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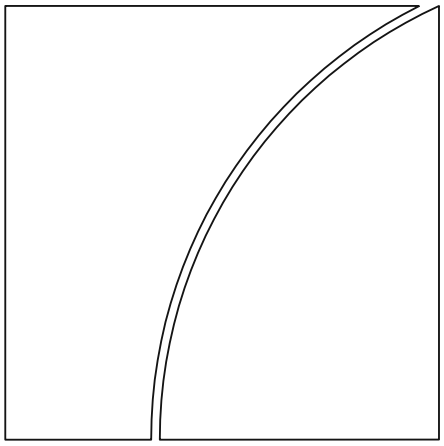

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Monetary and Economic Department

March 2018

JEL classification: E0, F0, F1

Keywords: capital flows, exchange rates, FX borrowing, firm heterogeneity, firm leverage

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Exchange Rate Appreciations and Corporate Risk Taking*

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Abstract

We test the risk taking channel of exchange rate appreciations using firm level data from private and public firms in ten Asian emerging markets during 2002–2015. Since foreign currency (FX) debt at the firm level is not observed for the Asian economies, we approximate the FX debt of a given firm by assuming that any given firm will hold a constant share of its total debt in foreign currency, where this share is given by the firm's country's share of FX liabilities in total liabilities. We measure risk taking by firm's leverage. We show that firms with a higher volume of FX debt before the exchange rate appreciates, increase their leverage relatively more after the appreciation. Our results imply that more indebted firms become even more leveraged after the exchange rate appreciations.

JEL Classification: E0, F0, F1

Keywords: Capital Flows, Exchange Rates, FX Borrowing, Firm Heterogeneity, Firm Leverage

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1 Introduction

Exchange rate appreciations can be expansionary on contractionary for the country whose currency is appreciating vis-à-vis the US dollar. The standard textbook Mundell-Fleming model predicts a contractionary effect as a result of a decline in net exports with an appreciating currency, the so-called demand or expenditure switching effect. This model assumes everything else that determines output, such as investment and consumption, stays constant since these are not affected by the movements in the exchange rate. There can be an additional channel, where investment responds positively to an exchange rate appreciation. This can work via two channels: interest rate channel and balance sheet channel. Exchange rate appreciations are accompanied by positive capital inflows into the country and if these flows are exogenous to country fundamentals, then there will be a decline in the interest rates. As a result of this decline in the borrowing costs private sector debt and investment will increase.[1] It can also be the case that, both firms' and banks' balance sheets get a positive shock as a result of the local currency appreciating. On the bank side, banks' leverage constraint relaxes, and on the firm side firms' net worth increases.[2] Both of these balance sheet shocks will lead to more borrowing and higher investment.

To be able to guide the policy debate, one needs to know which of these channels dominates in the aggregate. Blanchard et al. (2015) argue that exchange rate appreciations leading to an expansion in output and credit are a phenomenon that cannot be explained by the standard models due to the dominating channel of trade, where a decline in net exports implies a decline in output. To have the credit and output expansion for the aggregate economy, the environment has to have financial frictions, where exchange rate appreciations relax these frictions.

Our paper provides evidence on this conjecture by focusing on the balance sheet effects. We ask, whether firms take on more debt (hence a relaxation of financial frictions on the firm side) if the exchange rate of their home country appreciates vis-à-vis the US dollar. We use firm-level data from the ORBIS database for ten major Asian emerging markets (EMs) over the period of 2002 to 2015. The ORBIS database allows us to have a granular look since it includes balance sheet variables for both listed and non-listed firms.

[1] See Baskaya et al. (2017) for this interest rate channel.

[2] See Bruno and Shin (2015a,b) for the bank side and Céspedes, Chang and Velasco (2004) for the firm side.

This is a big advantage over other firm-level datasets such as Worldscope which covers only listed firms, and the Capital IQ database which has an extremely small coverage of non-listed firms.

The ORBIS database does not break down firm-level debt and assets by currency. To obtain firm-level measures of foreign currency (FX) debt, we use data from the Bank for International Settlements (BIS) on the country-level FX debt. There are two datasets available from the BIS that we use. The first dataset is BIS Global Liquidity Indicators that provide data on country-level FX debt which is the sum of FX bonds and FX loans. FX bonds are debt securities issued in the US dollar, euro and Japanese yen and issued in international markets by the residents in the non-financial sector of a given economy. FX loans are bank loans extended to the non-bank sector of a given economy both by domestic banks and by international banks denominated in the US dollar, euro and Japanese yen. The second dataset is BIS Total Credit Database. It provides data on total loans and debt securities used for borrowing by the residents in the non-financial sector of a given economy. Since these data cover total loans and bonds, it has loans and bonds both in domestic and foreign currencies. To obtain firm-level FX debt, first we calculate the country-level share of FX debt, defined as country total FX debt divided by country total debt, where we divide the sum of loans and bonds in FX from our first dataset by the sum of total loans and bonds from our second dataset. Then we apply this country-level share of FX debt to firms' total debt that we obtain from ORBIS. Hence we assume that every firm's FX share of debt in their total debt is same and equivalent to their home country share of FX debt in total debt.

Our results are in support of increased leverage (risk taking) as a result of a positive balance sheet shock to firms. When faced with local currency appreciation against the US dollar, firms with larger FX debt before the exchange rate appreciates increase their leverage relatively more than those with smaller FX debt after the appreciation. This is conditional on firm size. Since we apply same share of FX debt to all firms in an economy, firms who are larger will have more debt and hence more FX debt. Hence it is essential to control firm size. Upon doing so, we still find that, more FX debt ex-ante leads to higher leverage ex-post. Even if the result is driven by larger firms having more debt, which will translate into more FX debt under our assumption of the constant share of FX debt for every firm, it is still not clear why large firms with more debt should respond

to exchange rate appreciations if a large part of their debt is not in FX. Note that this is not a simple valuation effect since we define leverage as total financial debt to total assets, where an exchange rate related movement will affect the value of the denominator and numerator more or less equally. We control for country- and industry-level demand and supply shocks and policy changes by using country-sector-year fixed effects.

We run a simple leverage regression using annual data, where we regress firm-level leverage on firm fixed effects, standard controls and a dummy variable for FX debt exposure interacted with a dummy variable for exchange rate appreciation. The firm-level dummy variable for "high FX debt exposure" is time invariant and takes the value of one when the average value of FX debt of a firm is higher than the value of FX debt of the median firm in the same country. The "appreciation" dummy takes a value of one when the exchange rate appreciates more than 10 percent.

It is important to have firm fixed effects in this regression given the scale effects where larger firms will have more FX debt on average. We have also used firm-level FX debt normalised by firm-level total assets for robustness checks, and obtained overall similar results. We control for time-varying firm size by log(assets) as this is a standard control in leverage regressions. We use country-year fixed effects to ensure our results are not driven by country-level demand and policy changes. We also use industry-year fixed effects to guard against the possibility of industry specific shocks driving our results.

We find that, when faced with local currency appreciation against the US dollar, firms with larger FX debt before the exchange rate appreciates increase their leverage relatively more than those with smaller FX debt after the appreciation. We also show that such effects of local currency appreciation via FX debt on firm-level leverage are stronger for firms in the non-tradable sector than those in the tradable sector, and that such a risk-taking channel works mainly through increases in long-term debt for firms in the tradeable sector and through increases in both long- and short-term debt for firms in the non-tradeable sector.

Our results are not large. During our sample period we do not observe large appreciations: the largest is 17 percent. This observation explains our small effects. Our benchmark estimate of 0.036 implies that a firm who has FX debt more than the typical firm's FX debt will increase its leverage ratio 3.6 percentage points more than the firm with FX debt lower than the typical firm as a result of a 10 percent appreciation of the

exchange rate. This represents a 22 percent increase over the sample mean of leverage. Our estimates are larger for the firms in the non-tradeable sector. The estimate for the average firm in the non-tradable sector is 0.06, representing a 6 percentage point increase in relative leverage between high and low FX debt firms, which corresponds to a 37 percent increase relative to the sample mean leverage. This is precisely the reason why the empirical literature has focused on currency crises/depreciation episodes since such episodes provide a large "sudden" shock given the large devaluation.

Related literature

Most papers in the existing empirical literature consider the impact of currency depreciations with a focus on very specific episodes of capital outflows, i.e., sudden stops and balance of payments crises. Aguiar (2005) considers large depreciations during the 1995 Mexico debt crisis and finds that firms with heavy exposure to short-term FX debt before the devaluation experienced relatively low levels of post-devaluation investment. By contrast, Bleakley and Cowan (2008) point out that a depreciation of local currency works via a balance sheet channel (negative net worth effects) and a competitiveness channel (positive expansionary effects) for non-financial firms carrying foreign currency debt, and show that following average depreciations, more than 450 firms in five Latin American countries holding more dollar debt in the 1990s did not invest less than their local currency indebted counterparts. Kalemli-Ozcan, Kamil and Villegas-Sanchez (2016) provide an explanation for these seemingly conflicting results by using firm-level data on the currency composition of debt on listed firms in six Latin American countries, Argentina, Brazil, Chile, Colombia, Mexico and Peru. They show that balance sheet mismatch causes a decline in investment during depreciations if firms do not have access to liquidity, which they proxy through foreign ownership and internal capital markets of multinationals. They also differentiate between currency crises and banking crises and show that depreciations are only contractionary when there is a banking crisis and firms have FX debt with no hedge on their balance sheet (currency mismatch). All these papers use balance sheet data on listed firms focusing on both bonds and loans. Allayannis, Brown and Klapper (2003) use a very small data set on 327 large East Asian corporations from 1996 to 1998, focusing on bond issuance and show that local currency debt is associated with the biggest drop in market value. Serena and Sousa (2017) match firm-level

balance sheet data with a dataset of firm-level bond issuance for about 1,000 firms from 36 EMs over the period of 1998–2014. They find that, conditional on the amount of debt issued in foreign currency, exchange rate depreciations are contractionary on firm-level investment spending. Niepmann and Schmidt-Eisenlohr (2017) use loan-level data from US banks' regulatory filings for 19,210 borrowing firms in 105 different countries and find that a 10 percent depreciation of the local currency against the US dollar increases the probability that a firm becomes past due on its loans by 69 to 160 basis points more for firms with foreign currency debt than for firms with domestic currency debt in the same country, industry and quarter and with the same bank-internal rating. This result provides direct evidence on the balance sheet channel, that is, firms do not perfectly hedge against exchange rate risk, which translates into credit risk for banks.

This paper contributes to the growing empirical literature that focuses on the boom periods with exchange rate appreciations and the associated corporate risk taking. The existing empirical literature on the risk-taking channel of exchange rate fluctuations solely relies on correlations produced using macro-country/time level data. For example, Bruno and Shin (2015b) show that an expansionary shock to US monetary policy increases cross-border bank capital flows through higher leverage of global banks. Bruno and Shin (2015a) show that an appreciation of the local currency against the US dollar is associated with an acceleration of bank capital flows to individual countries. These two papers focus on the quantity dimension of the risk-taking via global banks. They use data at aggregate levels from flow of funds in the United States and on cross border loans from the BIS. Hence, they cannot focus on bank- or firm-level heterogeneity as envisioned in the models given the aggregate nature of their data. Similarly, Hofmann, Shim and Shin (2017) use aggregate data but focus on the price dimension of the risk-taking channel, where in EMs, an appreciation of local currency vis-à-vis the US dollar leads to a compression in government bond yields.

Our paper is the first in this literature that provides direct evidence at the firm-level on the risk-taking channel, by looking at *all* firms' balance sheet FX exposure and whether this exposure interacts with appreciations in a way that the stronger balance sheet leads to more borrowing when there is an appreciation in their home currency vis-à-vis the US dollar.[3] This allows us to look at both loans and bonds, where in EMs the largest

[3]Baskaya et al. (2017) is an exception, where they quantify the appreciation related risk-taking channel by using loan level data from Turkey during 2002–2012. They show that, in the case of Turkey,

external liability is loans from global banks (not external corporate bond issuance) and loans obtained in FX from domestic banks.[4]

We do not attempt to separate whether the mechanism works via demand for credit or the supply of credit. In most countries, banks are regulated so that banks' balance sheets cannot have a currency mismatch. This means that exchange rate appreciations work via improving firms' balance sheets and their creditworthiness, which will in turn affect both demand for and the supply of credit. Even if banks are not regulated and appreciation also improves the banks' balance sheets, this will improve the lending capacity and willingness of banks to take more leverage and work in the same direction. The key difference in our paper from the ones in the literature focusing on appreciations driven risk-taking channel is to have the firm-level FX exposure measure where we can differentiate between firms who were constrained and those who were not constrained before the exchange rate shock, in a similar vein to the papers that focused on large depreciation/sudden stop episodes. This allows us to have an identification mechanism, where we can quantify the effect of appreciation on firm-level risk taking as a result of firms' balance sheet strength due to relaxation of financial constraints.

The paper proceeds as follows. Section 2 presents stylised facts on FX debt for forty-two economies in 2002–2015 including countries other than the ten Asian EMs that we use in our main empirical exercise. Section 3 describes the data in detail. Section 4 lays out our identification methodology. Section 5 presents empirical benchmark results on firm-level leverage. Section 6 shows robustness results. Finally, section 7 concludes.

2 Stylised Facts on Foreign Currency Debt

The central variable in our study is the amount of foreign currency borrowing by firms. Such data are not readily available for most firms in EMs. Large publicly listed companies sometime report their loans and bonds denominated in foreign currency. By contrast, it is difficult to obtain such data for relatively small listed firms and entirely impossible for non-listed private firms in EMs.

Considering such difficulty, we proxy the share of firm-level FX debt with the country-

lower borrowing costs due to exogenous capital flows are the leading explanation for the domestic credit boom instead of stronger firm balance sheets due to appreciation.

[4]See Advjiev et al. (2017) for details.

level one. We use the amount of foreign currency debt produced by the BIS as part of its Global Liquidity Indicators. Specifically, the amount of FX debt is calculated as the sum of the amount of FX debt securities issued by the non-financial sector in an economy and the amount of foreign currency bank lending to non-banks in the economy both domestically and externally. The amount of FX loans and FX-denominated debt securites in the US dollar, the euro and the Japanese yen are converted into the US dollar. The BIS data cover 42 economies[5] and are available from Q1 2000 on a quarterly frequency. We use the data updated in April 2017. A few breaks in data series generated by the reporting of new series by national authorities were corrected.

We can calculate the FX debt share in two ways: use total credit to the non-financial sector (including general government, non-financial corporates and households) or total credit to the non-financial corporate sector as the denominator. Similar to the definition of FX debt, total credit includes both loans and debt securities used for borrowing by different sectors of the economy. When we use total credit to the non-financial corporate sector as the denominator of the FX debt share, for some economies in certain quarters, the share becomes greater than one since the numerator covers more borrower sectors in the economy. We use both ratios, where the numerator is the FX debt to the non-financial sector and the denominator can be total debt in the non-financial sector or total debt in the non-financial corporate sector, in our empirical analysis and obtain similar results.

The correlation between the measures is very high as shown in Table 1. The only countries where the ratio differs substantially depending on whether we use total non-financial debt or total corporate debt in the denominator are India and Turkey as shown by the low correlation in Table 1. We plot the two series normalised by different denominators for these two countries in Appendix figures. Since our regressions only use India, it is not surprising that we got similar results. In the paper we report results where we use total debt to the non-financial sector as the denominator but the other set of results using total debt to the non-financial corporate sector are reported in the robustness section.

Figure 2 shows the time series of the ratio of FX debt to total credit to the non-

[5]Ten Asian EMs are China, Chinese Taipei, Hong Kong SAR, Indonesia, India, Korea, Malaysia, the Philippines, Singapore and Thailand. Seven economies in central and eastern Europe, Middle East and Africa are the Czech Republic, Hungary, Israel, Poland, Russia, Turkey and South Africa. Four Latin American economies are Argentina, Brazil, Chile and Mexico. Twenty one advanced countries are Austria, Australia, Belgium, Canada, Switzerland, Germany, Denmark, Spain, Finland, France, the United Kingdom, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, Norway, Portugal, Sweden and the United States.

financial sector for each of the ten Asian EMs considered in our paper. Some economies such as Hong Kong SAR and Indonesia exhibited an increasing trend of the ratio of FX debt to total debt after 2008, while others such as Korea, Malaysia and the Philippines showed a decreasing trend during the same period. Moreover, the FX debt share of financial centres such as Hong Kong SAR and Singapore is relatively high. There is also quite a bit of cross-country variation, where some countries have the FX debt share as high as 50 percent of total debt (eg Hong Kong SAR), while others have around 5 percent (eg India) as of the end of 2015.

Figures 3 to 5 show the average level of the FX debt share for each region under different averaging methods. In particular, Figure 3 shows the simple average of the FX debt share of the economies within a region. Here we give equal weights for each economy's FX debt share. Figure 4 calculates the weighted average of the FX debt share among the economies in each region, where the amount of each economy's total credit is used as the weight. Finally, Figure 5 calculates the weighted average of the FX debt share among the economies in each region, where the amount of each economy's FX debt is used as the weight. Under this weighting scheme, an economy with a larger amount of FX debt receives a greater weight since that economy is more likely to create instability in the region.

Overall, the Latin American countries have the highest level of the FX debt share in terms of both unweighted and weighted averages, while the advanced countries have the lowest level. The Asian EMs are somewhere in between the general level of the two regions. In the time dimension, the FX debt share remained stable overall for the Asian EMs and the central and eastern European (CEE) countries over the period of 2002 to 2015. The share has gone down after the Global Financial Crisis for the Latin American countries, while it increased for the advanced economies after the Global Financial Crisis. Table 2 shows the ratio of FX debt to total debt in each of the 42 economies for the first and last year of our sample.

Finally, Figure 6 shows the ratio of FX debt to domestic currency debt for selected countries. For most there is an increasing trend in the ratio over time and for some the ratio seems to be constant over time. The increasing trend seems to coincide with quantitative easing policies in major advanced economies in the aftermath of the Global Financial Crisis.

3 Data

Our study uses accounting data of non-financial firms for the period of 2002 to 2015 in the following ten economies: China, Chinese Taipei, Hong Kong SAR, India, Indonesia, Korea, Malaysia, the Philippines, Singapore and Thailand. We obtained annual data on firm-level balance sheet items such as total assets, total debt, long-term debt, short-term debt, sales, tangible fixed assets and earnings before interest and taxes (EBIT) from the ORBIS database produced by Bureau van Djik. Exchange rate data come from the BIS. One feature of our sample is that it contains not only publicly traded companies, but also privately held firms which represent the majority of GDP for many economies in the sample. Our sample is restricted to firms with leverage information available. Finally, we exclude from the sample the firms inactive during the sample period and those in bankruptcy procedures.

Since we intend to analyse the effect of the appreciation of the local currency on firms' risk taking by taking advantage of the ownership and headquarter information provided in the ORBIS database, we also exclude those firms that are likely to make risk-taking decisions outside their financial reporting locations.[6] For example, a branch of a Korean company located in China reports the financial information to China, but its risk-taking decisions are made in its headquarters in Korea. Such a branch is excluded from our sample because the decisions have little to do with the fluctuations in the value of Chinese yuan against the US dollar. To avoid double counting, we use unconsolidated financial information for the firms reporting both consolidated and unconsolidated information. We further clean up the financial data following the procedures described in Kalemli-Ozcan et al. (2015).

Finally, we combine the cleaned financial data from the ORBIS database and the country-level nominal bilateral exchange rate data synchronised with each country's fiscal year applied to financial reporting. The fiscal year of the financial data reported before June are assigned to the year before the reporting-end year. The unit of observation in the sample is "firm-year". Our final sample contains 1,661,677 firm-year observations. The upper half of Table 3 shows the number of observations and descriptive statistics of the main variables in the final sample after winsorisation. All the variables (except the

[6] Using filters provided in the ORBIS database, we exclude from the sample the firms that are identified as "branches of foreign companies" and those with their headquarters or ultimate parents located outside the financial reporting country in terms of the ISO country code.

dummy variables) are winsorised at 1 percent to control for outliers before it is used in the regressions, while $Salesgrowth$ is windsorised at 5 percent.

Our sample is an unbalanced panel with an average firm having around three years of balance sheet data over the 14-year sample period. To control for possible biases from using this unbalanced panel sample, we can only consider firms that have financial information in all years from 2002 to 2015 and construct a balanced panel. The lower half of Table 3 shows summary statistics of this balanced panel sample containing 25,533 firms and 211,805 firm-year observations after we apply the same winsorisation method to the variables. The average value of leverage (that is, the ratio of financial debt to total assets) of the smaller balanced panel sample (0.287) is greater than that of the larger unbalanced panel sample (0.162). Also, the mean and median values of firm size in the balanced panel sample are much larger than those in the unbalanced panel, respectively.

Our dependant variable is a firm's financial leverage measured by the book value of total financial debt scaled by the book value of total assets, describing the firm's risk-taking decision. Total financial debt is the total value of the outstanding bank loans and financial bonds at the end of the fiscal year. We do not use the book value of total liabilities as the main measure of firm leverage in our benchmark analysis. This is because such liabilities contain information on trade credits or other forms of liabilities such as pension liabilities, thus making the risk-taking measure mingled with non-financial liabilities unrelated to active financial risk taking. We look at alternative measures of leverage for robustness and obtain broadly similar results.

Since we are interested in the effects of EM local currency appreciation on firms' risk-taking behaviour via firms' balance sheet, we consider both a variable capturing a firm's FX debt exposure and a variable capturing currency appreciation. In particular, we consider a time invariant dummy variable for firm-level FX debt exposure, $HighFXdebt$, which takes value one when the average of value of FX debt of a firm is higher than the respective value of the median firm in the same country, and zero otherwise. The amount of each firm's FX debt is estimated as the share of FX debt in total debt in the country multiplied by the book value of a firm's total debt.

In order to gauge the impact of currency appreciation on a firm's balance sheet, in our baseline regressions, we interact $HighFXdebt$ dummy with an appreciation dummy. The appreciation dummy equals to one when the nominal exchange rate of a local currency

against the US dollar increases (i.e. the local currency appreciates) between the end of the previous fiscal year and the end of the current fiscal year by more than 10 percent (so between $t-1$ and t). The interaction term is our key independent variable.

Consistent with Rajan and Zingales (1995), the other control variables are typical of leverage regressions and include $Collateral$ measured by tangible fixed assets/total assets,[7] $Profitability$ measured by the EBIT/total assets, $Size$ measured by the logarithm of total assets, and $Salesgrowth$ measured by the growth in sales.[8] For all firms in our sample, total debt and other financial variables reported in local currency are converted into the US dollar by using the bilateral exchange rates of the nearest quarter-end of the reporting date. All the control variables are lagged by one year relative to the dependent variable.

4 Identification Framework

As mentioned above, the key explanatory variable is the interaction term of the high FX debt exposure dummy of firm i, $HighFXdebt_i$, with the appreciation dummy of country c in year t, $A_{c,t}$. This interaction term corresponds to a "Difference-in-Difference" interpretation of the effect of an appreciation on firms with different degrees of FX debt exposure. The estimated coefficient will indicate the balance sheet effects of an appreciation on firms holding high levels of FX debt *relative to* firms holding low levels of FX debt. Since appreciation leads to more beneficial changes in the balance sheet of firms holding more FX debt and this effect should enhance firms' risk-taking capacity, we predict that the sign of the coefficient on this interaction term is positive.

In addition to the interaction term and other controls affecting firm leverage, we also include the firm, industry-year and country-year fixed effects. The firm fixed effects help to control the possible pre-existing differences across firms. Because the general level of firm leverage is quite different across industries, the industry-year fixed effects are

[7]Here we use the level of collateral as a control variable and consider the impact of exchange rate changes on firm leverage. However, a shock to firm investment may affect firm leverage. To consider this possibility, we used the change in tangible fixed assets relative to the total asset as a control variable instead of the level of collateral. We find that that the coefficient on the change in tangible fixed assets is positive and that the coefficient on the interaction term is consistent with the baseline results which use the level of collateral as a control variable.

[8]In the literature, the market-to-book value is typically used to control a firm's growth opportunity. Since there is no market value for non-listed firms in our sample, we use sales growth as a proxy for growth opportunity.

included to account for changes in the leverage of all firms in the same industry. We define industries by using the 2-digit SIC codes provided in ORBIS. Finally, the country-year fixed effects capture the macroeconomic changes that may affect all firms in the same economy.

Our baseline specification (for firm i in industry j and country c in year t) is as follows:

$$Y_{i,j,c,t} = \beta \cdot HighFXdebt_i \times A_{c,t} + \theta \cdot X_{i,c,t-1} + \alpha_i + \gamma_{c,t} + \phi_{j,t} + \varepsilon_{i,c,t} \quad (1)$$

where $Y_{i,j,c,t}$ is the firm-level financial leverage measured by financial debt/assets. $X_{i,c,t-1}$ is the set of control variables that are firm size, collateral, profitability and sales growth. Note that all the micro-level explanatory variables are lagged by one year. α_i captures firm fixed effects, while $\gamma_{c,t}$ and $\phi_{j,t}$ country-year and industry-year fixed effects, respectively. We estimate the regression model using the ordinary least squares (OLS) method. We also conducted a dynamic system general method of moments (GMM) estimation and obtained similar results. We use robust standard errors clustered at the firm level.

5 Benchmark Results on Firm Leverage

To show the balance sheet channel for firms' financial risk taking, we estimate the baseline specification in equation (1) detailed above. Consistent with our hypothesis on the sign of the coefficient of the interaction term, we find that the firms with more existing FX debt tend to increase their financial leverage more when the local currency of the economy in which the firms operate appreciates.

Since firms in the tradable sector have more capacity to generate revenues in foreign exchange, their borrowing in foreign currency could be hedged by cash flows. The balance sheet channel therefore should work stronger for firms in the non-tradable sector because they are likely to be more sensitive to the exchange rate shock. Therefore, we further employ the empirical methodology for both the tradable sector and the non-tradable sector. As commonly classified in the literature, the tradable sector include agriculture, mining and manufacturing industries, while the non-tradable sector includes construction, transportation, communication, utilities, wholesale/retail trade, and services. Table 4 provides summary statistics for the tradable sector firms and the non-tradable sector firms separately. We find that the non-tradable sector firms have greater leverage than

the tradable sector firms in terms of both the mean and median, while the firms in the tradable sector have higher values of collateral, profitablity, size and sales growth than those in the non-tradable sector. In terms of the amount of FX debt between the two groups of firms, the median value of FX debt for the non-tradable sector firms is twice as large as the median value of FX debt for the tradable sector firms. Consistent with these statistics, we find that the non-tradable sector firms show a more significant balance sheet effect than the tradable sector firms.

Table 5 presents the estimates for equation (1), showing the relationship between firm leverage and currency appreciation for firms with different levels of FX debt. The estimates for the full sample are reported in column (1), and the estimates for the tradable sector and the non-tradable sector are shown in columns (2) and (3), respectively. We obtain significantly positive coefficients for all three samples of firms, with the largest coefficient on the interaction term for the non-tradable sector firms, which is in line with our conjecture. Compared to firms with lower FX debt in the previous year, firms with higher FX debt exposure tend to have on average a 3.5 percentage point higher ratio of debt to total assets during the year in which local currency has experienced more than 10 percent appreciation (Table 5, column (1)).[9,10]

This result is robust to the inclusion of the interaction terms of each of the control variables and the appreciation dummy. These interaction terms help to separate the balance sheet channel from the other effects from the control variables that possibly correlate with the FX debt variable. Adding these terms can also help to allow the possible systematic change in the coefficients for all explanatory variables caused by the appreciation shock. Table 6 shows that including the additional interaction terms actually increases the significance of the coefficient on the main interaction term and the sectoral pattern of the coefficient in the baseline results remains unchanged.

Finally, in Table 7 we report the effect of currency appreciation on short-term and

[9]Recall that both FX debt and appreciation are captured by dummy variables.

[10]When we divide the firms in the sample into those with higher and lower FX debt, we can use the 25 percentile or 75 percentile threshold instead of the median threshold. When we also consider different definitions of the appreciation dummy as explained in the robustness section for the interaction term, we obtain overall consistent results for the 25 percentile and 75 percentile thresholds. The only case where we obtain a negative coefficient is when we use HighFXDebt(75th percentile) x A(>10). One possible reason for obtaining this negative coefficient is that a very small number of firm-year observations fall into country-years of greater than 10% appreciation and at the same time apply to firms in the upper 25 percentile of the FX debt amount (that is, the sample sizes become very uneven when the interaction term take different values). The detailed results are available from the authors upon request.

long-term debt. We find that on average the main effect of the local currency appreciation shows more in the increase in long-term financial debt leverage than in short-term financial debt leverage. And the effect on short-term financial debt leverage is driven by firms in the non-tradable sector.

6 Robustness

This section provides the results of additional regressions of firm leverage as robustness checks. In particular, we consider the following six different aspects and show that our baseline results are robust.

Appreciation rate. First, instead of using a dummy for appreciation, we can use the actual rate of appreciation in percent. This provides us with more variation. Table 8 shows that the coefficients on the interaction term are positive and significant, and similar in magnitude to those in the baseline regression.

Balance sheet impact of appreciation. Next, we consider the interaction term of the ratio of FX debt to total assets and the actual rate of appreciation. If we normalise FX debt with total debt then we get back to the share which is same for every firm. This is why we decided to normalise with assets. Table 9 shows that the regression results are very similar to the baseline results. The magnitude of the coefficients is different because now we have a ratio as opposed to a dummy, but the coefficients imply similar small quantitative effects.[11]

Alternative appreciation dummies. We use alternative definitions of the appreciation dummy, A, to see if our results from the 10 percent appreciation dummy in the benchmark regressions are robust. In particular, we use $A(>0)$ and $A(>5)$ for the local currency appreciation of 0 percent and 5 percent, respectively, against the US dollar. Ta-

[11]The amount of FX debt for each firm in each year is obtained by multiplying the country-level FX debt share for each year by the amount of total financial debt for each firm in each year. In order to examine whether the country-level FX debt share or the firm-specific amount of total financial debt drives the result here, we considered a new specification including the triple interaction term, FX debt share x Financial debt/total assets x Δln(exchange rate), and three double interaction terms. We obtained the coefficient of 10.9023 for the triple interaction term, the coefficient of –0.4445 for the double interaction term, Financial debt/total assets x Δln(exchange rate), and the coefficient of –1.0131 for the double interaction term FX debt share x Δln(exchange rate). At the simple average value of the FX debt share of 0.1519, the sensitivity of firm leverage as the dependent variable to Financial debt/total assets x Δln(exchange rate) is 1.2116. Also, at the average level of firm leverage of 0.162, the sensitivity of firm leverage as the dependent variable to FX debt share x Δln(exchange rate).is 0.753. Therefore, we find that the firm-specific amount of total financial debt is more important than the country-level FX debt share in terms of explaining variations in firm leverage.

ble 10 shows that we obtain very similar results when we use the 0 percent or 5 percent dummy, although the coefficients are smaller in magnitude.[12]

Alternative definition of the FX debt share. In our regressions so far, we used total credit to the non-financial sector as the denominator in the calculation of the FX debt share. We can alternatively define the country-level FX debt share as the ratio of FX debt to total credit to the non-financial corporate sector. As shown in Table 1, the two measures of total credit have very high correlations overall. Nor surprisingly, Table 11 shows that we obtain quantitatively very similar results when we use this alternative measure of the FX debt share.

Adjustment of the FX valuation effect. As the dependent variable in the financial leverage regression, we use the ratio of financial debt to total assets at the end of fiscal year. Since financial debt includes FX debt, local currency appreciation may affect the value of financial debt, although the balance sheet data in ORBIS are recorded in book value. To adjust for this possible valuation effect, we redefine the dependent variable as the ratio of adjusted financial debt to total assets. In particular, we calculate the local currency equivalent value of FX debt at the end of fiscal t by using the exchange rate at the end of fiscal year t-1. Specifically, the adjusted ratio is calculated as the sum of the ratio of financial debt to total assets and the ratio of FX debt to total assets multiplied by Δlog(exchange rate). Table 12 shows that the coefficient on the interaction term is very similar to the one from the baseline regression.

Balanced panel. The sample we have used so far is an unbalanced panel with an average firm having around three years of balance sheet data over the 14-year sample period. To control for potential biases arising from using an unbalanced panel sample, we only consider a balanced sample of firms that have financial information in all years from 2002 to 2015. Table 13 shows that we obtain quantitatively similar coefficients on the interaction term from the balanced panel sample.

[12]In addition, we also considered a depreciation dummy. In particular, we defined the 5 percent depreciation dummy to be equal to 1 when the local currency depreciates against the US dollar by more than 5 per cent and zero otherwise. The expected sign of the coefficient on HighFXDebt Dummy x Depreciation Dummy is negative. We obtained consistent results for the 5 percent depreciation dummy under both the whole sample and the non-zero sample. Given that the coefficient on the interaction terms including the depreciation dummy is negative and smaller in magnitude than the coefficient on the appreciation dummies, we can also say that our baseline results are mainly driven by EME currency appreciations, not by depreciations.

7 Conclusion

This paper provides firm-level evidence supporting the risk-taking channel of currency appreciations. In particular, it shows that firms with a higher value of FX debt before the exchange rate appreciates, increase their leverage more compared to firms with a lower value of FX debt after the appreciation. We also show that such a risk-taking channel works stronger for firms in the non-tradable sector than those in the tradable sector.

Although our findings are economically small, they still have policy implications given the potential of this channel to gain weight in time. First, in the firm level, they highlight the importance of monitoring firms' FX exposure and in particular, the extent of currency mismatch on their balance sheet. We show that currency appreciation combined with higher levels of FX exposure can prompt firms to increase their leverage during the good times, but that such firms are likely to become subject to deleveraging pressures when their local currency depreciates.

Second, in the country level, the FX debt share of the non-financial corporate sector also needs close monitoring. To the extent that FX debt of non-financial corporates in a country is not matched by their FX assets and also to the extent that the maturity of FX debt is shorter than that of FX assets, the higher FX debt share implies that the non-financial corporate sector firms are more likely to be subject to FX valuation and liquidity risks, respectively. In many EMs, when their firms suffer from FX valuation losses and FX funding strains, the national authorities are often expected to step in to provide FX liquidity to these firms either directly or indirectly through their banks to minimise the negative impact on growth. Such circumstances require consideration of the adequate amount of available FX safety net in proportion to the size of FX mismatches both in aggregate and across firms.

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Table 1. Correlation between FX Debt/Total Debt and FX Debt/Corporate Debt.

Argentina	Austria	Australia	Belgium	Brazil	Canada	Switzerland
0.929	0.995	0.942	0.980	0.986	0.936	0.939
Chile	China	Czech Republic	Germany	Denmark	Spain	Finland
0.992	0.944	0.937	0.955	0.977	0.930	0.988
France	United Kingdom	Greece	Hong Kong SAR	Hungary	Indonesia	Ireland
0.941	0.637	0.927	0.927	0.985	0.878	0.940
Israel	India	Italy	Japan	Korea	Luxembourg	Mexico
0.930	0.581	0.995	0.997	0.966	0.998	0.903
Malaysia	Netherlands	Norway	Philippines	Poland	Portugal	Russia
0.995	0.987	0.975	0.937	0.956	0.994	0.877
Sweden	Singapore	Thailand	Turkey	Chinese Taipei	United States	South Africa
0.942	0.697	0.799	−0.068	0.981	0.961	0.915
All						
0.819						

This table shows the correlation of the ratio of FX debt to total credit to the non-financial sector and the ratio of FX debt to total credit to the non-financial corporate sector. Source: BIS.

Table 2. FX Debt/Total Debt, 2002 vs 2015.

	2002Q1	2015Q4
Argentina	70.50	18.84
Austria	6.76	2.40
Australia	6.70	7.39
Belgium	3.30	1.90
Brazil	18.12	9.27
Canada	11.13	11.86
Switzerland	6.44	7.14
Chile	24.48	23.46
China	5.50	3.88
Czech Republic	10.38	12.03
Germany	1.80	1.42
Spain	2.26	1.21
Denmark	7.32	9.58
France	2.74	2.06
Finland	6.22	3.25
United Kingdom	17.51	17.51
Greece	8.12	4.16
Hong Kong SAR	32.64	51.13
Hungary	15.06	17.83
Indonesia	14.71	28.31
Ireland	20.34	10.69
Israel	6.26	7.38
India	2.68	4.50
Italy	3.20	0.75
Japan	0.84	1.97
Korea	7.05	3.80
Luxembourg	60.82	101.49
Mexico	34.27	32.68
Malaysia	11.33	4.96
Netherlands	9.25	14.85
Norway	7.85	8.56
Philippines	39.26	23.51
Poland	11.58	13.71
Portugal	3.08	1.05
Russia	26.23	29.76
Sweden	11.40	10.08
Singapore	28.31	29.58
Thailand	12.89	7.92
Turkey	26.43	36.63
Chinese Taipei	4.68	4.46
United States	1.29	0.84
South Africa	10.75	10.70

This table shows the level of the FX debt shares at the end of Q1 2002 and at the end of Q4 2015 in per cent for 42 economies. Source: BIS.

Table 3. Descriptive Statistics of the Winsorised Sample.

	N	Mean	Median	s.d.	Min	Max
Unbalanced panel of firms						
Financial debt/total assets	1,661,677	0.162	0.000	0.241	0.000	0.998
Foreign Currency Debt	1,661,677	236.530	5.103	849.761	0.000	5362.950
HighFXdebt dummy	1,661,677	0.473	0.000	0.499	0.000	1.000
Collateral	1,661,677	0.319	0.258	0.269	0.000	0.985
Profitability	1,661,677	0.077	0.052	0.175	−0.521	0.938
Size	1,661,677	0.815	0.681	1.906	−3.444	6.373
Sales growth	1,661,677	0.267	0.120	0.580	−0.464	1.993
Balanced panel of firms						
Financial debt/total assets	211,805	0.287	0.264	0.227	0.000	0.964
Foreign Currency Debt	211,805	1491.964	89.503	6362.659	0.000	52217.690
HighFXdebt dummy	211,805	0.551	1.000	0.497	0.000	1.000
Collateral	211,805	0.305	0.265	0.248	0.000	0.961
Profitability	211,805	0.059	0.055	0.093	−0.420	0.382
Size	211,805	2.133	1.967	1.836	−3.577	7.232
Sales growth	211,805	0.128	0.071	0.370	−0.430	1.220
Macroeconomic variable						
Δlog(exchange rate)	130	−0.000	0.000	0.073	−0.298	0.173

This table presents summary statistics of firm-year obervations for the 10 Asian economies in our sample. Financial debt/total assets is the ratio of the book value of total financial debt over the book value of total assets at the end of fiscal year t. Foreign currency debt is the US dollar amount of foreign currency debt of a firm, which is calculated as the product of the country-level FX debt share and firm-specific total financial debt. The values shown in the row for foreign currency debt are in thousands of US dollars. HighFXdebt is a dummy variable which takes value 1 when the time-series average of the lagged book value of foreign currency debt of a firm is higher than the median of those values of all firms in the same country, and 0 otherwise. Collateral is tangible fixed assets scaled by total assets. Profitability is the ROA ratio (ie EBIT/total assets). Size is the logarithm of total assets in millions of US dollars. Salesgrowth is the growth rate in sales. The micro-level accounting variables are one-year lagged relative to the dependent variable. The exchange rate is the bilateral exchange rate expressed in local currency/US dollar. Δlog(exchange rate) is contemporaneous with the dependent variable. A positive value of the macroeconomic variable, Δlog(exchange rate), denotes appreciation in local currency. Sources: ORBIS; BIS.

Table 4. Descriptive Statistics of Tradable and Non-tradable Sector Firms, Winsorised Sample.

	N	Mean	Median	s.d.	Min	p1	p99	Max
Tradable sector firms								
Financial debt/total assets	797,053	0.182	0.024	0.244	0.000	0.000	0.906	0.998
Foreign Currency Debt	797,053	231.394	2.999	827.811	0.000	0.000	5362.950	5362.950
Collateral	797,053	0.347	0.318	0.233	0.000	0.000	0.914	0.995
Profitability	797,053	0.109	0.062	0.228	−1.556	−0.303	1.152	1.480
Size	797,053	1.397	1.259	1.673	−5.832	−2.352	5.454	5.454
Sales growth	797,053	0.327	0.165	0.636	−0.529	−0.529	2.408	2.408
Non-tradable sector firms								
Financial debt/total assets	505,118	0.209	0.105	0.255	0.000	0.000	0.998	0.998
Foreign Currency Debt	505,118	214.715	6.528	824.528	0.000	0.000	5362.950	5362.950
Collateral	505,118	0.255	0.135	0.280	0.000	0.000	0.982	0.995
Profitability	505,118	0.054	0.054	0.205	−1.556	−0.736	0.563	1.480
Size	505,118	0.614	0.425	1.891	−5.832	−3.632	5.454	5.454
Sales growth	505,118	0.223	0.081	0.615	−0.529	−0.529	2.408	2.408

This table presents summary statistics of firm-year obervations of the tradable and non-tradable sector firms for the 10 Asian economies in our sample. Financial debt/total assets is the ratio of the book value of total financial debt over the book value of total assets at the end of fiscal year t. Foreign currency debt is the US dollar amount of foreign currency debt of a firm, which is calculated as the product of the country-level FX debt share and firm-specific total financial debt. The values shown in the row for foreign currency debt are in thousands of US dollars. HighFXdebt is a dummy variable which takes value 1 when the time-series average of the lagged book value of foreign currency debt of a firm is higher than the median of those values of all firms in the same country, and 0 otherwise. Collateral is tangible fixed assets scaled by total assets. Profitability is the ROA ratio (ie EBIT/total assets). Size is the logarithm of total assets in millions of US dollars. Salesgrowth is the growth rate in sales. The micro-level accounting variables are one-year lagged relative to the dependent variable. Sources: ORBIS; BIS.

Table 5. Benchmark Results.

Dependent variable: Financial debt/assets			
	(1)	(2)	(3)
	All	Tradable sector	Non-tradable sector
HighFXdebt x A	0.0356***	0.0134***	0.0454***
	(21.8)	(5.5)	(19.5)
Profitability	−0.0445***	−0.0330***	−0.0550***
	(−24.3)	(−15.8)	(−17.7)
Collateral	0.0704***	0.0782***	0.0731***
	(37.9)	(36.3)	(22.1)
Size	0.0205***	0.0232***	0.0186***
	(28.7)	(26.6)	(15.6)
Salesgrowth	−0.0006**	−0.0020***	0.0010**
	(−2.0)	(−5.4)	(2.2)
Firm FE	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes
Cluster SD by	Firm	Firm	Firm
Observations	1,372,970	768,318	547,414
R-squared	0.79	0.82	0.76

This table reports the OLS regression results based on a panel data from 2002 to 2015 for 10 Asian economies. Financial debt/total assets is the ratio of the book value of total financial debt over the book value of total assets at the end of fiscal year t. HighFXdebt is a dummy that equals to 1 if a firm's average foreign currency debt in year t-1 during the sample period is higher than the country's sample median, and equals to 0 otherwise. The other control variables are consistent with those in Rajan and Zinglas (1995) and the values as of the end of fiscal year t-1 are used. Collateral is tangible fixed assets scaled by total assets. Profitability is the ROA ratio (ie EBIT/total assets). Size is the logarithm of total assets. Salesgrowth is the growth rate in sales. The appreciation dummy, A, is 1 when local currency appreciation is over 10 per cent. The industry indicator is the 2-digit SIC code. Regressions include the firm fixed effects, industry-year fixed effects and country-year fixed effects. The standard errors are robust and clustered at the firm level. t-statistics are reported in brackets. ***, **, and * indicate statistical significance at 1, 5 and 10 percent, respectively.

Table 6. Robustness I–Additional Interactions.

Dependent variable: Financial debt/assets			
	(1)	(2)	(3)
	All	Tradable sector	Non-tradable sector
HighFXdebt x A	0.0554***	0.0346***	0.0644***
	(26.9)	(11.0)	(22.5)
Profitability	−0.0427***	−0.0304***	−0.0550***
	(−23.2)	(−14.8)	(−17.2)
Profitability x A	-0.0150***	-0.0385***	0.0021
	(-2.7)	(-4.0)	(0.3)
Collateral	0.0704***	0.0784***	0.0721***
	(38.1)	(36.6)	(21.9)
Collateral x A	−0.0115***	−0.0194***	−0.0023
	(−3.6)	(−3.4)	(−0.5)
Size	0.0212***	0.0238***	0.0196***
	(29.5)	(27.2)	(16.4)
Size x A	−0.0106***	−0.0101***	−0.0112***
	(−19.7)	(−11.8)	(−14.9)
Salesgrowth	−0.0005*	−0.0021***	0.0012***
	(−1.8)	(−5.7)	(2.7)
Salesgrowth x A	−0.0023	−0.0003	−0.0035
	(−1.4)	(−0.1)	(−1.6)
Firm FE	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes
Cluster SD by	Firm	Firm	Firm
Observations	1,372,970	768,318	547,414
R-squared	0.79	0.82	0.76

See footnotes for Table 4 for variable definitions. The standard errors are robust and clustered at the firm level. t-statistics are reported in brackets. ***, **, and * indicate statistical significance at 1, 5 and 10 percent, respectively.

Table 7. Robustness II–Role of Maturity.

Dependent variable:	LT debt/ total assets	ST debt/ total assets	LT debt/ total assets	ST debt/ total assets	LT debt/ total assets	ST debt/ total assets
	(1)	(2)	(3)	(4)	(5)	(6)
	All		Tradable sector		Non-tradable sector	
HighFXdebt x A	0.0194***	0.0029***	0.0116***	−0.0015	0.0199***	0.0056***
	(18.2)	(4.3)	(6.9)	(−1.3)	(14.0)	(6.0)
Profitability	−0.0347***	−0.0188***	−0.0212***	−0.0159***	−0.0477***	−0.0220***
	(−21.6)	(−25.6)	(−11.4)	(−19.6)	(−17.7)	(−16.9)
Collateral	0.0711***	0.0095***	0.0809***	0.0058***	0.0699***	0.0155***
	(42.8)	(9.9)	(42.1)	(5.0)	(23.9)	(8.7)
Size	0.0132***	0.0051***	0.0136***	0.0052***	0.0138***	0.0041***
	(21.8)	(14.0)	(18.3)	(12.0)	(14.1)	(6.9)
Salesgrowth	0.0020***	−0.0014***	0.0020***	−0.0023***	0.0022***	−0.0006**
	(7.9)	(−8.8)	(6.4)	(−11.7)	(5.8)	(−2.4)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster SD by	Firm	Firm	Firm	Firm	Firm	Firm
Observations	1,561,414	1,809,099	858,326	1,039,864	637,551	697,963
R-squared	0.60	0.73	0.63	0.73	0.60	0.71

See footnotes to Table 4 for variable definitions. Long-term debt/total assets is the ratio of the book value of long-term (remaining maturity more than 1 year) financial debt over the book value of total assets at the end of fiscal year t. Short-term debt/total assets is the ratio of the book value of short-term (remaining maturity equal to or less than 1 year) finacial debt over the book value of total assets at the end of fiscal year t. The standard errors are robust and clustered at the firm level. t-statistics are reported in brackets. ***, **, and * indicate statistical significance at 1, 5 and 10 percent, respectively.

Table 8. Robustness III–Appreciation Rate.

Dependent variable: Financial debt/assets			
	(1)	(2)	(3)
	All	Tradable sector	Non-tradable sector
HighFXdebt x Δlog(exchange rate)	0.0698***	0.0421***	0.0794***
	(18.9)	(7.5)	(15.6)
Profitability	−0.0446***	−0.0330***	−0.0553***
	(−24.3)	(−15.8)	(−17.7)
Collateral	0.0705***	0.0783***	0.0732***
	(38.0)	(36.4)	(22.1)
Size	0.0204***	0.0232***	0.0185***
	(28.6)	(26.6)	(15.5)
Salesgrowth	−0.0006**	−0.0020***	0.0010**
	(−2.0)	(−5.4)	(2.2)
Firm FE	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes
Cluster SD by	Firm	Firm	Firm
Observations	1,372,970	768,318	547,414
R-squared	0.79	0.82	0.75

See footnotes to Table 4 for variable definitions. The standard errors are robust and clustered at the firm level. t-statistics are reported in brackets. ***, **, and * indicate statistical significance at 1, 5 and 10 percent, respectively.

Table 9. Robustness IV–FX Debt Ratio and Appreciation Rate.

Dependent variable: Financial debt/assets			
	(1)	(2)	(3)
	All	Tradable sector	Non-tradable sector
FX debt/assets	3.6890***	4.1569***	3.2464***
	(119.3)	(87.2)	(73.0)
FX debt/assets x Δlog(exchange rate)	2.1076***	0.5464**	3.0155***
	(11.1)	(2.0)	(10.5)
Profitability	−0.0291***	−0.0223***	−0.0361***
	(−16.9)	(−11.5)	(−11.6)
Collateral	0.0368***	0.0394***	0.0412***
	(22.4)	(20.7)	(13.7)
Size	0.0142***	0.0168***	0.0125***
	(23.4)	(23.2)	(11.8)
Salesgrowth	0.0008***	−0.0000	0.0020***
	(2.6)	(−0.1)	(4.3)
Firm FE	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes
Cluster SD by	Firm	Firm	Firm
Observations	1,206,923	691,305	465,579
R-squared	0.83	0.86	0.81

See footnotes to Table 4 for variable definitions. The standard errors are robust and clustered at the firm level. t-statistics are reported in brackets. ***, **, and * indicate statistical significance at 1, 5 and 10 percent, respectively.

Table 10. Robustness V–Alternative Definition of Appreciation Dummy.

Dependent variable: Financial debt/total assets						
	(1)	(2)	(3)	(4)	(5)	(6)
	All	Tradable sector	Non-tradable sector	All	Tradable sector	Non-tradable sector
HighFXdebt x A(>0)	0.0167***	0.0168***	0.0159***			
	(24.0)	(15.2)	(17.2)			
HighFXdebt x A(>5)				0.0204***	0.0091***	0.0292***
				(35.1)	(14.2)	(27.4)
Profitability	−0.0447***	−0.0331***	−0.0553***	−0.0445***	−0.0329***	−0.0552***
	(−24.3)	(−15.8)	(−17.8)	(−24.2)	(−15.7)	(−17.7)
Collateral	0.0706***	0.0783***	0.0732***	0.0709***	0.0784***	0.0738***
	(38.0)	(36.4)	(22.2)	(38.2)	(36.4)	(22.3)
Size	0.0204***	0.0232***	0.0184***	0.0206***	0.0233***	0.0185***
	(28.5)	(26.6)	(15.5)	(28.8)	(26.7)	(15.6)
Salesgrowth	−0.0006*	−0.0020***	0.0010**	−0.0006**	−0.0020***	0.0010**
	(−1.9)	(−5.3)	(2.3)	(−2.1)	(−5.5)	(2.2)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster SD by	Firm	Firm	Firm	Firm	Firm	Firm
Observations	1,372,970	768,318	547,414	1,372,970	768,318	547,414
R-squared	0.79	0.82	0.75	0.79	0.82	0.76

See footnotes for Table 4 for variable definitions. The appreciation dummy, A(>0) is 1 when local currency appreciation is over 0 per cent. The appreciation dummy, A(>5), is 1 when local currency appreciation is over 5 per cent. The standard errors are robust and clustered at the firm level. t-statistics are reported in brackets. ***, **, and * indicate statistical significance at 1, 5 and 10 percent, respectively.

Table 11. Robustness VI–Alternative Definition of the FX Debt Share.

Dependent variable: Financial debt/total assets			
	(1)	(2)	(3)
	All	Tradable sector	Non-tradable sector
HighFXdebt x A	0.0314***	0.0098***	0.0406***
	(19.1)	(4.0)	(17.3)
Profitability	−0.0445***	−0.0330***	−0.0551***
	(−24.3)	(−15.8)	(−17.7)
Collateral	0.0704***	0.0782***	0.0730***
	(37.9)	(36.3)	(22.1)
Size	0.0205***	0.0232***	0.0186***
	(28.7)	(26.6)	(15.6)
Salesgrowth	−0.0006**	−0.0020***	0.0010**
	(−2.0)	(−5.4)	(2.2)
Firm FE	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes
Cluster SD by	Firm	Firm	Firm
Observations	1,372,846	768,241	547,384
R-squared	0.79	0.82	0.75

See footnotes to Table 4 for variable definitions. The ratio of FX debt to total credit to the non-financial corporate sector is used as an alternative measure of the country-level FX debt share to estimate firm-level FX debt. The standard errors are robust and clustered at the firm level. t-statistics are reported in brackets. ***, **, and * indicate statistical significance at 1, 5, and 10 percent, respectively.

Table 12. Robustness XII–Adjustment of the Exchange Rate Valuation Effect.

Dependent variable: FX adjusted financial debt/total assets			
	(1)	(2)	(3)
	All	Tradable sector	Non-tradable sector
HighFXdebt x A	0.0378**	0.0155***	0.0476***
	(23.0)	(6.3)	(20.4)
Profitability	−0.0445***	−0.0330***	−0.0550***
	(−24.3)	(−15.8)	(−17.7)
Collateral	0.0702***	0.0781***	0.0730***
	(37.8)	(36.2)	(22.1)
Size	0.0205***	0.0232***	0.0186***
	(28.6)	(26.6)	(15.6)
Salesgrowth	−0.0006**	−0.0020***	0.0010**
	(−2.0)	(−5.5)	(2.2)
Firm FE	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes
Cluster SD by	Firm	Firm	Firm
Observations	1,372,966	768,317	547,411
R-squared	0.79	0.82	0.75

See footnotes to Table 4 for variable definitions. The dependent variable is the ratio of adjusted financial debt to total assets. The local currency equivalent value of foreign currency debt at the end of fiscal year t is calculated by using the exchange rate at the end of fiscal year t-1. Specifically, the ratio of the adjusted financial debt to total assets is calculated as the sum of the ratio of financial debt to total assets and the ratio of FX debt to total assets multiplied by Δlog(exchange rate). The standard errors are robust and clustered at the firm level. t-statistics are reported in brackets. ***, **, and * indicate statistical significance at 1, 5, and 10 percent, respectively.

Table 13. Robustness XIII–Balanced Panel Regressions.

Dependent variable: Financial debt/total assets			
	(1)	(2)	(3)
	All	Tradable sector	Non-tradable sector
HighFXdebt x A	0.0226**	0.0153	0.0183**
	(3.9)	(1.6)	(2.4)
Profitability	−0.1536***	−0.1908***	−0.1222***
	(−19.7)	(−15.0)	(−11.9)
Collateral	0.1453***	0.1586***	0.1387***
	(27.8)	(22.4)	(17.8)
Size	0.0379***	0.0490***	0.0290***
	(17.4)	(16.6)	(9.0)
Salesgrowth	0.0017**	0.0013	0.0018*
	(2.0)	(0.9)	(1.7)
Firm FE	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes
Cluster SD by	Firm	Firm	Firm
Observations	208,337	106,261	94,086
R-squared	0.77	0.75	0.77

See footnotes to Table 4 for variable definitions. This table reports regression results using a balanced panel sample of 25,533 firms who have financial information in all years from 2002 to 2015. The standard errors are robust and clustered at the firm level. t-statistics are reported in brackets. ***, **, and * indicate statistical significance at 1, 5, and 10 percent, respectively.

Figure 1. **Corporate Debt to GDP (Asian EMs, %).** Source: BIS.

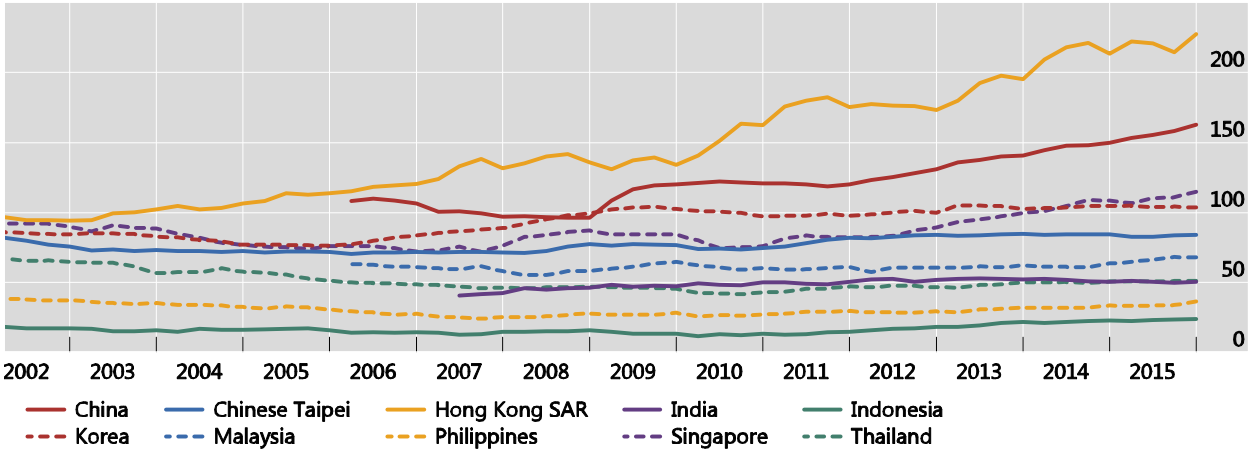


Figure 2. **FX Debt/Total Debt (Asian EMs, %).** Source: BIS.

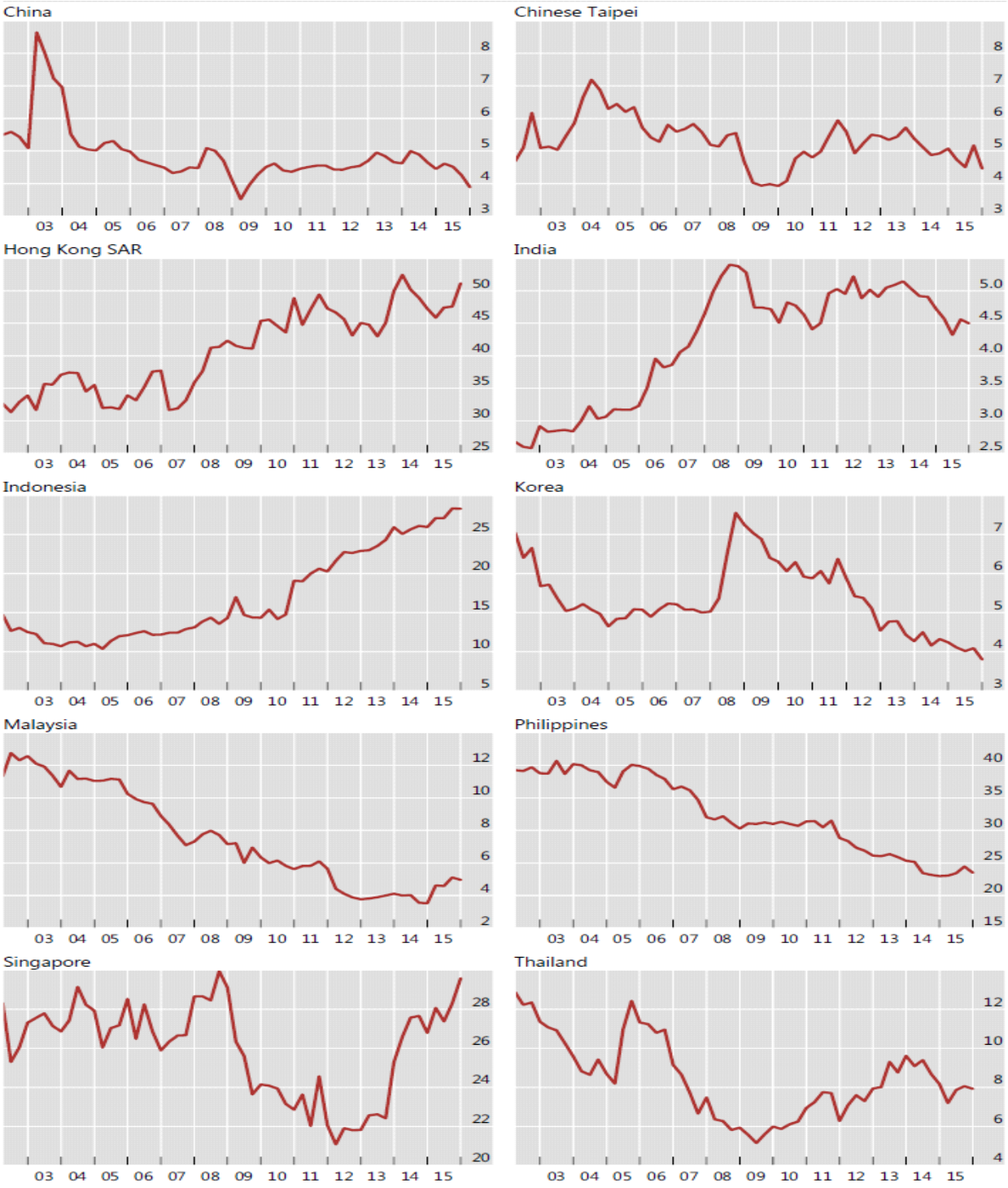


Figure 3. **FX Debt/Total Debt (Asian EMs, %)** Source: BIS.

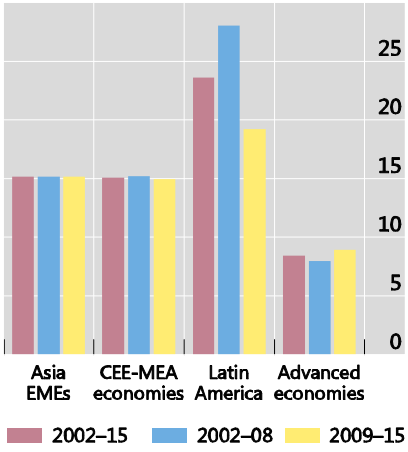


Figure 4. **FX Debt/Total Debt (weighted by total credit, %).** Source: BIS.

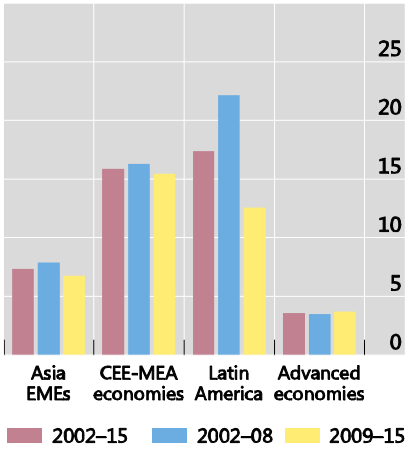


Figure 5. **FX Debt/Total Debt (weighted by FX debt, %).** Source: BIS.

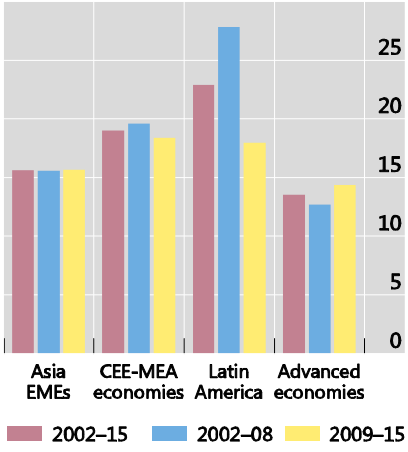
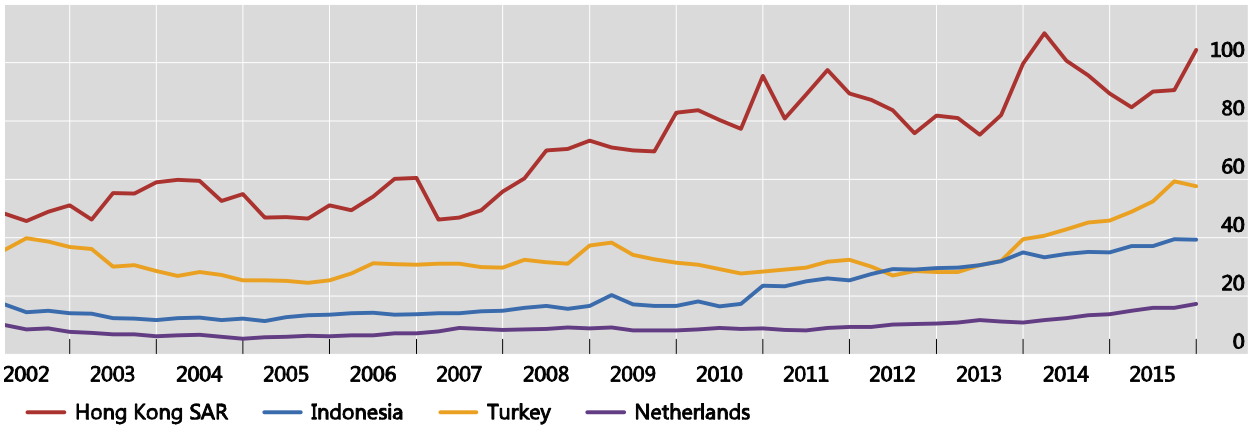
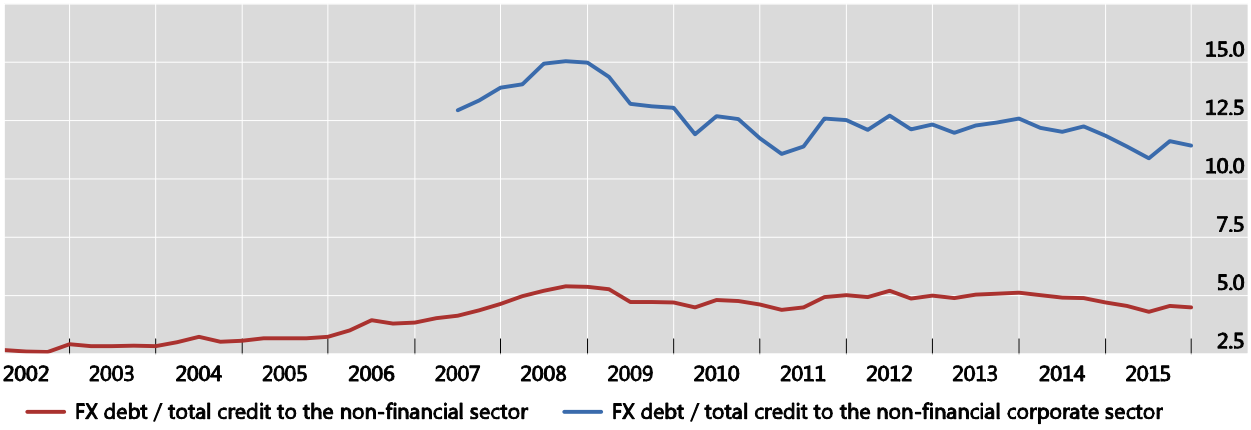
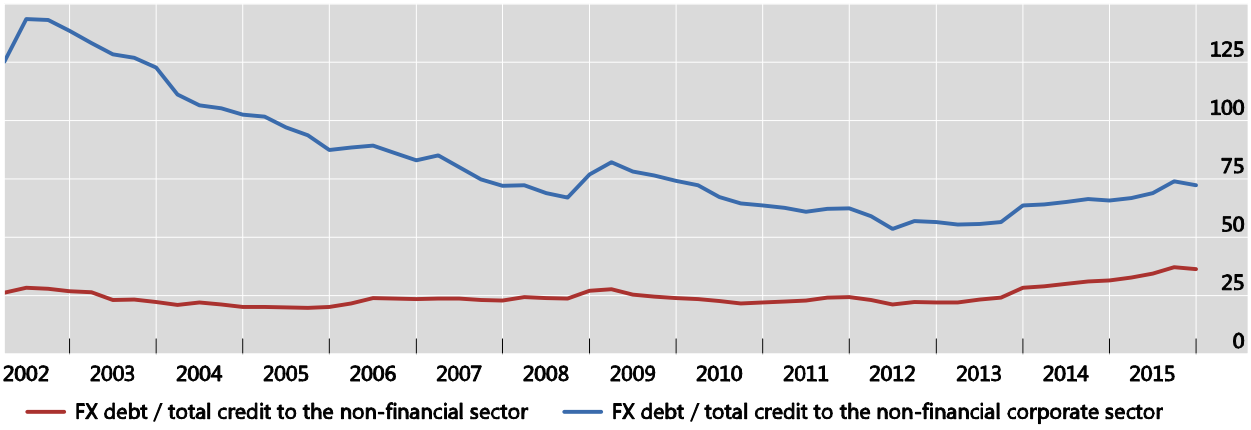


Figure 6. **FX Debt/Domestic Currency Debt (%).** Source: BIS.





Appendix Figure 1: FX Debt/Total Corporate Debt (India, %). Source: BIS.



Appendix Figure 2: FX Debt/Total Corporate Debt (Turkey, %). Source: BIS.

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