EVALUATING THE IMPACT OF POST-CRISIS GROWTH IN EMERGING MARKET CORPORATE DEBT

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Abstract

In this paper, we investigate how increased corporate leverage among emerging market firms in the post-crisis period (2010-2015) had an impact on underlying credit risk. Using firm-level credit risk, financial, and balance sheet data from 350 firms in 23 emerging markets over an extended period (2002-2015), we show that (a) an increase in post-crisis period leverage significantly increases corporate credit default swap (CDS) spreads, and (b) the incremental effect of leverage growth on CDS spreads is not significantly different between the crisis (2007-09) and post-crisis periods. Both findings are robust to a battery of tests and imply potential firm-level corporate vulnerability due to increased corporate debt in emerging markets. There is considerable heterogeneity in the impact on CDS spreads at regional, industry, and firm levels. The effect of post-crisis leverage growth on credit risk is significantly lower for high growth prospect firms, and for those domiciled in countries with high net capital inflows and superior governance. Finally, while the increase in post-crisis corporate leverage is found to impact aggregate corporate vulnerability, there is no evidence that it increases sovereign credit risk in the emerging markets.

Keywords: emerging markets, corporate debt, credit risk, post-financial crisis

JEL Classification: G10, G14 G15, G30.

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The Economist

The world economy

The never-ending story

First America, then Europe. Now the debt crisis has reached emerging markets

The Economist, Nov 14th, 2015

1. Introduction

Emerging market economies accounted for less than a third of the global economy in 1990, but by 2013 these economies grew to roughly half of the world's GDP, or almost 60% in terms of purchasing-power parity. This has been described as possibly "the biggest economic transformation in modern history" (Economist, July 27, 2013). The 1999-2007 period was marked by strengthening balance sheets of emerging economies due to a combination of current account surpluses, a shift from debt funding to equity funding, and the stockpiling of liquid foreign reserves. Beginning in 2007, however, significant reversals occurred as emerging economies accumulated extensive external debt, while non-financial corporations from emerging markets greatly increased their external borrowing through the offshore issuance of debt securities (see for example, Shin, 2013; Avdjiev et al., 2014; Acharya et al., 2015). Since 2007, emerging market firms have been able to issue bonds at better terms (i.e., lower yields and longer maturities), with many issuers taking advantage of favorable financial conditions to refinance their debt (IMF Global Financial Stability report, 2015), despite weaker balance sheets.[1,2] In this paper, we investigate how increased corporate leverage of emerging market firms in the post-crisis period

[1] For example, emerging market corporate loans and debt rose from 73% of GDP at the end of 2007 to 107% of GDP by the end of 2014. Including the credit extended by non-bank financial institutions, or "shadow banks", there was an even steeper rise and a higher total burden amounting to 127% of GDP (source: Economist, Nov 14, 2015). Overall, the corporate debt of nonfinancial firms across major emerging market economies quadrupled between 2004 and 2014 (IMF Global Financial Stability Report, 2015).

[2] In addition, there has been growing currency mismatch. For example, China has almost 25% of its corporate debt that is dollar denominated, but only 8.5% of its corporate earnings are generated in dollar terms. Furthermore, according to Morgan Stanley, this debt is highly concentrated, with 5% of firms holding 50% of debt (Source: "The mighty dollar feeling green" Economist, March 3, 2015).

affected underlying credit risk.[3] If leverage substantially went up during the post-financial crisis period (2010-2015), we ask whether such leverage growth incrementally contributed to corporate credit risk compared to the impact of leverage growth during the crisis (2007-2009) and pre-crisis (2002-2006) periods. Further, we examine the specific channels through which leverage growth during the post-crisis period has affected the underlying credit risk.

The effect of growing leverage on credit risk is determined by two offsetting effects. On one hand, higher growth opportunities among firms drive higher corporate investment, growth in credit, and hence increased borrowing. In this case, higher leverage propels growth and firm value, and thus lowers risk. On the other hand, higher leverage can lead to currency risk (if funded through foreign debt), interest rate, rollover, and currency risks, and as such exacerbate the borrowing firms' default risks (Shin, 2013; Chui et al., 2014). Therefore, excessive borrowing may translate into onerous debt servicing costs, amplifying the adverse effects of negative firm-specific news events, and thereby increasing a firm's credit risk.

Herein, we investigate the potential fallout from this increased corporate leverage in emerging market firms. We assess whether the increased corporate leverage during the post-financial crisis period had an *incremental effect* on firm-level credit risk in emerging markets. We also explore possible *heterogeneity* in such incremental effects by ascertaining specific firm-, industry-, and market-wide channels through which corporate leverage might have affected credit risk. Our work contributes to the literature on emerging market debt by quantifying the effects of post-crisis leverage on firm-level credit risk and the underlying transmission channels.

Previous studies have examined the choice between onshore versus offshore corporate bond issuance for emerging market firms (Avdjiev et al., 2014; Chui et al., 2016). These firms tend to borrow more in the US when the US dollar carry-trade is more favorable in terms of three criteria: appreciating local currency; high interest differential; and low exchange rate volatility (Bruno and Shin, 2017). Accompanying the offshore issuance has been a growth in corporate deposits in the domestic banking system, which are vulnerable to withdrawal in the event of corporate distress (Shin, 2013;Turner, 2014; Avdjiev et al. 2014;). Our paper focusses on the

[3] Corporate defaults in China have been rising in the face of increased leverage of Chinese firms; see "China's corporate bonds so murky for many investors" Wall Street Journal (June 6, 2016).

effects of burgeoning corporate leverage on credit risk of firms in emerging markets during the post-crisis period (2010-2015).

We employ a large monthly panel series data of 350 firms from 23 emerging countries that have traded Credit Default Swap (CDS) contracts over the 2002-2015 period. We use several measures of leverage such as company's net debt/total assets, net debt/market value, net debt/equity, and net debt/EBIT. Credit risk is measured using 5-year maturity CDS spreads, sourced from Markit. We also report 12-month-ahead probability of default (PD) and distance to default (DTD) measures sourced from Credit Risk Initiative for robustness.

First, we conduct a univariate analysis, which reveals a secular trending up of corporate leverage in the post-crisis period. At the same time, we witness a drop in several key financial performance variables of the firms, including return on sales, return on assets, Q ratio, price-to-book, and interest coverage ratios. Both CDS spreads and DTD measures show that emerging market credit risks soared significantly during the crisis and spiked thereafter in years 2012 and 2015. The PD measure for the corresponding firms, however, registered a secular increase in the post-crisis period with only a minor drop in 2014.

Further analysis provides evidence of cross-sectional heterogeneity in leverage and credit risk. Growth in post-crisis leverage is mainly evident among Asian and Latin American firms, while EMEA (consisting of Eastern Europe, Middle East, and Africa) firms experience a gradual decline in leverage. CDS spreads registered a steep increase in all the regional markets during the financial crisis. For Asian and EMEA firms, CDS spreads also spike during 2011-2012 (European debt crisis), and for EMEA firms, CDS spreads are affected by the 2014 US taper tantrum episode[4]. For Latin American firms, CDS trend up gradually during post-crisis years 2011-2015.

Second, bivariate sorts based on leverage and idiosyncratic volatility show that both the crisis and post-crisis periods are characterized by higher CDS spreads compared to the pre-crisis period across different portfolios. ANOVA tests further reveal that the post crisis period has similar or significantly higher CDS spreads compared to the crisis period for three of the volatility quartiles. Our univariate results together indicate possible corporate vulnerability from increased

[4] Taper tantrum refers to a bout of panic selling in global financial markets after US Federal Reserve Chairman Ben Bernanke hinted at a reversal of Quantitative Easing (QE) led stimulus package in June, 2013.

corporate debt in the post-crisis period.

Third, robust panel data regression analysis shows that the post-crisis increase in leverage has a significant impact on CDS changes. Such an incremental effect is not different between post-crisis and crisis periods, implying potential corporate vulnerability from increased corporate debt in emerging markets. Our results remain robust to endogeneity correction, alternate credit risk proxies, quarterly data, alternate CDS restructuring clauses, and alternate regression methodology.

Fourth, we observe significant heterogeneity at region-, industry-, and firm-levels. Broadly, the incremental effect of post-crisis leverage in Asia are driven by "Telecom and Utilities" firms; in EMEA by "Financial" firms; and in Latin America by "Basic Materials, Industrials, Oil & Gas" firms. Moreover, higher growth opportunities (measured as Q ratios) help offset the increase in credit risk for firms with high leverage. For high growth firms, leverage seems to have significantly less impact on credit risk in the post-crisis period. In addition, firms from countries with high net capital inflows or better governance experience significantly less effects of post-crisis leverage on credit risk.

Finally, we test if corporate leverage growth in the post-crisis period also leads to an incremental increase in credit risk at the aggregate level. We measure country level credit risk in two ways: aggregate corporate credit risk and sovereign credit risk. Aggregate corporate credit risk captures the credit risk of all the firms, while sovereign credit risk measures the credit of the government. We find that while increases in post-crisis corporate leverage significantly influence aggregate corporate credit risk, there is no evidence that it has any significant impact on the financial vulnerability of the economy or subsequent effects on the sovereign credit risk in the emerging markets.

Our paper contributes to multiple strands of literature. Firstly, previous literature has examined the risks to emerging market firms from increased leverage. While emerging market non-financial corporations increase leverage and overseas borrowing in response to low interest rates, this inevitably increases the borrower's interest rate, rollover and currency risks, and vulnerabilities from earnings' shocks, thereby leading to financial crises (Gourinchas and Obstfeld, 2012; Chui et al., 2014; Beltran et al., 2017; Beltran and Collins, 2018). Emerging market corporations often face a currency mismatch between their revenues and liability payments which affects their default risks (Delikouras et al., 2015). High exposure to global factors poses external

and domestic challenges for policy makers, particularly when global cycles reverse. Across the board decline in emerging market companies' profitability can trigger significant shocks that may aggravate local market volatility (Turner, 2014; Acharya et al., 2015; Chui et al., 2016). Gourio et al. (2015) shows that when a country's stock market volatility increases, political risk also goes up, and that political risk significantly affects capital flows due to possible expropriation risk. Further, US term structure and credit risk factors contribute more predictive power for corporate default risk in emerging markets than domestic macroeconomic variables (Asis and Chari, 2018).[5]

Secondly, extant work has examined the growth of corporate leverage in the emerging markets post–financial crisis. During the post-financial crisis period, global cyclical factors and search for yield accounted for the growth in the corporate leverage of emerging markets. Quantitative easing (QE) in the US had significant spillover effects on emerging market financial conditions and played a sizable role in explaining enhanced capital inflows, equity prices, and exchange rates (Tillmann, 2016). Moreover, post-financial crisis growth in leverage, issuance, and spreads in emerging markets seems to be mainly driven by global drivers, while the role of firm- and country-specific factors has diminished (IMF Global Financial Stability report, 2015). Following the Lehman crisis, emerging market corporate bond spreads widened in response to higher US corporate default risk, while the sovereign spreads decoupled from the US corporate market (Zinna, 2014). During the US taper tantrum episode, equity prices, exchange rates, and foreign reserves tended to co-move across countries (Eichengreen and Gupta, 2014). Average leverage for the emerging market sample is found to be higher in the post-Global Financial Crisis period than during the Asian Financial Crisis; however, in the post-financial crisis period, emerging market corporate balance sheet indicators have not deteriorated to Asian Financial crisis levels (Alfaro et al., 2017).[6]

In this paper, we contribute to the emerging market literature by undertaking a large-scale,

[5] Previous work in emerging market credit risks includes the impact of index tracking (Miyajima and Shim, 2014); relevance of text mining in credit risk evaluation (Lu et al., 2013; Tsai et al., 2016;) earnings news impact on CDS and bond markets (Baik et al., 2015); and determinants of financial stress indices of emerging markets (Park and Mercado, 2014).

[6] Other studies examine emerging market capital flows (Dornbusch, 2001; Kumar et al., 2003; Cohen and Remolona, 2008; and Chari et al., 2017), emerging market bond spreads (Min et al., 2003; Park et al., 2013; Shin and Kim, 2015; and Timmer, 2018), and emerging market sovereign credit risks (Ismailescu and Kazemi, 2010; Kennedy and Palerm, 2014; and Amstad et al., 2016).

multi-country, firm-level study to quantify (a) the incremental effect of accumulating emerging market corporate leverage on the underlying credit risk; (b) heterogeneity of the impacts of such leverage on credit risk; and (c) the channels through which leverage affects credit risk.

Our findings have bearing on systemic risk evolution in emerging markets because systemic risks are a function of both default and network risks. If the markets were to experience exogenous exchange rate and/or interest rate shocks, stress on corporate balance sheets can lead to spikes in default risk. This in turn could rapidly spill over into balance sheet distress of financial sector firms, engendering systemic risks, and inflicting losses on the corporate debt holdings of global asset managers, banks, and other financial institutions (Das, Kalimipalli and Nayak, 2018).

Our analysis and discussion proceed as follows. Section 2 describes the data and results of univariate analysis, Section 3 presents the baseline panel data model and results, and Section 4 presents the robustness tests. Section 5 explores the region-, industry-, firm-, and aggregate-level channels through which higher leverage in the post-crisis period can affect credit risk in emerging markets. Section 6 studies the effect of leverage on aggregate risk and Section 7 concludes our analysis.

2. Data and Summary Statistics

Our sample of emerging countries was obtained by combining the IMF's & MSCI's lists of emerging countries with firm-level credit risk data based on the CDS market. We extract corporate CDS data from Markit. As a robustness test, we use other credit risk proxies (DTD, PD, and PD slope, defined in Appendix A) sourced from the Credit Risk Initiative (CRI), National University of Singapore (NUS). The stock return, financial, and balance sheet data are obtained from Datastream. Appendix B presents details on sample construction and specifics of country-wide distribution. Our final monthly data sample consists of 350 firms from 23 emerging market countries for the 2002-2015 period. We note that Indian and Taiwanese firms together account for 33% of the sample.

Figure I presents the average net debt and leverage variables for all emerging market firms in the sample for the 2002-2015 period. It shows the secular trending up of the monthly net corporate debt and leverage in the post-crisis period (2010-2015). The net debt grew by over 30% from $1.3 billion in 2010 to over $1.7 billion by the end of 2015. Leverage, defined as the net debt

as a proportion of market value of total assets, spiked significantly from 18 to 22% during that period.

[Insert Figure I here]

Table I reports that, on average, annual net debt (leverage) is 87% (8%) higher during post-crisis compared to the crisis period. The mean leverage trends up from 14% pre-crisis to 17% during crisis and 18% post-crisis. Latin America and EMEA region firms have higher mean leverage ratios close to 20% compared to 16% for Asian firms. There is wide heterogeneity in leverage by industry with Telecom, Utility, and Health care firms having significantly higher average leverage of over 20%, while technology firms have the lowest leverage (6%).

[Insert Table I here]

Table I further reveals that, at the same time, from crisis to post-crisis periods, there is a drop in several key financial variables measuring the financial performance of the firms including price-to-book (PTBV), interest coverage (INTCOV), sales to assets (STA), return on sales (ROS), return on assets (ROA), and Q ratios. For example, annual PTBV, ROA, and Q ratio decline on average by 22%, 29%, and 16%, respectively, between crisis and post-crisis periods. We see a wide heterogeneity among variables across regions and industries.

Figure II and Table II present credit risk measures benchmarked to the underlying leverage of the emerging market firms. We report end-of-the-month 5-year maturity CDS spreads. While the CDS spreads dropped significantly post-crisis, they went up again in 2012, fell thereafter for the next two years until going up slightly in 2015.[7] DTD follows an analogous trend, as expected, in the opposite direction, i.e., the DTD went up post-crisis, dropped in 2012, and again in 2015, where a drop in DTD indicates heightened distress risk. On the other hand, the 12-month PD measure registered a secular increase in the post-crisis period with a minor drop in 2014.

[Insert Figure II and Table II here]

[7] Our results are qualitatively similar using monthly mean or median CDS values obtained using daily data.

Table II also shows wide heterogeneity in credit risk measures across regions and industries. For example, EMEA firms have the highest credit risk based on CDS (mean CDS spread of 3.1% and CDS range of 0.006) and DTD level of 3.121, and the lowest liquidity in credit risk market based on CDS liquidity of 2.841. Asian firms have the highest PD (both level of 0.003 and slope of 0.039) and equity market risk of 7.8%. At the industry level, healthcare firms seem to have the highest CDS market risk (based on spreads of 5.3% and volatility of 0.009) and equity market risk (based on firm-level Ivol of 10.1% and negative skewness (Iske) of –13.2%, the latter not tabulated for brevity), while financial and industrial sector firms seem to have highest distress risk based on PD and DTD measures.

Table III presents correlations for variables of the underlying firms. The variables include financial variables in Panel A and credit risk proxies in Panel B. From Panel A, we find significantly positive correlations among different leverage proxies. High leverage firms have lower interest coverage, profitability (ROE and ROA), and growth (or Q) ratios. Moreover, profitable firms based on high ROA have lower leverage, higher interest coverage and price-to-book valuations. We find firms with a high Q ratio have higher price-to-book and ROA. From Panel B, in general we find that high leverage firms have credit risk proxies, i.e., CDS, PD, DTD, and equity market risk (stock return volatility). High leverage firms also have high PD slope, reflecting higher expected default risk, and low CDS liquidity measures.[8] Among credit risk proxies, we observe strong correlations among: (a) CDS spreads and CDS liquidity; (b) CDS spreads and CDS volatility; (c) various PD measures; and (d) PD and DTD measures. Based on the above findings, we focus on the incremental impact of leverage on CDS spreads.

[Insert Table III here]

3. Empirical Tests

3.1 Bivariate sorts

Our initial objective is to describe credit risk variation along two primary dimensions: underlying

[8] Furthermore, in unrtabulated results, we observe that high idiosyncratic volatility firms have idiosyncratic negative skewness (Iske) and kurtosis (Ikur).

leverage and idiosyncratic volatility (Ericsson et al., 2009)[9]. This is to understand how the CDS spreads conditioned by their two principal dimensions (i.e., leverage and volatility) compare across different sub-sample periods. Therefore, we conduct a bivariate sorting, where we first sort the firm leverage into quartiles each month, and then further sort each leverage quartile into four sub-quartiles based on the idiosyncratic volatility of the underlying firms. Table IV reports the results. We show the average value of CDS spreads for each of the 4 X 4 bins for the full sample period from 2002-2015, and separately for each of pre-, crisis, and post-crisis sub-periods. From Table IV, we observe that CDS spreads increase for firms with higher quartiles of idiosyncratic volatility or leverage. The intersection of 4th quartiles of both leverage and idiosyncratic volatility yields firms that have the highest CDS spreads, more so in the crisis and post-crisis periods. The average CDS spread for the riskiest quartile is 6.4 bps for the full sample period, and 7.4 (6.0) bps in the crisis (post-crisis) period.

We next conduct an ANOVA test for equality of CDS spreads across leverage quartiles between crisis and post-crisis periods for each volatility group. The last row in Table IV reports the corresponding F test and significance values. F test values imply that CDS spreads are significantly higher in the post crisis period for the first two volatility quartiles. We also find that CDS spreads are not significantly different between the two periods for the fourth volatility quartile. Together our univariate results indicate possible corporate vulnerability due to higher or similar CDS spreads in the post-crisis versus crisis period.

We also report the differences of CDS spreads between the 4th and 1st quartile (or high minus low) portfolios, across both rows and columns.[10] In general, the high minus low CDS spreads tend to rise for higher quartiles, and more so during the crisis period. For the 2002-2015 period, the CDS spread differences rise from 1.3 bps to 3.1 bps from lowest to highest volatility quartiles; and from 2 to 3.8 bps for lowest to highest leverage quartiles.

[Insert Table IV here]

[9] Ericsson et al. (2009) show that volatility and leverage have substantial explanatory power in univariate and multivariate CDS changes regressions.

[10] All the differences, reported in italics, are found to be significant at 1% and are not reported for brevity.

3.2 Baseline panel data regression models

We next implement panel regression models with a two-fold objective. To examine (a) if the post-crisis growth in leverage had an incremental impact on credit risk, and if so (b) how the leverage effect is different between post-crisis and other periods. We hence conduct monthly panel regressions of credit risk changes for all emerging markets using the data for the 2002-2015 period. To examine the first issue, we consider the following panel regression model in changes:

$$(\Delta credit\ risk\ measure)_{i,j,t} = \alpha + \beta_0\ (interaction\_variables)_{i,j,t} + \beta_1\ (\Delta firm\text{-}characteristics)_{i,j,t} + \beta_2 (\Delta aggregate\_variables)_{i,j,t} + error_{i,j,t} \quad (1)$$

for a given firm *i* from country *j* at time *t*, where the dependent variable is our main firm-specific credit risk measure (CDS spread). Interaction variables are comprised of leverage and firm-level idiosyncratic volatility variable changes, each with dummy interactions for crisis (2007-2009) and post-crisis (2010-2015) periods. We focus on leverage and volatility as the corporate CDS spread evolution is shown to be mainly dependent on them (Ericsson et al., 2009). The key variable of interest is Δ*Leverage x postcrisis*, which measures the incremental effect of post-crisis growth in corporate leverage on the CDS spreads.

We condition for several firm-level and market risk factors. Regression covariates consist of key firm-specific characteristics such as leverage (*leverage*), idiosyncratic volatility (*Ivol*), interest coverage (*INTCOV*), sales to assets (*STA*), return on sales (*ROS*), and price-to-book value (*PTBV*).[11] We also consider aggregate market credit and liquidity risk factors, i.e., local emerging market returns (*market_returns*), S&P 500 index returns (*sp500*), VIX (*vix*), default factor (*default_factor*), term-structure level (*level_rates*) and slope (*slope_rates*), and funding liquidity or TED (*TED*) spread. Appendix A defines all variables. These US market factors proxy for global risks and are chosen based on extant literature (Huang et al., 2019). Our baseline regression is estimated in changes, where all variables are first-differenced to adjust for possible non-stationarity. Finally, the panel regression includes controls for firm- and month-specific fixed effects, and t-statistic adjustments for heteroscedasticity, autocorrelation, and cross-correlations.

[11] Similar financial variables have been used in the extant literature (Campbell and Taksler, 2003; Chen et al., 2007; and Das et al., 2009). We re-estimate the regressions by dropping some of the firm-specific financial variables to control for possible multicollinearity and the results are still robust.

Results are presented in Table V. Regression (1) presents results for leverage and aggregate risk variables. It shows that post-crisis leverage interaction (*ΔLeverage x post-crisis*) is positive 0.011 and significant at 5% implying that post-crisis leverage growth significantly increases CDS spreads. Next, we examine the economic significance as a sigma shock of the impact of leverage growth, calculated as the product of post-crisis standard deviation of the leverage variable (1.65%) and its coefficient estimate (0.011). This yields 1.81%, or for one standard deviation change in post-crisis leverage this implies CDS spread variation between 1.1% and 4.8% centred around the mean CDS spread of 2.94%. This implies a variation of CDS cost between $112,415 and $475,107 based on a notional value of $10 million CDS contract. Up to this point, our findings suggest that leverage growth had a non-trivial impact on post-crisis credit risk.

We also observe a significant role for several market risk factors. There is a significant negative impact (-0.007) of local market returns on credit risk. Higher VIX factor, reflecting elevated levels of aggregate risk aversion, has a positive and significant effect on credit risk change. Elevated levels of credit proxied by the default spreads significantly increase credit risks. Higher short-term yields imply significantly lower credit risks. Higher funding risk, proxied by the TED spreads, significantly increases CDS spreads (with a coefficient of 0.002) of emerging market borrowers.

Regression (2) includes additional idiosyncratic volatility variables and the post-crisis leverage effect remains robust. Regression (3) presents the base-line regression, where explanatory variables include leverage, volatility, other firm-specific characteristics, and aggregate market variables. Once again, we observe that an increase in post-crisis leverage has a significant impact on CDS spread changes. Using the coefficient of 0.010, the economic significance in terms one-sigma shock now amounts to 1.65%, or a CDS cost variation between $128,901 and $458,621 based on a notional value of $10 million CDS contract in the post-crisis period. Regarding firm-specific variables, the price-to-book variable, which represents relative market-to-book valuation, has a significantly negative effect on credit risk.

[Insert Table V here]

Our primary objective is to examine how the leverage effect is different between post-crisis

and other periods. Our null hypotheses are that the incremental contribution of leverage growth on the credit risk (i.e., *Δleverage x post-crisis interaction effect*) during the post-crisis period is not significantly different from leverage growth effect in the pre-crisis-period (i.e., *Δleverage x pre-crisis interaction effect*), or crisis period (i.e., *Δleverage x crisis interaction effect*). Since leverage went up substantially during the post-crisis period (2010-2015), testing our null hypotheses will help us test if the incremental contribution of such leverage growth on credit risk is significantly different compared to leverage growth during the pre-crisis (2002-2006) and crisis periods (2007-2009).

Accordingly, we present F-tests for two null hypotheses: (a) H1: post-crisis leverage effect = pre-crisis leverage effect, here we test if the coefficient of *Δleverage x post-crisis* equals the coefficient of *Δleverage x pre-crisis;* and (b) H2: post-crisis leverage effect = crisis leverage effect, here we test if the coefficient of *Δleverage x post-crisis* equals the coefficient of *Δleverage x crisis.*

The results are reported in the last two rows of Table V. We observe that for regressions (1) to (3) the H1 null hypothesis is rejected, implying that the post-crisis effect is significantly different from pre-crisis effect. Post-crisis increase in leverage has a significantly greater impact on CDS spreads compared to the pre-crisis period. Further, evidence from the H2 hypothesis shows that post-crisis and crisis leverage effects are not significantly different. Evidence from both hypotheses, along with regression evidence from Table V, suggests that the increase in post-crisis leverage has a significant incremental impact on CDS spread changes. Moreover, the incremental effect of post-crisis leverage growth on credit risk is not significantly different from that during the crisis period, suggesting potential vulnerability due to increased corporate debt in emerging markets.

3.3 Endogeneity correction

We also address possible endogeneity in our estimation. In the context of this study, there are two potential sources for endogeneity: (a) omitted variables; and (b) reverse causality arising from self-selection. We already consider a comprehensive set of firm-level financial variables. The omitted or unobservable variables problem is additionally addressed by including firm- and month-fixed effects. Endogeneity can, however, arise from self-selection as risky firms may be characterized

by higher leverage levels. Managers of such risky firms may issue debt to fund their operating or capital expenditures. Therefore, we consider the possibility that firm leverage may be endogenously determined by the underlying firm based on credit risk, financial, and balance sheet variables.

To address this concern, we conduct a Heckman correction applied to the baseline regression (model (3) in Table V). We run the first stage probit regressions of leverage level (high=1; low=0) on several instrumental variables, such as sales to assets, return on assets, Q ratios, industry dummies, and lagged CDS spreads. The high (or low) leverage is based on a firm's debt being above (or below) the firm's average leverage ratio over the sample period. We then use inverse Mills ratio (IMR) from the probit model as an additional independent variable in the second stage regression. Only the second stage regression results are reported in column (4), Table V. We observe that the effects of leverage in the post-crisis period remain significant after adjusting for endogeneity. The economic significance and F test results from regression (4) are still robust. Subsequently, we conduct a battery of robustness tests to validate our findings.

4. Robustness Tests

4.1 Alternative credit risk proxies

We examine effects of leverage growth using alternative credit risk measures. We consider three proxies: DTD, PD, and PD slope. Regressions (1), (2), and (3) in Table VI report the results. They are estimated using the covariates based on the baseline model (3) in Table V. We observe that the increase in post-crisis leverage has a significant impact on changes in all credit risk measures, i.e., DTD (-1.513), PD (0.013), and PD slope (0.009), where numbers in parentheses reflect the corresponding coefficients, and all variables are significant at 5% or lower. This implies that greater post-crisis leverage significantly lowers DTD, while significantly increasing PD and PD slope (or expected future rise in PD), thereby increasing credit risk.

To understand how the leverage effect compares across time periods, we report F tests of hypotheses H1 and H2, as in section 3.2. The H1 hypothesis is rejected for all regressions implying that post-crisis effect is significantly different from pre-crisis effect for all three credit risk proxies. For DTD and PD slope variables, post-crisis leverage effect is also significantly higher compared

to the pre-crisis period. The H2 hypothesis is not rejected (rejected) for PD and PD slope (DTD) variables. This implies that the incremental effect of leverage growth on credit risk measures during the post-crisis is similar (for PD and PD slope) or greater (for DTD) than the effect in the crisis period. Overall, our findings indicate that the increase in post-crisis leverage has a significant incremental impact on all three credit risk measures and there is evidence of continuing vulnerability from leverage growth during the crisis period. Our findings in Table V remain robust.

[Insert Table VI here]

4.2 Quarterly data

While credit risk and market risk variable data are updated monthly, balance sheet and financial variables are updated quarterly, or less frequently when additional financial reporting information becomes available. For example, our net debt, total assets, book value of equity, and other performance variables, sourced from Worldscope (Datastream), are based on 12-month trailing values, and the items are populated based on the availability of the underlying data. Therefore, to better control for the asynchronous data, we re-estimate our baseline regressions using quarterly data. Results for credit risk changes are reported for CDS and DTD respectively in columns (4) and (5) of Table VI.[12] The results validate our earlier findings in Table V.

4.3 Restructuring clause

The Restructuring Clause of a CDS contract defines the credit events that trigger settlement and implies that CDS spreads are higher for contracts with fewer restrictions on the protection buyer's settlement obligations, i.e., the more flexibility a protection buyer has to deliver a bond, the more valuable the CDS contract (see Packer and Zhu, 2005; Markit Credit Indices Primer, 2008). The Complete Restructuring (CR) clause is the most common for emerging markets and under the CR or full-restructuring clause, any restructuring event qualifies as a credit event (and any bond of maturity up to 30 years is deliverable). The regressions reported in Table V employ CDS data screened for the CR clause. However, we want to evaluate if the leverage impact on credit risk is likely to be different for other restructuring clauses. We consider the 5-year maturity CDS

[12] Results for PD are consistent but not tabulated for brevity.

contracts based on the Modified Restructuring (MR) clause. Introduced in 2001, MR limits the deliverable obligations to those with a maturity of 30 months or less after the termination date of the CDS contract. The MR clause was intended to limit opportunistic behaviour by sellers in the event of restructuring agreements that did not cause loss. Column (6) in Table VI present baseline regression results for firms with traded 5-year CDS contracts with only a MR clause. We once again find that the post-crisis increase in leverage has a significant and incremental effect on credit risk, validating the results in Table V.

4.4 Alternate estimation method

As a robust check to our panel data estimates, we consider an alternate estimation method. Given that our sample may be dominated by some countries (e.g., India, Taiwan, and Korea) and hence may potentially bias the standard errors, we consider weighted least squares (WLS) estimation that will weigh each country equally in the panel regressions. Regression (7) in Table VI presents the baseline model results for CDS changes. Once again, our earlier results hold.

Collectively, our findings imply that post-crisis growth in leverage has a significant impact on credit risk; such an incremental effect is not dissimilar to that in the crisis period, indicating potential vulnerability in emerging markets due to increased corporate debt.

5. Evaluating Alternative Credit Risk Channels

Next, we examine possible heterogeneity in how leverage affected credit risk. The objective is to map out possible channels through which growth in post-crisis leverage may have affected CDS spreads. We evaluate alternative regional- and industry-, and country- and firm- specific channels that may have played a role.

We first plot monthly leverage and CDS spreads separately for three geographic regions (i.e., Asia, EMEA, and Latin America). Figure III shows wide heterogeneity in leverage and CDS spread evolution across the regions. In the post-crisis period, leverage growth is mainly evident for Asian and Latin American firms. On the contrary, EMEA firms experience a gradual decline in leverage. Turning to credit risk, we observe that CDS spreads registered a steep increase in all three markets during the financial crisis. For Asian firms, CDS spreads remain stable in the post

crisis period; however, for EMEA firms, CDS spreads experienced periodic spikes in credit risk as CDS spreads went up during 2011-2012 corresponding to the European debt crisis, and subsequently in the latter half of years 2013 (US taper tantrum) and 2015. Latin American firms are characterized by a gradual trending up of CDS spreads during the post-crisis years of 2011-2015.

[Insert Figures III]

To better understand cross-sectional heterogeneity, we consider the three geographic regions (i.e., Asia, EMEA, and Latin America) and then group firms in each region into five industry groups: (1) Basic Materials, Industrials, and Oil & Gas; (2) Financials; (3) Technology; (4) Consumer Goods and Services, and Health Care; and (5) Telecommunications and Utilities. Overall, we consider 3 regions X 5 industries or 15 buckets and estimate baseline panel regression (3) from Table V for CDS changes for each bucket. Table VII presents the results. We only report the post-crisis leverage interaction variable *(Δleverage x postcrisis)* for brevity. We observe significant heterogeneity across region/ industry groups. Broadly, incremental leverage effects in Asia are driven by "Telecom and Utilities" firms, in EMEA by "Financial" firms, and in Latin America by "Basic Materials, Industrials, Oil & Gas". Interestingly, we observe that CDS spreads decrease in the EMEA region for "Telecom and Utilities" firms and in Latin America for "Consumer Goods and Services" firms. Collectively, our results show that leverage expansion can have varying effects across industries and regions, possibly driven by firm- and country-level risks.

[Insert Table VIII here]

Subsequently, we evaluate the role of firm-level risk variables. In particular, we study the impact of post-crisis leverage on CDS spreads conditional on firm-specific growth opportunities (Q ratio). Previous work shows that leverage is positively (negatively) related to subsequent investment for firms with strong (weak) growth opportunities (Lang et al.,1996; Aivazian et al., 2005). Moreover, higher leverage in the presence of improved prospects of company growth and firm profitability will decrease the likelihood that the company's value will reach the default threshold and hence lower the implicit default and firm level risks (Shin and Stulz, 2000; Avramov

et al., 2007). If an increase in emerging market firm borrowing is, therefore, driven by greater growth opportunities, higher leverage should be associated with an increase in firm investment and value, and a decrease in default risk. However, if higher growth leads to higher firm value uncertainty it can leads to increased default risk. We test the firm-level growth effect on leverage for emerging markets. We employ a triple interaction *Δleverage x post-crisis x high (low) Q*, where *high (low) Q* is a dummy set to 1 (0) for the highest (lowest) quartiles of Q ratio. We examine the differential impact of higher leverage on credit risk between high and low Q ratio firms. Regressions (1) and (2) in Table VIII report the results. Regression (1) measures the incremental effects of top and bottom quartiles versus the two middle quartiles; regression (2) measures the incremental effects of the top quartile versus the remaining quartiles. We find that the post-crisis leverage effect is positive and significant while the effect of leverage on credit risk in the post-crisis period is significantly negative for greater growth prospect firms. The differential impact captured using the triple interaction *Δleverage x post-crisis x highQ* is significantly negative, with coefficients of -0.029 and -0.030 for Regressions (4) and (5), respectively. This implies that for high growth prospect firms, higher post-crisis leverage significantly lowers the incremental leverage effect on credit risk.

In addition, we examine the effect of Q ratio at the industry level. We study the incremental effect of leverage on credit risk for Financial, Tradable, and Telecom and Utilities sector firms that have a high growth potential. Financial firms were affected during the financial crisis as the hidden dangers of the shadow banking system came to light (e.g., Coval, Jurek, and Stafford 2009; Adrian and Shin 2010; Greenwood and Scharfstein 2012). Tradable industry firms have significant foreign exposure as they can export their goods and services internationally, and hence are exposed to increased global trade competition (Booms and Are, 2004). Higher levels of industry competition and global product market shocks can, in turn, lead to their increased credit and default risks (Agoraki, et al., 2011). Telecom and Utilities sector firms in emerging markets have borrowed extensively to finance their expansion. For example, Table 1 shows that Telecom and Utilities firms in our sample have the highest leverage ratios (22% and 24%, respectively) and together account for 35% of the total emerging market corporate debt.

We use a four-way interaction *Δleverage x post-crisis x industrial x highQ* to capture the

industry effect. Industry type is captured using three dummies: (a) Financial dummy, which refers to all banking and financial services firms; (b) Tradable sector dummy, which refers to "Basic Materials, Industrials, Oil & Gas, and Technology" sector firms; and (c) Telecom and Utilities dummy (tel_uti) that refers to all "Telecom and Utilities" firms. Regressions (3), (4), and (5) in Table VIII present the results. We find that for tradable and telecom/utility firms, the effect of leverage growth on credit risk post-crisis is significantly negative (-0.055) for high growth firms. Overall, our findings validate the firm-level growth effect and suggest that higher growth opportunities help to offset the increase in credit risk for firms with high leverage. In this case, higher leverage propels growth and firm value, and thus lowers risk.

Finally, we evaluate the effect of country-level risk variables on leverage credit risk relationship. We examine two hypotheses concerning aggregate capital inflows and governance. Accordingly, we examine the effects of two key variables i.e. net capital flows and country-level governance on corporate credit risk.

Previous work examines the impact of high capital flows on financial stability (Mishkin, 1999; Avdjiev et al., 2014; Eichengreen and Gupta, 2014). Blanchard et al. (2015) present a model showing that high capital inflows can have two counteracting effects: (a) on one hand, capital inflows may decrease the rate on equities and bank liabilities, and hence reduce the cost of financial intermediation; and (b) on the other, capital inflows can lead to currency appreciation. In emerging markets with a relatively underdeveloped financial system, following the model set up by Blanchard et al., the effect of a reduction in the cost of financial intermediation may dominate the latter effect in (b), leading to a credit boom and an output increase despite the currency appreciation. We test the validity of the capital flow hypothesis in emerging markets. We examine how capital flows influence the effect of leverage on credit risk. We capture capital flows using non-foreign direct investment net capital flows (capflows), which measures the monetary value of capital inflows net of capital outflows other than foreign direct investment.

We employ a triple interaction Δ*leverage x post-crisis x high (low) country variable dummy* to tease out the incremental effects. For capital flows, we report the triple interaction Δ*leverage x post-crisis x high (low) capflows* where *capflows* is a dummy set to 1 (0) for the highest (lowest) quartile of net capital flows. Table IX presents the results. Regression (1) measures the incremental

effects of top and bottom quartiles 1 and 4 versus the two middle quartiles; regressions (2) and (3) measure the incremental effects of top quartile versus the remaining quartiles. We find that high (low) net capital inflows significantly decrease (increase) the impact of leverage on CDS spreads post-crisis. This is consistent with the expansionary effect on demand, where the positive effect of these lower rates on domestic demand may offset the adverse effects of currency appreciation on external demand (Blanchard et al., 2015).

[Insert Table X here]

A number of studies suggest that in international debt markets, better country governance reduces the cost of borrowing (see for example, Miller and Puthenpurackal, 2002; Ball et al., 2011; Claessens and Yurtoglu, 2013; Huang et al., 2019). Better governance helps emerging market firms through greater access to financing, lower cost of capital, better performance, and more favorable treatment of all stakeholders. We test how improved country-level governance impacts the leverage effect on underlying credit risk in emerging markets. We obtain the governance (Gov) variable as the first principal component of multiple country-specific governance variables, sourced from several databases (defined in Appendix A). As a result, superior country level governance is captured by variables reflecting a progressive legal system, better shareholder protection, strong property and creditor rights, enhanced corporate transparency, improved disclosures, and better accounting standards. To test the governance effect, we use a triple interaction with the high governance dummy set to 1 (0) for the highest (lowest) quartile of governance factor. Regression (4) measures the incremental effects of top and bottom quartiles 1 and 4 versus the two middle quartiles; regression (5) measures the incremental effects of top quartile versus the remaining quartiles. As expected, better governance significantly lowers the impact of leverage on credit risk while weaker governance leads to higher CDS spreads.[13]

Collectively, our results show that there is a considerable heterogeneity in the effects of post-crisis leverage growth on emerging market CDS spreads at regional, industry, and firm levels. The key channel seems to be the firm specific Q ratio that measures firm-level growth potential,

[13] We further test the role of several other macro-variable channels, such as commodity prices, exchange rates, terms-of-trade, and external debt and find no robust evidence of their role in incremental leverage effect.

where leverage in high growth firms seems to have significantly less impact on credit risk, particularly for firms in tradables and telecom/utility industries. In addition, two country-level variables, net capital flows and country-level governance, play a key role, where the impact of leverage on credit risk is significantly lower for firms from countries with high net capital inflows or better governance.

6. Impact of Corporate Leverage on Aggregate Credit Risk

We finally examine whether an increase in corporate leverage has any adverse impact on aggregate credit risk. If corporate leverage growth in the post-crisis period had a significant effect on firm-level credit risk, does it also lead to an incremental increase in credit risk at the aggregate level? Specifically, we consider two measures of country-level credit risk: (a) aggregate corporate credit risk; and (b) sovereign credit risk. If firm-level credit risk goes up incrementally, it could affect the aggregate credit risk of all firms in the country. Moreover, increase in aggregate corporate credit risk may in turn increase the financial vulnerability of the economy and increase the expected bailout costs for the government, affecting sovereign credit risk.

First, we consider regressions involving aggregate corporate credit risk. The aggregate-level credit risk is measured as the first principal component of CDS changes for all firms in the country. The first principal component captures the common factor that affects the corporate CDS spreads of all firms in a given country over time and hence represents the aggregate credit risk factor. Explanatory variables consist of the first principal component of firm-level variables of all firms for each country, in addition to aggregate market variables drawn from baseline regression (3) in Table V. Regression (1) in Table X reports the results. In the table we only report leverage and idiosyncratic volatility variables for brevity. All regressions include an autoregressive dependent variable, in addition to year-index and country-index fixed effects, and t-statistic adjustments for heteroscedasticity and autocorrelation.

[Insert Table X here]

The results show that higher leverage in the post-crisis period significantly increases the firms' CDS spreads, with a coefficient of 0.144 at 1% significance, indicating that the impact of leverage on credit risk also holds at the aggregate level. As in Table V, we present F-tests for two

null hypotheses: (a) H1: the post-crisis and pre-crisis aggregate leverage effects are equal; and (b) H2: the post-crisis and crisis aggregate leverage effects are equal. H1 is rejected, implying that the post-crisis effect is significantly different from the pre-crisis effect at the aggregate level, similar to the results for firm level (Table V). Based on coefficient values, we observe that a post-crisis increase in leverage has significantly greater impact compared to the pre-crisis period. Evidence for H2 shows that post-crisis and crisis leverage effects are not significantly different, implying potential exposure to credit risk at the aggregate level arising from increased leverage in the emerging markets.

We also consider an alternative aggregate credit risk regression based on cross-sectional averages of CDS changes across firms for each country. The cross-sectional average captures the average of corporate credit risk across all firms from a given country. The explanatory variables consist of cross-sectional averages of each firm-level variable, in addition to aggregate market variables drawn from baseline regression (3), Table V. Regression (2) of Table X reports the results. Once again, we find that post-crisis leverage growth has a significant impact on changes in CDS spreads at the aggregate level (with a coefficient of 0.045, significant at 1%). The evidence from F statistics still holds. In summary, our findings for aggregate corporate credit risk imply that the impact of post-crisis leverage extension on credit risk continues to hold at the aggregate level.

Next, we consider the effect of leverage on sovereign credit risk. Sovereign credit risk is measured as monthly 5-year sovereign CDS spreads sourced from Bloomberg (see Appendix A for details). Sovereign CDS spreads measure the market price of aggregate credit risk of each country over time. We present Regressions (3) and (4), Table X, using sovereign CDS spreads as the dependent variable. The explanatory variables in Regression (3) consist of principal components as defined in Regression (1); those in Regression (4) use cross-sectional averages as defined in Regression (2). Evidence from Regressions (3) and (4) show that increase in corporate-level leverage has no statistically significant effect on sovereign credit risk. While an increase in post-crisis corporate leverage may significantly influence corporate credit risk at an aggregate level of the emerging markets, there is no evidence that it increases the financial vulnerability of the economy, and hence has no effect on sovereign credit risk.

7. Summary and Conclusions

In this paper, we focus on the post-crisis period (2010-2015), a climactic phase marked by excessive debt accumulation among emerging market firms that took advantage of favorable financial conditions to refinance their debt. Given that leverage went up substantially during the post-crisis period, we examine the incremental contribution of such leverage growth on corporate credit risk. In so doing, we quantify the impact of post-crisis leverage on firm- and aggregate-level credit risk and identify the underlying channels of transmission using large-scale, firm-level emerging market data.

Our robust panel data regressions reveal that the post-crisis increase in leverage significantly increase CDS spreads. The incremental effect of post-crisis leverage growth on CDS spreads is not significantly different from that in the crisis period, implying potential continuing vulnerability from increased corporate debt in emerging markets. Our results remain robust to endogeneity correction, use of alternate credit proxies, quarterly data, CDS restructuring clauses, and alternative estimation methods.

We observe a wide heterogeneity in leverage and CDS spread evolution across the regions and industries analyzed. In the post-crisis period, leverage growth is mainly evident for Asian and Latin American firms. Incremental leverage effects on CDS spreads in Asia are driven by "Telecom and Utilities" firms, in EMEA by "Financial" firms, and in Latin America by "Basic Materials, Industrials, Oil & Gas" firms.

The effect of post-crisis leverage growth on credit risk is significantly lower for high Q ratio (or growth prospect) firms and for firms domiciled in countries with high net capital inflows, signifying an expansionary effect (Blanchard et al., 2015), and strong country level governance, calculated using metrics related to the legal system, share-holder protection, property and creditor rights, corporate transparency, disclosures, and accounting standards.

Finally, post-crisis increase in leverage is found to have a significant impact on aggregate CDS spreads. This suggests that the increase in firm-level credit risk due to higher leverage in the post-crisis period significantly affects the aggregate corporate credit risk. We also find that the incremental effect of leverage on the aggregate CDS spreads is not significantly different between crisis and post-crisis periods. While the increase in post-crisis corporate leverage may imply potential aggregate corporate vulnerability in the emerging markets, there is no evidence that it

increases the financial vulnerability of the economy, and hence has no effect on sovereign credit risk.

Our findings are relevant to a range of stakeholders, including foreign investors, borrowing firms, regulators, and sovereigns. A rise in individual credit risk of large firms can impact the aggregate market valuation of firms and, in turn, the market-wide perception of emerging market risks. Overall, this can lead to punitive capital costs for emerging market firms on account of increased solvency, and credit, liquidity, and funding risks.

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Appendix A. Variable Definitions

VARIABLE	DEFINITION
Panel A: Credit risk variables (Sources: CDS data: Markit; DTD and PD data: Risk Management Institute (RMI) at the National University of Singapore (NUS); Equity market risk data: Datastream)	
CDS spread	5-year CDS spread at the end of the month
CDS liquidity	The number of unique contributors for the 5-year CDS spreads (composite depth) at the end of the month
CDS volatility range	the range (maximum minus minimum) of 5-year CDS spreads over the month
CDS volatility std dev	standard deviation of historical daily 5-year CDS spreads over 6-month moving window.
CDS slope	The difference between 10-year and 1-year CDS spreads at the end of the month.
PD	12-month probability of default
PD slope	The difference between 60-month and 12-month probabilities of default
DTD	Monthly distance-to-default measure, which is a volatility-adjusted leverage measure based on Merton (1974).
Equity market risk	We use three idiosyncratic risk metrics (based on a moving historical window of 12-month market adjusted firm returns): idiosyncratic volatility (Ivol), skewness (Iske), and kurtosis (Ikur).
Sovereign CDS	Country level CDS data (Source: Bloomberg). Egypt, Poland, Taiwan, Thailand, Turkey and Ukraine have missing or insufficient data on Bloomberg and hence are excluded.
Panel B: Firm-level variables (Source: Datastream)	
MVE	Market value of company at the end of the month.
Netdebt	Net debt represents Total debt minus Cash & Short-term investments; 12-month trailing values are calculated by Datastream based on Worldscope data; reported in USD millions
Leverage	The ratio of Net Debt to Market value of total assets (MVA): [Net Debt / (Total Assets - Book value of equity + Market value of equity)]. The ratio is referred to as "leverage". The denominator is obtained using consolidated market value of equity (i.e. in case a firm has more than one type of shares issues it is a sum of market values of all share types). Total Assets and Book Value of Equity are 12-month trailing values that are calculated by Datastream based on Worldscope data.
Debt/EBIT	The ratio of Net debt to EBIT. EBIT 12-month trailing values are calculated by Datastream based on Worldscope data.
Debt/BVE	The ratio of Net debt to Book value of equity. Book value of equity 12-month trailing values are calculated by Datastream based on Worldscope data.
Debt/MVE	The ratio of Net debt to Market value of equity.
PTBV	Price-to-book value ratio.
INTCOV	Interest charge coverage is the ratio of EBIT to Total Interest Expense, 12-month trailing values are calculated by Datastream based on Worldscope data.
STA	The ratio of company's Net Sales to Total Assets. Net sales and Total assets 12-month trailing values are calculated by Datastream based on Worldscope data.
ROS	The ratio of company's Net Income to Net Sales. Net income and Net sales 12-month trailing values are calculated by Datastream based on Worldscope data.
PTBV	Price-to-book value ratio.
INTCOV	Interest charge coverage is the ratio of EBIT to Total Interest Expense, 12-month trailing values are calculated by Datastream based on Worldscope data.

ROA	The ratio of company's Net Income to Total Assets. Net income and Total assets 12-month trailing values are calculated by Datastream based on Worldscope data.
Q ratio	Tobin's Q ratio defined as ratio of market value of assets to book value of assets: [(Total Assets - Book value of equity + Market value of equity)/Total Assets]. Total Assets and Book Value of Equity are 12-month trailing values that are calculated by Datastream based on Worldscope data.

Panel C: Industry-level variables (Source: Datastream)

Industry	Industry under the FTSE/DJ Industry Classification Benchmark (ICB).
Financial	Financial industry firms.
Tradable	Tradable sector includes firms from Basic Materials, Industrials, Oil and Gas, and Technology; non-tradable sector includes firms from Construction, Transportation, Communications, Utilities, Wholesale/retail trade, and Services.
Tel_uti	Telecommunication and Utilitity industry firms.

Panel D: Country-level variables (Source: Datstream)

Market_returns	Country-specific monthly stock index returns
SP500	Marker returns using the S&P 500 index.
VIX	Equity market volatility factor, obtained as VIX index.
Default_factor	Default factor, sourced as Moody's BAA yield minus 10-year swap rate.
Level_rates	Term structure level factor obtained as 3-month T-Bill rate.
Slope_rates	Term structure slope factor, obtained as 10-year rate minus 2-year Treasury rates.
TED	Aggregate liquidity factor referred to as TED spread, obtained as 30-day LIBOR rate minus 3-month Treasury-Bill rate.
Capflows	Capital flows is captured using "non-foreign direct investment net capital" which measures the monetary value of capital inflow net of capital outflow other than foreign direct investment. (source: Oxford Economics, Datastream).

Panel E: Governance variables

Gov	Global governance factor obtained as the first principal component of the following static and time-series governance variables: • Legal system (overall score of legal system & property rights from the Economic Freedom Dataset by Fraser Institute) • Legal origin (from Djankov, La Porta, Lopez-de-Silanes, and Shleifer, 2008) • Anti-self-dealing index (from Djankov, La Porta, Lopez-de-Silanes, and Shleifer, 2008) • Revised Anti-director Index (from Djankov, La Porta, Lopez-de-Silanes, and Shleifer, 2008) • Creditor rights index (from La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1998) • Creditor rights index (Djankov, McLiesh, Shleifer, 2007) • Disclosure intensity (CIFAR) (created by examining and rating companies' annual reports on their inclusion or omission of 90 items. These items fall into seven categories: general information, income statements, balance sheets, funds flow statement, accounting standards, stock data, and special items. See Bushman, Piotroski, and Smith, 2004) • Financial disclosures (DISCL) (average ranking of the answers to the following questions: A6g (R&D), B3f (capital expenditure), Ca (subsidiaries),Cb (segment-product), Cc (segment-geographic), and D1 (accounting policy); see Bushman et al., 2004) • Governance disclosures (GOVERN) (average ranking of the answers to the following questions: B2a (range of shareholdings), B2b (major shareholders), Ce (management information), Cf (list of board members and their affiliations), Cg (remuneration of directors and officers), and Ch (shares owned by directors and employees); see Bushman

et al., 2004)

- Accounting principles (MEASURE) (average ranking of the answers to the following questions: A3 (consolidation) and A6p (discretionary reserves); see Bushman et al., 2004)
- Timeliness of disclosures (TIME) (average ranking of the answers to the following interim reporting questions: Ea (frequency of reports), Ed–Ef (count of disclosed items), and Eb (consolidation of interim reports); see Bushman et al., 2004)
- Accounting standards index (sum of 21 items from Bae, Tan, Welker, 2008)

Panel F: Emerging market economies

Asia	Includes China, India, Indonesia, Korea, Malaysia, Phillipines, Taiwan, Thailand, and Russian Federation.
EMEA	Refers to Eastern Europe, Middle East and Africa, and includes Bulgaria, Czech Republic, Egypt, Greece, Hungary, Turkey, Poland, South Africa, and Ukraine.
Latin America	Includes Argentina, Brazil, Chile, Colombia, and Mexico.

Appendix B. Sample Construction

We identify the list of emerging countries by combining the IMF's & MSCI's lists of emerging countries. Out of the 28 emerging countries from the IMF's and MSCI's lists, 23 emerging countries have CDS data available in Markit database. From Datastream we then extract a comprehensive list of stocks publicly listed in these markets. From this list, we exclude preference shares and other secondary types of shares issued by companies with the exception is China where we exclude A-shares and include B-shares and H-shares that are accessible to foreign investors.

From Markit database, we extract daily CDS spreads data for stocks from the 23 emerging markets for the period January 2002 to December 2015. In particular, we collect issue level data on 2-year, 5-year and 10-year CDS spreads and the number of contributors. The Complete Restructuring (CR) clause is the most common clause for emerging markets. We therefore filter out other clauses (like modified restructuring clause), and only keep the CR clause. We match the emerging market companies covered in Markit database against the list of emerging market stocks from Datastream and obtain 350 companies from 23 emerging countries. Table I provides sample distribution by country. The largest contributors to the sample are India (21.1%) and Taiwan (12.0%).

Next, we match the identified 350 stocks against the Credit Research Initiative database of the Risk Management Institute (RMI) of the National University of Singapore (NUS). From this database, we extract company-level monthly data on the probability of default (PD) and the distance to default (DTD).

Firm-level variables for the sample stocks (including industry classification, market data – i.e. market value of equity, and balance sheet items) are sourced from Datastream.

Finally, we recover country-level governance and market risk variables from multiple data sources as identified in Appendix A. The data for each variable is winsorized at 1% level to deal with any outliers. The sample is described in the table below.

Sample Distribution by Country

We report sample breakdown by each emerging market country for the period 2002-2015.

Home country	Number of companies	% of total number of companies
Argentina	7	2.0%
Brazil	29	8.3%
Bulgaria	1	0.3%
Chile	8	2.3%
China	12	3.4%
Colombia	3	0.9%
Czech Republic	2	0.6%
Egypt	1	0.3%
Greece	7	2.0%
Hungary	3	0.9%
India	74	21.1%
Indonesia	17	4.9%
Malaysia	17	4.9%
Mexico	18	5.1%
Philippines	13	3.7%
Poland	1	0.3%
Russia	22	6.3%
South Africa	11	3.1%
South Korea	34	9.7%
Taiwan	42	12.0%
Thailand	17	4.9%
Turkey	9	2.6%
Ukraine	2	0.6%
TOTAL	350	100.0%

Figure I: Net debt and Leverage variables of emerging markets over time

We present plots of monthly net debt and leverage (i.e. net debt/ market value of assets) variables averaged over all emerging market firms for the period 2002-15. All variables are defined in Appendix A.

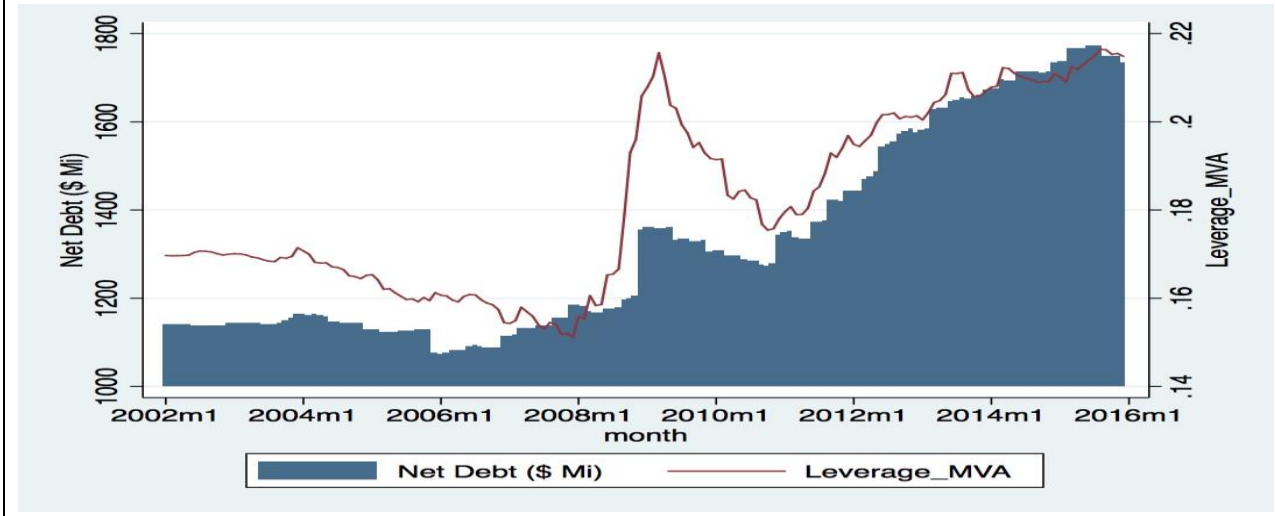

Figure II: Key credit risk variables of emerging markets over time

We present plots of monthly leverage, CDS spread, PD and DTD variables averaged over all emerging market firms for the period 2002-15. All the variables are defined in Appendix A.

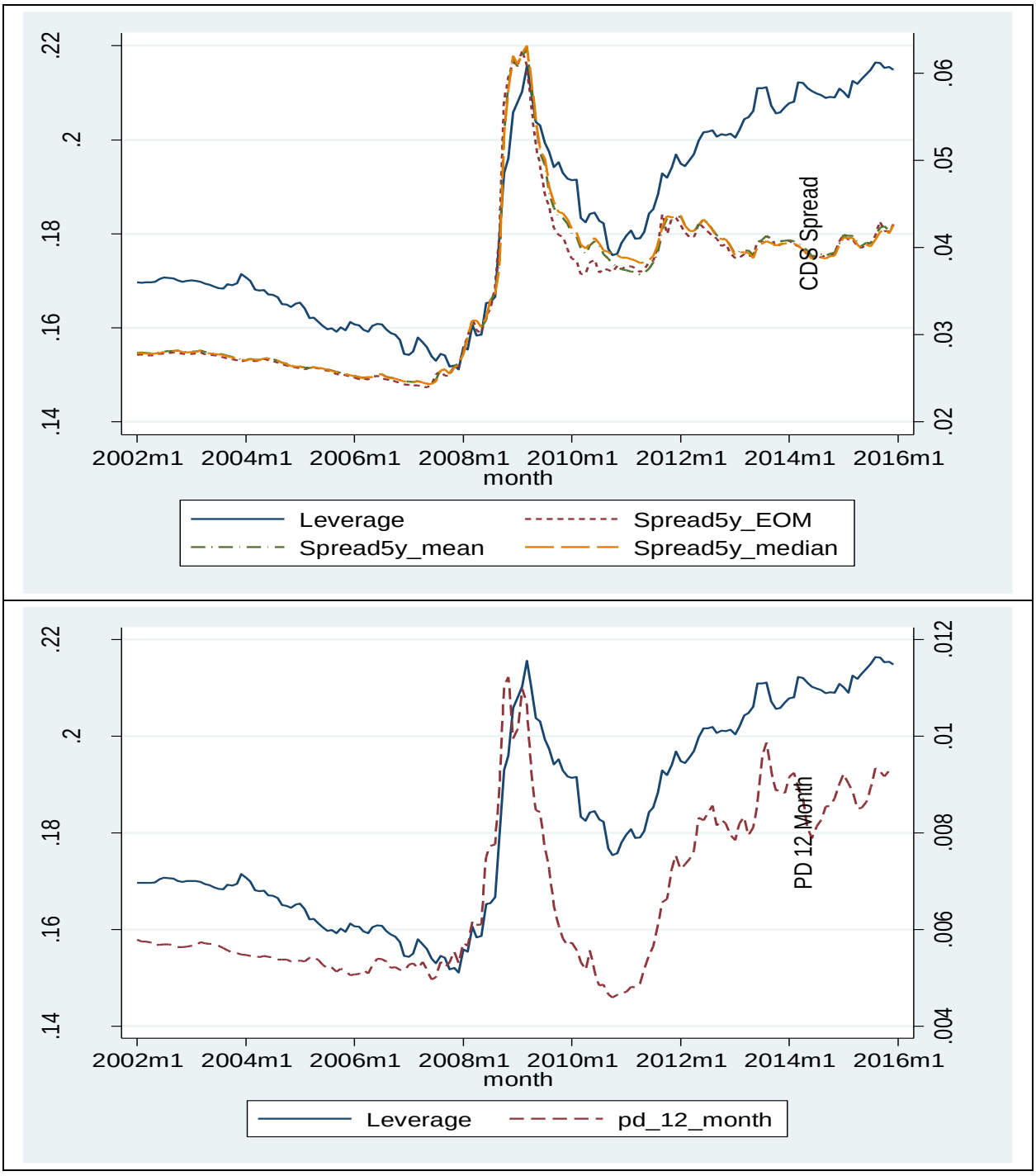

Figure II: Key credit risk variables of emerging markets over time contd.

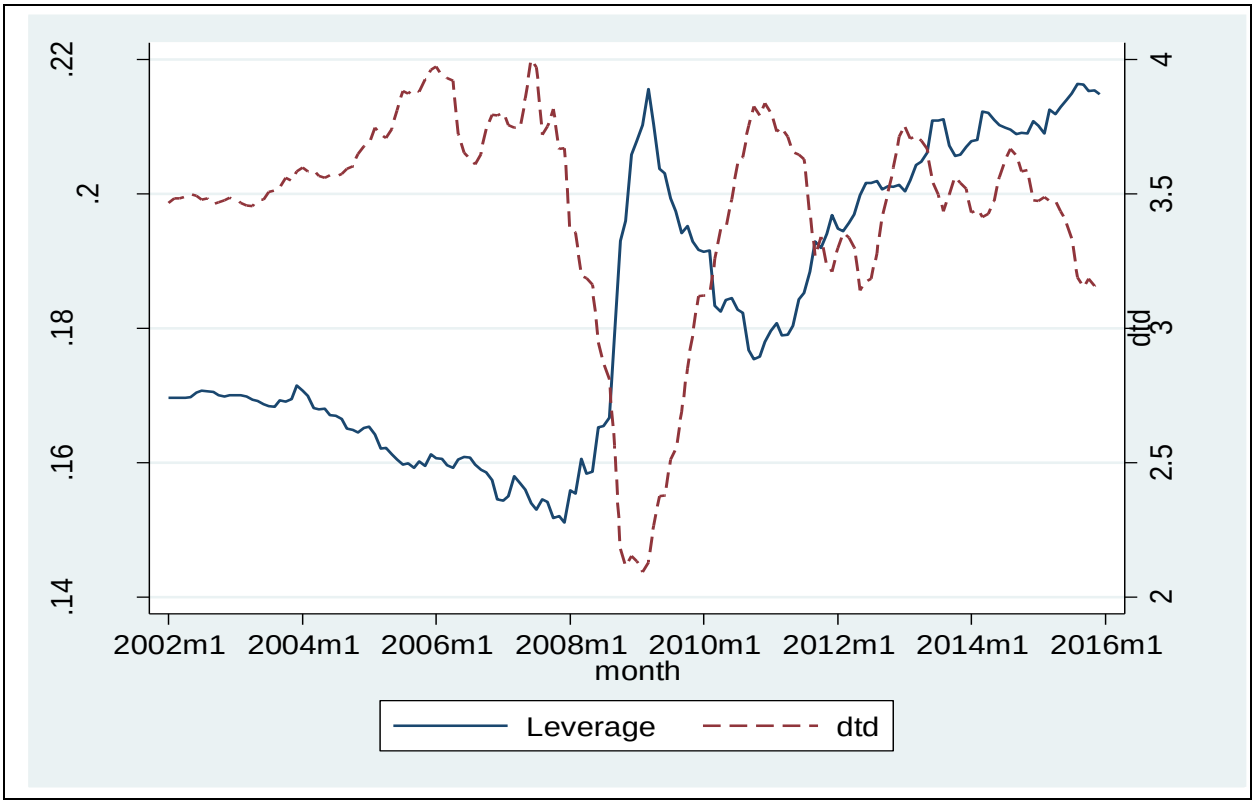

Figure III: CDS spreads of emerging markets by region over time

We present plots of monthly leverage and CDS spreads averaged over emerging market firms separately for each region (i.e. Asia, EMEA and Latin America) for the period 2002-15. All the variables are defined in Appendix A.

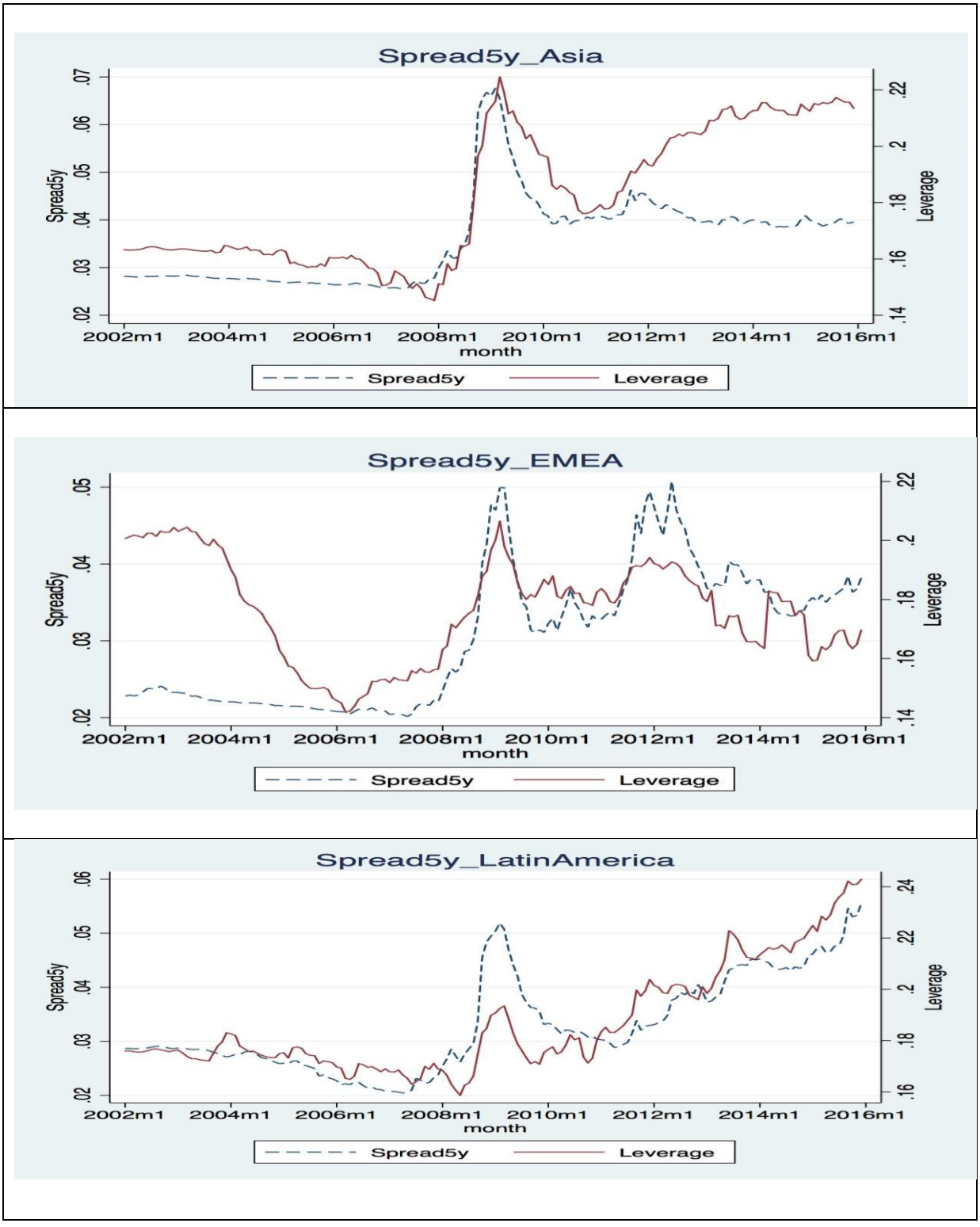

Table I: Summary statistics of balance sheet and accounting variables

This table reports summary statistics (mean values) of several key variables including leverage, balance sheet and accounting variables by year, region, industry, and sub-period samples using the data for the period 2002-2015. All variables are defined in Appendix A.

	Netdebt ($ mi)	Leverage	PTBV	INTCOV	STA	ROS	ROA	Q ratio
Years								
2002	1,415.9	0.203	1.711	5.303	0.454	0.124	0.052	1.291
2003	1,057.4	0.171	1.592	6.980	0.453	0.111	0.045	1.276
2004	1,108.8	0.150	1.792	8.543	0.489	0.127	0.049	1.350
2005	1,017.0	0.137	1.951	12.793	0.539	0.123	0.056	1.409
2006	939.9	0.129	2.270	12.506	0.555	0.123	0.056	1.538
2007	886.9	0.129	2.617	16.331	0.582	0.124	0.058	1.675
2008	838.0	0.165	2.122	14.997	0.599	0.111	0.056	1.436
2009	1,241.2	0.203	1.692	9.436	0.555	0.068	0.029	1.263
2010	1,118.2	0.178	1.998	13.225	0.534	0.100	0.039	1.342
2011	1,592.3	0.163	1.848	11.705	0.510	0.115	0.042	1.277
2012	1,730.0	0.176	1.640	11.087	0.507	0.094	0.031	1.222
2013	1,996.4	0.188	1.465	7.732	0.489	0.085	0.024	1.164
2014	2,035.8	0.187	1.536	7.466	0.484	0.086	0.024	1.175
2015	2,599.5	0.184	1.580	6.823	0.472	0.076	0.020	1.180
Regions								
Asia	1,858.1	0.158	1.779	13.556	0.543	0.105	0.041	1.337
EMEA	90.8	0.187	1.862	6.693	0.421	0.099	0.031	1.263
Latin America	688.7	0.198	2.245	5.625	0.548	0.087	0.041	1.364
Sub-periods								
Pre-crisis: 2002-2006	1,030.6	0.143	1.993	10.911	0.528	0.127	0.054	1.427
Crisis: 2007-2009	988.2	0.167	2.128	13.529	0.590	0.101	0.050	1.450
Post-crisis: 2010-2015	1,807.9	0.179	1.689	9.850	0.517	0.099	0.031	1.231
Industries								
Basic Materials	1,483.6	0.197	1.906	9.004	0.655	0.072	0.048	1.391
Consumer Goods	2,784.2	0.195	1.753	20.933	0.905	0.067	0.051	1.417
Consumer Services	555.4	0.118	2.019	5.910	0.513	0.099	0.045	1.535
Financials	1,320.8	0.121	1.645	8.828	0.088	0.148	0.011	1.075
Health Care	12.6	0.209	3.548	23.242	0.578	0.144	0.080	2.242
Industrials	765.7	0.183	1.840	7.776	0.680	0.055	0.034	1.319
Oil & Gas	533.0	0.164	1.492	15.454	1.036	0.090	0.072	1.338
Technology	467.5	0.057	1.737	29.483	0.805	0.063	0.051	1.445
Telecommunications	2,318.0	0.224	2.506	5.011	0.584	0.081	0.049	1.455
Utilities	2,032.8	0.237	1.766	8.063	0.451	0.123	0.045	1.400

Table II: Summary statistics of credit risk proxies

This table reports summary statistics (mean values) of different firm-level risk proxies by year, region, industry and sub-period samples using the data for the period 2002-2015. We report different credit default swap (CDS) risk proxies (spread in bps, liquidity, volatility and slope); probability of default (PD) proxies (level and slope), distance to default (DTD), and equity market risk variables. All variables are defined in Appendix A.

	Leverage	CDS					PD		DTD	Equity market risk
		spread	liquidity	volatility range	volatility std dev	slope	level	slope		
Years										
2002	0.246	0.015	2.843	0.002	0.003	0.010	0.003	0.022	4.383	0.069
2003	0.194	0.013	3.949	0.002	0.002	0.007	0.003	0.019	4.110	0.065
2004	0.178	0.011	4.918	0.002	0.002	0.009	0.002	0.017	4.467	0.060
2005	0.167	0.010	5.106	0.002	0.001	0.009	0.002	0.016	5.057	0.057
2006	0.165	0.010	4.157	0.001	0.001	0.008	0.002	0.020	4.843	0.067
2007	0.179	0.014	3.562	0.002	0.001	0.008	0.003	0.024	4.528	0.068
2008	0.197	0.039	3.679	0.012	0.008	0.009	0.007	0.037	2.783	0.095
2009	0.224	0.050	3.472	0.010	0.012	0.003	0.008	0.047	2.335	0.112
2010	0.213	0.031	0.000	0.005	0.004	0.007	0.004	0.032	3.886	0.075
2011	0.186	0.030	3.258	0.006	0.004	0.007	0.006	0.031	4.105	0.064
2012	0.189	0.034	3.409	0.006	0.004	0.008	0.008	0.036	3.551	0.076
2013	0.201	0.030	3.486	0.005	0.003	0.012	0.008	0.036	3.926	0.071
2014	0.202	0.024	3.386	0.004	0.002	0.012	0.007	0.034	3.980	0.070
2015	0.197	0.027	3.297	0.005	0.003	0.012	0.008	0.036	3.603	0.072
Regions										
Asia	0.182	0.027	3.839	0.005	0.004	0.008	0.003	0.039	3.831	0.078
EMEA	0.213	0.031	2.841	0.006	0.004	0.008	0.002	0.022	3.121	0.068
Latin America	0.231	0.029	3.311	0.005	0.004	0.011	0.002	0.031	4.044	0.077
Subperiods										
Pre-crisis: 2002-2006	0.175	0.011	4.456	0.002	0.001	0.008	0.002	0.019	4.735	0.063
Crisis: 2007-2009	0.201	0.034	3.576	0.008	0.007	0.007	0.006	0.036	3.162	0.093
Post-crisis: 2010-2015	0.198	0.030	3.370	0.005	0.003	0.010	0.007	0.034	3.840	0.071
Industries										
Basic Materials	0.224	0.037	3.080	0.006	0.005	0.009	0.006	0.032	4.114	0.084
Consumer Goods	0.214	0.034	4.120	0.006	0.006	0.007	0.005	0.027	4.164	0.090
Consumer Services	0.158	0.020	3.954	0.003	0.003	0.010	0.002	0.017	4.735	0.065
Financials	0.131	0.022	3.453	0.006	0.003	0.009	0.009	0.039	2.378	0.064
Health Care	0.309	0.053	2.125	0.007	0.009	-0.006	0.004	0.038	4.235	0.101
Industrials	0.212	0.037	3.366	0.005	0.005	0.010	0.007	0.042	3.415	0.090
Oil & Gas	0.185	0.028	3.737	0.006	0.005	0.011	0.004	0.031	4.092	0.075
Technology	0.059	0.029	2.570	0.004	0.005	0.011	0.001	0.009	4.485	0.084
Telecommunications	0.281	0.028	4.768	0.006	0.005	0.008	0.005	0.030	4.316	0.086
Utilities	0.266	0.018	3.789	0.004	0.003	0.009	0.004	0.026	5.697	0.061

Table III: Correlations for balance sheet and credit risk variables

This table presents correlations among key variables for all the underlying emerging market firms for the period 2002-2015. Panel A reports correlations among balance sheet, leverage and financial variables. Panel B presents correlations among CDS risk proxies (spread, liquidity, volatility and slope), PD proxies (level and slope), DTD and equity market risk (Ivol) variables. P-values for all correlations are found to be significant and are not reported. Correlations 35% and above are highlighted. All variables are defined in Appendix A.

Panel A: correlations among financial variables

	Variables	1	2	3	4	5	6	7	8	9	10	11
1	Netdebt	1.00										
2	Leverage	0.23	1.00									
3	Debt/EBIT	0.14	0.35	1.00								
4	Debt/MVE	0.27	0.68	0.38	1.00							
5	Debt/BVE	0.16	0.64	0.41	0.71	1.00						
6	PTBV	-0.11	-0.22	-0.08	-0.30	0.04	1.00					
7	INTCOV	-0.09	-0.36	-0.10	-0.19	-0.23	0.11	1.00				
8	STA	0.02	0.01	-0.11	-0.18	-0.21	0.04	0.08	1.00			
9	ROS	-0.12	-0.39	-0.09	-0.27	-0.16	0.25	0.29	-0.26	1.00		
10	ROA	-0.12	-0.36	-0.16	-0.35	-0.29	0.35	0.41	0.31	0.62	1.00	
11	Q ratio	-0.12	-0.34	-0.12	-0.33	-0.17	0.74	0.32	0.16	0.32	0.58	1.00

Panel B: Correlations among credit risk measures

	Variables	1	2	3	4	5	6	7	8	9	10
1	Leverage	1.00									
2	CDS spread	0.32	1.00								
3	CDS liquidity	-0.11	-0.23	1.00							
4	CDS volatility range	0.15	0.49	-0.01	1.00						
5	CDS volatility std dev	0.23	0.69	-0.07	0.59	1.00					
6	CDS slope	0.01	-0.21	-0.08	-0.08	-0.20	1.00				
7	PD level	0.21	0.35	-0.11	0.26	0.23	0.04	1.00			
8	PD slope	0.27	0.32	-0.12	0.23	0.26	0.11	0.82	1.00		
9	DTD	-0.29	-0.37	0.24	-0.27	-0.29	-0.01	-0.49	-0.46	1.00	
10	Equity market risk	0.26	0.46	-0.14	0.26	0.39	-0.06	0.33	0.31	-0.41	1.00

Table IV: Bivariate sorting based on leverage and idiosyncratic volatility

This table reports results of bi-variate sorting into quartile portfolios based on leverage and idiosyncratic volatility variables. We first sort the firm leverage into quartiles each month and then further sort each leverage quartile into quartiles based on the idiosyncratic volatility of the underlying firms for all the emerging markets using the data for the period 2002-2015 and different sub-periods. We report the average value of CDS spreads, for each of the 4 X 4 bins. Last row presents the F-test based on the ANOVA test for equality of CDS spreads across leverage quartiles between crisis and post crisis periods, for each idiosyncratic volatility group. We also report the differences between 4th and 1st (or High-Low) quartile values for each bin, row and column wise; all the high-low differences are found to be significant at 1% level and the corresponding p-values are not reported for brevity. ***, **, and * indicate significance at 1, 5, and 10 percent levels, respectively. All the variables are defined in Appendix A.

	Idiosyncratic return volatility (Ivol)				
	Lowest Ivol	2	3	Highest Ivol	High-Low
			CDS Spread5y		
Leverage			full sample: 2002-15		
Lowest lev	0.012	0.015	0.019	0.033	*0.020*
2	0.017	0.018	0.023	0.041	*0.024*
3	0.021	0.022	0.027	0.039	*0.019*
Highest lev	0.026	0.029	0.037	0.064	*0.038*
High-Low	*0.013*	*0.015*	*0.018*	*0.031*	
			pre-crisis: 2002-06		
Lowest lev	0.007	0.008	0.009	0.014	*0.007*
2	0.009	0.009	0.012	0.017	*0.008*
3	0.011	0.009	0.011	0.017	*0.006*
Highest lev	0.007	0.010	0.018	0.020	*0.013*
High-Low	*0.001*	*0.002*	*0.009*	*0.007*	
			crisis: 2007-09		
Lowest lev	0.009	0.016	0.019	0.033	*0.024*
2	0.012	0.019	0.029	0.042	*0.030*
3	0.017	0.021	0.031	0.048	*0.031*
Highest lev	0.030	0.030	0.041	0.074	*0.044*
High-Low	*0.021*	*0.014*	*0.022*	*0.041*	
			post-crisis: 2010-15		
Lowest lev	0.015	0.017	0.022	0.034	*0.019*
2	0.020	0.022	0.022	0.045	*0.025*
3	0.025	0.026	0.028	0.035	*0.010*
Highest lev	0.029	0.035	0.039	0.060	*0.030*
High-Low	*0.014*	*0.018*	*0.016*	*0.025*	
F-test (p-value): crisis CDS spreads = post-crisis CDS spreads	*105.99* ***	*101.96***	*6.455***	*0.84*	

Table V: Baseline panel regressions of credit risk

This table reports the results of monthly panel regressions of CDS changes (or first-differences) for all emerging markets using the data for the period 2002-2015. The dependent variable is the 5-year CDS spread changes based on end of the month CDS spread data. Regression (1) reports results for leverage and aggregate risk variables; regression (2) additionally includes idiosyncratic volatility variables. Regression (3) presents the base-line regression, with explanatory variables that include leverage, volatility, firm-specific characteristics, and aggregate market variables. The leverage and firm level idiosyncratic volatility variables in all the regressions have dummy interactions for crisis (2007-09) and post-crisis (2010-2015) periods. Regression (4) reports the results of Heckman procedure applied to the baseline panel regression (3) for CDS changes. For Heckman correction, we run the first stage probit regressions of leverage level (high=1; low=0) on several instrumental variables: Sales to Assets, Return on Assets, Q ratio, all industry dummies, and lagged CDS. The high (low) leverage is set based on firm's debt being above (below) the firm's average leverage ratio over the sample period. We then use inverse Mills ratio (IMR) from the probit model as an additional independent variable in the second stage regression. Only the second stage regression results for changes are reported. The key variable of interest *Δleverage x post-crisis* is highlighted in all regressions. Constant value coefficients are not reported for brevity. All the variables are defined in the Appendix A. All regressions include controls for firm- and month- specific fixed effects, and t-statistics adjustments for heteroscedasticity, autocorrelation and cross-correlations. Values of standard errors are reported in parentheses. In addition, for each regression, we report F-statistics and corresponding p-values for two types of null hypotheses: (a) H1: post-crisis leverage effect = pre-crisis leverage effect (to test if the *coefficient of Δleverage x post-crisis* equals the *coefficient of Δleverage x pre-crisis);* and (b) H2: post-crisis leverage effect = crisis leverage effect (to test if the *coefficient of Δleverage x post-crisis* equals the *coefficient of Δleverage x crisis).* ***, **, and * indicate significance at 1, 5, and 10 percent levels, respectively.

			Baseline regressions	Baseline regressions with Heckman correction
	(1)	(2)	(3)	(4)
VARIABLES	ΔSpread	ΔSpread	ΔSpread	ΔSpread
Leverage	0.000	0.001	-0.002	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Leverage X crisis	0.013*	0.013*	0.011	0.011
	(0.007)	(0.008)	(0.008)	(0.008)
Leverage X postcrisis	0.011**	0.011**	0.010**	0.010**
	(0.004)	(0.005)	(0.005)	(0.005)
Ivol		-0.001	0.001	0.002
		(0.007)	(0.006)	(0.006)
Ivol X crisis		0.034	0.031	0.031
		(0.022)	(0.022)	(0.022)
Ivol X postcrisis		0.014	0.012	0.012
		(0.011)	(0.011)	(0.011)
INTCOV			-0.000	-0.000
			(0.000)	(0.000)
STA			0.001	0.001
			(0.001)	(0.001)
ROS			0.001	0.001
			(0.003)	(0.003)
ROA			-0.018	-0.017
			(0.011)	(0.011)
PTBV			-0.002***	-0.002***
			(0.000)	(0.000)
Market_returns	-0.007***	-0.007***	-0.006***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)
SP500	-0.000	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.003)	(0.003)
VIX	0.0004***	0.0004***	0.0004***	0.0004***
	(0.000)	(0.000)	(0.000)	(0.000)
Default_factor	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
Level_rates	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Slope_rates	-0.000	-0.001*	-0.001*	-0.001*
	(0.000)	(0.000)	(0.000)	(0.000)
TED	0.002***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
IMR				-0.0001*
				(0.000)
Observations	16,797	16,395	16,022	16,022
Adjusted R-squared	0.135	0.138	0.141	0.143
F-stat (P-value): post-crisis leverage effect = pre-crisis leverage effect	3.92** (0.048)	3.80* (0.052)	4.60** (0.033)	3.76* (0.053)
F-stat (P-value): post-crisis leverage effect = crisis leverage effect	0.07 (0.786)	0.08 (0.783)	0.01 (0.935)	0.01 (0.930)

Table VI: Robustness tests of the baseline regressions

This table reports presents robustness tests of monthly baseline panel regression (3) from Table V for the full sample period 2002-2015. Regression (1) presents the monthly regression using distance to default changes (ΔDTD). Regressions (2) and (3) report results using the changes in PD level and PD slope as the dependent variables. Regressions (4) and (5) examine 5-year CDS and DTD changes estimated using quarterly data. Regression (6) reports CDS spread change regressions using contracts with only modified restructuring (MR) clause. Regression (7) reports ΔCDS regression using weighted least squares (WLS) method. For each regression, we report only standalone and interaction variables for leverage and firm level idiosyncratic volatility; the dummy interactions involve crisis (2007-2009) and post-crisis (2010-2015) periods. We do not report firm-specific and aggregate control variables for brevity. The key variable of interest *Δleverage x post-crisis* is highlighted in all regressions. All variables are defined in the Appendix A. Regressions (4) to (5) include controls for firm- and quarterly- specific fixed effects, while rest of the regressions include controls for firm- and monthly- specific fixed effects. For all regressions, except the WLS regression, the t-statistics involve adjustments for heteroscedasticity, autocorrelation and cross-correlations. Finally, for each regression, we report F-statistics and corresponding p-values for two types of null hypotheses: (a) H1: post-crisis leverage effect = pre-crisis leverage effect (where we test if the *coefficient of Δleverage x post-crisis* equals the *coefficient of Δleverage x pre-crisis);* and (b) H2: post-crisis leverage effect = crisis leverage effect (where we test if the *coefficient of Δleverage x post-crisis* equals the *coefficient of Δleverage x crisis).* Values of standard errors are reported in parentheses. ***, **, and * indicate significance at 1, 5, and 10 percent levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	monthly data			quarterly data		MR only	WLS
VARIABLES	ΔDTD	ΔPD	ΔPD slope	ΔSpread	ΔDTD	ΔSpread	
Leverage	-0.323	0.000	0.013**	0.001	-0.663	0.000	0.023
	(0.558)	(0.001)	(0.005)	(0.004)	(0.983)	(0.002)	(0.056)
Leverage X crisis	-0.546	0.012***	0.007**	0.047**	-0.440	0.006	0.100*
	(0.483)	(0.003)	(0.003)	(0.021)	(0.990)	(0.005)	(0.060)
Leverage X postcrisis	-1.513**	0.013***	0.009**	0.019*	-2.385**	0.034***	0.121**
	(0.611)	(0.003)	(0.004)	(0.010)	(1.148)	(0.013)	(0.060)
Ivol	-3.353**	0.003	0.037***	-0.013	-2.504	0.013**	-0.088
	(1.455)	(0.003)	(0.008)	(0.011)	(2.424)	(0.005)	(0.088)
Ivol X crisis	0.749	0.004	-0.011	0.109***	-1.405	-0.010	0.081
	(1.633)	(0.007)	(0.008)	(0.039)	(2.660)	(0.019)	(0.091)
Ivol X postcrisis	-0.068	0.003	-0.024**	0.053***	-3.992	0.020	0.195**
	(1.525)	(0.007)	(0.010)	(0.019)	(2.534)	(0.035)	(0.097)
Constant	0.003***	0.000***	-0.000	0.000***	0.020***	-0.001*	-0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)
Observations	17,734	17,734	17,734	5,490	5,936	5,952	16,154
Adjusted R-squared	0.131	0.099	0.103	0.367	0.180	0.200	0.0767
Fstat (P-value): post-crisis leverage effect = pre-crisis leverage effect	6.12**	16.40**	5.62**	3.76*	4.32**	7.03**	4.06**
	(0.013)	(0.001)	(0.018)	(0.053)	(0.038)	(0.008)	(0.045)
Fstat (P-value): post-crisis leverage effect = crisis leverage effect	6.66**	0.14	0.62	1.52	6.77***	3.83*	0.43
	(0.010)	(0.713)	(0.432)	(0.218)	(0.009)	(0.051)	(0.510)

Table VII: Panel regressions of credit risk by region and industry

This table reports the results of monthly baseline panel regression (3) from Table V for CDS changes implemented separately for geographic regions and industries for the period 2002-2015. We consider three emerging market geographic regions i.e., Asia, EMEA and Latin America. Regression results are broken down into five industries for each region: (1) Basic Materials, Industrials, and Oil & Gas; (2) Financials; (3) Technology; (4) Consumer Goods; Consumer Services; and (5) Telecommunications and Utilities. For each region X industry group, we present only the post crisis leverage interaction effect i.e. *Δleverage x post-crisis*, our key variable of interest, for brevity. Blank cells marked "—" denote missing or limited sample data for the respective industry firms. Explanatory variables in all regressions include leverage, volatility and other firm-specific characteristics, and aggregate market variables. The leverage and firm level idiosyncratic volatility variables have dummy interactions for crisis (2007-09) and post-crisis (2010-2015) periods. We highlight the *Δleverage x post-crisis* interactions that are significant. All geographic regions and regression variables are defined in Appendix A. All regressions include controls for firm- and month- specific fixed effects, and t-statistics adjustments for heteroscedasticity, autocorrelation and cross-correlations. Values of standard errors are reported in parentheses. ***, **, and * indicate significance at 1, 5, and 10 percent levels, respectively.

Industry groups	ΔSpread **Leverage X postcrisis**		
	Asia	EMEA	Latin America
Basic Materials; Industrials; Oil & Gas	-0.001 (0.009)	-0.039 (0.037)	0.046* (0.026)
Financials	0.010 (0.007)	0.045* (0.022)	0.003 (0.005)
Technology	-0.057 (0.035)	—	—
Consumer Goods; Consumer Services	-0.006 (0.008)	—	-0.068*** (0.021)
Telecommunications; Utilities	0.031** (0.011)	-2.256*** (0.028)	0.012 (0.012)

Table VIII: Further tests of industry and firm variables on credit risk

This table reports the effects of industry and firm specific variables on the post-crisis leverage-credit risk relationship. We employ baseline panel regression (3) in Table V for CDS changes for the full sample period 2002-2015. Regressions (1) to (3) present industry effects of post-crisis growth in leverage. We employ a triple interaction of *Δleverage x post-crisis x industry* type, where industry type is captured using three dummies: (a) finance dummy (financial) =1 for all financial firms and zero otherwise; (b) tradable sector dummy (tradable) i.e. 1 for tradable sector (Basic Materials, Industrials, Oil and Gas, and Technology) and zero for non-tradable sector (construction, transportation, communications, utilities, wholesale/ retail trade, and services); and (c) telecom and utilities dummy (tel-uti) =1 for all firms belonging to telecommunications and utilities industries and zero otherwise. Regressions (4) and (5) explore impact of growth opportunities (or Q ratio) on leverage-credit risk relationship in the post-crisis period. Regression (4) employs a triple interaction of *leverage x post-crisis x high (low) Q*, where high (low) Q dummy is set to 1 for the highest (lowest) quartiles of Q ratio, and zero otherwise. Regression (5) employs a triple interaction of *Δleverage x post-crisis x highQ*, where high Q dummy is set to 1 for the top Q quartile; and zero otherwise. Overall, Regression (4) measures the incremental effects of post-crisis leverage for top and bottom Q ratio quartiles versus the two middle quartiles; whereas, Regression (5) measures the incremental effect of post-crisis leverage for the highest Q ratio quartile versus the rest of the quartiles. Regressions (6) to (8) further explore the credit risk impact of Q ratio by industry type. We employ a four-way interaction of *Δleverage x post-crisis x industry type x highQ*, where industry type is captured using three dummies: (a) finance dummy (financial); (b) tradable sector dummy (tradable); and (c) telecom and utilities dummy (tel-uti). HighQ is a high Q dummy set to 1 for the highest Q quartile. In all regressions, explanatory variables include leverage, volatility and other firm-specific characteristics, and aggregate market variables. All variables are defined in Appendix A. We do not report firm specific and aggregate control variables for brevity. All regressions include controls for firm- and month- specific fixed effects, and t-statistics adjustments for heteroscedasticity, autocorrelation and cross-correlations. Values of standard errors are reported in parentheses. ***, **, and * indicate significance at 1, 5, and 10 percent levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ΔSpread							
Leverage	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Leverage X crisis	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.007
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Leverage X postcrisis	0.010	0.009*	0.009*	0.012**	0.012**	0.010	0.009*	0.009*
	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.005)
Leverage X postcrisis X financial	-0.000					0.000		
	(0.008)					(0.009)		
Leverage X postcrisis X tradable		0.005					0.030	
		(0.015)					(0.022)	
Leverage X postcrisis X tel_uti			0.004					0.009
			(0.012)					(0.014)
Leverage X postcrisis X highQ				-0.029**	-0.030**			
				(0.015)	(0.014)			
Leverage X postcrisis X lowQ				0.001				
				(0.008)				
Leverage X postcrisis X financial X highQ						-0.005		
						(0.009)		
Leverage X postcrisis X tradable X highQ							-0.055**	
							(0.025)	
Leverage X postcrisis X tel_uti X highQ								-0.055**
								(0.026)
Observations	16,022	16,022	16,022	16,022	16,022	16,022	16,022	16,022
Adjusted R-squared	0.143	0.143	0.144	0.144	0.144	0.143	0.144	0.145

Table IX: Credit risk channels: Effects of country-wide variables on credit risk

This table reports effects of capital flows (regressions (1) to (3)) and country-level governance (regressions (4) and (5)) on the impact of post-crisis growth in leverage on credit risk. We employ Table V baseline regression (3) for CDS changes for the full sample period 2002-2015. Regressions (1) and (2) report triple interaction *Δleverage x post-crisis x high (low) capflow*, where *high(low) capflow* dummy is set to 1 for the highest (lowest) quartile of net capital flows, and zero otherwise. In both regressions, the *capflow* dummy measures the incremental effects of top and bottom quartiles 1 and 4 versus the two middle quartiles; Regression (3) reports triple interaction *leverage x post-crisis x high capflow*, where *highcapflow* dummy is set to 1 for the highest quartile of net capital flows, and zero otherwise, and measures the incremental effects of top quartile versus the rest of the quartiles. We employ a triple interaction *Δleverage x post-crisis x gov*, where *gov* is the governance factor. We employ a triple interaction *leverage x post-crisis x highgov*, where *highgov* dummy is set to 1 for the highest quartiles of governance, and zero otherwise, and measures the incremental effects of top quartile versus the rest of the quartiles. In all regressions, explanatory variables include leverage, volatility and other firm-specific characteristics, and aggregate market variables. All variables are defined in Appendix A. We do not report firm specific and aggregate control variables for brevity. All regressions include controls for firm- and month- specific fixed effects, and t-statistics adjustments for heteroscedasticity, autocorrelation and cross-correlations. Values of standard errors are reported in parentheses. ***, **, and * indicate significance at 1, 5, and 10 percent levels, respectively.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	ΔSpread				
Leverage	-0.002	-0.002	-0.006	-0.002	-0.002
	(0.002)	(0.002)	(0.004)	(0.002)	(0.004)
Leverage X crisis	0.009	0.008	0.015	0.010	-0.001
	(0.007)	(0.007)	(0.010)	(0.008)	(0.012)
Leverage X postcrisis	0.009*	0.009*	0.015**	-0.002	0.018*
	(0.005)	(0.005)	(0.006)	(0.004)	(0.010)
Capflows			-0.000***		
			(0.000)		
Leverage X postcrisis X highcapflows	-0.002*	-0.002**	-0.002*		
	(0.001)	(0.001)	(0.001)		
Leverage X postcrisis X lowcapflows	0.002**				
	(0.001)				
Leverage X postcrisis X highgov				0.002	-0.019*
				(0.006)	(0.011)
Leverage X postcrisis X lowgov				0.022**	
				(0.011)	
Observations	14,255	14,255	12,772	13,217	4,921
Adjusted R-squared	0.126	0.125	0.129	0.134	0.140

Table X: Effects of corporate credit risks on sovereign risk

This table reports the impact of post-crisis growth in leverage on *aggregate* credit risk for the full sample period 2002-2015. Regressions (1) and (2) present aggregate corporate CDS spread changes as the dependent variable; specifically, Regression (1) is based on the first principal component extracted from first differences of CDS across all firms for each country, whereas Regression (2) uses the cross-sectional averages of CDS changes across firms for each country. Regressions (3) and (4) are based on sovereign 5-year CDS spread changes as the dependent variable. Explanatory variables in Regressions (1) and (3) consist of first principal components extracted from first balance sheet variables across all firms for each country. The explanatory variables in Regressions (2) and (4) uses cross-sectional averages (row means) of each variable across firms in a given country. In all regressions, explanatory variables include aggregate market variables drawn from baseline regression (3) in Table V. All variables are defined in Appendix A. We only report idiosyncratic volatility and leverage variables for brevity. All regressions include an autoregressive dependent variable, in addition to year-index and country-index fixed effect, and t-statistics adjustments for heteroscedasticity, and autocorrelation. In addition, for each regression, we report F-statistics and corresponding p-values for two types of null hypotheses: (a) H0: post-crisis leverage effect = pre-crisis leverage effect (where we test if the *coefficient of Δleverage x post-crisis* equals the *coefficient of Δleverage x pre-crisis);* and (b) H0: post-crisis leverage effect = crisis leverage effect (where we test if the *coefficient of Δleverage x post-crisis* equals the *coefficient of Δleverage x crisis).*Values of standard errors are reported in parentheses. ***, **, and * indicate significance at 1, 5, and 10 percent levels, respectively.

	(1)	(2)	(3)	(4)
	ΔSpread		ΔSovereign CDS	
VARIABLES	PCA	Row means	PCA	Row means
Leverage	-0.0642**	-0.019***	-0.160***	-0.038**
	(0.0319)	(0.006)	(0.0570)	(0.016)
Leverage X crisis	0.132*	0.057***	-0.0276	0.036
	(0.0728)	(0.021)	(0.1000)	(0.031)
Leverage X postcrisis	0.144***	0.045***	0.185	0.165
	(0.0556)	(0.014)	(0.136)	(0.106)
Ivol	-0.00658	-0.013	-0.103**	0.004
	(0.0669)	(0.010)	(0.0431)	(0.040)
Ivol X crisis	0.264**	0.135*	0.0928	0.012
	(0.130)	(0.078)	(0.156)	(0.096)
Ivol X postcrisis	0.0464	0.034	0.201**	0.443
	(0.0845)	(0.034)	(0.0968)	(0.363)
Observations	2,538	2,547	2,097	2,393
Adjusted R-squared	0.404	0.276	0.172	0.196
Fstat (P-value): post-crisis leverage effect = pre-crisis leverage effect	6.74*** (0.009)	10.46***(0.001)	2.49 (0.115)	2.43 (0.119)
Fstat (P-value): post-crisis leverage effect = crisis leverage effect	0.03 (0.869)	0.25 (0.619)	0.14 (0.707)	1.30 (0.255)