively contain overcapacity.” This document tightened access to domestic credit (bank loans and issuance of securities) for firms that operate in economic sectors that are deemed to be risky (for a detailed classification see Table A5). On May 28, 2010, the People’s Bank of China and the China Banking Regulatory Commission issued a joint regulation titled “Notice on Financial Services to Further Support Energy Saving and Eliminate the Backward-Production Capacity”, which further restrained access to credit for firms that operate in risky sectors.

In a classic case of regulatory arbitrage, there is evidence that these policies contributed to the rapid growth of the Chinese shadow banking system. Chen *et al.* (2016) show that the share of entrusted loans (a typical shadow banking instrument in China) in total bank lending tripled during the tightening period, and more than 60 percent of these entrusted loans were channeled to firms that operate in risky sectors. In fact, we find that the risky sectors not only channel more inter-firm loans, but also provide less provision for their exposure, see Figures 5 and 6.

Here we study a different type of regulatory arbitrage. We use the policy shock of 2009-10 as a means of identification. Specifically, we test whether the regulatory reforms of 2009-10 increased the likelihood that risky firms issue dollar bonds and then use the proceeds to onlend to domestic firms in similar sectors. The rationale for such behavior is that information asymmetries are paramount in the shadow banking system, but these information asymmetries are likely to be less important for firms that operate in the same sector. Hence firms that lend through entrusted loans (or other shadow banking instruments) are more likely to fund firms that operate in similar sectors (or similar cities, for evidence see Allen *et al.* (2017)).

Table 2 depicts respectively dollar bond issuance (Panel A) and outstanding dollar bonds (Panel B) by risky sectors since 2006. The proportion of dollar bonds issued by risky sectors surged immediately after the 2009 regulations. From 2010-2012, dollar bonds issued by risky

sectors account for nearly 20% of the total issuance, with the dollar bond outstanding from risky sectors growing to 18% of the total exposure.

Consider now a situation in which firms in risky sectors face tighter domestic credit conditions, while some large firms that belong to risky sectors are unconstrained as they have access to the international capital market. Then these large firms can exploit their knowledge of credit constrained firms that operate in similar sectors by borrowing abroad and then on-lending to risky sector firms domestically. We test this hypothesis by estimating the following differences-in-differences model:

$$\frac{InterFirmLoans_{i,t}}{Revenues_{i,t}} = \alpha ISSUER_{i,t} + \beta POLICY_t + \delta (ISSUER_{i,t} \times POLICY_t) + \varepsilon_{i,t} \quad (3)$$

Here *ISSUER* is a dummy variable that takes the value one for firms that issue dollar bonds and the value zero for firms that do not issue dollar bonds, and *POLICY* is a dummy variable that takes the value zero for the period 2006-2009 and the value one for the period 2010-2014.¹⁵ Our parameter of interest is δ , which measures whether the policy had a differential effect for firms that issue dollar bonds.

Column 1 of Table 12 shows that δ is positive and statistically significant, indicating that the policy led to an increase in inter-firm loans by firms that issue dollar bonds but had no effect for firms that do not issue dollar bonds (in fact, the effect for non-issuers is negative, albeit small, and statistically significant).

As dollar issuers are more likely to belong to risky sectors (see Table 1), we check whether the policy had an effect on risky sector firms by substituting the *ISSUER* dummy with a dummy variable that takes the value one for firms that belong to risky sectors. Column 2 of Table 12 shows that firms in risky sectors have higher inter-firm loans than firms that do not belong to risky sectors (α is positive and statistically significant) and that the policy shock increases inter-firm loans in risky sectors. Column 3 of Table 12 separates the effect of being in

¹⁵We show that our results are robust to using 2008 as a break year.

a risky sector and that of issuing dollar bonds and suggests that belonging to a risky sector is key for explaining inter-firm loans in the post-2008 period.

7 Conclusions

The aftermath of the global financial crisis was characterized by a massive increase in international bond issuances by emerging market nationals. Non-financial firms played an important role, and Chinese issuers now account for 20 percent of outstanding international bonds issued by EM nationals and 22 percent of international bond issuances by EM non-financial corporations.

This paper uses firm-level data to analyze the main patterns of international bond issuances by Chinese non-financial corporations. It shows that dollar bond issuance is positively correlated with firm size and leverage, but that there is no correlation between firm profitability and the likelihood to issue dollar bonds. Firms that belong to risky economic sectors are more likely to issue dollar bonds. Surprisingly, we find that exporters (i.e., firms that have a natural hedge against currency fluctuations) are less likely to issue dollar-denominated bonds. We also find that dollar issuances are positively correlated with the differential between domestic and foreign interest rates. This interest rate differential increases the likelihood of dollar bond issuance by risky firms and decreases the likelihood of dollar bond issuance of exporters and profitable firms.

These results are not in line with the hypothesis that firms choose their liability structure to jointly minimize funding cost and currency risk. Our findings are instead consistent with a situation in which safe and profitable firms with good investment projects do not borrow much abroad, and when they do so, they use the funds to finance investment projects. Riskier firms, instead, try to boost profitability by engaging in speculative activities that mimic the behavior of financial institutions while escaping the various types of prudential regulation that limit risk taking in highly-leveraged financial firms. They engage in a specific form of carry trade executed in the framework of China's shadow banking system.

References

- Acharya, V.V. and Steffen, S., 2015. The “greatest” carry trade ever? understanding eurozone bank risks, *Journal of Financial Economics*, 115 (2), 215–236.
- Acharya, V.V. and Vij, S., 2016. Foreign currency borrowing of corporations as carry trades: Evidence from India, *in: NSE-NYU Conference on Indian Financial Markets*, 21–22.
- Alfaro, L., Asis, G., Chari, A., and Panizza, U., 2017. Lessons unlearned? corporate debt in emerging markets, Working Paper 23407, National Bureau of Economic Research.
- Allen, F., Qian, Y., Tu, G., and Yu, F., 2017. Entrusted loans: A close look at China’s shadow banking system, *Working Paper*.
- Bai, C.E., Hsieh, C.T., and Song, Z.M., 2016. The long shadow of a fiscal expansion, Working Paper 22801, National Bureau of Economic Research.
- Brunnermeier, M.K., Sockin, M., and Xiong, W., 2017. China’s gradualistic economic approach and financial markets, *American Economic Review P&P*, 107 (5), 608–13.
- Bruno, V. and Shin, H.S., 2015. Capital flows and the risk-taking channel of monetary policy, *Journal of Monetary Economics*, 71, 119–132.
- Bruno, V. and Shin, H.S., 2017. Global dollar credit and carry trades: a firm-level analysis, *The Review of Financial Studies*, 30 (3), 703–749.
- Caballero, J., Panizza, U., and Powell, A., 2016. The second wave of global liquidity: Why are firms acting like financial intermediaries?, Working Paper IDB-WP-641, IDB.
- Chen, K., Ren, J., and Zha, T., 2016. What we learn from China’s rising shadow banking: Exploring the nexus of monetary tightening and banks’ role in entrusted lending, Working Paper 21890, National Bureau of Economic Research.
- Cong, L.W., Gao, H., Ponticelli, J., and Yang, X., 2017. Credit allocation under economic stimulus: Evidence from China, Chicago Booth Research Paper No. 17-19.
- Elekdag, S., Alter, A., Arregui, N., Ichiue, H., Khadarina, O., Kikkawa, A.K., Kumarapathy, S., Narita, M., and Zhang, J., 2015. Corporate leverage in emerging markets—a concern, *IMF Global Financial Stability Report*.

- Frank, M. and Shen, T., 2016. U.S. dollar debt issuance by Chinese firms., *Working Paper*.
- Gao, H., Ru, H., and Tang, D.Y., 2017. Subnational debt of China: The politics-finance nexus, *Working Paper*.
- Gručić, B., Upper, C., and Villar, A., 2014. What does the sectoral classification of offshore affiliates tell us about risks?, *BIS Quarterly Review*, 20–1.
- He, Q., Lu, L., and Ongena, S., 2016. Who gains from credit granted between firms? evidence from inter-corporate loan announcements made in China, CFS Working Paper No. 529.
- Huang, Y., Pagano, M., and Panizza, U., 2016. Public debt and private firm funding: Evidence from Chinese cities, CEPR Discussion Paper No. DP11489.
- Jiang, G., Lee, C.M., and Yue, H., 2010. Tunneling through intercorporate loans: the China experience, *Journal of Financial Economics*, 98 (1), 1–20.
- Mayer, C., Sussman, O., *et al.*, 2004. A new test of capital structure, CEPR Discussion Papers No. 4239.
- Myers, S.C., 1984. Finance theory and financial strategy, *Interfaces*, 14 (1), 126–137.
- Shin, H.S., 2014. The second phase of global liquidity and its impact on emerging economies, *in: Volatile Capital Flows in Korea*, Springer, 247–257.
- Shin, H.S. and Zhao, L., 2013. Firms as surrogate intermediaries: evidence from emerging economies, *Working Paper*.

Table 1. The drivers of US dollar bond issuance

This table contains a set of OLS firm-level regressions where the dependent variable is a dummy that takes value 1 in years when a firm issues a dollar bond and the controls are the lagged values of return on assets (ROA), leverage, firm size (measured as the log of total assets), share of exports over total revenues (For. Exp.) a dummy variable that takes value 1 for firms that belong to risk sectors, the Bloomberg carry trade index (CT) and the Wenzhou shadow rate index (SR). These two indexes are not lagged. Coefficients and standard errors are multiplied by 100 to improve readability.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ROA	0.12 (0.18)	0.16 (0.19)	0.04 (0.20)	-0.24 (0.19)	-0.13 (0.20)	0.09 (0.26)	0.54* (0.28)
Leverage	2.63*** (0.38)	2.59*** (0.38)	2.49*** (0.40)	0.63 (0.39)	1.30*** (0.41)	0.17 (0.47)	1.20** (0.51)
Ln(Asset)	0.76*** (0.07)	0.76*** (0.07)	0.91*** (0.07)	0.88*** (0.07)	0.96*** (0.07)	0.77*** (0.13)	0.68*** (0.14)
For. Exp.	-0.85*** (0.16)	-0.84*** (0.17)	-0.82*** (0.18)	-0.62*** (0.16)	-0.74*** (0.18)	-0.11 (0.23)	-0.33 (0.26)
Risky Sector	1.34*** (0.25)	1.35*** (0.25)	1.29*** (0.27)	1.32*** (0.25)	1.31*** (0.26)		
CT		0.07*** (0.01)		-2.25*** (0.14)			
SR			0.09*** (0.03)		-4.09*** (0.38)		
ROA×CT				-0.06*** (0.02)		-0.07*** (0.02)	
Leverage×CT				0.18*** (0.04)		0.14*** (0.05)	
Ln(Asset)×CT				0.10*** (0.01)		0.11*** (0.01)	
Foreign Exposure×CT				-0.08*** (0.02)		-0.08*** (0.02)	
Risky×CT				0.15*** (0.02)		0.15*** (0.02)	
ROA×SR					-0.05 (0.05)		-0.02 (0.06)
Leverage×SR					0.06 (0.13)		-0.04 (0.13)
Ln(Asset)×SR					0.20*** (0.02)		0.19*** (0.02)
Foreign Exposure×SR					-0.21*** (0.05)		-0.20*** (0.05)
Risky×SR					0.25*** (0.06)		0.26*** (0.06)
Firm FE	N	N	N	N	N	Y	Y
Year FE	Y	N	N	N	N	Y	Y
Observations	24,596	24,596	23,188	24,596	23,188	24,596	23,188

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 2. Investment in fixed assets and dollar bond issuances

This table reports the results of a set of fixed effects regressions in which the dependent variable is capital expenditure over revenues and the explanatory variables are dollar bond issuer status (columns 1 and 2 use a dummy variable that takes value one if the firm has issued in a given year, columns 3 and 4 use the dollar value of bond issuances over revenues, and columns 5 and 6 use the dollar value of outstanding bonds over revenues), leverage, returns on assets, firm size (log of total assets) and the interaction between the demanded value of the Bloomberg carry trade index (CT) and issuer status.

	(1)	(2)	(3)	(4)	(5)	(6)
Issuer	-0.04 (0.04)	-0.04 (0.04)	0.07 (0.26)	0.08 (0.26)	-0.24 (0.33)	-0.15 (0.35)
Issuer×CT		0.00 (0.01)		0.04 (0.04)		0.03 (0.04)
Leverage	-0.15*** (0.03)	-0.15*** (0.03)	-0.16*** (0.03)	-0.16*** (0.03)	-0.16*** (0.03)	-0.15*** (0.03)
ROA	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)
Size	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)
Year FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Observations	21,220	21,220	21,220	21,220	21,220	21,220
Issuer is:	Dummy	Dummy	Amount Issuance	Amount Issuance	Amount Outstanding	Amount Outstanding

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 3. Cash holdings and dollar bond issuances

This table reports the results of a set of fixed effects regressions in which the dependent variable is liquid financial assets over revenues and the explanatory variables are dollar bond issuer status (columns 1 and 2 use a dummy variable that takes value one if the firm has issued in a given year, columns 3 and 4 use the dollar value of bond issuances over revenues, and columns 5 and 6 use the dollar value of outstanding bonds over revenues), leverage, returns on assets, firm size (log of total assets) and the interaction between the demanded value of the Bloomberg carry trade index (CT) and issuer status.

	(1)	(2)	(3)	(4)	(5)	(6)
Issuer	5.45 (4.02)	4.44 (4.10)	56.88*** (15.49)	52.39*** (15.9)	57.97** (24.04)	71.36*** (25.37)
Issuer×CT		0.88 (0.72)		3.16 (2.53)		4.93* (2.98)
Leverage	-43.73*** (2.10)	-43.75*** (2.10)	-43.76*** (2.10)	-43.78*** (2.10)	-43.71*** (2.10)	-43.76*** (2.10)
ROA	0.72 (1.29)	0.7 (1.29)	0.62 (1.29)	0.6 (1.29)	0.69 (1.29)	0.66 (1.29)
Size	5.52*** (0.27)	5.52*** (0.27)	5.48*** (0.27)	5.47*** (0.27)	5.51*** (0.27)	5.50*** (0.27)
Year FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Observations	21,528	21,528	21,528	21,528	21,528	21,528
Issuer is:	Dummy	Dummy	Amount Issuance	Amount Issuance	Amount Outstanding	Amount Outstanding

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 4. Inter-firm loans holdings and dollar bond issuances

This table reports the results of a set of fixed effects regressions in which the dependent variable is inter-firm loans over revenues and the explanatory variables are dollar bond issuer status (columns 1 and 2 use a dummy variable that takes value one if the firm has issued in a given year, columns 3 and 4 use the dollar value of bond issuances over revenues, and columns 5 and 6 use the dollar value of outstanding bonds over revenues), leverage, returns on assets, firm size (log of total assets) and the interaction between the Bloomberg carry trade index (CT) and issuer status.

	(1)	(2)	(3)	(4)	(5)	(6)
Issuer	1.33* (0.78)	1.32* (0.78)	14.74*** (3.14)	18.96*** (3.22)	10.84** (4.90)	24.25*** (5.52)
Issuer×CT		0.36*** (0.12)		2.87*** (0.51)		3.46*** (0.66)
Leverage	3.33*** (0.51)	3.30*** (0.51)	3.33*** (0.51)	3.27*** (0.51)	3.35*** (0.51)	3.28*** (0.51)
ROA	-1.23*** (-0.32)	-1.24*** (-0.32)	-1.25*** (-0.31)	-1.28*** (-0.31)	-1.23*** (-0.32)	-1.25*** (-0.31)
Size	1.31*** (0.06)	1.31*** (0.06)	1.30*** (0.06)	1.29*** (0.06)	1.31*** (0.06)	1.30*** (0.06)
Year FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Observations	22,163	22,163	22,163	22,163	22,163	22,163
Issuer is:	Dummy	Dummy	Amount Issuance	Amount Issuance	Amount Outstanding	Amount Outstanding

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 5. Inter-firm loans dollar and RMB bond issuances

This table reports the results of a set of fixed effects regressions in which the dependent variable is inter-firms loans over revenues and the explanatory variables are dollar bond issuer status (Issuer USD columns 1 and 2 use a dummy variable that takes value one if the firm has issued in a given year, columns 3 and 4 use the value of bond issuances over revenues, and columns 5 and 5 use the value of outstanding bonds over revenues), RMB bond issuer status (Issuer RMB columns 1 and 2 use a dummy variable that takes value one if the firm has issued in a given year, columns 3 and 4 use the value of bond issuances over revenues, and columns 5 and 5 use the value of outstanding bonds over revenues) leverage, returns on assets, firm size (log of total assets) and the interaction between the Bloomberg carry trade index (CT) and issuer status.

	(1)	(2)	(3)	(4)	(5)	(6)
Issuer USD	1.23 (0.79)	1.23 (0.79)	14.70*** (3.14)	18.79*** (3.22)	10.20** (4.91)	23.46*** (5.58)
Issuer RMB	0.47 (0.30)	0.31 (0.39)	0.20 (0.31)	0.15 (0.31)	0.11 (0.07)	0.10 (0.14)
Issuer USD×CT		0.38*** (0.12)		2.85*** (0.47)		3.38*** (0.66)
Issuer RMB×CT		0.03 (0.05)		0.14 (0.10)		-0.00 (0.01)
Leverage	3.94*** (0.52)	3.89*** (0.52)	3.34*** (0.51)	3.26*** (0.51)	3.35*** (0.51)	3.28*** (0.51)
ROA	-5.49*** (0.29)	-5.50*** (0.29)	-1.25*** (0.31)	-1.28*** (0.31)	-1.24*** (0.32)	-1.25*** (0.31)
Size	-1.02*** (0.15)	-1.02*** (0.15)	1.30*** (0.06)	1.29*** (0.06)	1.31*** (0.06)	1.30*** (0.06)
Year FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Observations	22,163	22,163	22,163	22,163	22,163	22,163
Issuer is:	Dummy	Dummy	Amount Issuance	Amount Issuance	Amount Outstanding	Amount Outstanding

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 6. Inter-firm loans holdings and dollar bond issuances intensive versus extensive margin

This table reports the results of a set of fixed effects regressions in which the dependent variable is inter-firm loans over revenues and the explanatory variables are dollar bond issuer status (Issuer dummy is a dummy variable that takes value one if the firm has issued in a given year), amount issued (in columns 1 and 2 Issuer amount is the dollar value of bond issuances over revenues and in columns 3 and 4 use Issuer amount as the dollar value of outstanding bonds over revenues), leverage, returns on assets, firm size (log of total assets) and the interaction between the Bloomberg carry trade index (CT) and issuer status and amount.

	(1)	(2)	(3)	(4)
Issuer Dummy	0.23 (0.82)	0.37 (0.82)	0.68 (0.88)	0.12 (0.89)
Issuer Dummy \times CT		0.15 (0.14)		0.10 (0.15)
Issuer amount	14.45*** (3.30)	18.60*** (3.37)	8.86 (5.54)	23.41*** (6.25)
Issuer amount \times CT		2.64*** (0.52)		3.16*** (0.78)
Leverage	3.33*** (0.51)	3.25*** (0.51)	3.33*** (0.51)	3.27*** (0.51)
ROA	-1.25*** (0.31)	-1.28*** (0.31)	-1.23*** (0.32)	-1.25*** (0.31)
Size	1.31*** (0.06)	1.29*** (0.06)	1.31*** (0.06)	1.30*** (0.06)
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Observations	22,163	22,163	22,163	22,163
Issuer amount is:	Issuances	Issuances	Outstanding	Outstanding

Robust standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 7. Inter-firm loans holdings and dollar bond issuances

This table reports the results of a set of fixed effects regressions in which the dependent variable is inter-firm loans over revenues and the explanatory variables are dollar bond issuer status (columns 1 and 2 use a dummy variable that takes value one if the firm has issued in a given year, columns 3 and 4 use the dollar value of bond issuances over revenues, and columns 5 and 6 use the dollar value of outstanding bonds over revenues), leverage, returns on assets, firm size (log of total assets) and the interaction between the shadow rate dummy and issuer status.

	(1)	(2)	(3)	(4)	(5)	(6)
Issuer	1.33* (0.78)	-0.003 (0.014)	14.74*** (3.14)	-0.019 (0.048)	10.84** (4.90)	-0.047 (0.066)
Issuer×SR		0.027* (0.015)		0.225*** (0.059)		0.295*** (0.087)
Leverage	3.33*** (0.51)	0.033*** (0.005)	3.33*** (0.51)	0.034*** (0.005)	3.35*** (0.51)	0.034*** (0.005)
ROA	-1.23*** (0.32)	-0.014*** (0.004)	-1.25*** (0.31)	-0.015*** (0.004)	-1.23*** (0.32)	-0.015*** (0.004)
Size	1.31*** (0.06)	0.015*** (0.001)	1.30*** (0.06)	0.015*** (0.001)	1.31*** (0.06)	0.015*** (0.001)
Year FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Observations	22,163	22,163	22,163	22,163	22,163	22,163
Issuer is:	Dummy	Dummy	Amount Issuance	Amount Issuance	Amount Outstanding	Amount Outstanding
SR is:	Dummy (above median=1, below median=0)					

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 8. Inter-firm loan holdings and dollar bond issuances

This table reports the results of a set of fixed effects regressions in which the dependent variable is inter-firm loans over total assets and the explanatory variables are dollar bond issuer status (columns 1 and 2 use a dummy variable that takes value one if the firm has issued in a given year, columns 3 and 4 use the dollar value of bond issuances over total assets, and columns 5 and 6 use the dollar value of outstanding bonds over total assets), leverage, returns on assets, firm size (log of total assets) and the interaction between the shadow rate dummy and issuer status.

	(1)	(2)	(3)	(4)	(5)	(6)
Issuer	0.74*** (0.23)	0.41 (0.31)	0.28 (4.65)	7.07 (5.07)	2.11 (4.43)	0.97 (4.45)
Issuer×SR		0.06 (0.04)		2.48*** (0.02)		1.53*** (0.57)
Leverage	0.07*** (0.02)	0.07*** (0.02)	0.07*** (0.02)	0.07*** (0.02)	0.07*** (0.02)	0.07*** (0.02)
ROA	-0.26*** (0.09)	-0.26*** (0.09)	-0.25*** (0.09)	-0.25*** (0.09)	-0.26*** (0.09)	-0.25*** (0.09)
Size	0.05** (0.02)	0.05** (0.02)	0.05** (0.02)	0.04** (0.02)	0.05** (0.02)	0.05** (0.02)
Year FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Observations	26,297	26,297	26,297	26,297	26,297	26,297
Issuer is:	Dummy	Dummy	Amount Issuance	Amount Issuance	Amount Outstanding	Amount Outstanding
SR is:	Dummy (above median=1, below median=0)					

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 9. Inter-firm loans and dollar and RMB bond issuances

This table reports the results of a set of fixed effects regressions in which the dependent variable is inter-firm loans over total assets and the explanatory variables are dollar bond issuer status (Issuer USD columns 1 and 2 use a dummy variable that takes value one if the firm has issued in a given year, columns 3 and 4 use the value of bond issuances over total assets, and columns 5 and 6 use the value of outstanding bonds over total assets), RMB bond issuer status (Issuer RMB columns 1 and 2 use a dummy variable that takes value one if the firm has issued in a given year, columns 3 and 4 use the value of bond issuances over total assets, and columns 5 and 6 use the value of outstanding bonds over total assets), leverage, returns on assets, firm size (log of total assets) and the interaction between the Bloomberg carry trade index (CT) and issuer status.

	(1)	(2)	(3)	(4)	(5)	(6)
Issuer USD	0.74*** (0.23)	0.41 (0.31)	0.08 (4.56)	6.91 (5.01)	1.77 (4.33)	0.69 (4.35)
Issuer RMB	0.26*** (0.09)	0.19 (0.12)	0.06 (0.09)	0.03 (0.09)	0.03 (0.02)	0.02 (0.04)
Issuer USD×CT		0.05 (0.04)		2.44*** (0.73)		1.46*** (0.56)
Issuer RMB×CT		0.01 (0.01)		0.04 (0.03)		0.00 (0.00)
Leverage	0.08*** (0.02)	0.08*** (0.02)	0.05** (0.02)	0.05** (0.02)	0.05** (0.02)	0.05** (0.02)
ROA	-0.58*** (0.08)	-0.59*** (0.08)	-0.22** (0.09)	-0.22** (0.09)	-0.22** (0.09)	-0.22** (0.09)
Size	-0.26*** (0.04)	-0.26*** (0.04)	0.05** (0.02)	0.04** (0.02)	0.05** (0.02)	0.05** (0.02)
Year FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Observations	26,297	26,297	22,175	22,175	22,175	22,175
Issuer is:	Dummy	Dummy	Amount Issuance	Amount Issuance	Amount Outstanding	Amount Outstanding

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 10. Inter-firm loans, dollar bond issuance and firm heterogeneity

This table reports the results of a set of fixed effects regressions in which the dependent variable is inter-firms loans over revenues and the explanatory variables are dollar bond issuer status (Issuer dummy is a dummy variable that takes value one if the firm has issued in a given year), amount issued (in columns 1-3 Issuer amount is the dollar value of bond issuances over revenues and in columns 3-6 use Issuer amount is the dollar value of outstanding bonds over revenues), leverage, returns on assets, firm size (log of total assets) and the interaction between firm characteristics (return on assets, risky firms and Tobin's Q, using sample average of each firm) and each of issuer status and issuer amount.

	(1)	(2)	(3)	(4)	(5)	(6)
Issuer Dummy	0.72 (0.82)	1.45* (0.84)	0.68 (0.86)	0.94 (0.88)	1.29 (0.89)	1.58* (0.94)
Issuer amount	7.67** (3.52)	-2.52 (3.91)	-7.11 (4.38)	5.06 (5.63)	0.25 (5.79)	-21.99*** (7.24)
Issuer Dummy \times FC	6.12*** (1.66)	-2.66*** (0.93)	-0.24* (0.14)	5.97*** (1.77)	-2.72*** (1.01)	-0.33** (0.15)
Issuer amount \times FC	-35.28*** (6.17)	35.57*** (4.38)	1.50*** (0.18)	-41.74*** (10.89)	35.84*** (7.03)	3.40*** (0.38)
Leverage	3.32*** (0.51)	3.25*** (0.51)	-0.09 (0.99)	3.33*** (0.51)	3.28*** (0.51)	-0.09 (0.99)
ROA	-1.26*** (0.31)	-1.28*** (0.32)	-1.07* (0.61)	-1.25*** (0.32)	-1.26*** (0.32)	-1.08* (0.61)
Size	1.30*** (0.06)	1.29*** (0.07)	1.14*** (0.11)	1.31*** (0.06)	1.30*** (0.07)	1.13*** (0.11)
Year FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Observations	22,163	21,995	7,470	22,163	21,995	7,470
Issuer amount is: FC is:	Issuance ROA	Issuance Risky	Issuance Tobin's Q	Outstanding ROA	Outstanding Risky	Outstanding Tobin's Q

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 11. NFC USD Bond Issuance and Outstanding by Industry

Panel A: USD Bond Issuance by NFC		
Sector	Billion USD	%
Oil and Gas	33	22
Real Estate	15.02	13
Utilities	10.67	12
Constructions	5.18	12
Holding Companies	0.8	7

Panel B: USD Bond Outstanding by NFC		
	Billion USD (2016)	%
Oil and Gas	166.02	34
Real Estate	92.29	19
Computers	73.47	15
Utilities	44.93	9
Constructions	22.14	5

Table 12. Inter-firm loans as regulatory arbitrage

This table shows the results of a set of firm-level regressions in which the dependent variable is inter-firm loans over revenues and the explanatory variables are either dollar issuer status (Treatment in column 1) or risky firm status (Treatment in columns 2 and 3) a dummy that takes a value 1 after 2008 (Policy) and various interactions among these variables.

	(1)	(2)	(3)	(4)
Treatment	-1.99** (0.80)	2.73*** (0.26)	-3.97 (4.53)	-0.71 (3.54)
Policy	-2.25*** (0.16)	-2.10*** (0.18)	-2.11*** (0.18)	-2.29*** (0.41)
Treatment \times Policy	2.71*** (0.87)	0.14 (0.36)		
USD Issuer			3.26 (3.58)	
USD Issuer \times Policy			-1.88 (3.93)	
Risky Sector			2.74*** (0.26)	
Risky Sector \times Policy			-0.19 (0.37)	
USD Issuer \times Risky Sector \times Policy			9.92** (4.93)	8.04** (3.80)
Observations	24,596	24,596	24,596	6,208
Treatment is	USD Issuer	Risky Sector	Risky USD Issuer	USD Issuer in Risky Subsample

Robust standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure 1. International Bonds issued by Chinese Non-Financial Corporates

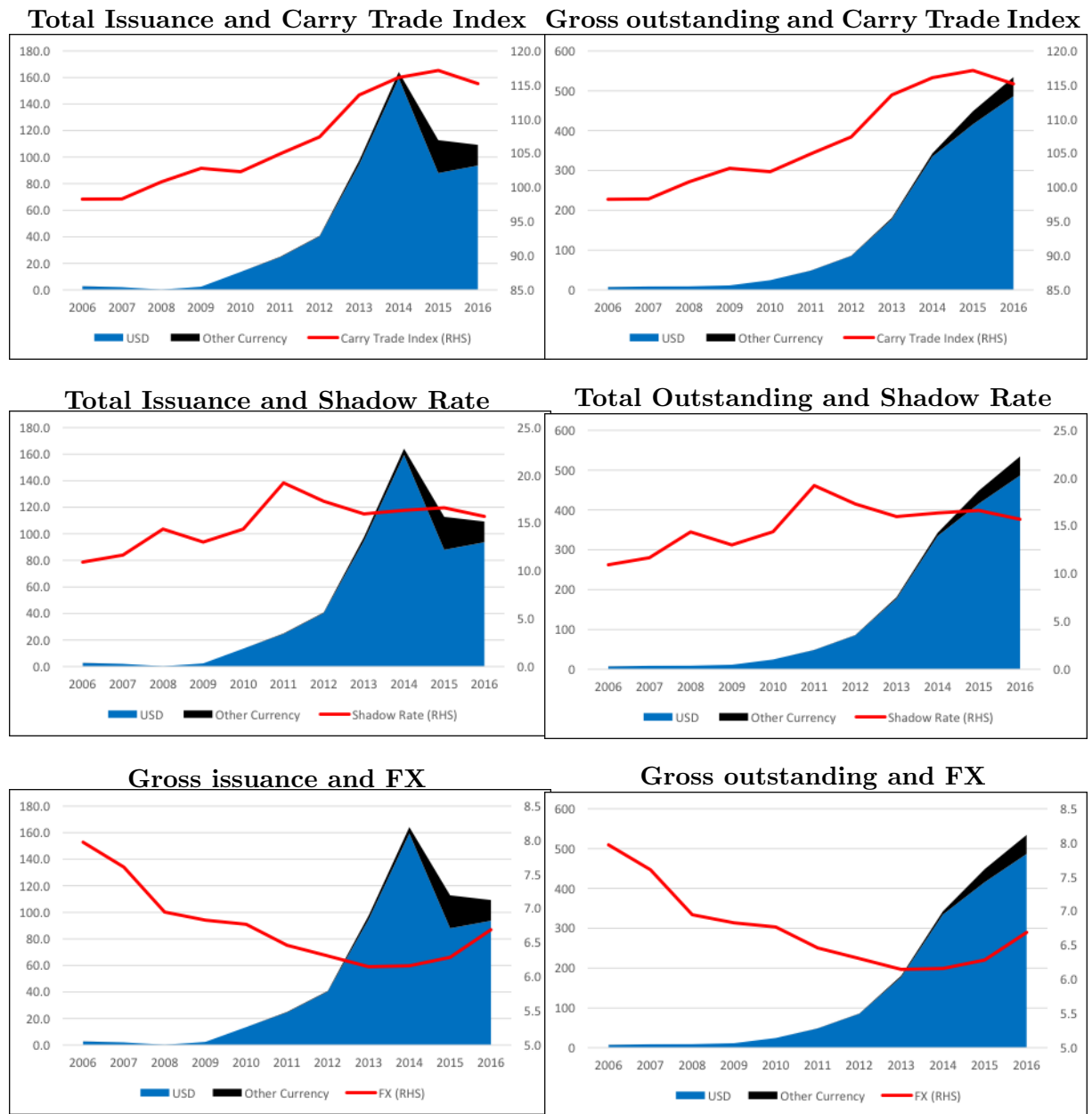


Figure 2A. International bonds by Chinese Residents and Chinese Nationals

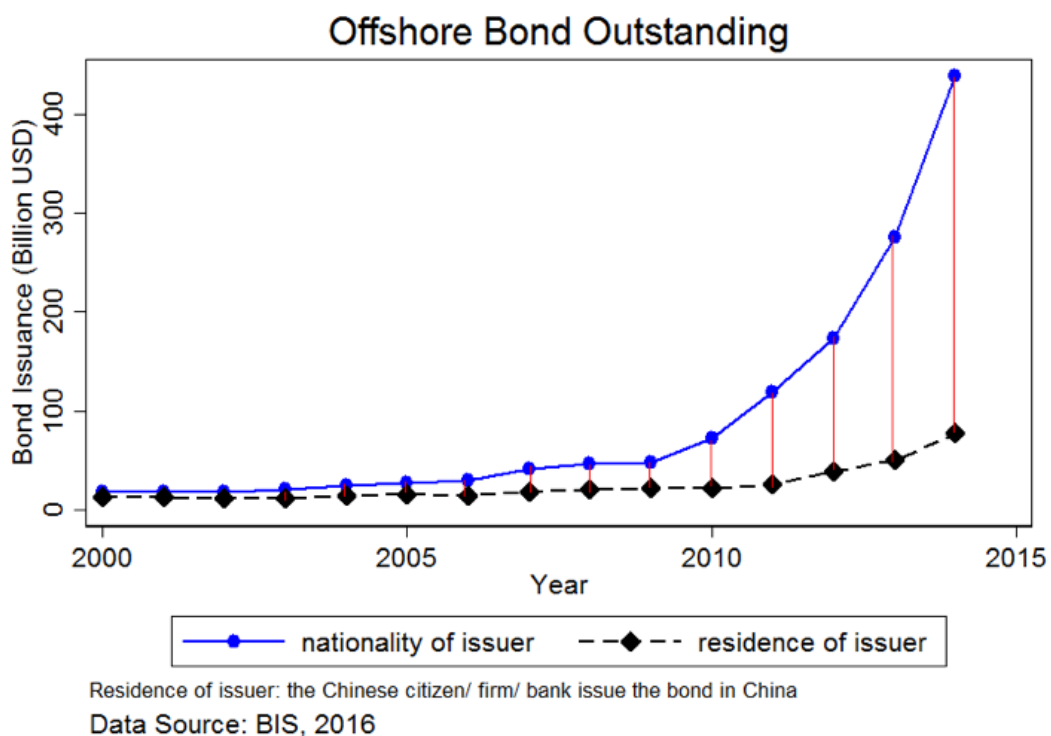


Figure 2B. Dealogic versus BIS data

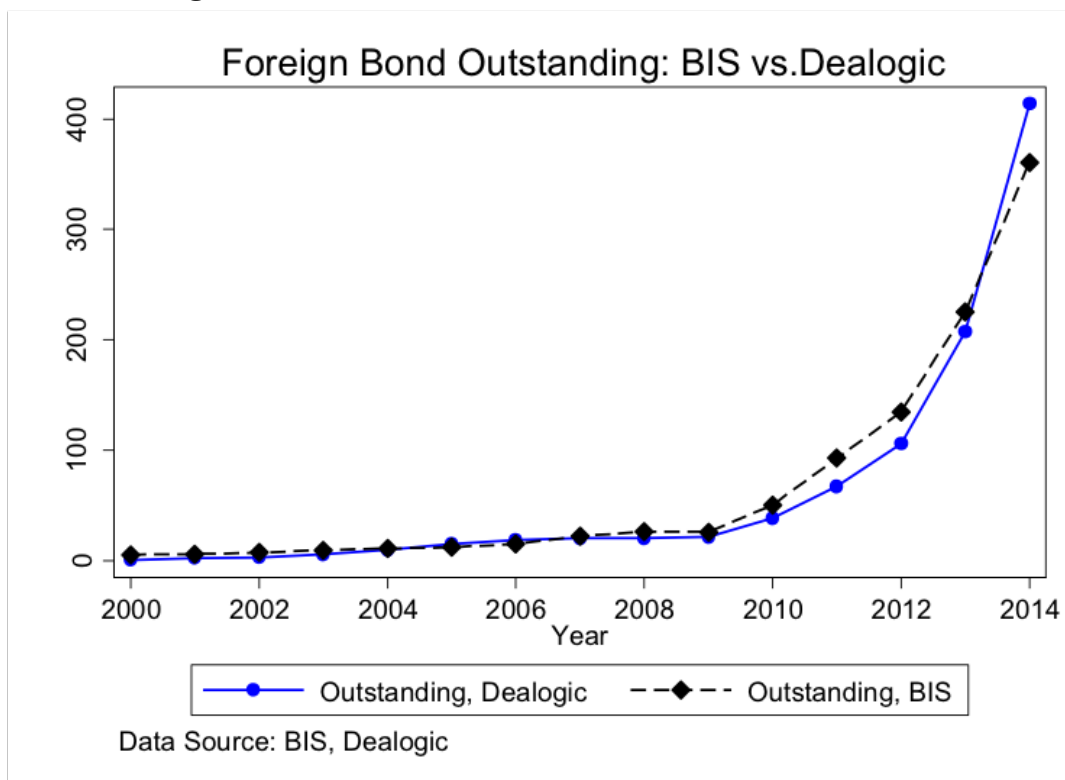


Figure 3. NFC bond issuances and outstanding by currency

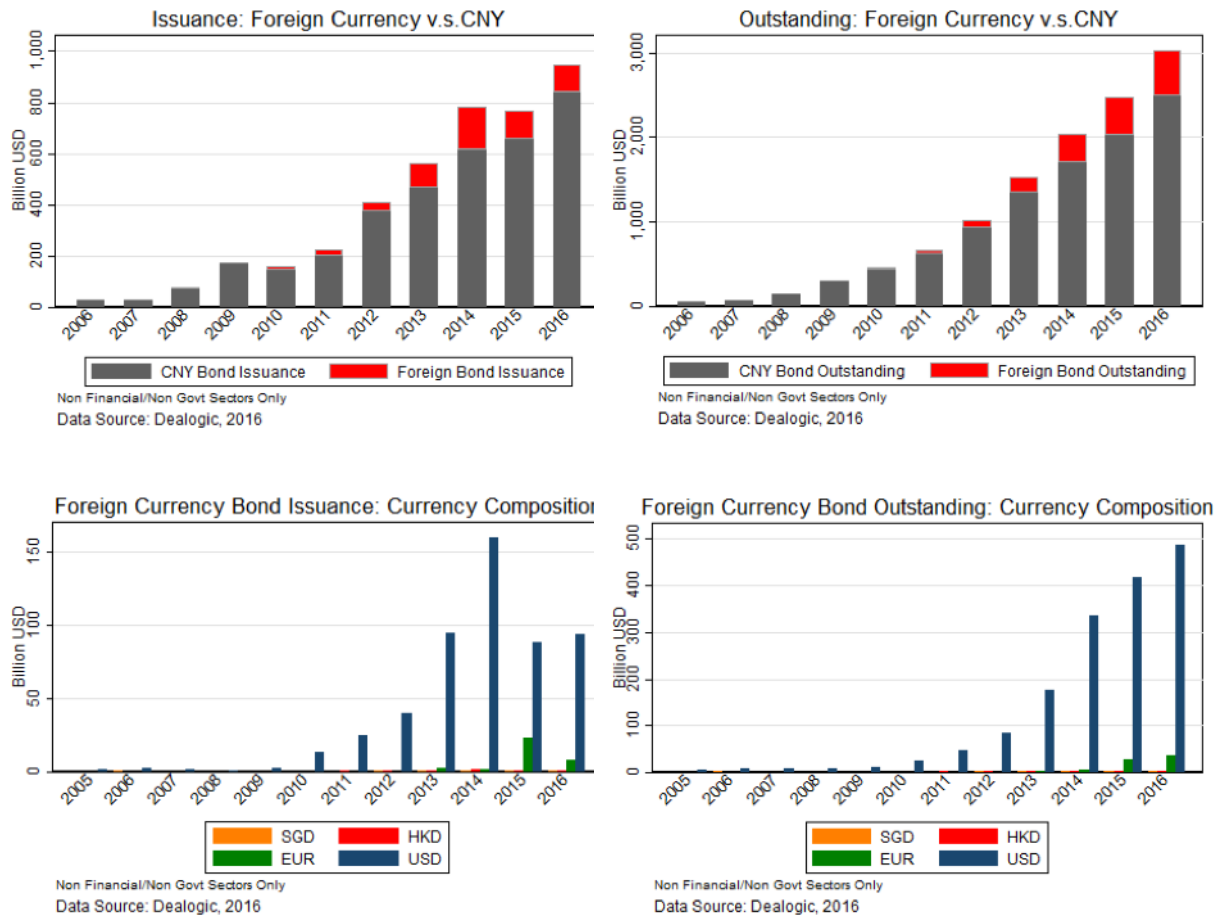
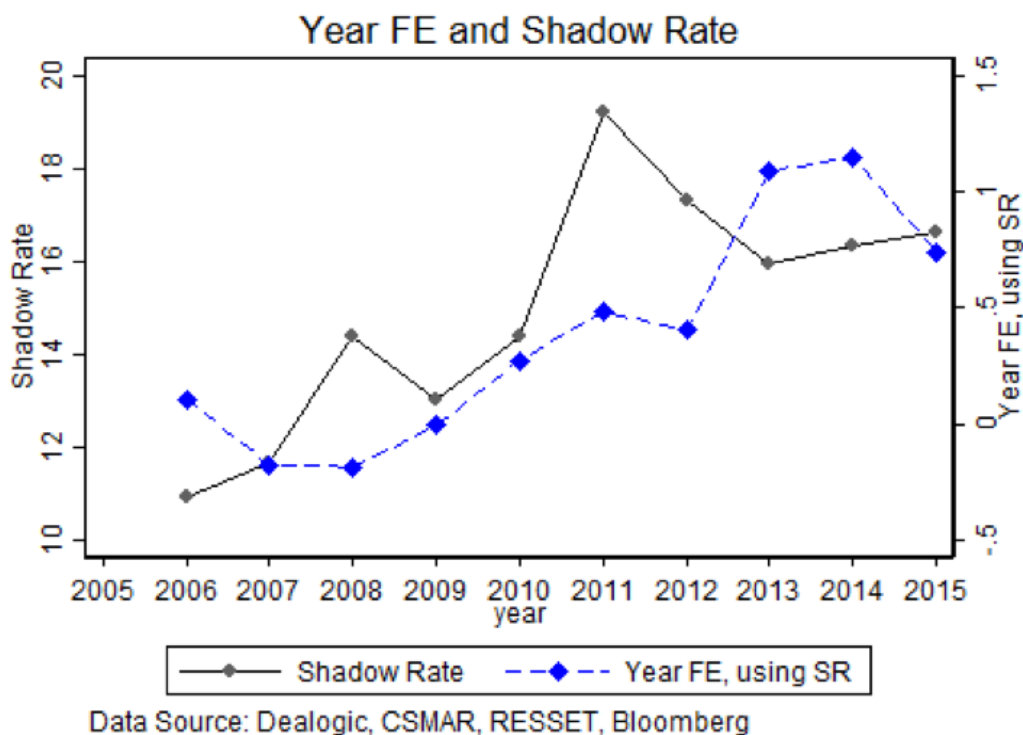
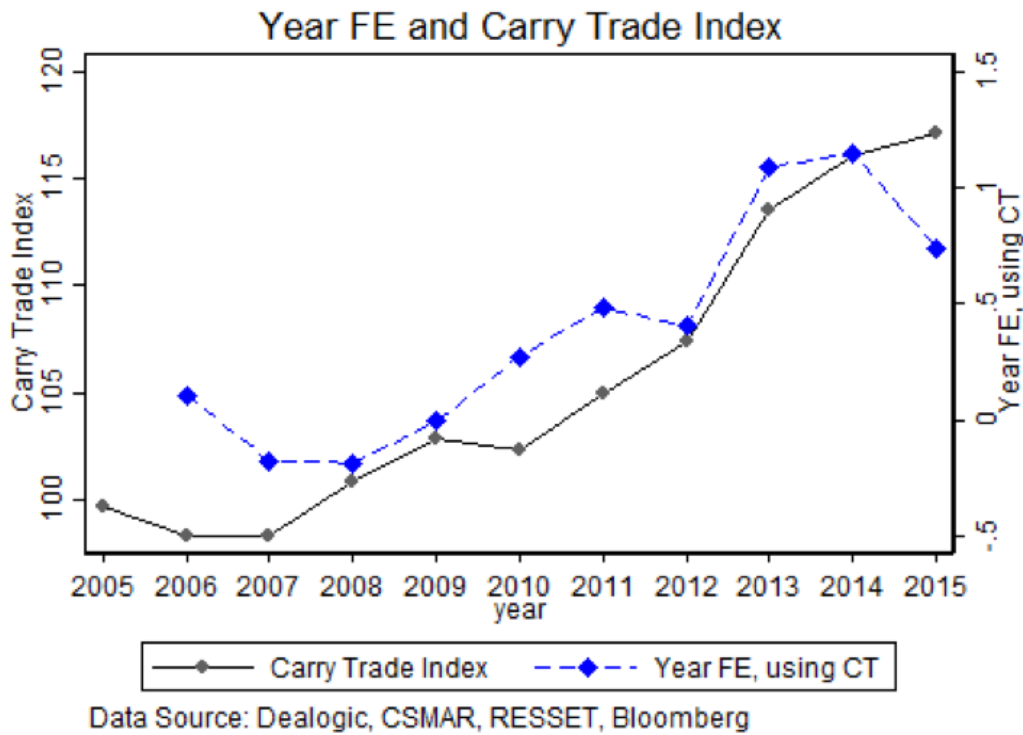


Figure 4. Year fixed effects and returns from carry trade



These two figures plot the year fixed effects recovered from the regression of Column 1 of Table 1 against the Bloomberg carry trade index (top panel) and shadow rate of private lending interest rate in the Chinese shadow banking system.

Figure 5. NFC inter-firm loan and provision rate by sector

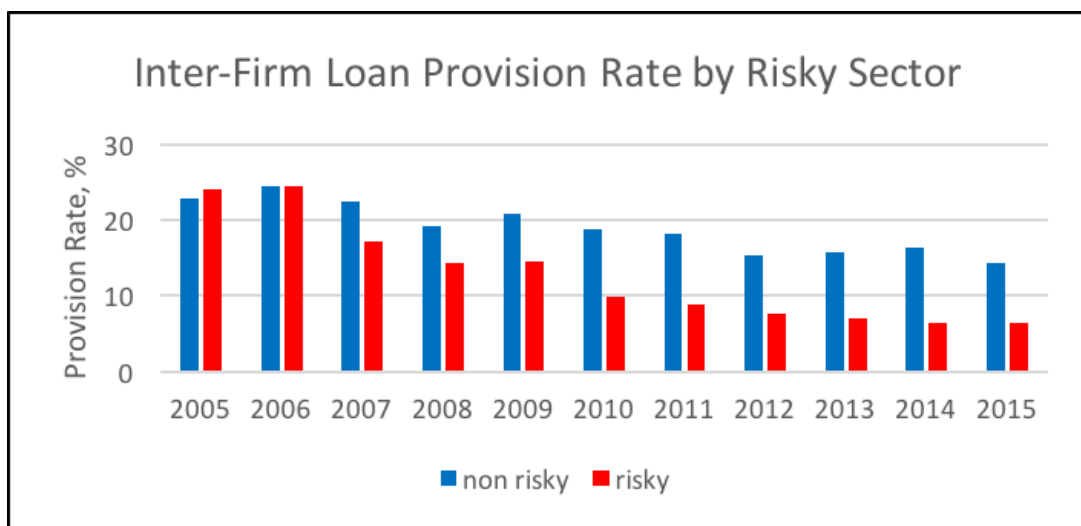
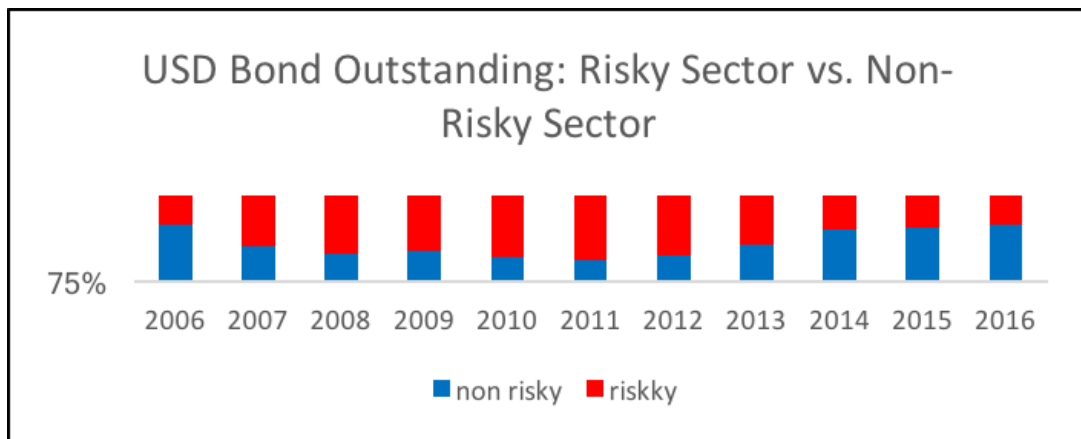
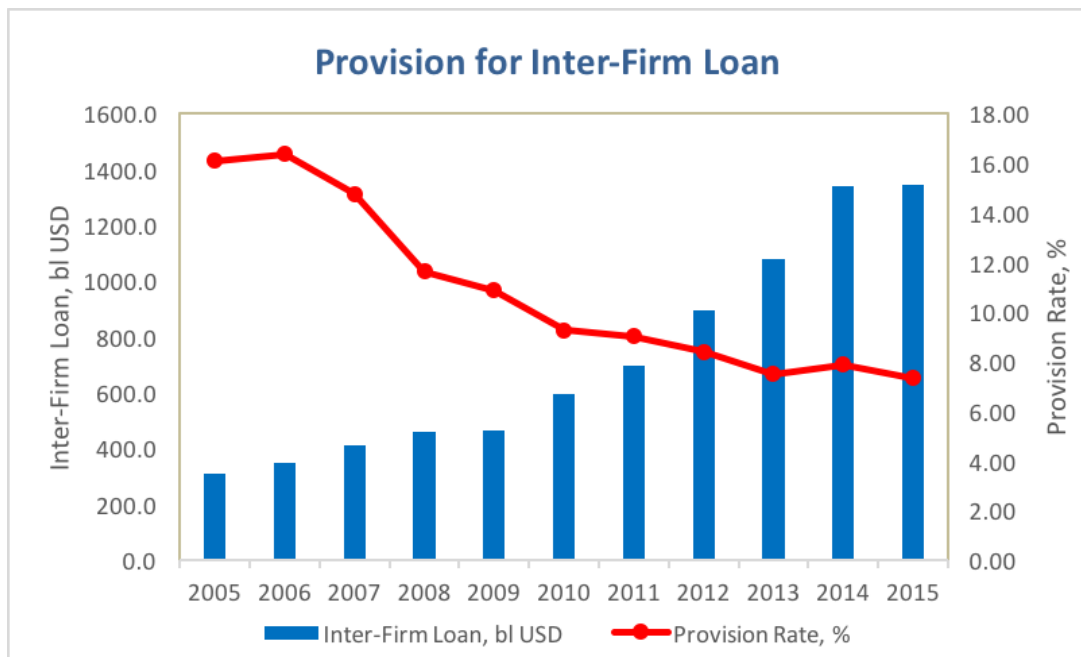


Figure 6. Inter-firm loan and provision rate



Appendix

Table A1. summary statistics

Variable	Obs	Mean	Std.	Min	Max	Source
USD issuer	24,806	0.009	0.095	0	1.000	Dealogic
USD issuance value/revenue	24,806	0.001	0.023	0	1.590	Dealogic
USD issuance outstanding/revenue	24,806	0.001	0.014	0	0.796	Dealogic
Fixed asset investment/revenue	22,618	0.230	0.488	-0.444	3.519	CSMAR
Cash/revenue	24,083	0.411	0.469	0.023	2.473	CSMAR
Inter-firm loan/revenue	24,806	5.532	12.48	0.056	95.920	CSMAR
Leverage	24,806	0.471	0.213	0.075	0.927	CSMAR
ROA	24,806	0.696	0.454	0.089	2.150	CSMAR
Asset/revenue	24,806	2.306	1.980	0.464	10.900	CSMAR
Carry trade index	24,806	106.400	6.706	98.28	117.100	Bloomberg
Shadow rate	23,367	15.250	2.377	10.930	19.220	Wenzhou Index

Table A2. The drivers of US dollar bond issuance (Logit)

This table contains a set of panel Logit firm-level regressions where the dependent variable is a dummy that takes value 1 in years when a firm issues a dollar bond and the controls are the lagged values of return on assets (ROA), leverage, firm size (measured as the log of total assets), share of exports over total revenues (For. Exp.) a dummy variable that takes value 1 for firms that belong to risk sectors, the Bloomberg carry trade index (CT) and the Wenzhou shadow rate index (SR). These two indexes are not lagged. Coefficients and standard errors are multiplied by 100 to improve readability.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ROA	-0.52 (0.34)	-0.36 (0.34)	-0.74** (0.36)	-0.43 (0.37)	-0.96** (0.40)	1.14 (0.80)	-0.27 (0.94)
Leverage	2.47*** (0.80)	2.59*** (0.79)	2.71*** (0.82)	2.15*** (0.82)	2.67*** (0.83)	1.81 (1.28)	0.67 (1.36)
ln(Asset)	1.28*** (0.12)	1.29*** (0.12)	1.45*** (0.13)	1.25*** (0.12)	1.46*** (0.14)	0.94*** (0.34)	1.03*** (0.34)
For. Exp.	-1.11*** (0.30)	-1.15*** (0.30)	-1.04*** (0.31)	-1.41*** (0.38)	-0.98*** (0.33)	-0.51 (0.70)	-0.46 (0.70)
Risky Sector	1.23*** (0.29)	1.23*** (0.29)	1.17*** (0.30)	1.13*** (0.32)	1.13*** (0.32)		
CT		0.09*** (0.01)		-0.57** (0.27)			
SR			0.17*** (0.04)		-1.74** (0.86)		
ROA×CT				0.03 (0.04)		0.06 (0.04)	
Leverage×CT				0.13 (0.09)		0.11 (0.12)	
ln(Asset)×CT				0.02* (0.01)		0.02 (0.02)	
Foreign Exposure×CT				0.05 (0.04)		0.06 (0.05)	
Risky×CT				0.02 (0.03)		0.02 (0.03)	
ROA×SR					0.17 (0.12)		0.19 (0.14)
Leverage×SR					-0.23 (-0.29)		-0.48 (-0.35)
ln(Asset)×SR					0.08** (-0.04)		0.10** (-0.05)
Foreign Exposure×SR					-0.1 (-0.11)		-0.14 (-0.14)
Risky×SR					0.06 (0.09)		0.05 (0.12)
Firm FE	N	N	N	N	N	Y	Y
Year FE	Y	N	N	N	N	Y	Y
Observations	27,719	27,719	26,111	27,719	26,111	1,133	1,049

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table A3. Investment in fixed assets and dollar bond issuance

This table reports the results of a set of fixed effects regressions in which the dependent variable is capital expenditure over total assets and the explanatory variables are dollar bond issuer status (columns 1 and 2 use a dummy variable that takes value one if the firm has issued in a given year, columns 3 and 4 use the dollar value of bond issuances over total assets, and columns 5 and 6 use the dollar value of outstanding bonds over total assets), leverage, returns on assets, firm size (log of total assets) and the interaction between the demanded value of the Bloomberg carry trade index (CT) and issuer status.

	(1)	(2)	(3)	(4)	(5)	(6)
Issuer	-0.06 (0.04)	-0.06 (0.06)	-0.85 (0.93)	-0.80 (1.07)	-0.97 (0.87)	-1.01 (0.87)
Issuer*CT		-0.00 (0.01)		0.01 (0.15)		0.04 (0.11)
Leverage	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)
ROA	-0.03* (0.02)	-0.03* (0.02)	-0.03* (0.02)	-0.03* (0.02)	-0.03* (0.02)	-0.03* (0.02)
Size	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)
Year FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Observations	25,159	25,159	25,159	25,159	25,159	25,159
Issuer is:	Dummy	Dummy	Amount Issuance	Amount Issuance	Amount Outstanding	Amount Outstanding

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table A4. Cash holdings and dollar bond issuances

This table reports the results of a set of fixed effects regressions in which the dependent variable is liquid financial assets over total assets and the explanatory variables are dollar bond issuer status (columns 1 and 2 use a dummy variable that takes value one if the firm has issued in a given year, columns 3 and 4 use the dollar value of bond issuances over total assets, and columns 5 and 6 use the dollar value of outstanding bonds over total assets), leverage, returns on assets, firm size (log of total assets) and the interaction between the Bloomberg carry trade index (CT) and issuer status.

	(1)	(2)	(3)	(4)	(5)	(6)
Issuer	0.48 (1.09)	-0.31 (1.75)	19.8 (22.80)	13 (24.42)	17.55 (20.76)	21.23 (21.41)
Issuer*CT		0.11 (0.19)		-2.75 (3.54)		-1.83 (2.60)
Leverage	-0.61*** (0.08)	-0.61*** (0.08)	-0.61*** (0.08)	-0.61*** (0.08)	-0.60*** (0.08)	-0.61*** (0.08)
ROA	3.50*** (0.35)	3.49*** (0.35)	3.50*** (0.35)	3.50*** (0.35)	3.50*** (0.35)	3.50*** (0.35)
Size	-0.05 (0.07)	-0.05 (0.07)	-0.05 (0.07)	-0.05 (0.07)	-0.05 (0.07)	-0.05 (0.07)
Year FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Observations	25,658	25,658	25,658	25,658	25,658	25,658
Issuer is:	Dummy	Dummy	Amount Issuance	Amount Issuance	Amount Outstanding	Amount Outstanding

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table A5. Sector classification

SIC	Sector (0=non risky, 1=overcapacity, 2=real estate, 3=other risky)
Aluminum extruded products	1
Aluminum rolling and drawing, NEC	1
Aluminum sheet, plate, and foil	1
Anthracite mining	1
Bituminous coal and lignite—surface	1
Bituminous coal—underground	1
Blast furnaces and steel mills	1
Bridge, tunnel, and elevated highway	3
Cellulosic manmade fibers	3
Cement, hydraulic	1
Coal and other minerals and ores	1
Coal mining services	1
Cold finishing of steel shapes	1
Concrete block and brick	1
Concrete products	1
Converted paper products, NEC	3
Copper ores	3
Copper rolling and drawing	3
Flat glass	1
Glass and glazing work	1
Gray and ductile iron foundries	1
Heavy construction, NEC	2
Iron ores	3
Lead and zinc ores	3
Nonresidential building operators	2
Nonresidential construction	2
Organic fibers, noncellulosic	3
Paper mills	3
Petroleum and coal products, NEC	1
Primary aluminum	1
Primary copper	3
Ready-mixed concrete	1
Real estate agents and managers	2
Real estate investment trusts	2
Real property lessors, NEC	2
Residential construction	2
Ship building and repairing	1
Single-family housing construction	2
Soybean oil mills	1
Steel foundries, NEC	1
Steel pipe and tubes	1
Steel wire and related products	1

We code risky sectors using Chen *et al.* (2016) classification of China's economic sectors into: (i) non-risky sectors; (ii) over-capacity sectors; (iii) real estate sector; and (iv) other risky sectors.¹⁶ We use information from the WIND database to code sectors that belong to the last three groups as risky. The full list is in Table A1.

¹⁶Chen *et al.* (2016) classification is, in turn, based on the definition of the Ministry of Industry and Information

Technology of the People's Republic of China which in 2014 labeled 15 industries as over-capacity industries.

Figure A1. NFC bond issuance by currency: yield and maturity

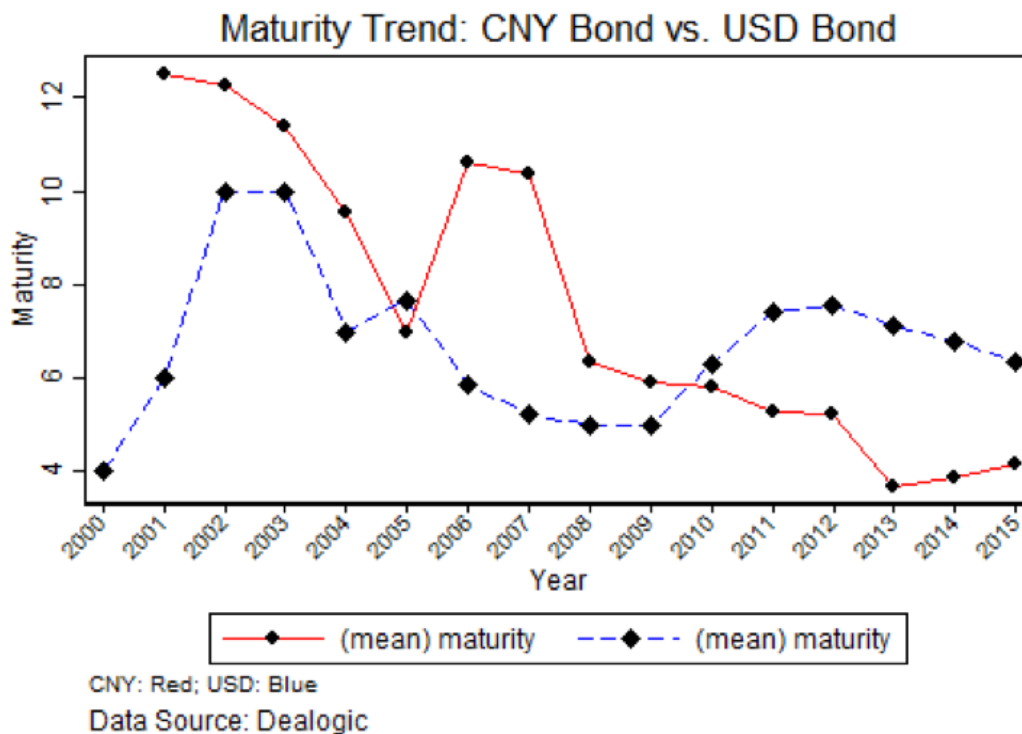
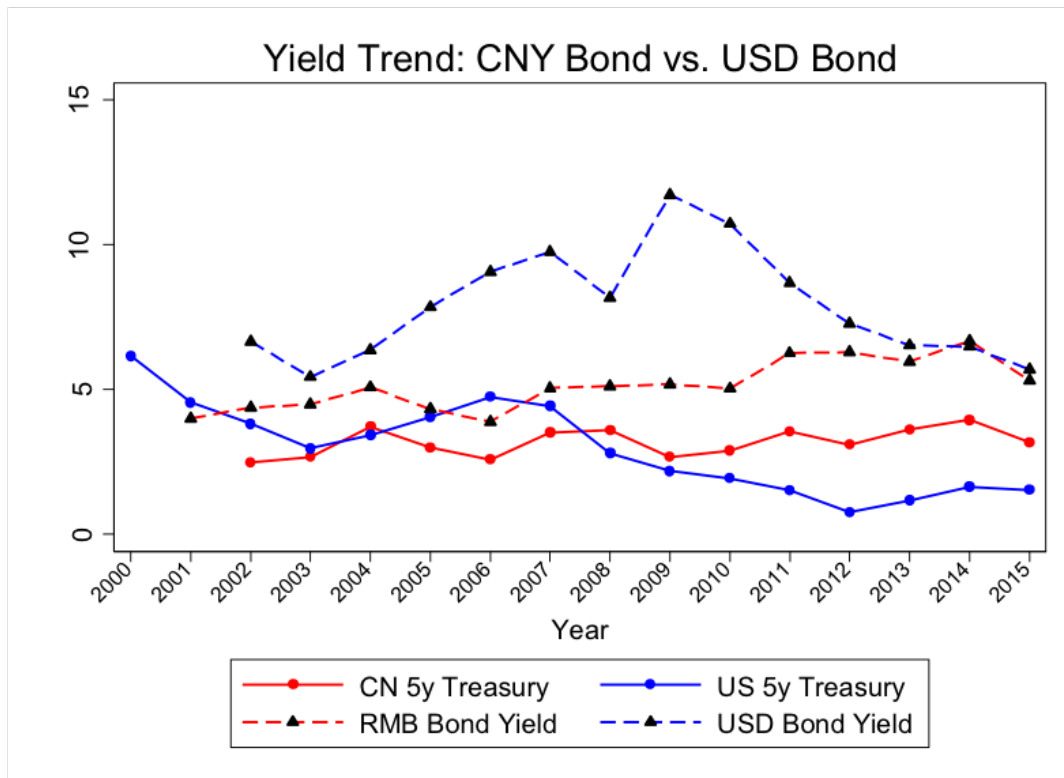


Figure A2. data quality

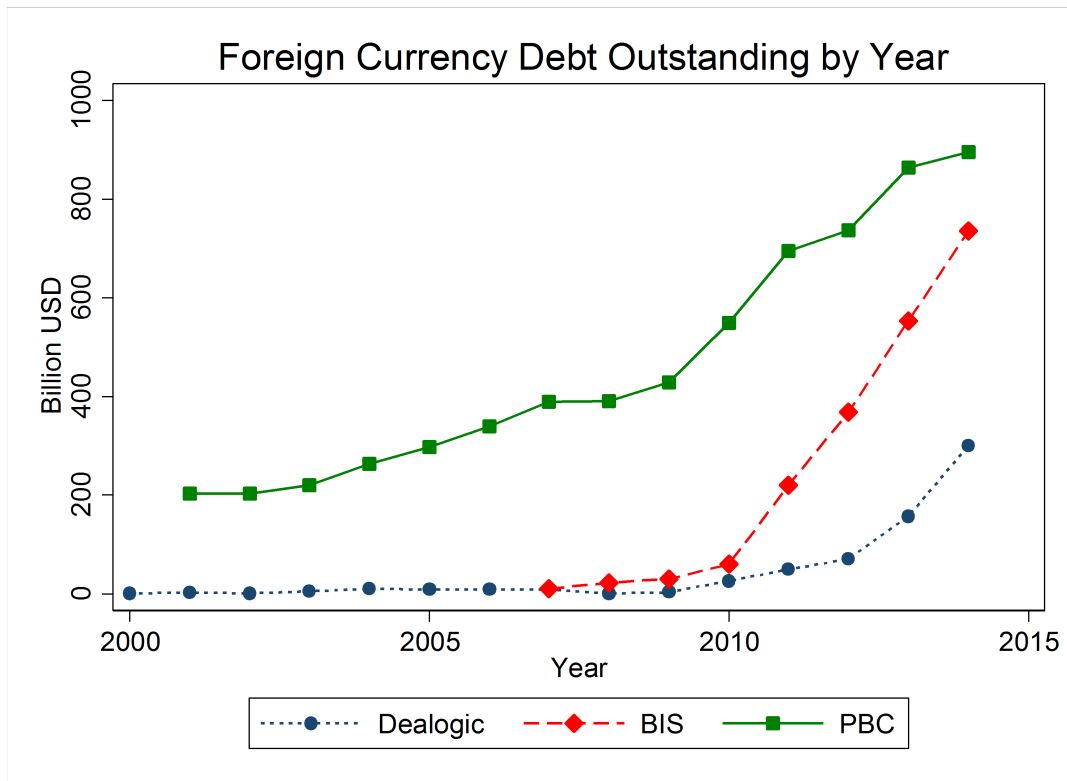


Figure A3. Intra/Inter-Group Loan Proportion

