NBER WORKING PAPER SERIES

LESSONS UNLEARNED? CORPORATE DEBT IN EMERGING MARKETS

Laura Alfaro
Gonzalo Asis
Anusha Chari
Ugo Panizza

Working Paper 23407
http://www.nber.org/papers/w23407

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
May 2017

We thank participants at NBER conference Capital Flows and Debt in Emerging Markets, Luis Serven for an insightful discussion, Carmen Reinhart and Sebnem Kalemli-Ozcan for comments and suggestions. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

Lessons Unlearned? Corporate Debt in Emerging Markets
Laura Alfaro, Gonzalo Asis, Anusha Chari, and Ugo Panizza
NBER Working Paper No. 23407
May 2017
JEL No. F34,G01,G15,G32

ABSTRACT

This paper documents a set of stylized facts about leverage and financial fragility in the non-financial corporate sector in emerging markets since the Global Financial Crisis (GFC). Corporate debt vulnerability indicators prior to the Asian Financial Crisis (AFC) attributed to corporate financial roots provide a benchmark for comparison. The firm-level data suggest that emerging markets post-GFC have lower leverage ratios than the five Asian crisis countries (Asian Five) in the run-up to the AFC. However, a broader set of emerging market countries show weaker liquidity, solvency, and profitability indicators. More countries are also in the Altman Z-score's "grey zone", that is, at risk for corporate distress. Regression estimates confirm that leading up to the AFC and in the aftermath of the GFC, firms with higher leverage have Z-scores that are closer to the financial distress range. The data also corroborate two macro-related hypotheses: first, that leverage interacted with currency depreciation had a statistically significant adverse impact on Z-scores in pre-AFC; and second, that in countries with higher GDP growth leverage is correlated with less corporate financial fragility. Consistent with Gabaix (2011) the paper finds a granularity effect in that large firms are systemically important—idiosyncratic shocks to large firms significantly correlate with GDP growth in our emerging markets sample. Also, the more-levered large firms are more vulnerable to exchange rate shocks than smaller firms with comparable levels of leverage. While this result holds for the average country in our sample, there is substantial cross-country heterogeneity.

Laura Alfaro
Harvard Business School
Morgan Hall 263
Soldiers Field
Boston, MA 02163
and NBER
lalfaro@hbs.edu

Gonzalo Asis
University of North Carolina at Chapel Hill
gasis@live.unc.edu

Anusha Chari
301 Gardner Hall
CB#3305,
Department of Economics
University of North Carolina at Chapel Hill
Chapel Hill, NC 27599
and NBER
achari@unc.edu

Ugo Panizza
The Graduate Institute, Geneva
Department of International Economics
PO Box 36, 1211 Geneva 21
Switzerland
ugo.panizza@graduateinstitute.ch

1. Introduction

There was a rapid credit expansion in emerging-market countries in the aftermath of the Global Financial Crisis (GFC). A surge in foreign borrowing and deterioration in net external debt positions accompanied the increase in domestic credit (BIS, 2014; IMF, 2015). The non-financial corporate sector accounts for the lion's share of this surge in leverage, which was also characterized by a large increase in international bond issuance (BIS, 2016). The total domestic and international debt of emerging market-based non-financial firms increased from $2.4 trillion to $3.7 trillion, and outstanding international bonds grew from $360 billion to $1.1 trillion between 2007 and 2015 (BIS, 2016).

A worrisome slowdown in emerging-market economic growth has accompanied the build-up of corporate debt—slower growth in emerging markets will make it harder to repay that debt. Also, numerous emerging-market currencies have lost value against the dollar since 2015. Further currency depreciation will only make it more difficult to repay the foreign-currency denominated portion of that debt.

Further, the impact of monetary policy reversals in advanced economies on emerging-market sovereign debt premia, in conjunction with low corporate profitability and market valuations,[1] have the potential to cause severe liquidity problems for emerging market firms. Nearly $1 trillion flowed out of emerging markets in the first three-quarters of 2015, eclipsing the outflows during the GFC.

A number of direct and indirect channels can transmit shocks to highly leveraged non-financial corporates to the domestic economy. For example, a deterioration of credit quality of corporate borrowers or a sudden withdrawal of funds from the domestic financial system by firms that are unable to roll-over their international obligations can impair the domestic banking system (Acharya et. al., 2015). Understanding potential vulnerabilities requires knowing more about the state of emerging market corporate balance sheets, the drivers of debt accumulation, and the effects of both on the macroeconomy. Our paper fills this gap.

[1] The growth in corporate profits has slowed considerably and the return on invested capital in emerging-market firms has significantly declined since the financial crisis. As evidence, emerging markets usually trade at a lower valuation than their advanced-economy counterparts, and while these relative valuations increased in the aftermath of the GFC, emerging markets are trading at a discount again.

The first objective of this paper is to document a set of stylized facts about leverage and financial fragility in the non-financial corporate sector in emerging markets. Following a wave of capital market liberalizations that opened up many emerging financial markets to international portfolio investment, detailed firm-level data is more readily available. We use this data to document stylized facts about the evolution of corporate leverage and its relationship to financial fragility in emerging markets over the last twenty years.

With this data in hand, we compare corporate debt before the Asian Financial Crisis (AFC) with corporate debt in emerging markets in the aftermath of the GFC. The AFC serves as the benchmark that allows us to answer the following question: How do corporate debt vulnerability indicators in emerging markets today compare with these indicators on the eve of the AFC?[2] In particular, how is corporate financial fragility related to leverage and other pertinent firm characteristics?

Why the AFC? Historically, emerging market crises arose from sovereign debt problems, and twin banking and currency crises were frequent (Reinhart and Rogoff, 2009). However, the underlying microeconomic roots attributed to the AFC include corporate debt vulnerabilities (Pomerleano,1998; Corsetti et. al. 1999) as well as implicit guarantees and moral hazard (Krugman 1998, Craig, et al. 2003). The crisis was accompanied by widespread corporate failures due to adverse balance sheet effects via currency and maturity mismatches at the firm level. Corporate debt levels associated with the AFC, therefore, serve as a natural benchmark to assess corporate sector vulnerabilities in emerging markets today.

While research on the state of corporate balance sheets in emerging markets shows that leverage and foreign currency exposure of emerging-market-based corporates have increased, a lack of relevant benchmarks prevents prior studies from assessing the magnitude of the risks brought about by these trends (IMF 2015). The second objective of our paper is to provide such a benchmark by comparing the current situation with the evolution of corporate balance sheets in the run-up to the AFC. Third, we ask whether leverage poses a risk to the health of emerging market firms. To test this, we regress corporate fragility on leverage and other firm level and macroeconomic control variables, focusing on different periods, sectors, and exchange rate regimes.

[2] Chari and Henry (2015) use this methodological approach to compare and contrast the fiscal policy response and its impact on the recovery of GDP growth in the aftermath of the AFC to examine Europe's pivot from stimulus to austerity and it's impact on European growth in the aftermath of its crisis.

Fourth, as noted by Gabaix (2011), the largest firms dominate economic activity across many countries and shocks to the largest firms can affect total output as these shocks do not get diversified in the aggregate data.[3] The role of large firms is particularly critical in many emerging markets. The final objective of the paper is to carefully examine whether the most levered and financially fragile firms are also the most systemically important. In particular, implicit the vulnerability of systemically large firms is intimately linked to bailout guarantees and moral hazard issues in emerging market lending where widespread corporate debt vulnerabilities can turn into full-blown financial crises.

We compile extensive firm-level data between 1992 and 2014 from Worldscope and Osiris for 26 countries classified as emerging markets by the Bank of International Settlements. We exclude financial firms from our analysis. The firm-level data provide different indicators from the balance sheets and income statements to analyze cash flows, leverage, liquidity, solvency, and profitability ratios—the returns on equity and invested capital.

To document the stylized facts, we split the sample into two sub-periods: pre-AFC (1996-1998) and post-GFC (2009-2014). We compare the post-GFC indicators to three benchmarks: (i) a within-country comparison relative to 1996-1998 values for a given indicator; (ii) a crisis-country comparison to the 1996-1998 average of the five Asian countries involved in the AFC (Asian Five),[4] and (iii) a within-group comparison relative to the 1996-1998 average for all the emerging markets in our sample.[5]

The data reveal the following stylized facts. First, to assess the risk of corporate debt levels in the post-GFC period, the patterns of corporate financial vulnerability and performance confirm that the appropriate benchmark is an important consideration for the analysis and for which there exists no consensus. The within-country cross-time benchmark, the Asian Five benchmark and the full emerging market pre-AFC benchmark yield varying cross-country patterns of results.

[3] Note that weak bank balance sheets and non-performing loans leading up to the AFC were arguably associated with corporate sector weaknesses (see Corsetti et al., 1999).

[4] Indonesia, Malaysia, Philippines, South Korea and Thailand.

[5] In robustness analyses, we also exclude, obtaining similar results, the period 1999-2002 to avoid contaminating our tests with emerging market crises which were associated with sovereign debt episodes as the Russian, Brazilian, and Argentine crises of the late 1990s early 2000s were not clearly attributable to corporate leverage, (see Reinhart and Rogoff, 2009).

Second, while approximately half of the emerging markets in our sample display increased leverage in the post-GFC period, only two countries have leverage ratios that exceed the average of the Asian Five on the eve of their crisis. Third, more than half our sample countries have higher short-term liquidity needs measured by current to total liabilities compared to the Asian Five, while a third have higher short-term liquidity needs compared to the emerging market average before the AFC. Fourth, about 85% of countries in the sample have weaker solvency positions measured by coverage ratios than the average emerging market country before the AFC.[6]

Fifth, a measure of corporate financial fragility (Altman's (2005) emerging-market Z-score) shows that altogether nine countries are in the grey or "vulnerable zone" post-GFC compared to three in the pre-AFC period. Also, countries in the safe zone show a fall in their Z-scores compared to their pre-AFC scores and are barely over the grey zone threshold. However, three countries were in the distress zone pre-AFC while post-GFC there are no countries in the distress zone.

Next, we formally analyze the relationship between leverage and corporate financial fragility at the firm level controlling for a variety of firm-, sector- and country-level (macroeconomic) factors. Regression estimates confirm that leading up to the AFC and in the aftermath of the GFC, there is a negative and statistically significant correlation between leverage and firm financial fragility. In other words, firms with higher leverage have Z-scores that are closer to the financial distress range. We also find that financially fragile sectors affected by leverage are different across the two crises. While the non-tradable sector was more financially fragile leading up to the AFC, post-GFC, it appears that, conditional on leverage, the tradable sector is more financially vulnerable. The data also corroborate two macro-related hypotheses: first, that leverage interacted with currency depreciation has a statistically significant adverse impact on Z-scores; and second, that in countries with higher GDP growth leverage is correlated with less corporate financial fragility.

To examine whether the leverage and corporate financial fragility patterns can portend adverse macroeconomic consequences, we examine the role of large firms in the macroeconomy. Consistent with Gabaix (2011) we find that large firms are systemically important—idiosyncratic shocks to large firms significantly correlate with GDP growth in our sample of emerging markets.

[6] This could be a result of higher liabilities, lower profitability or a combination of the two.

We also find that while large firms are, on average, less leveraged than smaller firms, the more-levered large firms are more vulnerable to exchange rate shocks than smaller firms with comparable levels of leverage. While this result holds for the average country in our sample, we also find that there is substantial cross-country heterogeneity.

Our paper is related to several strands of literature. First, the paper is related to the literature on the recent evolution of corporate debt in the aftermath of the GFC. IMF (2015) documents the main trends and shows that global factors drive the increase in corporate leverage in the aftermath of the GFC. This finding is in line with Shin's (2013) view that the response to the crisis led to a sudden increase in global liquidity. Acharya et al. (2015) present several case studies and evaluate vulnerabilities and potential policy responses.

The paper is also related to the literature on the origins of the AFC. Several papers suggest that weak fundamentals and excessive risk-taking by corporates caused the crisis. The "crony capitalism" view suggests that the increase in corporate leverage was due to moral hazard attributed to weak banking supervision and implicit guarantees for well-connected borrowers (Corsetti et al., 1998, Claessens and Glaessner, 1997, Krugman, 1998, Johnson et al., 2000; Burnside et al., 2001, 2003).[7] Pomerleano (1998) uses firm-level data and finds that excessive leverage and poor financial performance in the corporate sector caused the AFC.[8] More generally, this paper relates to the literature documenting the association between rapid credit growth and the building of corporate leverage and financial crises (Mendoza and Terrones 2008, and Schularick and Taylor, 2012).

The paper proceeds as follows. Section 2 presents trends in broad macro-indicators to motivate the analysis. Section 3 describes the firm-level data. Section 4 uses the AFC as a benchmark to present stylized facts about leverage and corporate financial fragility, and Section 5 presents formal firm-level regression results. Section 6 analyzes the interplay between emerging-market corporate fragility and the macroeconomy. Section 7 concludes.

[7] An alternative view as in Furman and Stiglitz (1998), Radelet and Sachs (1998), and Stiglitz and Bhattacharya (2000) maintains that there was nothing particularly wrong with the pre-crisis fundamentals of most East Asian economies.

[8] Ghosh et al. (2002) also show that in 1995–96 several East Asian countries had debt ratios and share of short-term debt which were significantly higher than debt ratios and short-term debt shares in OECD countries. Claessens et al. (2000) suggest that corporate financial risk factors may have been an amplifying factor in the crisis.

2. Setting the Stage: Emerging Market Borrowing in the Aftermath of the Global Financial Crisis

In the aftermath of the GFC, advanced economies were characterized by increases in government borrowing and household and corporate deleveraging.[9] Emerging markets stand in stark contrast. Over 2001-2007 average credit to the non-financial sector in emerging market countries remained close to 120% of GDP. The GFC caused a sudden reduction in credit, which went from 122% of GDP in 2007 to 109% in 2008. Credit started expanding rapidly in 2009 and reached 175% of GDP in 2015, a 67-percentage point increase with respect to the 2008 trough (Figure 1). Borrowing by non-financial corporations was a key driver of this surge in leverage—corporate debt went from 57% to 101% of GDP over 2008-15.[10]

There is, however, substantial heterogeneity across emerging market countries (Figure 2). In the post-crisis period (December 2008-September 2015) domestic credit grew by more than 6 percent per year in China but increased by close to 3 percent per year in Argentina, Hungary, Indonesia, India, Korea, Poland, and South Africa. Annual credit growth was between three and four percent in Brazil, Czech Republic, Mexico, Thailand, and Turkey.

By the end of 2015 total domestic credit to the non-financial sector was above 200 percent of GDP in China and South Korea and below 100 percent of GDP in Argentina, Indonesia, Mexico, and Russia. Borrowing by non-financial corporations is important in China, Korea, Hungary, Czech Republic, and Turkey.[11] According to BIS data, in the case of China the total credit-to-GDP ratio for the non-financial sector went from 150% in 2008 to nearly 250% in 2015, with borrowing by non-financial corporations increasing from 100% to 166% of GDP. If we exclude China from our sample of emerging market countries we find a more moderate credit expansion (solid line in Figure 1).

---

[9] Low global interest rates notwithstanding, the higher leverage led to a rapid increase in the debt service ratios of emerging market borrowers. In a period when the average debt service ratio of Advanced Economies decreased from 21 to 18 percent, the average debt service ratio of emerging markets increased from 10 to 12.5 percent. In a subset of emerging economies characterized by rapid credit expansion, debt service ratios surpassed the advanced economy average (BIS credit statistics).

[10] Over the same period, household debt increased by 12 percentage points and government debt increased by 9 percentage points.

[11] While borrowing by households is important in Malaysia and Thailand, public sector borrowing is relatively more important in Brazil, India, Indonesia, South Africa, Mexico, and Argentina.

Non-financial corporations also played a key role in international bond issuances.[12] Over 2008-2015, outstanding international bonds issued by non-financial corporations grew from $360 billion (approximately 30% of total outstanding bonds) to $1.1 trillion (more than 40% of total outstanding bonds). Issuances by non-financial corporations were particularly important in Asia and Latin America, where they now represent nearly 50% of total outstanding bonds. In addition, by 2015, total claims of BIS reporting banks on emerging markets and outstanding international securities issued by emerging market nationals surpassed $5.8 trillion, representing an 80% increase over emerging-market liabilities in 2007. The largest increases, both in percentage and absolute terms, were in Emerging Asia and Latin America (148% and 93%, respectively).[13] The increase in leverage was particularly important in non-tradable cyclical sectors such as construction.

As mentioned in the introduction, domestic credit expansion in emerging markets was accompanied by a surge in foreign borrowing.[14] In 2007 foreign currency bonds represented 16 percent of international debt by emerging market-based non-financial corporations and by 2014 the foreign currency share had grown to 22 percent (IMF, 2015).[15] However, the increase in leverage and foreign currency debt documented above took place in an environment of ample global liquidity and record low policy rates in advanced economies. Emerging market-based corporates have therefore been able to borrow at longer maturities and lower yields.[16] Recent fears are that, as monetary policy conditions in the US normalize, they could trigger a wave of corporate failures in a number of emerging economies.

---

[12] In 2015, borrowing by non-financial corporation accounted for about 25 percent of EM cross-border borrowing from BIS reporting banks.

[13] The figures for Asia and, to some extent, Latin America are however driven by two important outliers. As mentioned, liabilities by Chinese nationals increased by 500 percent and, if we remove China from the Asian total, we find a more modest increase in foreign liabilities (a 58% increase compared to 148%). In the case of Latin America, instead, removing Brazil from the total brings down the increase in foreign liabilities from 93% to 76%. Brazil and China account for 48% of the increase in total claims of BIS reporting banks on EMs and outstanding international securities issued by EM nationals, and excluding Brazil and China from the EM total reduces the percentage increase of these liabilities from 80% to 45%. Alfaro, Chari, and Kanczuk (2013) analyze the effects of Brazilian capital control policies regarding capital inflows.

[14] Total cross-border claims on EMs by BIS reporting banks increased from $2.4 trillion in 2008 to a peak of $3.7 trillion on 2014. Data for 2015 indicates a $200 billion retreat, with total cross-border claims standing just below $3.5 trillion (Table 1).

[15] The share of dollar-denominated bonds issued by non-financial corporations is higher than the overall share of dollar-denominated bonds.

[16] Maturity went from the pre-crisis average of 5 years to more than six years and average yields decreased from 8 to 6 percent (IMF, 2015).

Moreover, there may be additional negative consequences given that much of the foreign-currency denominated corporate borrowing appears linked to speculative carry-trade activities rather than the need to fund real investment projects (Bruno and Shin, 2015 and Caballero et al., 2015). Bruno and Shin (2015) conclude that the borrowing decisions of non-financial corporates are sometimes motivated by "financial risk-taking rather than real risk-taking opportunities." Caballero et al. (2015) suggest that regulatory arbitrage may in part drive the observed foreign currency borrowing by non-financial emerging-market corporates. In other words if non-financial corporates behave like banks and deposit the proceeds of foreign bond issuances in the domestic banking system (Powell, 2014) a shock to international funding may be quickly transmitted to the domestic financial system.

3. Data

Firm-level data are from Worldscope (gathered through Datastream) and Osiris.[17] Both sources provide detailed historical information for listed and unlisted firms for a wide sample of countries. We compared Worldscope and Osiris' coverage for emerging markets and chose the data source with the most data availability for each country. Osiris had better coverage for China and India, while Worldscope dominated for all other countries.

The sample consists of data on non-financial firms from 1992–2014 for the main countries classified as emerging markets by the Bank of International Settlements.[18] We use several indicators of corporate financial vulnerabilities and firm performance.

For *leverage*, we use as a main indicator the debt to equity ratio (a firm's total debt divided by its common equity), which indicates how much debt a company is using to finance its assets relative to its common equity. As a proxy for *liquidity*, we use the current ratio (current to total liabilities). For *solvency*, we compute the coverage ratio, the ratio of earnings before interest,

[17] The Worldscope database provides detailed historical financial statement information for the world's leading public and private companies. Osiris, published by Bureau van Dijk, has information as well on listed, and major unlisted/delisted, companies around the world. All data for Tangible fixed assets is also from Osiris. When extracting data from Osiris, we restricted the sample to include sales information.

[18] These countries are Argentina, Brazil, Chile, China, Colombia, Czech Republic, Hungary, India, Indonesia, Jordan, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Poland, Russia, Slovakia, Slovenia, South Africa, South Korea, Taiwan, Thailand, Turkey, and Vietnam. Coverage of Eastern European countries is extremely sparse. We therefore group together firms from Czech Republic, Hungary, Poland, Slovakia, and Slovenia as 'Eastern Europe' in our tables.

taxes, depreciation, and amortization (EBITDA) over total liabilities to measure a company's ability to use their cash flow to pay back its outstanding liabilities.

For firm performance, we analyze as well the increase in tangible fixed assets as a proxy for *investment*. *Profitability* is captured by the return on equity (ROE) and return on invested capital (ROIC). ROE is defined as the amount of net income returned as a percentage of shareholders' equity, and ROIC is the ratio of operating profit (earnings before interest and tax) to invested capital (sum of shareholders' equity and debt liabilities).

As a summary measure of *corporate fragility*, we calculate the Altman (2005) Emerging Market Z-score. The measure weighs four ratios constructed using the firms' financial statements (working capital to total assets, retained earnings to total assets, operating income to total assets, and book value of equity to total liabilities).[19] The measure is an enhanced version of the standard Z-score model, adjusted to incorporate the characteristics of emerging market firms and best suited to assess the relative vulnerability of the sample of countries we consider in this paper. Lower Z-scores are associated with greater vulnerability and likelihood of bankruptcy. Companies with EM Z-scores greater than 6.25 are considered to be in the "safe zone", scores between 5.85 and 3.75 indicate vulnerability, and scores below 3.75 indicate that the firm is in state of distress. The following table from Altman (2005) compares Z-scores with bond ratings.

We select for our sample all companies that have data for each indicator.[20] We exclude outliers and all noticeable errors in the data. The sample varies from a maximum of 8,286 firms with data on ROIC (totaling 41,888 firm-year observations) to a minimum of 2,986 firms (14,393 observations) with enough data to compute Altman's Emerging Market score. Coverage is highest for China, India, and South Korea and lowest for Eastern Europe.

[19] EM score =6.56 (X_1) + 3.26 (X_2) + 6.72(X_3) + 1.05(X_4) + 3.25, where X_1= working capital/ total assets, X_2=retained earnings /total assets, X_3=operating income /total assets, X_4=book value of equity /total liabilities. The constant term (derived from the median Z`` score for bankrupt US entities) standardizes the analysis so "that a default equivalent (D) is consistent with a score below zero." The use of book value of equity, not market value, was motivated by a concern that equity markets may be less liquid than in developed markets. Altman (2005) adjusts the measure to consider currency devaluation vulnerability, industry adjustments (relative to U.S.): competitiveness position adjustment (dominant firms in the industry due to size, political influence, etc.); special debt issue figure (collateral or bona fide, high-quality guarantor); sovereign spread (comparison to US corporate bond of the same rating).

[20] The number of companies with data for every variable and year of interest is too small to create a balanced sample. Nonetheless, we have performed the analysis maintaining a balanced sample during different periods, obtaining similar results (e.g. to analyze yearly debt/assets ratio for the 2009-2014 period, we select for our sample all companies that have data for each indicator of Total Debt, Total Assets, and Sales for each year in 2009-2014).

Overall, the dataset covers primarily larger firms. While a lack of smaller firm coverage tends to pose problems in other settings, a focus on large corporations is to our advantage in this paper. As mentioned in the introduction, large firms have the propensity to contribute more to systemic risk, and thus they are precisely the firms whose financial health is of greatest concern to policy-makers.

Table A. Altman Z''-Score and Bond Rating

	Z' Score			Rating	Z' Score			Rating	
		>	8.15	AAA	5.65	-	5.85	BBB-	
	7.60	-	8.15	AA+	5.25	-	5.65	BB+	
	7.30	-	7.60	AA	4.95	-	5.25	BB	Grey Zone
	7.00	-	7.30	AA_	4.75	-	4.95	BB-	
	6.85	-	7.00	A+	4.50	-	4.75	B+	
	6.65	-	6.85	A	4.15	-	4.50	B	
Safe Zone	6.40	-	6.65	A-	3.75	-	4.15	B-	
	6.25	-	6.40	BBB+					
	5.85	-	6.25	BBB	3.20	-	3.75	CCC+	
					2.50	-	3.20	CCC	Distress Zone
					1.75	-	2.50	CCC-	
						<	1.75	D	

4. Emerging Markets Corporate Fragility: Some Stylized Facts

We begin by comparing corporate financial fragility indicators during the build-up of the AFC – which was deemed to have corporate financial roots – with the same indicators following the GFC, a period characterized by the rapid build-up in emerging market corporate debt. To do so, we divide the data into two periods: pre-AFC (1996-1998) and post-GFC (2009-2014).[21] We use the indicators described in Section 3 to analyze corporate fragility and profitability using data from the balance sheet, income statements, and cash flows. For different indicators of corporate financial vulnerabilities and firm performance, Table 2 and Figures 3-6 present several stylized facts using weighted mean values using sales (as a proxy for size) as the weights. The weighted means are calculated for all firms in a country by year. The yearly weighted means are then averaged for each of the two sub-periods, also by country. We also analyze simple means and

[21] We also compared results against an average of the period 1992-1997. The main results and implications are similar.

simple and weighted medians. The Asian Five includes Indonesia, Malaysia, Philippines, South Korea and Thailand.

Leverage: Panel A of Table 2 presents the findings for changes in leverage levels (weighted means), measured as the debt to equity ratio for the firms in the sample.[22] It is important to note that the debt to equity ratio provides a more striking perspective on a firm's leverage position than the debt to assets ratio. For example, South Korea's pre-AFC average debt to asset ratio of 68% for the firms in our sample seems less burdensome than its debt to equity ratio of more than 280%, which implies that debt obligations are more than twice as high as shareholder commitments.

We also documented the patterns for the simple means and medians, as well as the weighted median. Here a point about the relevance of the summary statistic used is worth noting. In general, the weighted median measure attenuates the distributional consequences of observations in the tails of a distribution. In many circumstances this adjustment is warranted to ensure that outliers do not drive the results. In other words, if a few observations skew the weighted mean, the weighted median that adjusts for non-uniform statistical weights and gives the 50% weighted percentile measure is the more appropriate statistic. However, in the case of leverage and measuring the overall riskiness of corporate debt for the financial system in a country, we would like to assess the upper bound of the risk. If a few large firms are also the ones with the highest leverage, it is desirable to give a larger weight to these observations since arguably these firms have the greatest potential to generate systemic risk—we focus on these large firms in Section 6. We therefore present the main results using the (sales) weighted mean rather than the weighted median while recognizing that the weighted median provides a useful alternative benchmark.

Columns 1 and 2 present the firm level weighted mean leverage by country for the pre-AFC (1996-98) and post-GFC (2009-14) periods. Column 1 shows that the average debt to equity ratio in the Asian Five was close to 145% while the average for the full emerging market sample was 80%. It is clear that the benchmark to assess how post-GFC corporate debt levels

[22] The debt to equity is a leverage ratio that compares a company's total liabilities to its total shareholder's equity. The measure provides information about the magnitude of the commitments from lenders and creditors to a firm compared to the magnitude of shareholder commitments. The debt to equity ratio therefore provides an alternative lens from which to view a firm's leverage position by comparing total liabilities to shareholders' equity rather than to assets. Similar to the debt to assets ratio, a lower percentage means that a company is using less leverage and has a stronger equity position.

compare with leverage ratios before the AFC differs significantly depending on whether we focus on the countries most adversely affected by the crisis or the group average for emerging markets viewed collectively.

Columns 3 examines whether for any given country, the post-GFC average is higher than the pre-AFC period. Column tabulates whether the average post-GFC period leverage for a given country is higher than the average pre-AFC leverage in the Asian Five. Column 5 tabulates whether the average post-GFC period leverage for a country is higher than the average pre-crisis leverage in the full sample of emerging markets on the eve of the AFC.

Column 3 shows that out of the countries for which we have data for both sub-periods,[23] 10 countries have higher average leverage ratios in the post-GFC period. Column 4 suggests that none of the countries have higher leverage ratios compared to the average leverage in the Asian Five on the eve of their crisis. Column 5 shows that 12 countries have higher leverage compared to the pre-AFC average for emerging markets as a group. Figure 3 confirms these patterns visually to demonstrate the two thresholds of pre-AFC average leverage ratios—the Asian Five and the full emerging market sample.

For purposes of illustration it is interesting to note the patterns we obtain when we use the (sales) weighted median instead of the weighted mean. First, in the pre-AFC period the weighted median leverage ratios for the Asian Five and full emerging market sample are much lower than the weighted mean, close to 93% and 67%, respectively. Second, 14 out of 19 countries have a higher post-GFC weighted median. Third, three countries have a higher weighted median compared to the Asian Five while seven countries have a higher weighted median leverage compared the pre-AFC emerging market weighted median.

These simple statistics confirm that in order to assess the risk of corporate debt levels in the post-GFC period, the appropriate benchmark is an important consideration for the analysis and for which there exists no consensus.

Liquidity: Panel B of Table 2 provides the (sales) weighted mean of the current to total liabilities ratio by country to analyze the liquidity needs of the firms in our sample.[24] Column 3

[23] Data for Jordan following the Global Financial crises was patchy for leverage.

[24] Current liabilities measure a firm's debts and other obligations that are due within one year and include short-term debt, accounts payable, accrued liabilities and other debts. Note that current liabilities provide a more comprehensive measure of a firm’s short-term liquidity needs compared to short-term debt since it includes accounts payable and accrued liabilities.

suggests that six countries for which we have current liability data for both periods demonstrate a higher current to total liability ratio in the post-GFC sub-period. Interestingly, this ratio (~ 60%) was not significantly different across the Asian Five versus total emerging market sample in the pre-AFC sub-period. Column 4 shows that 11 out of the 22 countries have higher short-term liquidity needs compared to the Asian Five while 11 countries have higher short-term liquidity needs compared to the full sample of emerging markets before the AFC (Column 5). Figure 4 presents a graphical representation of these patterns.

Solvency: The coverage ratio is a measure of a firm's ability to meet its obligations to lenders. Generally, the higher the coverage ratio, the better the ability of the firm to fulfill its debt obligations. Common coverage ratios include the interest coverage ratio, debt service coverage ratio and the asset coverage ratio. The interest payment and debt service ratio data are very sparse in our sample of emerging market firms. We therefore use a modified version of the coverage ratio that is the ratio of EBITDA to total liabilities. By definition, this modified ratio will be biased downward as total liabilities exceed interest expenses or other debt obligations used to calculate more standard versions of the coverage ratio. Nevertheless it provides a useful snapshot of a firm’s solvency position.

In Panel C of Table 2, we see that the pre-crisis coverage ratio average of the Asian Five has increased. The average for the full emerging markets sample on the other hand has remained unchanged. Column 3 shows that half of countries have coverage ratios that are lower than their pre-AFC levels, and 20 countries have coverage ratios that exceed that of the Asian Five. However, 13 countries have post-GFC coverage ratios that are below the average coverage ratio for the emerging market sample prior to the AFC. It is striking that in the post-GFC period a much larger number of countries have a weaker liquidity position compared to the pre-AFC period. This could be a result of higher liabilities, lower profitability or a combination of the two. Regardless, the weakening coverage ratio suggests an increase in corporate financial vulnerability across a broader set of emerging markets when compared to the pre-AFC period. Figure 5 visually confirms these patterns.

Profitability: Next we examine the profitability of the firms in our sample (Panel D, Table 2). We use two measures: the return on invested capital (ROIC) and the return on equity (ROE). A concern with increased leverage is that if it is accompanied by a slowdown in profitability, firms will find it more difficult to service their debt obligations. Unlike equity, debt is a non-contingent claim that needs to be met regardless of the state of firm profits. Firm-level liquidity and solvency ratios therefore feature some measure of earnings relative to debt service obligations to provide a measure of a firm's flexibility with respect to these obligations.

Panel D shows that while the ROIC for the Asian Five prior to the AFC was close to 7% the number for the overall emerging markets sample was approximately 10%. In the post-GFC period, the average ROIC across all emerging markets in our sample was similar to the pre-AFC sample period. Consistent with a picture of a broader sample of emerging markets displaying greater corporate vulnerability we see that half of the countries show higher profits compared to the pre-AFC period.

Interestingly, consistent with an increase in leverage, the return on equity (ROE) shows a much different pattern. Note that increased leverage (debt) increases the expected rate of return on the equity simply because leveraged investments are riskier than unlevered ones. The average ROE went from negative to 13% for the Asian Five across the two sample periods while the overall emerging market average increases from 9% to 14% (not reported). More than half the sample of countries has higher ROE values in the post-GFC period compared to the pre-AFC period. Strikingly, post-GFC, most of the countries have higher ROE values compared to the Asian Five before the AFC (Column 4).

Corporate Fragility: As mentioned in section 3, a modified version of Altman's Z score can be used as a composite summary statistic for corporate fragility. The measure includes various income statement and balance sheet items such as the ratio of working capital, retained earnings and operating income to assets as well as the book value of assets to total liabilities to combine various aspects of firm operations to give an overall picture of corporate health or ill-health as the case may be. The advantage of the approach, as the data section shows, is that the different ranges of "safe", "grey" and "distress" can be correlated with corporate ratings letter grades used by credit rating agencies. Altman modifies the summary statistic to account for different structural characteristics of emerging market firms such as replacing the market value of assets to the book value to adjust for the relative illiquidity of trading in emerging markets in comparison to firms in advanced economies. The Z-score statistics correspond to AAA to BBB for the safe zone, BBB- to B- for the grey zone and CCC+ and below for the distress zone.

Panel E of Table 2 presents the results. Companies with EM Z-scores greater than 6.25 are considered to be in the "safe zone", scores between 5.85 and 3.75 indicate vulnerability, and scores below 3.75 indicate that the firm is in state of distress. The table shows that among the Asian Five South Korea was in the distress zone prior to the AFC. Malaysia, Philippines and Thailand were in the grey area as well as China, India, and Pakistan. The only Asian country in the safe zone was Taiwan. In Latin America, while Argentina and Brazil were in the grey zone, Chile, Colombia, Mexico and Peru were in the safe zone. Note also that both Turkey and South Africa were in the safe zone. The average Z-score for the Asian Five was 5.2 (in the grey zone) and the pre-AFC emerging market average was 6.1 (close to the safe zone). The picture changes in the post-GFC period. Countries with higher Z-scores in the post-GFC period are Colombia, Eastern Europe, Malaysia and Indonesia. South Korea moved from the distress zone into the safe zone. China, India and Turkey are in the grey zone as is Mexico. The picture suggests that the issues of corporate vulnerability apply to a broader set of emerging markets in the post-GFC period given the number of countries in the grey zone. It is worth pointing out that there are no countries in the distress zone post-GFC. Also, note that some of the countries in the safe zone show a fall in their Z-scores compared to their pre-AFC scores and are now barely over the grey zone threshold. If the Altman scores provide a leading indicator of the potential for distress, the data suggest that corporate financial vulnerabilities are more widespread now than in the run-up to the AFC.

Summary: Thus far, we have contrasted a range of firm-level indicators related to corporate fragility and profitability prior to the AFC of 1998 and the aftermath of the GFC of 2008–2009. We compare the indicators using three benchmarks:(i) a within-country cross-time comparison to the 1996-1998 values for a given indicator, (ii) a comparison relative to the 1996-1998 average of the Asian Five, and (iii) a within-group comparison relative to the 1996-1998 average for all the emerging markets in our sample.

In the 1996-1998 period, East Asian corporates had greater leverage and financial vulnerabilities than corporates in other emerging markets. While there is substantial cross-country heterogeneity in the post-GFC period, our data suggest that corporate leverage and vulnerabilities are higher now than prior to the AFC.

However, while these vulnerability levels are not necessarily higher than in the East Asian countries that were eventually hit by the crisis, a broader range of countries are in the “grey zone” or at risk. A word of caution in interpreting these results is warranted. Internal and external conditions have changed between the two sample periods. But overall, when comparing the data, it is clear that the benchmark matters.

5. Emerging Markets Corporate Fragility: Firm Level Evidence

In the previous section we found lower leverage ratios and less severe corporate fragility now than before the AFC. However, we found more countries in Altman's grey zone, with weaker solvency positions and less return on invested capital today.

In this section we delve further into the firm-level data and run regressions to assess the overall risk and the channels that link leverage to default risk. As a first step, we examine whether the relationship between leverage and Z-score is different across time periods by estimating the following model:

$$Z_{i,c,t} = \alpha_i + \delta_{c,t} + (\beta_1 D1 + \beta_2 D2 + \beta_3 D3)L_{i,c,t} + \varepsilon_{i,c,t} \qquad (1)$$

where $Z_{i,c,t}$ is the Z-score for firm *i*, country *c*, year *t*; $L_{i,c,t}$ is leverage for firm *i*, country *c*, year *t*; α_i are firm fixed effects; $\delta_{c,t}$ are country-year fixed effects; D1 is a dummy that takes a value of 1 for years 1996-98 (the AFC period and its run-up); D2 is a dummy for years 2003-2007 (tranquil period); and D3 is a dummy for years 2009-14 (post-GFC period).[25]

Column 1 of Table 3 shows that in the pre-AFC and post-GFC periods there is a negative and statistically significant correlation between leverage and firm financial fragility (i.e., scores for firms with high leverage are closer to the distress range). The coefficient in the post-GFC period has a lower magnitude than that in the pre-AFC period. In contrast, during the tranquil period the correlation between leverage and financial fragility is essentially zero and statistically insignificant.

Turning to the sector-specific dimension, we use a linear regression with dummy variables to test whether the relationship between leverage and the Z-score differs across sectors. For instance, industries such as energy and mining are traded but exposed to commodity prices.

[25] In the baseline regression, we exclude 1993-1995 from the regressions because we have a small number of firms for this period. We also exclude 1999-2002 to avoid contaminating our tests with emerging market crises associated with sovereign – not corporate – debt episodes (i.e. Russian, Brazilian, and Argentinean crises). However, as a robustness check we include these years and more generally, find that the results remain robust to alternate specifications of the subsamples.

Industries such as construction and utilities tend to be non-traded and therefore particularly exposed to currency risk when they access international capital markets. Currency mismatches associated with excessive foreign currency leverage were one of the root causes of the AFC. However, such mismatches may be less damaging for firms that, by operating in the tradable sector, may have natural hedges through foreign currency revenues.[26]

We observe two patterns. In the pre-AFC period the negative correlation between leverage and the Z-score is not statistically significant in the tradable sector (Column 2a, Table 3) and it is larger in magnitude and statistically significant in the non-tradable sector (Column 2b, Table 3). The opposite is true in the post GFC period, when the correlation is larger and statistically significant in the tradable sector but is not statistically significant in the non-tradable sector. The two results suggest that the financially fragile sectors affected by leverage are different across the two time periods. The non-tradable sector in East Asia, notably real estate, was highly levered prior to their crisis and, therefore, the finding that the non-tradable sector was more financially fragile leading up to the crisis is consistent with the data. Post-GFC, it appears that conditional on leverage, the tradable sector is more financially vulnerable.

Next, we conduct an examination of the impact of the interaction of leverage and the three macroeconomic variables: exchange rates, interest rates and GDP growth on financial fragility. We begin with the exchange rate. This variable may play an important role because, in the presence of foreign currency denominated debt, the relationship between leverage and the Z-scores may vary with currency movements. While we do not have data on the currency composition of firm-level debt, the finding that currency movements amplify the correlation between leverage and corporate financial fragility measured by the Z-score would be consistent with the presence of currency mismatches. We test this hypothesis by estimating the following equation:

$$Z_{i,c,t} = \alpha_i + \delta_{c,t} + (\beta_1 D1 + \beta_2 D2 + \beta_3 D3) L_{i,c,t} + \\ + (\gamma_1 D1 + \gamma_2 D2 + \gamma_3 D3) L_{i,c,t} \Delta EX_{c,t-1} + \varepsilon_{i,c,t} \quad (2)$$

[26] We start as classifying as non-tradable all firms that have a SIC2 code above 39, but then we also classify as non-tradable firms with SIC2 codes 7 (Agricultural Services), 9 (Fishing, Hunting and Trapping), 15 (Construction - General Contractors & Operative Builders), 16 (Heavy Construction, Except Building Construction, Contractor), 17 (Construction - Special Trade Contractors), 25 (Furniture and Fixtures), 27 (Printing, Publishing and Allied Industries), and 32 (Stone, Clay, Glass, and Concrete Products). This classification yields 5,888 observations in the tradable sector and 4,000 in the non-tradable sector. Our results are robust to using the simpler above 39 and below split.

Here, $\Delta EX_{c,t-1}$ is the percentage change in the nominal exchange rate, where $\Delta EX > 0$ represents a currency depreciation. Table 4 presents the results. The first column's negative, statistically significant coefficient on γ_1(AFC*ΔXR) suggests that, in the pre-AFC period and conditional on a depreciating currency, leverage has a statistically adverse impact on the firm-fragility score.

At the same time, β_3, the unconditional effect of leverage on the Z-score remains negative and statistically significant and γ_3, the effect of leverage conditional on currency changes is not statistically significant. This result is consistent with the fact that in the pre-AFC period firms with high leverage also had currency mismatches. However, currency mismatches do not seem to be important in the post-GFC period, possibly due to the lack of severe currency depreciations. Also, note that while Asian currencies experienced significant depreciations during the AFC, the post-GFC period was generally marked by an appreciation of emerging market currencies barring the period after 2013.

Column 2 of Table 4, shows that the results are generally robust to controlling for other firm-specific factors like investment in fixed assets (investment), return in assets (ROA), and firm size (log of total assets) which are all positively correlated with the Z-score. Specifically, large firms, profitable firms and firms with positive real investment are correlated with higher Z-scores or lower financial vulnerability. One key difference between Columns 1 and 2 of Table 4 is that in column 2 (and also column 3), we no longer find a statistically significant relationship between leverage and the Z-score in the post GFC period. This difference may be either due to the fact that the relationship between leverage and corporate financial fragility is captured by the firm-level controls of column 2 or related to the fact that in column 2 we lose nearly 2,500 observations. We find that our results are driven by the second of these two factors. If we re-estimate the model of column 1 on the sample of column 2, we find identical results to those of column 2.

Finally, we split the sample between firms in the tradable and non-tradable sectors. As before, we do not run separate regressions but interact the coefficients with tradable and non-tradable dummies. Column 3 shows that in the pre-AFC period the differences between firms in the tradable and non-tradable sectors are not apparent. The point estimates on γ_1, i.e., the interaction effect of leverage during the pre-AFC period conditional on changes in exchange rates are virtually identical across the two sectors, albeit the coefficient is more precisely estimated for the non-tradable sectors.[27] Taken together, the findings are consistent with the idea that in the AFC period (and its run-up) the link between leverage and corporate financial fragility could have been driven by the presence of currency mismatches.[28]

In emerging markets, currency depreciations are often accompanied by economic recessions and tighter financial conditions. The previous results could thus be driven by the fact that highly leveraged firms suffer more during recessions or, in the presence of maturity mismatches, are particularly affected by sudden increases in the interest rate. In Table 5, we take these underlying macro fundamentals into account by further interacting our three period dummies (AFC, tranquil, and GFC) with lagged GDP growth and the deposit rate (we would have preferred a lending rate but faced data constraints).

The main results from the table on the adverse impact of leverage conditional on currency depreciations (γ_1) on Z-scores during the pre-AFC period remain unchanged. Column 1 includes lagged real GDP growth as a control and suggests that during the post-GFC period leverage conditional on higher real GDP growth rates is positively correlated with Z-scores, suggesting that leverage in growing countries is correlated with less corporate financial vulnerability. Column 2 controls for leverage interacted with lagged values of the interest rate. The coefficient estimates are not statistically significant. Column 3 includes both interaction effects (lagged real GDP growth and lagged interest rates). The interaction effect on lagged real GDP growth continues as positive and significant and that on lagged interest rates remains statistically insignificant. In columns 4-6 we include the additional controls for firm-observables. As in Table 5, β_3 is no longer statistically significant and once again this difference is due to the smaller sample and not to the controls.

One may argue that our results are driven by the fact that exchange rate movements were different in the two periods. In the period following the immediate aftermath of the post-GFC period when international capital flows began their surge towards emerging markets, many

[27] As in Table 3, Columns 3a and 3b are estimated jointly. In robustness analysis (not shown) the results are robust to including the periods excluded from the table (the excluded periods are 1993-95 and 1999-2002).

[28] The former shows that the correlation is stronger for firms in non-tradable sector and the latter shows that the correlation is driven by leverage conditional on movements in the exchange rate. In the post-GFC period by contrast the exchange rate does not appear to drive the link between leverage and Z-scores. Of course, this pattern may be attributed to be the fact that in the post-GFC period the effects of emerging market currency depreciations were not as significant as in the AFC period.

emerging markets experienced appreciating currencies (2010-2012) and/or relatively modest depreciations (2012-2014) in comparison to the massive currency depreciations in the AFC period. To examine whether this may be the case, we distinguish between periods of currency appreciation and depreciation. Specifically, we estimate the following model:

$$Z_{i,c,t} = \alpha_i + \delta_{c,t} + (\beta_1 D1 + \beta_2 D2 + \beta_3 D3)L_{i,c,t} + \\ +(\gamma_1 D1 + \gamma_2 D2 + \beta\gamma_3 D3)L_{i,c,t}\Delta EX_{c,t-1} + \\ +A_{c,t-1}(\theta_1 D1 + \theta_2 D2 + \beta\theta_3 D3)L_{i,c,t}\Delta EX_{c,t-1} + \varepsilon_{i,c,t} \quad (3)$$

where $A_{c,t-1}$ is a dummy that takes a value of 1 if $\Delta EX_{c,t-1} < 0$ (i.e., if we observe a currency appreciation). The specification captures the differential effects of depreciations and appreciations interacted with leverage on corporate financial fragility. In this set up γ_i measures the joint effect of leverage and change in the exchange rate on Z-scores conditional on a currency depreciation, and $\gamma_i + \theta_i$ measures the effects conditional on an appreciation. We find γ_1 to be negative and statistically significant whereas $\gamma_i + \theta_i$ yields positive but statistically insignificant values (result not shown). This pattern corroborate the hypothesis that leverage interacted with currency depreciation has a statistically significant adverse impact on Z-scores, our measure of corporate financial fragility in emerging markets.

6. Emerging Market Corporate Fragility and the Macroeconomy

A key question is whether the increase in corporate leverage documented above can have large negative macroeconomic consequences when central banks in advanced economies start raising their interest rates (a process already begun by the Federal Reserve). Acharya et al. (2015) suggest this could lead to capital outflows from emerging markets and potential problems associated with the presence of currency mismatches in firm balance sheets

We address this question by studying the behavior of large firms. Specifically, we proceed in two steps. First, we follow Gabaix (2011)[29] and show that idiosyncratic shocks to

[29] Gabaix (2011) shows that idiosyncratic shocks to firms can generate aggregate fluctuations. An intuitive reason is that some firms are very large, and further that initial shocks can be intensified by a variety of generic amplification mechanisms. In the context of exchange rate or other shocks that can adversely impact highly levered firms, an additional concern is that shocks to systemically important firms in emerging markets could have feedback effects

large firms are significantly correlated with GDP growth in our sample of emerging markets.[30] Second, we test whether large firms are particularly vulnerable to exchange rate movements. We find that large firms are, on average, less leveraged than smaller firms. However, we also find that the more-leveraged large firms are more vulnerable to exchange rate shocks compared to equally-leveraged smaller firms. This evidence is consistent with the idea that large firms make a greater use of foreign currency borrowing and that they are not fully hedged against exchange rate movements. While this result holds for the average country in our sample, we also find that there is substantial cross-country heterogeneity.

6.1 Granularity in emerging market countries

Gabaix (2011) shows that if the distribution of firm size can be approximated with a fat-tailed power law (formally $P(S > x) = ax^{-\xi}$ where S is firm size and $\xi \geq 1$) idiosyncratic firm-level shocks can play a key role in explaining aggregate fluctuations. He builds a "granularity" index that captures idiosyncratic shocks for the largest 100 US firms and shows that this index is closely correlated with overall US GDP growth.

According to Gabaix, granularity effects are likely to be even more important in countries that are less diversified than the United States. He mentions several emerging market countries and suggests that "It would be interesting to transpose the present analysis to those countries" (Gabaix, 2011 p. 737). We take this suggestion seriously and build a granularity index for our sample of 26 emerging market countries.

Gabaix (2011) measures granularity with the following index:

$$\Gamma_t = \sum_{i=1}^{K} \frac{S_{i,t-1}}{Y_{i,t-1}} \left(g_{i,t} - \bar{g}_t\right) \tag{4}$$

where $S_{i,t-1}$ measures sales of firm i, $Y_{i,t-1}$ is GDP, $g_{i,t}$ is the growth rate of firm i (defined as the growth rate of the sales to employees ratio) and $\bar{g}_t$ is the simple average of the growth rate of

---

for the financial systems in these countries. The financial vulnerability of large firms is inextricably linked to the banking system in particular.

[30] Gabaix (2011) uses data for US listed firms. To the best of our knowledge, we are the first to apply his methodology to emerging market countries and show that the result also holds in this sample of countries.

the largest Q firms in the economy (with $Q \geq K$, and where firm size is measured by sales). Gabaix sets K=100 and experiments with Q=100 and Q=1000. When Q=100, the index is equal to the weighted growth rate of the 100 largest firms minus the (simple) average growth rate of these same firms. When Q=1000, the index is equal to the weighted growth rate of the 100 largest firms minus the (simple) average growth rate of the largest 1000 firms. It should be noted that the weights ($\frac{S_{i,t-1}}{Y_{i,t-1}}$) do not add up to one because the weights are computed for a subset of firms and the numerator is sales and the denominator is GDP.

In order to build a granularity index for our sample of emerging markets we need to address two issues. The first issue relates to data limitations. As mentioned above, Gabaix measures firm growth as the growth rate of the sales-to-employees ratio. Unfortunately, we do not have a good coverage of firms with data on total employment. Therefore, we measure firm growth by focusing on the growth rate of total sales. Our measure is a good approximation of the sales to employees growth rate as long as most of the variance in the ratio used by Gabaix arises from variations in sales rather than in variations of employment.

The second issue relates to the definition of "large" firms in an emerging market context. While it is reasonable to assume that, in a large and diversified economy like the United States, the largest 100 firms are indeed very large, this assumption is problematic in smaller and less diversified emerging market countries.

One possible way to address this issue is to simply use a smaller number of firms for all countries in our sample. In choosing this number however the number of firms needs to be large enough to capture some variability in idiosyncratic shocks and cover a meaningful share of overall GDP. Among the various possible thresholds, the largest number that allows us to include all the countries in our sample is 25.[31]

An alternative strategy is to use a criterion based on the share of total sales over GDP. For instance, we can rank firms in descending order of size and impose a cumulative sales-to-GDP ratio threshold.[32] Formally, let $f_{1,c,t}$ be total sales of the largest firm (by sales) in country c, year, t, $f_{2,c,t}$, the sales of the second largest and $f_{n,c,t}$ the sales of the n$^{\text{th}}$ largest firm. Let x be a

[31] Note that country heterogeneity poses a challenge. 25 firms are likely to capture a large share of the economy in a relatively small country like Peru, but twill capture a much smaller share of the economy in a larger country like Brazil or China.

[32] As before there are tradeoffs in the choice of the threshold, *x*. If the threshold is too low there will be too few "large" firms and if the threshold is too high there will be many countries in our sample with few listed firms that do not reach a higher threshold.

threshold in terms of cumulated sales of over GDP. Then firm are defined as large up to the point where:

$$\sum_{i=1}^{N} \frac{f_{i,c,t}}{GDP_{c,t}} < x \tag{5}$$

We experimented, with different thresholds and found that most country-years in our sample reach the level of 20% of the cumulative sales-to-GDP ratio. One issue is that in countries with high degrees of concentration, a very small number of firms are sufficient to breach the threshold.

In the end, we adopt an intermediate strategy: we define as large, the largest firms for whom cumulative sales are below 20 percent of GDP. However, if less than 25 firms are sufficient to reach this threshold, our definition of large is the largest 25 firms. As we do not want to include more firms than what Gabaix includes for the US, we limit the number of large firms to 100. Summing up, we rank firms by sales and we define as large a firm $f_{i,c,t}$ if $i \leq 25$ or $\sum_{i=1}^{N} \frac{f_{i,c,t}}{GDP_{c,t}} < 20$, and $i \leq 100$.[33] Table 6 replicates Gabaix's results and shows that granularity is positively correlated to GDP growth in our sample of emerging market countries.

6.2 Large Firms and Exchange Rate Vulnerabilities

Having established that idiosyncratic shocks to large firms are correlated with GDP growth, we now examine whether leveraged large firms are more vulnerable to currency depreciations. As a first step, we check if there is there are differences in leverage and other potential measures of fragility between large and smaller firms. Column 1 of Table 7 shows that compared to smaller firms, lower levels of leverage characterize the large firms in the sample. Columns 2-4 show that there are no statistically significant differences in other measures of corporate financial vulnerabilities such as solvency, liquidity, and the Z-score.

While large firms have lower leverage with respect to smaller firms, it is possible that they have an "unhealthier" type of leverage. Specifically, in the presence of fixed costs it is easier for large firms to borrow abroad and foreign borrowing tends to be in foreign currency.

[33] The results are robust to defining as large the largest 25 firms without taking into consideration the cumulative sales-to-GDP ratio.

There is evidence that large firms issue international bonds not only to finance investment projects but also to engage into carry trade activities (Bruno and Shin, 2016, Caballero, Panizza, and Powell, 2015). Lack of data on the currency composition of firm liabilities prevents us from directly testing if this is the case for our full sample of countries, but there is some evidence that (i) large Brazilian firms are more likely to have foreign currency debt compared to smaller firms (Bonomo et al.2003); (ii) large firms in US use more foreign currency derivatives (Allayannis and Weston, 2001); (iii) large firms in Finland are more likely to borrow in foreign currencies than small firms (Keloharju and Niskanen, 2001); and larger firms hold a higher fraction of dollar debt in a set of firms from Argentina, Brazil, Chile, Colombia, and Mexico (Bleakley and Cowan, 2005).

Given that we cannot test directly whether currency mismatches are potentially more problematic for larger firms, we test whether sales growth (associated with GDP growth in the granularity regressions of Table 6) responds more to exchange rate movements in large and leveraged firms than in equally leveraged smaller firms. As a first step we estimate the following model for our full sample of firms:

$$GR_{i,c,t} = LEV_{i,c,t}(\beta + \gamma DXR_{ct}) + \delta LARGE_{i,c,t} + \theta DXR_{ct} + \alpha_i + \varepsilon_{i,ct,t} \qquad (6)$$

where $GR_{i,c,t}$ is sales growth in firm i, country c, year t, $LEV_{i,c,t}$ is leverage, DXR_{ct} is the percentage change in the exchange rate in country c, year t (positive values are depreciations), $LARGE_{i,c,t}$ is a dummy variable that takes a value of one for large firms (defined as above), and α_i are firm fixed effects.

Column 1 of Table 8 shows that currency depreciations and leverage are negatively correlated with sales growth, but that the interaction between leverage and sales growth is not statistically significant. The lack of a significant effect on the interaction between leverage and currency depreciations may be due to the fact that for the average firm in our sample the negative effect of depreciation is not linked to the presence of negative balance sheet effects brought about by the presence of foreign currency debt. Alternatively, this lack of statistical significance may be due to the fact that firms that have currency mismatches are less leveraged on average. As we saw earlier, large firms are less leverage and may have larger shares of foreign currency debt. When we augment the model with country-year fixed effects (a specification that does not allow us to separately estimate the effect of the exchange rate change, DXR), we find results that are essentially identical to those of the model without country-year fixed effects (compare the first two columns of Table 8).

Next, we estimate our model with country-year fixed effects separately for large and small firms. Columns 3 and 4 of Table 8 show that leverage and the interaction between leverage and exchange rate movements are statistically significant for large firms and are not statistically significant for smaller firms. There are also large differences in the coefficients. The leverage coefficient is three times larger in the large firms subsample and the interaction between leverage and DXR is ten times larger in the large firms subsample. The point estimates imply that in large firms, a 20% depreciation of the exchange rate (DXR=0.2) yields correlations between leverage and sales growth ranging from -0.03 to -0.13.

In column 4, we pool all our observations but allow for the differential effect of firm size by estimating the following model:

$$GR_{i,c,t} = LEV_{i,c,t}\left(\beta + \gamma DXR_{ct} + \phi LARGE_{i,c,t} + \psi LARGE_{i,c,t} \times DXR_{ct}\right) + \\ + \delta LARGE_{i,c,t}(\delta + \lambda DXR_{ct}) + \alpha_i + \chi_{c,t} + \varepsilon_{i,ct,t} \qquad (7)$$

Where $\chi_{c,t}$ is a country-year fixed effect and all other variables are defined as above. In this case our parameter of interest is ψ, which captures how firm size affects the impact on sales of the interaction between depreciation and leverage. The results are in Column 5 of Table 8. We find that ψ is negative, large in absolute value, and statistically significant. This confirms that the interaction between leverage and currency depreciations in absolute value is significantly larger for large firms. We also find that λ is negative and statistically significant, suggesting that large firms are negatively impacted by currency depreciations even in the absence of leverage.

Given that our panel is highly unbalanced with some countries in the sample with more than 400 listed firms while others with only 20 listed firms, we re-estimate our model by keeping a maximum of 150 firms per country-year. The results remain near identical to what we obtain for the full sample of firms (compare columns 5 and 6 of Table 8).

Our findings are consistent with the hypothesis that many large firms may have unhedged foreign currency liabilities and are thus vulnerable to sudden currency depreciations. Given our previous evidence that idiosyncratic shocks to large firms affect overall economic activity, one is tempted to conclude that a sudden capital flows reversal could lead to very adverse effects on real output in emerging markets.

Such a pessimistic conclusion is however mitigated by the fact that, while the results of Table 8 are valid for the average emerging market country, there is substantial heterogeneity among the countries included in our sample. Figure 7 reports the point estimates of the parameter ψ obtained by estimating Equation 7 (without the country-year fixed effects) separately for 16 countries in our sample.[34] The point estimates range between -1 (Pakistan) and 2.5 (Russia). They are negative for 10 countries (statistically significant for 5 countries) and positive for 6 countries (statistically significant for one country). Thus there is substantial cross-country heterogeneity and one challenge for future research will be to identify the drivers of this heterogeneity.

5. Conclusion

This paper addresses widespread concerns about and potential macroeconomic repercussions of the rapid increase in corporate leverage in emerging markets following the GFC. In sum, firm-level stylized facts suggest that emerging markets today have lower leverage ratios than the average of the Asian Five in the run-up to the AFC. However, a broader set of emerging market countries show weaker liquidity, solvency, and profitability indicators since the GFC. More countries are also in the Altman Z-score's “grey zone”, that is, are at risk for corporate distress. A word of caution in interpreting our results is warranted: internal and external conditions have changed between the two sample periods. But overall, when comparing the data, it is clear that the benchmark matters.

Given the specific concerns about leverage, we investigate the relationship between leverage and corporate distress risk. Regression estimates suggest that leverage is correlated with corporate fragility prior to the AFC and following the GFC. However, currency depreciation exacerbated the link between leverage and corporate distress only during the pre-AFC. We also find that leveraged firms are more fragile during periods of slow economic growth.

[34] For the remaining countries in our sample, there was not enough information in the data to estimate country-specific coefficients.

The question that arises is whether the corporate financial health of certain types of firms is more important for the macroeconomy than others. Following Gabaix (2011), we find that at a granular level, large firms are systemically more important drivers of economic growth. These firms may therefore transmit the network and spillover effects of corporate distress in emerging markets, warranting special attention from policymakers. Although large firms are consistently less leveraged, they are more adversely impacted by exchange rate depreciations than their similarly levered smaller counterparts, albeit with substantial cross-country heterogeneity in the observed impacts.

The AFC was attributed to corporate financial roots. In particular, increased leverage on firm balance sheets in conjunction with foreign exchange denominated debt made firms vulnerable to the currency devaluations that accompanied the crisis. Currency and maturity mismatches led to widespread firm failures, while implicit bailout guarantees created moral hazard issues related to the increased leverage. Credit to emerging market firms has witnessed an unprecedented and rapid increase since the GFC. Given the systemic importance of large and highly levered firms, the present situation in emerging markets merits further attention.

References

Acharya, Viral, Stephen Cecchetti, Jose De Gregorio, Şebnem Kalemli-Özcan, Philip Lane, and Ugo Panizza (2015) "Corporate Debt in Emerging Economies: A Threat to Financial Stability," Committee on International Policy Reform, Brookings Institutions and CIGI.

Alfaro, Laura, Anusha Chari and Fabio Kanczuk (2013) "The Real Effects of Capital Control Taxes: Firm-Level Evidence from a Policy Experiment," NBER Working Paper 20726.

Allayannis, George and James Weston (2001) "The use of foreign currency derivatives and firm market value", Review of Financial Studies 14, 243-76.

Altman, Edward (2005) "An Emerging Market Credit Scoring System for Corporate Bonds," *Emerging Market Review* 6: 3011-323.

Altman, Edward (1993) *Corporate Financial Distress and Bankruptcy*. 2nd edition. John Wiley & Sons, New York.

Bank of International Settlement (2014), "Buoyant Yet Fragile?" *BIS Quarterly Review*, December 2014.

Bank of International Settlement (2016), *Debt Securities Data Base.* http://www.bis.org/statistics/secstats.htm

Bank for International Settlements (2012) "Developments in Domestic Government Bond Markets in EMEs and their Implications," BIS Papers, no. 67.

Bleakley, Hoyt and Kevin Cowan (2008) "Corporate Dollar Debt and Depreciations: Much Ado about Nothing?", Review of Economics and Statistics 90 (4), 612-626.

Burnside, Craig, Martin Eichenbaum and Sergio Rebelo (2001) "Prospective Deficits And The Asian Currency Crisis," *Journal of Political Economy* 109: 1155-1197

Burnside, Craig, Martin S. Eichenbaum, and Sergio Rebelo (2003) "On the Fiscal Implications of Twin Crises", in *Managing Currency Crises in Emerging Markets*, Michael P. Dooley and Jeffrey A. Frankel, editors, Chicago University Press.

Bruno, Valentina and Hyun Song Shin, (2015) "Global Dollar Credit and Carry Trades: A Firm-Level Analysis", BIS Working Paper, No 510, August.

Caballero, Julian, Ugo Panizza and Andrew Powell (2015), "The Second Wave of Global Liquidity: Why are Firms acting like Financial intermediaries?" CEPR Working Paper, 10926.

Chari, Anusha and Peter Blair Henry (2015) "Two Tales of Adjustment: East Asian Lessons for European Growth" *IMF Economic Review* Vol. 63(1) pp. 164-196.

Claessens, Stijn, Simeon Djankov, and Lixin Colin Xu (2000) “Corporate Performance in the East Asian Financial Crisis,” *The World Bank Research Observer*, vol. 15, no. 1: 23-46.

Claessens, Stijn and Thomas Glaessner (1997) “Are Financial Sector Weaknesses Undermining the East Asian Miracle?” IFC Technical Paper No. 3.

Corsetti, Giancarlo, Paolo Pesenti and Nouriel Roubini (1999) “What Caused the Asian Currency and Financial Crisis?” *Japan and the World Economy*, Vol. 11: 305-373.

Furman, Jason, and Joseph Stiglitz (1998) “Economic Crises: Evidence and Insights from East Asia.” *Brookings Papers on Economic Activity* 2:1–135.

Gabaix, Xavier (2011) “The Granular Origins of Aggregate Fluctuations.” *Econometrica* 79, 733–72.

Galindo, Arturo, Ugo Panizza, and Fabio Schiantarelli (2003) “Debt Composition and Balance Sheet Effects of Currency Depreciation: A Summary of the Micro Evidence,” *Emerging Markets Review*, Elsevier, vol. 4(4): 330-339.

Ghosh, Atish, Timothy Lane, Marianne Schultze-Ghattas, Ales Bulir, Javier Hamann, and Alex Mourmuras (2002) IMF-Supported Programs in Capital Account Crises. *Occasional Paper* 210. Washington: International Monetary Fund.

IMF (2015) “Corporate Leverage in Emerging Markets—A Concern?” in V*ulnerabilities, Legacies, and Policy Challenges Risks Rotating to Emerging Markets, Global Financial Stability Report*, October. Washington D.C.

Johnson, Simon, Peter Boone, Alasdair Breach, and Eric Friedman (2000) “Corporate Governance in the Asian Financial Crisis, 1997–8,” *Journal of Financial Economics* 58, 141-186.

Keloharju, Matti and Mervi Niskanen (2001) “Why do firms raise foreign currency denominated debt? Evidence from Finland”, European Financial Management 7, 481-496.

Krugman, Paul (1998) “What Happened to Asia?” unpublished, MIT.

Martínez-Solano, Pedro (2000) “Foreign exchange exposure in the Spanish stock market: Sources of risk and hedging”, Working Paper, University of Murcia, Spain.

McCauley, Robert, Patrick McGuire, and Vladyslav Sushko (2015) “Dollar Credit in Emerging Market Economies,” *BIS Quarterly Review*, December.

Mendoza, Enrique and Marco E. Terrones, E. 2008 “An Anatomy of Credit Booms: Evidence from Macro Aggregates and Micro Data,” NBER WP 14049.

Pomerlano, Michael (1998) “The East Asian Crisis and Corporate Finances: The Untold Microeconomic Story,” *Emerging Markets Quarterly*, Winter: 14-27.

Powell, Andrew (2014) "Global Recovery and Monetary Normalization: Escaping a Chronicle Foretold?" Latin American and Caribbean Macroeconomic Report, Inter-American Development Bank.

Radelet, Steven, and Jeffrey Sachs (1998) "The East Asian Financial Crisis: Diagnosis, Remedies, Prospects." *Brookings Papers on Economic Activity* 1:1–90.

Reinhart, Carmen and Kenneth Rogoff (2009) *This Time is Different: Eight Centuries of Financial Follies*. Princeton, New Jersey: Princeton University Press.

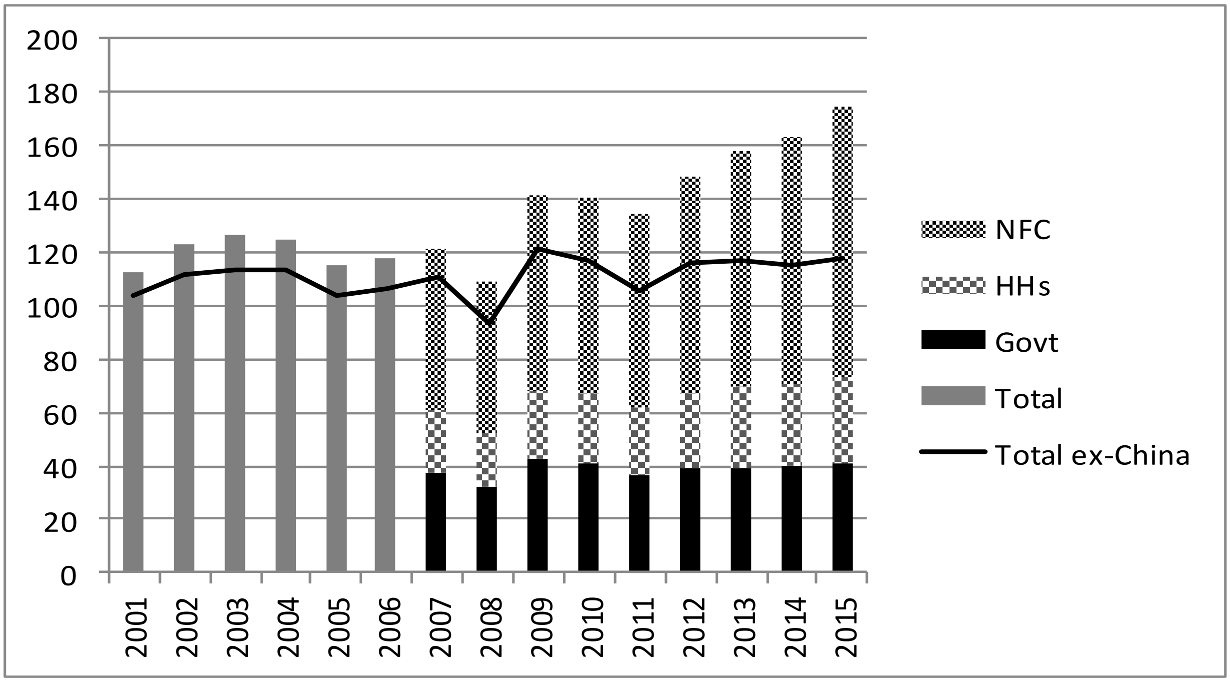
Schularick, Moritz and Alan M. Taylor (2012) "Credit Books Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crises: 1870-2008." *American Economic Review* 102 (2): 1029-61.

Stiglitz, Joseph E., and Amar Bhattacharya. 2000. "Underpinnings for a Stable and Equitable Global Financial System: From Old Debates to a New Paradigm." Proceedings of the World Bank Annual Conference on Development Economics 1999. Washington, D.C.: World Bank.

Truman, Edward (2013) "Asian and European Financial Crises Compared" Peterson Institute for International Economics WP 13-9.

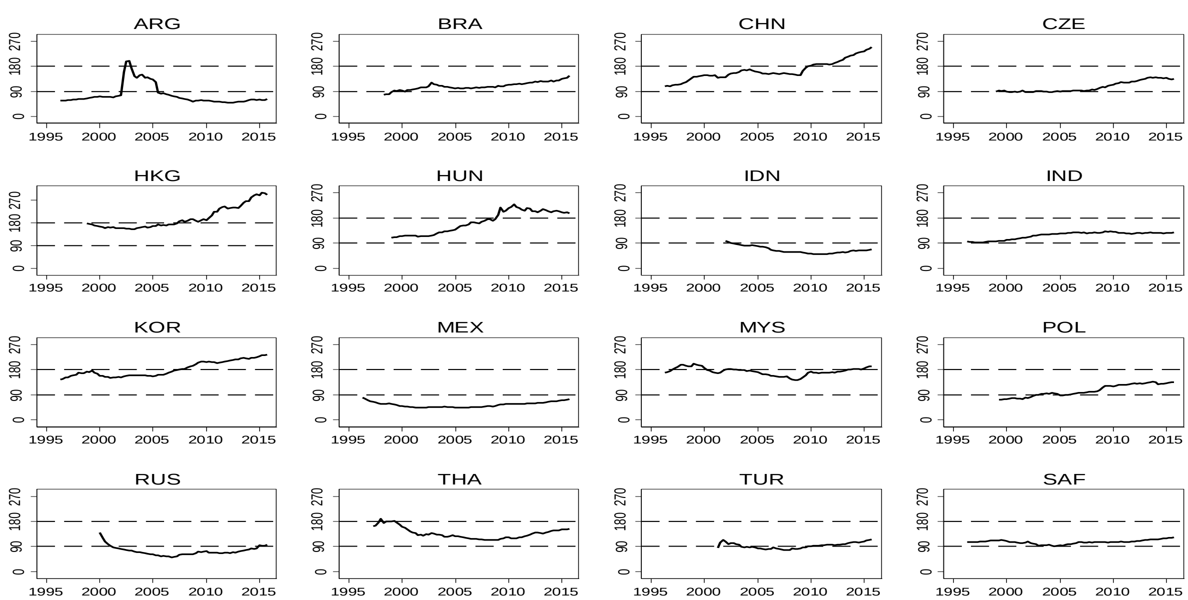
Shin, Hyun Song (2013) "The Second Phase of Global Liquidity and Its Impact on Emerging Economies" Proceedings of the Asia Economic Policy Conference, Federal Reserve Bank of San Francisco.

Figure 1: Total Credit to the Non-financial Sector in Emerging Markets (% of GDP)



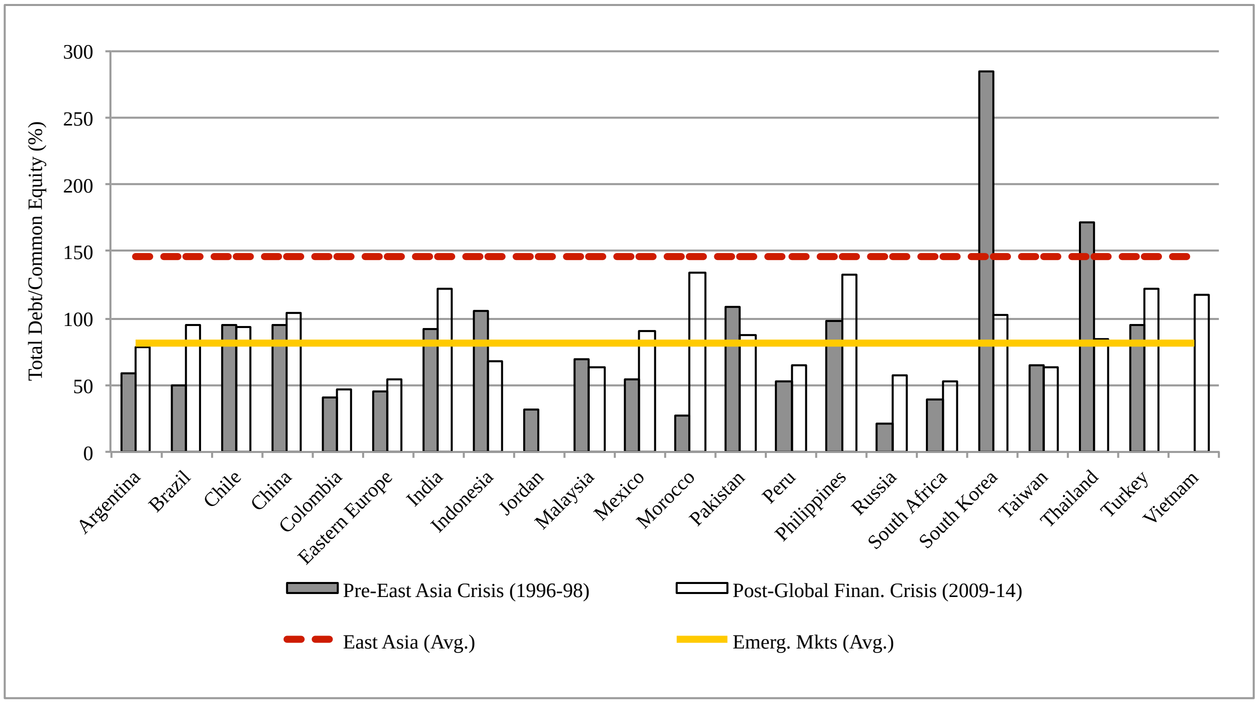
Source: authors calculations based on BIS total credit statistics. (Decomposition across sectors is only available after 2006)

Figure 2: Total Credit to the Non-Financial Sector in Emerging Markets (% of GDP)



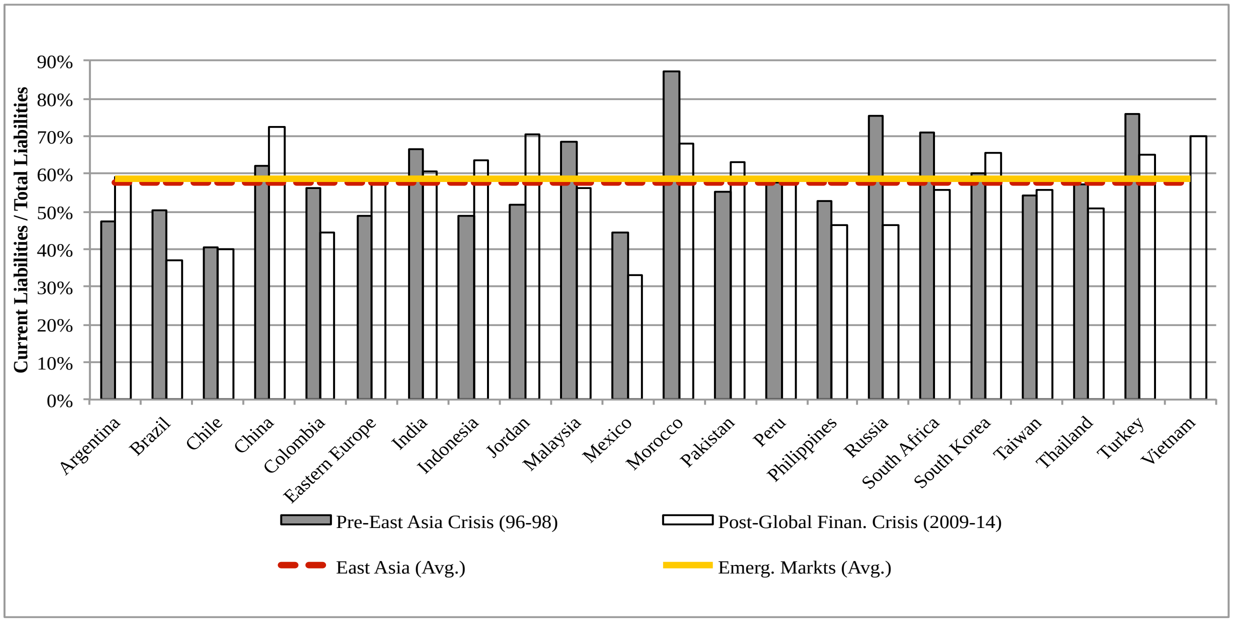
Source: authors calculations based on BIS total credit statistics

Figure 3: Leverage – Debt to Equity (Weighted Mean)



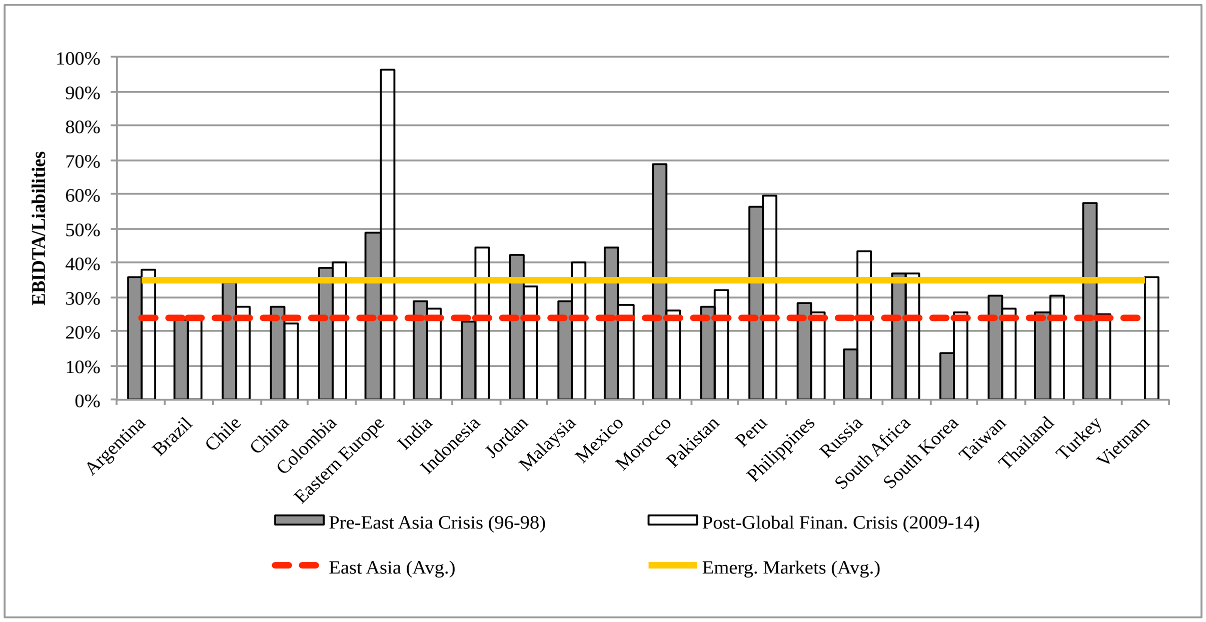
Source: authors calculations based on Worldscope data.

Figure 4: Liquidity – Current to Total Liabilities (Weighted Mean)



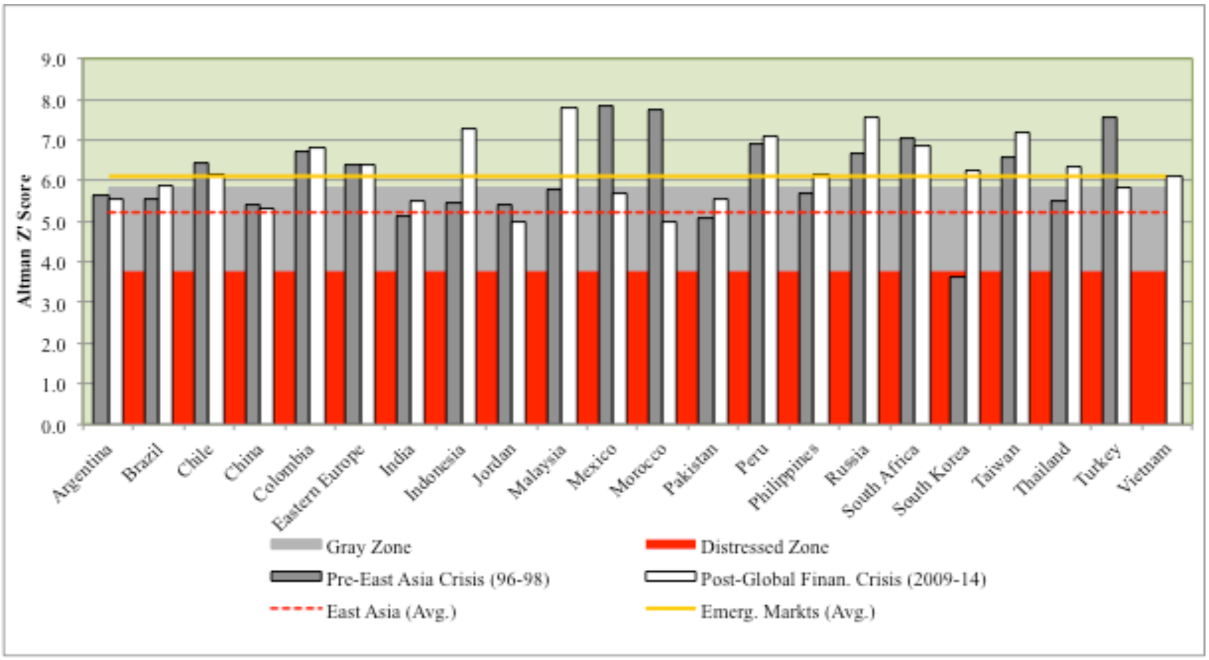
Source: authors calculations based on Worldscope data.

Figure 5: Solvency – EBITDA to Total Liabilities (Weighted Mean)



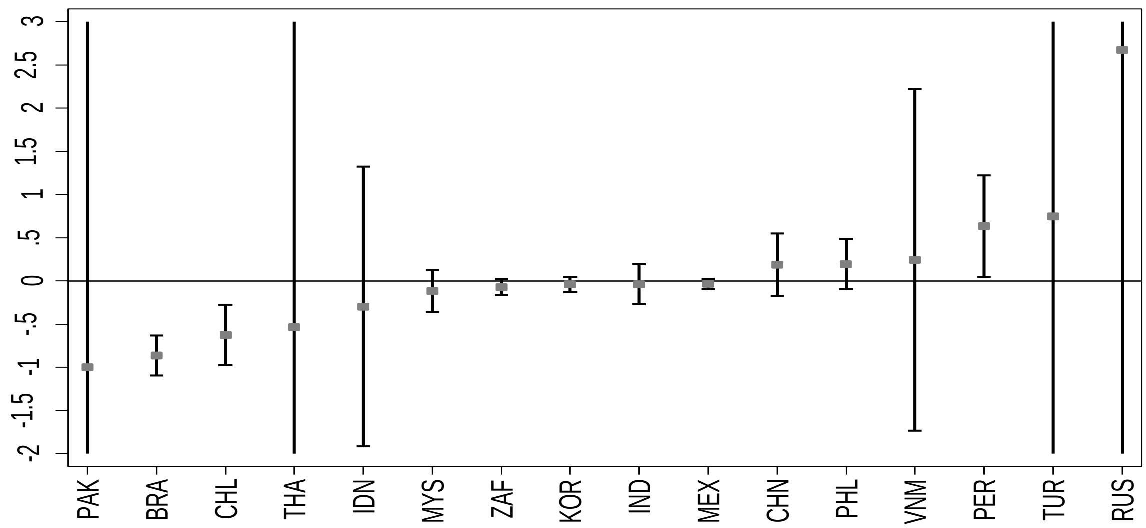
Source: authors calculations based on Worldscope data.

Figure 6: Altman Z''-Score EM (Weighted Mean)



Source: authors calculations based on Worldscope data.

Figure 7: Coefficient of the Parameter ψ



Notes: The figure plots the equation the coefficient (with a 95% Confidence Interval) of the Parameter ψ of X4 (Without the country-year fixed effects) estimate one country at a time.

Table 1: Total Claims on Emerging Market Countries, BIS reporting Banks (billion USD)

Source: Own elaborations based on BIS Locational Statistics. The data are for total claims (all instruments and all sectors) on residents of counterparty countries. Top five currencies are USD, euro, yen, British pound, and, Swiss franc.

	2007	2008	2009	2010	2011	2012	2013	2014	2015Q3
Emerging Markets									
Total	2,419	2,408	2,396	2,807	3,032	3,157	3,640	3,699	3,471
% top 5 curr.	81%	83%	81%	79%	79%	77%	77%	71%	74%
% USD	52%	53%	52%	53%	55%	53%	54%	55%	58%
Emerging Markets Ex-China									
Total	2,231	2,254	2,219	2,476	2,555	2,634	2,740	2,663	2,594
% top 5 curr.	82%	84%	81%	80%	81%	79%	81%	81%	82%
% USD	52%	53%	52%	53%	56%	55%	58%	61%	63%
Asia									
Total	830	738	783	1,064	1,258	1,349	1,801	1,945	1,752
% Total EM	34%	31%	33%	38%	41%	43%	49%	53%	50%
% top 5 curr.	78%	84%	80%	79%	79%	77%	74%	62%	65%
% USD	56%	58%	59%	59%	59%	56%	56%	53%	56%
Asia Ex-China									
Total	641	584	606	733	782	826	901	908	874
% Total EM	26%	24%	25%	26%	26%	26%	25%	25%	25%
% top 5 curr.	81%	86%	84%	82%	85%	83%	84%	82%	83%
% USD	57%	59%	60%	61%	66%	64%	67%	69%	71%
Latin America									
Total	403	410	413	533	602	626	647	633	627
% Total EM	17%	17%	17%	19%	20%	20%	18%	17%	18%
% top 5 curr.	83%	84%	76%	76%	78%	78%	79%	82%	85%
% USD	70%	74%	67%	67%	70%	70%	71%	75%	79%
Developing Europe									
Total	728	786	722	711	690	698	713	609	559
% Total EM	30%	33%	30%	25%	23%	22%	20%	16%	16%
% top 5 curr.	79%	81%	80%	76%	76%	73%	77%	77%	77%
% USD	35%	33%	29%	28%	29%	27%	31%	32%	31%
Africa and Middle East									
Total	459	474	478	499	481	484	479	513	533
% Total EM	19%	20%	20%	18%	16%	15%	13%	14%	15%
% top 5 curr.	87%	84%	85%	84%	86%	83%	84%	83%	84%
% USD	58%	60%	62%	61%	63%	61%	61%	63%	65%

Table 2: Pre-East Asian Financial Crisis vs Post-Global Financial Crisis

Leverage is measured by the debt to equity ratio: a firm's total debt divided by its common equity. Liquidity is measured by current-to-total liabilities. Solvency is measured by the coverage ratio: earnings before interest, taxes, and depreciation divided by total liabilities. Profitability is measured by the return on invested capital (ROIC): the ratio of operating profit (earnings before interest and tax) to invested capital (sum of shareholders' equity and debt liabilities). Altman's (2005) Emerging Market Z-Score measures firm fragility (computation described in the text). The first two columns present the average measure for each group of countries during our two fragile periods: The Pre-East Asia Crisis (1997-1997) and the Post-Global Financial Crisis (2009-2014). The last three columns count the number of countries in our sample which meet ("Yes") and don't meet ("No") the conditions above. The data is weighted by sales by year and then averaged per period per country. Periods include East Asian crisis countries include Indonesia, Malaysia, Philippines, South Korea, and Thailand. Source: authors calculations from Worldscope data.

	(1)	(2)		(3)	(4)	(5)
Countries	Pre-East Asian Crisis (1996-1998)	Post-Global Financial Crisis (2009-14)		Post-GFC > Pre-EAC (By country)	Post-GFC > Asian 5 avg. Pre-EAC	Post-GFC > EM avg. Pre-EAC
	Panel A: Leverage (Debt to Equity)					
East Asian Crisis Five	145.5%	73.9%	Yes	10	0	12
Emerging-Markets	80.8%	87.3%	No	8	21	9
	Panel B: Liquidity (Current to Total Liabilities)					
East Asian Crisis Five	57.6%	59.5%	Yes	6	11	11
Emerging-Markets	58.7%	56.4%	No	12	11	11
	Panel C: Solvency (Coverage ratio: EBITDA to Total Liabilities)					
East Asian Crisis Five	23.7%	48.3%	Yes	9	20	9
Emerging-Markets	34.9%	35.7%	No	9	2	13
	Panel D: Profitability (Return on Invested Capital)					
East Asian Crisis Five	7.3%	11.0%	Yes	9	17	9
Emerging-Markets	10.9%	10.7%	No	9	5	13
	Panel E: Emerging-Markets Z-score (Distance to Default)					
East Asian Crisis Five	5.2	6.6	Yes	9	20	13
Emerging-Markets	6.1	6.2	No	9	2	9

Table 3: The Relationship Between Leverage and Distance to Default in Different Time Periods

This table shows the results of a set of firm-level regressions where the dependent variable is distance to default (the Z-score) and the explanatory variables are the interactions between leverage and each of three dummy variables taking a value of one for the Asian Financial Crisis (1996-1998), tranquil period (2003-2007), and global financial crisis (2009-2014), respectively. In column two the variables are further interacted with a dummy taking a value of one for firms, which operate in tradable sectors (column 2a) and non-tradable sectors (column 2b). All regressions control for country-year and firm fixed effects. Robust standard errors clustered at the firm-level in parenthesis.

	(1)	(2)	
		(a)	(b)
β_1 (Asian Financial Crisis)	-0.596*	-0.388	-0.823*
	(0.344)	(0.390)	(0.493)
β_2 (Tranquil period)	-0.012	0.081	-0.120
	(0.282)	(0.353)	(0.379)
β_3 (GFC)	-0.421*	-0.642**	-0.089
	(0.246)	(0.313)	(0.339)
Observations	9,238	9,238	
Sample	All	Tradable	Non-Tradable
Number of firms	2,819	2,819	
Country-year FE	Yes	Yes	
Firm-FE	Yes	Yes	

Table 4: Distance to Default, Leverage, and the Exchange Rate

This table shows the results of a set of firm-level regressions where the dependent variable is distance to default (the Z-score) and the explanatory variables are the interactions between leverage and each of three dummy variables taking a value of one for the Asian Financial Crisis (1996-1998), tranquil period (2003-2007), and global financial crisis (2009-2014), respectively. These variables are then further interacted with the percentage change in the nominal exchange rate (lagged one period). In column two, the model is augmented with a set of firm-specific controls measuring investment, profitability (proxied by return on assets, ROA), and size (proxied by the log of total assets). The last two columns (3a and 3b) estimate separate effects for firms in the tradable and non-tradable sectors. All regressions control for country-year and firm fixed effects. Robust standard errors clustered at the firm-level in parenthesis.

	(1)	(2)	(3)	
			(a)	(b)
β_1 (AFC)	-0.199	0.214	0.364	0.0682
	(0.380)	(0.412)	(0.475)	(0.570)
β_2 (Traquil)	-0.038	0.051	0.094	0.032
	(0.284)	(0.320)	(0.390)	(0.423)
β_3 (GFC)	-0.418*	-0.197	-0.535	0.267
	(0.252)	(0.297)	(0.369)	(0.391)
γ_1 (AFC*ΔEX)	-3.983**	-4.915**	-4.905*	-5.051***
	(1.826)	(1.997)	(2.953)	(1.619)
γ_2 (Tranquil*ΔEX)	-1.905	-2.901	-4.382	1.157
	(2.618)	(2.754)	(2.913)	(3.737)
γ_3 (GFC*ΔEX)	0.317	-1.018	-3.431	3.099
	(2.680)	(3.085)	(3.775)	(4.358)
Investment		0.058**	0.061**	
		(0.027)	(0.027)	
ROA		1.118***	1.137***	
		(0.309)	(0.310)	
Firm Size		0.278**	0.278**	
		(0.117)	(0.117)	
Observations	9,238	6,814	6,814	
Sample	All	All	Tradable	Non-Tradable
Number of firms	2,819	1,714	1,714	
Country-year FE	Yes	Yes	Yes	
Firm-FE	Yes	Yes	Yes	

Table 5: Leverage, Distance to Default, Interest Rate, and Growth

This table shows the results of a set of firm-level regressions where the dependent variable is distance to default (the Z-score) and the explanatory variables are the interactions between leverage and each of three dummy variables taking a value of one for the Asian Financial Crisis (1996-1998), tranquil period (2003-2007), and global financial crisis (2009-2014), respectively. These variables are then further interacted with the percentage change in the nominal exchange rate (lagged one period), the local interest rate (IR is the deposit rate), and lagged GDP growth (GR). In columns 4-6, the model is augmented with a set of firm-specific controls measuring investment, profitability (proxied by return on assets, ROA), and size (proxied by the log of total assets). All regressions control for country-year and firm fixed effects. Robust standard errors clustered at the firm-level in parenthesis.

	(1)	(2)	(3)	(4)	(5)	(6)
β_1 (AFC)	0.043	0.285	0.217	0.266	0.254	0.248
	(0.408)	(0.701)	(0.712)	(0.463)	(0.751)	(0.752)
β_2 (Tranquil)	-0.358	-0.081	-0.339	0.069	0.173	0.131
	(0.464)	(0.408)	(0.501)	(0.535)	(0.447)	(0.587)
β_3 (GFC)	-0.861***	-0.571	-0.643	-0.618	-0.080	-0.131
	(0.330)	(0.479)	(0.472)	(0.385)	(0.542)	(0.524)
γ_1 (AFC*ΔEX)	-3.899**	-3.982*	-3.730*	-5.521***	-5.269**	-5.568***
	(1.936)	(2.072)	(2.022)	(1.943)	(2.219)	(2.043)
γ_2 (Tranquil*ΔEX)	-3.401	-2.079	-3.401	-2.668	-2.523	-2.659
	(3.038)	(2.732)	(3.043)	(3.271)	(2.888)	(3.290)
γ_3 (GFC*ΔEX)	-0.600	-0.148	0.126	-1.933	-0.773	-0.387
	(2.708)	(2.895)	(2.849)	(3.070)	(3.269)	(3.200)
AFC*GR	-0.827		-0.513	0.499		0.558
	(2.735)		(3.090)	(3.573)		(4.022)
Tranquil*GR	5.426		5.693	0.157		0.775
	(6.207)		(6.492)	(7.592)		(7.620)
GFC*GR	7.298*		8.806*	6.891		10.31**
	(4.091)		(4.637)	(4.642)		(5.174)
AFC*IR		-2.302	-1.560		0.303	0.185
		(4.828)	(5.516)		(5.181)	(5.916)
Tranquil*IR		0.692	-0.437		-1.419	-1.305
		(4.493)	(4.654)		(5.226)	(5.265)
GFC*IR		2.402	-5.901		-2.688	-13.31
		(8.581)	(9.483)		(9.857)	(10.51)
Investment				0.058**	0.058**	0.058**
				(0.028)	(0.027)	(0.028)
ROA				1.081***	1.075***	1.087***
				(0.309)	(0.309)	(0.309)
Firm Size				0.274**	0.279**	0.281**
				(0.120)	(0.120)	(0.120)
Observations	8,890	8,890	8,890	6,633	6,633	6,633
Sample	All	All	All	All	All	All
Number of firms	2,710	2,710	2,710	1,678	1,678	1,678
Country-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 6: The Granularity Effect

This table reports a set of regression in which the dependent variable is per-capita GDP growth and the explanatory variables are granularity (G) and its first two lag (L.G and L2.G). All the regressions control for country and year fixed effects. Robust standard errors clustered at the country level.

	(1)	(2)	(3)
G	0.698**	0.819***	0.810**
	(0.262)	(0.293)	(0.310)
L.G		0.527**	0.509*
		(0.236)	(0.258)
L2.G			-0.0739
			(0.365)
Observations	486	486	486
Nr of countries	26	26	26
Country fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Sample	1994-2014	1994-2014	1994-2014

Table 7: Fragility and Firm Size

This table reports a set of regression in which the dependent variables are various measures of potential or realized fragility (leverage, solvency, liquidity, and distance to default) and the explanatory variable is a dummy taking value 1 for large firms (Large). All the regressions control for country and year fixed effects. Robust standard errors clustered at the country level.

	(1)	(2)	(3)	(4)
	Leverage	Solvency	Liquidity	Distance to default
Large	-25.15***	1.737	0.392	-68.66
	(7.849)	(1.648)	(0.944)	(42.46)
Observations	45,104	38,741	39,271	16,687
Sample	All	All	All	All
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table 8: Leverage, Depreciation and Firm Size

This table reports a set of regression in which the dependent variable is sales growth and the explanatory variables are leverage, change in in the exchange rate, firms size and the interactions among these variables. All the regressions control for country and year fixed effects. Robust standard errors clustered at the country level.

	(1)	(2)	(3)	(4)	(5)	(6)
LEV	-0.0115*	-0.0119*	-0.0350**	-0.0108	-0.00824	-0.0290
	(0.00674)	(0.00709)	(0.0139)	(0.00865)	(0.00776)	(0.0404)
DXR _LEV	-0.0553	-0.0593	-0.500**	-0.0448	-0.0474	-0.0520
	(0.0495)	(0.0510)	(0.198)	(0.0571)	(0.0501)	(0.0533)
Large	-209.0***	-284.5***			-285.0***	-316.5***
	(19.20)	(24.70)			(24.70)	(27.94)
DXR	0.543					
	(4.742)					
DXR _LARGE					-35.14**	-32.46*
					(17.73)	(17.89)
LARGE_LEV					-0.0316*	-0.0113
					(0.0182)	(0.0466)
LARGE_LEV_DXR					-0.417**	-0.416**
					(0.201)	(0.203)
Observations	42,542	42,542	9,959	32,583	42,542	22,228
Number of firms	7,441	7,441	2,956	6,046	7,441	4,990
Sample	All	All	Large Firms	Other	All	Largest 150
Firm FE	YES	YES	YES	YES	YES	YES
CY FE	NO	YES	YES	YES	YES	YES