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Sensitivity of Emerging Market Corporate Borrowing Spreads to Global Financial Conditions

Abstract: Global financial conditions (GFC) considerably influence emerging markets (EM) firm dynamics. Albeit a vast literature on the vulnerability of EM firms to GFC, no study assesses the sensitivity of EM firm credit risk to GFC by looking at the sensitivity of borrowing spreads of EM firms to GFC. We fill this gap by calculating borrowing spreads for nearly 12000 non-financial firms from 13 EMs, analyzing the sensitivity of the spreads to GFC, and documenting the role of country fundamentals and firm characteristics. Using three levels of data—firm-level microdata, country-level macro data, and global financial data— and panel regressions, we document a clear pattern of EM firms' vulnerability to the GFC by illustrating significant global financial effects on the credit risk premium of EM firms. Specifically, we find that the firm-level borrowing spreads widen once the GFC tightens, suggesting that the perceived riskiness of EM firms, i.e., the credit risk premium, increases when the GFC tightens. We highlight the importance of country fundamentals and firm characteristics in the sensitivity of EM firms' borrowing spreads to GFC: (i) EM firms with weaker characteristics display more sensitivity to GFC; (ii) EM firms from risky EM countries are more exposed to the effects of GFC. Finally, we also find that currency depreciation increases the firm-level borrowing spreads, which is consistent with the risk channel of the exchange rate.

Key words: Corporate borrowing spreads, global financial conditions, firm dynamics, fundamentals, emerging markets.

JEL Classification: C33, F41, F65, G32.

1. Introduction

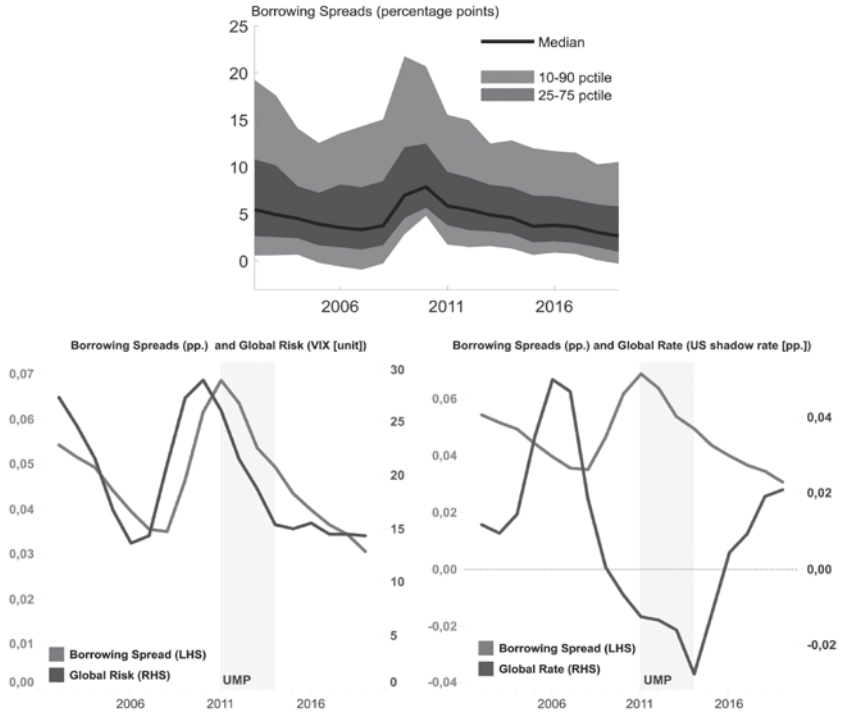
Borrowing spreads of emerging economies are highly vulnerable to global financial conditions (GFC) — *a key feature of these economies*. Many recent studies highlight this pattern at the aggregate (country) level by showing the substantial effects of global factors—*such as global risk-free rate and global financial risk* — on the country spreads, i.e., the country risk premium (Akinci, 2013; Chari, Garcés, Martínez, and Valenzuela, 2024; Gilchrist, Wei, Yue, and Zakrajšek, 2022; Uribe and Yue ,2006;). However, little is known about the firm-level sensitivity of the borrowing spreads, i.e., the firm's credit risk premium, to global financial factors. This study aims to fill this gap by calculating firm-level borrowing spreads for emerging market (EM) countries and analyzing the influence of GFC on them. In this sense, we seek to answer the following questions: (**i**) How do global financial factors affect the borrowing spreads of EM firms? (**ii**) Do country fundamentals and firm characteristics matter? and (**iii**) Do the effects vary across firm types? We address these crucial questions empirically by taking firm heterogeneity into account within two dimensions: i.e., firm size (Alter and Elekdag, 2020; Jin, 2021; Bose, Mallick, and Tsoukas, 2020; Crouzet and Mehrotra, 2020; Gertler and Gilchrist, 1994; Hadlock and Pierce 2010;) and *firm credit risk* Aysun, Jeon, and Kabukcuoglu, 2018; Bose, Filomeni, and Mallick, 2021; Palazzo and Yamarthy, 2022;).

We design our empirical framework on two main building blocks: *(i) constructing the firm-level borrowing spreads and (ii) assessing the impact of GFC on the spreads of EM firms through a panel regression analysis*. We calculated the borrowing spreads for nearly 12000 non-financial firms from 13 EMs. Unlike recent studies by e.g. Alter and Elekdag (2020); Banti and Bose (2021); Herwadkar (2017) that focus primarily on the quantity-based measures of the firm risk premium such as the leverage and foreign currency borrowings, we focus on dynamics in the firm-level borrowing spreads— *a lead proxy for the firm default risk premium*. Borrowing spread is a price-based measure of credit risk premium paid by firms over a global risk-free rate for debts. Specifically, the borrowing spread is the difference between what an individual firm pays and what would have been paid if all the debt had been used at global risk-free interest rates, suitable for maturities. A high(low) borrowing spread indicates a high(low) premium firms pay while borrowing.

Many studies have been attempting to calculate the firm-level spreads in EMs. For instance, Bräuning & Ivashina (2020) calculate the loan spread by focusing on foreign banks' lending[1], while De Gregorio & Jara (2024) compute the borrowing

[1] See also Saunders, Spina, Steffen, and Streitz (2025) and Wang & Shen (2023) for the corporate loan spreads.

Figure 1: Global Variables and Borrowing Spreads in EMs



Notes: The upper panel presents the borrowing spreads for EM firms for each year t— the median of the firm spreads is presented along with the 25-75 and 10-90 percentile ranges to capture the different patterns in the distribution. The lower panel (left) panel displays the moving averages of the borrowing spread (median[percentage points (pp.)]) and global financial risk (the VIX [unit]). The right panel indicates the moving averages of the borrowing spread (median) and the global risk-free rate (US shadow rate [percentage points (pp.)]).

(Source: DataStream and the Authors' own calculation)

risk-adjusted spread using USD-denominated and local currency bond data[2]. Caballero, Fernández, and Park (2019) also constructed the external financial indicator of the credit spreads for EMs based on micro-level bond (issued in foreign capital markets) data. On the other hand, Caballero et al. and other studies *such as* IMF (2015)use country-level measures of EM corporate spreads, such as JP

[2] Several studies — Anderson & Cesa-Bianchi (2020), Okimoto & Takaoka (2024), and Heger, Min, and Zagst. (2024) — also use bond-level data to construct the credit spreads. In addition, C. Wang et al. (2024) recently calculate the green bond credit spreads and analyze the impact of the credit spreads on bank loans.

Morgan's CEMBI (Corporate Emerging Markets Bond Index). In this study, we adopt a different approach to calculate the borrowing spread that considers all types of funding for firms. Our approach —*similar to that of* Aysun et al. (2018)— is more convenient for EM firms than other approaches that consider only foreign bank loans or bonds. Our methodology allows us to embody all forms of external finance when calculating borrowing spreads.

Moreover, our firm-level analysis, when compared to the country-level analysis with the CEMBI, enables us to deeply analyze the resilience of EM firms to global shocks by allowing us to assess the firm heterogeneity in the sensitivity of the spreads and to identify key drivers of the heterogenous sensitivity. The calculation uses the global risk-free rate as a common risk-free rate factor. Calculated borrowing spreads thus represent a *comparable* expression of the premium price of external financing, which reflects the differences in the interest rate premiums across firms. Therefore, we assume it precisely captures the firm credit risk. We also show that our calculated borrowing spread is a *reliable* measure of credit risk premium for EM firms by comparing it with the VIX (a key measure of global financial risk) and the EMBI spread (a primary measure of EM country risk) [see, Figure 2].

Figure 1 presents the calculated firm-level borrowing spreads and the relationship between the spreads and global variables. The upper panel shows that the spreads vary considerably in the cross-section and time dimensions. On the other hand, the lower panel of Figure 1 shows a tight link between the borrowing spread and global factors. Specifically, EM firm risk exhibits a similar motion pattern to global risk— *an identical history of rising and falling trends, indicating primarily global financial crisis and global unconventional monetary policy (UMP) episodes*. Similarly, EM firm credit risk also correlates to a global risk-free rate. A general decline in the global rate after the global financial crisis is followed by a sharp decrease in EM firm credit risk premium. This pattern is especially pronounced during global UMP episodes (2010-2014). In sum, these observations provide preliminary evidence about the sensitivity of the firm-level borrowing spreads to GFC.

After calculating the borrowing spreads, we estimate panel regressions using conventional panel estimators such as the fixed effects (FE) estimator and a generalized method of moments (GMM). Our model links firm-level borrowing spreads with global factors as well as the firm and country-specific fundamentals (see Figure 3 for a schematic illustration of our panel analysis with multilevel data). It, thus, includes three different levels of data: *(i) firm-level microdata, (ii) country-level macro-financial data, and (iii) global macro-financial data. We*

regress the borrowing spreads on two global financial variables that drive global financial cycles (Rey, 2015)— *(a) global risk free-rate (proxied by the US shadow federal funds rate) (b) global financial risk (proxied by the VIX index).* We then evaluate the role of firm and country fundamentals in the sensitivity of the firm-level spreads to GFC by *(i) employing double/triple interaction variables; (ii) classifying the firms initially into two categories through firm size—a) small firms; b) large firms*— and then into four categories through firm size and firm credit risk— *(a) small firms with high credit risk premium; (b) small firms with low credit risk premium; (c) large firms with high credit risk premium; (d) large firms with low credit risk premium*.

Consistent with our key argument that our spread measure is a suitable proxy for the firm-level borrowing spread of EMs, and with the stylized fact that indicates a tight link between our spread measure and the global financial factors, we find that the borrowing spreads of EM firms exhibit a significant sensitivity to GFC— *i.e., the firm-level spreads widen when GFC tighten*. Furthermore, this sensitivity relies on firm characteristics such as firm size and firm credit risk— *that is, EM firms with small size and/or high credit risk display more sensitivity to GFC*. Our results indicate that country fundamentals also matter—*i.e., firms from risky EM countries are more exposed to the effects of global financial factors*. Our study also provides an important finding about the role of exchange rates. We find that the borrowing spreads strongly respond to exchange rate movements—*that is, currency depreciation increases the firm-level borrowing spreads significantly, which is consistent with the risk-taking channel of the exchange rate*. Finally, we also find that the firm-level borrowing spreads exhibit a counter-cyclical characteristic. These primary findings are statistically and economically significant, even after controlling for the firm-level and country-level drivers of the borrowing spreads, as well as country- and year-fixed effects. Our findings are also robust during episodes of global UMP, as well as considering alternative measures of global variables and alternative panel estimators. Overall, these findings provide *a key message*: strong (firm and country) fundamentals play a key role in reducing the credit risk premium of EM firms and in strengthening their resilience to GFC.

Our study offers two primary contributions. First, it is the first study to calculate the firm-level borrowing spreads for EM firms and analyze how GFC influence the firm-level spreads. It, hence, provides new evidence to bridge the gap between open-economy macroeconomics and corporate finance literature. In this sense, we advance previous studies *focusing primarily on the macro-level impacts of GFC on the spreads* (Akinci, 2013; Chari et al., 2024; Ciarlone, Piselli, and Trebeschi, 2009; Özatay, Özmen, and Şahinbeyoğlu, 2009; Uribe and Yue, 2006 *and among others*). Second, we provide a unique insight into the role of the country fun-

damentals and firm characteristics in the resilience of EM firms to GFC. Our study, thereby, enhances understanding of the sources of EM firms' vulnerability to GFC and offers helpful policy implications.

The high sensitivity of EM firms' credit risk to global shocks is consistent with rapid financial globalization— *a key development in the global financial landscape, which* alters the transmission mechanism of GFC to EMs via dollarization of the balance sheets of EM financial and non-financial firms. It gives a central role to two crucial channels in the transmission: the balance sheet channel and the risk-taking (or financial) channel of the exchange rate (Caprio, 2012; Georgiadis & Mehl, 2016). Our key findings, in this sense, are consistent with the transmission mechanism of global financial shocks, which is based on the extensions of basic Mundell-Fleming framework where the two channels are at *center stage* in the transmission (Ahmed, Akinci, and Queralto , 2021; Banerjee and Mohanty, 2021; Gourinchas, 2018; Kalemli-Özcan, 2019; Saxegaard et al., 2022). Accordingly, a tightening in the GFC—*owing to a tight global monetary policy stance*(*i.e., a higher global interest rate) or a heightened global financial risk (i.e., a sharp spike in the VIX*) — increases the credit risk premium of the EM firms by undermining the dollarized balance sheets of EM firms through a currency depreciation, which exerts a negative valuation effect on the liability side of EM firms' balance sheets (see, e.g., Banerjee and Mohanty, 2021). The strength of such risk effects may vary across EM firms depending on their characteristics— *i.e., financially vulnerable firms that are highly contingent on external financing are expected to experience a more severe credit risk premium increase than their counterparts once the GFC tightens.*

2. Literature review

By interacting the EM firms' credit risk premium with GFC, our study connects two disciplines: (i) corporate finance and (ii) macroeconomics. More specifically, it relates to and contributes to the following strands of the literature.

Firstly, our study is closely related to Aysun et al. (2018). Calculating the borrowing spreads for US firms, the authors examine the sensitivity of US firm-level borrowing spreads to US monetary policy. They find that the borrowing costs of the US non-financial firms exhibit an asymmetric sensitivity to the U.S. monetary policy before and after the global financial crisis of 2008-09. We extend their analysis by looking at the story from the emerging market perspective. Precisely, in the first stage of our analysis, we closely follow their approach to compute the borrowing spreads for EM non-financial firms. However, given the dominance

of global shocks in EMs, the second stage of our analysis differs naturally from theirs. Unlike the credit channel theory-guided analysis of Aysun et al. that assesses the strength of transmission of domestic monetary policy by interacting with US domestic monetary policy and firms' borrowing spreads, we analyze the sensitivity of EM firm-level borrowing spreads to global financial factors and identify the role of firm and country fundamentals in the sensitivity by considering the financial and risk channels.

Secondly, the corporate finance literature—*focusing primarily on the sensitivity of EM corporates to global factors*— is another strand of the literature that we contribute. This strand of the literature assesses how GFC influence the firm-level dynamics in EMs. A growing number of studies in this literature shows the strong effects of global factors on EM firm dynamics such as leverage (Alter & Elekdag, 2020; Herwadkar, 2017; Kalemli-Özcan, 2019), investment (di Giovanni & Rogers, 2023; Li, Magud, and Valencia, 2020; Saxegaard et al., 2022), credit conditions (Banerjee and Mohanty, 2021; Banti and Bose, 2021; Bräuning and Ivashina, 2020), and productivity (Zhou, Wei, Xu, and Zhou, 2023). However, the evidence about the extent to which the credit risk premium of EM firms is sensitive to GFC is still scarce. This crucial topic, in other words, is underemphasized in the literature. Only two studies (Bräuning & Ivashina, 2020; Jiang & Sedik, 2019) look directly at the response of EM firm risk to global factors, with the former examining the sensitivity of EM firm risk to US monetary policy by calculating the loan spreads (a measure of firm risk premium) for EM firms and the latter analyzing the global effects on the risk premium of EM Asian firms by calculating Altman's EM "Z" score as a proxy of the default risk. We contribute to this strand of the literature by (**i**) calculating the firm-level borrowing spreads for 13 EMs, (**ii**) assessing the sensitivity of EM firm credit risk to GFC, and (**iii**) documenting the role of firm and country fundamentals in the firm-level sensitivity of credit risk premium to GFC.

We also contribute to the literature on the corporate response to exchange rate fluctuations. This literature inspects how currency depreciation influences EM corporate dynamics through a risk-taking (or financial) channel (Kalemli-Ozcan, Liu, and Shim, 2021; Kalemli-Özcan, 2019; for the role of depreciation in corporate leverage dynamics and Avdjiev, Bruno, Koch, and Shin, 2019; Banerjee, Hofmann, and Mehrotra,, 2022; Banerjee and Mohanty, 2021 for the corporate investment dynamics). We extend this literature by documenting evidence that currency depreciation widens the firm-level borrowing spreads. Our study, in this sense, complements the macro-level studies centering primarily on how currency depreciation affects country spreads. These studies indicate that EM country risk premium (proxied generally by the country-level EMBI spread) exhibits

a high vulnerability to currency depreciation: *—i.e., the country spread widens once EM local currency depreciates against the US dollar* (Bernoth and Herwartz, 2021; Hofmann, Shim, and Shin, 2020, 2016).

Finally, our study complements the previous studies that assess the impact of global financial shocks on the risk premium at the country-level. Some studies *such as* Akinci (2013), Chari et al. (2024), Gilchrist et al. (2022), Uribe and Yue (2006) reveal that EM country spreads widen (condense) once GFC tighten (loosen). We also find that a tightening (loosening) of GFC widens (condenses) EM firm-level borrowing spreads.

3. Data

To examine the global effects on the firm-level borrowing spreads, we focus on *nearly 12,000* public non-financial (according to NAICS industry classification) firms from 13 EMs: Brazil, China (Mainland), Colombia, Hungary, Malaysia, Mexico, Philippines, Poland, Romania, South Korea, Taiwan, Thailand, and Turkey. We had to exclude firms from other major EMs, such as Russia and India from our sample due to the missing data problem. We build our empirical analysis on *(i) the firm-level and country-level annual data from 13 EMs* and *(ii) global annual data from world capital and goods markets*, covering 2002-2019. Our primary data source is LSEG's DataStream and Eikon. The firm-level data comes from the Eikon, while the country-level and global data come mainly from the DataStream. Table A in Appendix A presents details about our dataset. After all eliminations[3], we use annual firm-level data consisting of 11,898 firms from 13 major EMs over the sample period of 2002-2019 and construct an unbalanced structured panel. Table B in Appendix A provides information about firm coverage by country and by sector.

Our empirical model includes three different levels of data: *(i) firm-level microdata, (ii) country-level macro-financial data*, and *(iii) global macro-financial data. The model involves four firm-level variables— (1) the borrowing spreads*; *(2) lever-*

[3] Our firm-level panel dataset includes only public companies as the relevant data is not fully available for private companies. We use the following criteria in the process of obtaining the firm-level data from LSEG Eikon. We include only public companies from non-financial industries (using NAICS industry classification). We incorporate firms to our firm sample if they have a positive actual interest payment because our interest is in firms which paid interest for its debts. We drop firms from our sample if the total assets and/or the total revenue is reported negative. All firm financial data is expressed in US Dollars. To reduce the effects of outliers, we manually removed outlier firms from the sample.

age (proxied by total debt percentage of total equity); (3) profitability (proxied by ROA); and *(4) firm size (proxied by the log of company market capitalization)*. Our key firm-level variable is the borrowing spread. We examine the global effects on this variable. Following Aysun et al. (2018), we construct a measure of this key variable (see methodology section about the calculation of the firm-level borrowing spreads). The other two firm-level variables, namely, *leverage and ROA*, act as firm-level control variables. The last variable, i.e., the firm size, is included in our model as an interaction variable. It allows us to examine whether the effects of global factors on the borrowing spreads vary across firms depending on the firm size, a proxy for firms' financial constraints. On the other hand, we include three country-level control variables— *(a) domestic output gap, (b) country risk, and (c) exchange rate*. Finally, we incorporate two key global financial variables into our model that drive global financial cycles (Rey, 2015) : *(i) global interest rate and (ii) global financial risk*. These variables play a key role in our model, capturing the global influences on the EM firm-level borrowing spreads, which is our primary emphasis in this study. We follow the international empirical macro literature while choosing appropriate measures of these key global variables. The literature (*see, for example*, Akinci, 2013; Chari et al., 2024; Epstein, Shapiro, and Gómez, 2019; Uribe and Yue, 2006) typically adopts U.S. aggregates as measures of these global variables: U.S. rates and the Chicago Board Options Exchange (CBOE) volatility index (the VIX). Following this literature, we use the U.S. shadow rate and the VIX index as proxies of the global risk-free rate and the global financial risk, respectively.

In the robustness section, we use three alternative measures of global rate and three alternative measures of global financial risk, Moreover, we consider the global UMP stance after GFC and examine the global effects by using UMP instruments. Finally, we incorporate an additional global variable, namely *the global output gap*, into our model. Table A in Appendix A provides details about our variables.

Table 1 presents summary statistics for our global, country, and firm-level variables. Panels A and B display the averages of global and country-level variables, respectively. Panel C represents the summary statistics of the firm-level variables. Our initial regression results, based on all firms, highlight the role of size and firm credit risk in determining the effects of global factors. Considering these results and following Aysun et al. (2018), we split firms into four groups using firm size and firm credit risk jointly as a classification criterion: ***(a)*** *small firms with high credit risk;* ***(b)*** *small firms with low credit risk;* ***(c)*** *large firms with high credit risk;* ***(d)*** *large firms with low credit risk*. Firms with above (below) median market capitalization are labeled as large (small) firms. Similarly, firms with the

above(below) calculated borrowing spread are labeled as firms with high(low) credit risk.[4]

Panel C of Table 1 reveals a clear pattern of *heterogeneity* across firms. Two observations herein are worth emphasizing. The first observation points to *differences* in access to credit and efficient use of credit between different groups of firms. For example, looking at medians, small firms with high credit risk, which used the most expensive debt, are the least leveraged and the least profitable in our sample. On the other hand, large firms with high credit risk used debt relatively cheaply, and they are relatively more leveraged and the most profitable. The second observation underlines two other patterns about the heterogeneity: *(i) large firms are more profitable than small firms; (ii) the most leveraged firms are large firms with low credit risk, while the most profitable firms are large firms with high credit risk*.

4. Methodology

Our empirical analysis builds on two key elements: *(i) constructing borrowing spreads for EM firms; and (ii) assessing the global effects on EM firm-level spreads*. Our methodological approach follows that of Aysun et al. (2018). They construct borrowing spreads from quarterly data for U.S. firms and estimate firm-level effects of U.S. monetary policy on the borrowing spreads. We extend their analysis by looking at the story from the emerging market perspective. Our empirical strategy differs from theirs in terms of scope— in particular, our study examines the firm-level effects of global financial factors on the borrowing spreads of EM firms since global factors are more important than local factors, given the increasing dominance of global shocks in EMs.

This part of our empirical design is closer to a different line of the literature focusing *specifically* on the role of global factors in EM firms' risk-related dynamics (*see, for example*, Alter & Elekdag, 2020; Banti & Bose, 2021; Herwadkar, 2017; *and among others*). These studies provide evidence for the global effects on the quantity-based measures of EM firm credit risk, such as leverage and foreign currency borrowings. Our study, however, computes a comprehensive measure of EM firm credit risk—*namely, the borrowing spread*— and analyzes the effects of global factors, *such as global interest rate and global risk*, on EM firm credit risk. In this sense, our study merges the abovementioned two streams of literature.

[4] Size and credit risk groups are determined according to median statistics. As a representative year we choose 2010 in grouping process.

Table 1: Summary Statistics

Panel A Global level		Period	Mean			
	Global risk-free rate (%)	18	0.867			
	Global financial risk (VIX)	18	2.892			
		Observations	Mean			
Panel B Country-level	Country risk (%)	234	1.303			
	Domestic output gap (%)	234	0.421			
	Exchange rate (%)	234	-0.349			
		All Firms	Small Firms with High Credit Risk	Small Firms with Low Credit Risk	Large Firms with High Credit Risk	Large Firms with Low Credit Risk
Panel C Firm-level	Number of firms	11898	2402	818	7572	1106
	Borrowing spread (%) [Firm credit risk]	2.758 (7.441)	3.818 (7.096)	1.447 (2.739)	3.322 (7.507)	1.549 (5.438)
	Leverage (%)	40.503 (82.572)	34.629 (86.552)	45.444 (68.685)	37.027 (81.288)	58.658 (89.658)
	ROA (%) [Firm Profitability]	4.251 (5.261)	2.911 (1.589)	3.196 (3.082)	5.329 (8.243)	4.294 (4.789)
	Market Cap [Firm Size]	18.826 (18.874)	17.452 (17.413)	17.667 (17.625)	19.956 (19.861)	20.191 (20.293)

Notes: Panel A and Panel B provide the averages of global and country-specific variables, respectively. All the statistics in Panel C represent the median and mean in parenthesis; except for the number of firms, which is the number of firms classified under one of the four groups of firms by size and by risk. The period is 18 years between 2002 and 2019. There are 13 EMs in our sample which are Brazil, China (Mainland), Colombia, Hungary, Malaysia, Mexico, Philippines, Poland, Romania, South Korea, Taiwan, Thailand, and Turkey. The global risk-free rate is measured by the U.S. shadow rate [Wu & Xia (2016)]. The VIX index is used as a primary measure of global financial risk. Country risk is represented by the Country-level JP Morgan Emerging Markets Bond Index Global (EMBIG) stripped spread. The domestic output gap is calculated by a Hodrick-Presscot filter (from country-specific real GDP). The exchange rate denotes a change in the US dollar bilateral exchange rate. The exchange rate is defined as domestic currency units per unit in US dollars. A positive change in the exchange rate denotes depreciation of the local currency against the US dollar. Leverage stands for the Total Debt Percentage of Total Equity. ROA stands for return on assets. Market Cap is the logarithmic form of Company market capitalization.

Firm-level borrowing spreads

We employ the following formulation to construct firm-level borrowing spreads by closely following Aysun et al. (2018);

$$BS_{i,j,t}^{EMfirm} = \frac{IX_{i,j,t}^{EMfirm} - \left\{STDebt_{i,j,t-1}^{EMfirm} \times Risk\_free_{t-1}^{Global\text{-}st} + LTDebt_{i,j,t-1}^{EMfirm} \times Risk\_free_{t-1}^{Global\text{-}lt}\right\}}{TotalDebt_{i,j,t}^{EMfirm}} \quad (1)$$

where *i*, *j*, and *t* are the indices of firms, countries, and time; $BS_{i,j,t}^{EMfirm}$ denotes the borrowing spreads of an "*i*" firm from "*j*" EM country at "*t*" time; $IX_{i,j,t}^{EMfirm}$ net interest payments; $STDebt_{i,j,t-1}^{EMfirm}$ short-term debt; $LTDebt_{i,j,t-1}^{EMfirm}$ long-term debt; $Totaldebt_{i,j,t}^{EMfirm}$ the total debt of an EM firm; $Risk\_free_{t-1}^{Global-st}$ the global short-term risk-free rate; and, $Risk\ \ free_{t-1}^{Global\_lt}$ the global long-term risk-free rate.[5]

For comparability reasons, we choose to use a common risk-free rate that EM firms (or countries) homogenously encounter instead of country-specific risk-free rates. We assume that this common risk-free rate is also exogenous to an emerging market economy. Global risk-free rate perfectly reflects these features. For this reason, we use the global risk-free rate as a common risk-free rate factor in the calculation. Furthermore, due to the heterogenous maturity structure of EM firms' debts, we, as in Aysun et al. (2018), divide this common risk-free rate into two components— *the short-term global risk-free rate (proxied by the U.S. 3-month Treasury rate) and the long-term global risk-free rate (proxied by U.S. 10-year Treasury rate)*— and match firms' short-term and long-term debt with the corresponding risk-free rates while calculating the firm-level spreads. This way, we can eliminate concerns arising from heterogeneities in debt maturity.

Note that our firm-level borrowing spread involves interest payments of EM firms on all types of funding, including two main items of corporate borrowing— *i.e.*, bank loan usage and corporate bond issuance. Although the latter financing method has substantially increased after the global financial crisis, bank loans are still the primary financing option for EM corporations (Alter & Elekdag, 2020). Therefore, it would be suitable for our analysis to consider all kinds of interest payments for firms instead of focusing only on bond issuances.

We do not have a direct market-based measure of firm-level borrowing spreads to help us assess the precision and usefulness of our spread measure. However, the macro-level risk benchmarks— *such as the VIX (a key measure of global financial risk)* and the EMBI spread (a primary measure of EM country risk)— are readily available, allowing us to evaluate the reliability of our measure. We use these aggregated financial risk measures to check whether the borrowing spread

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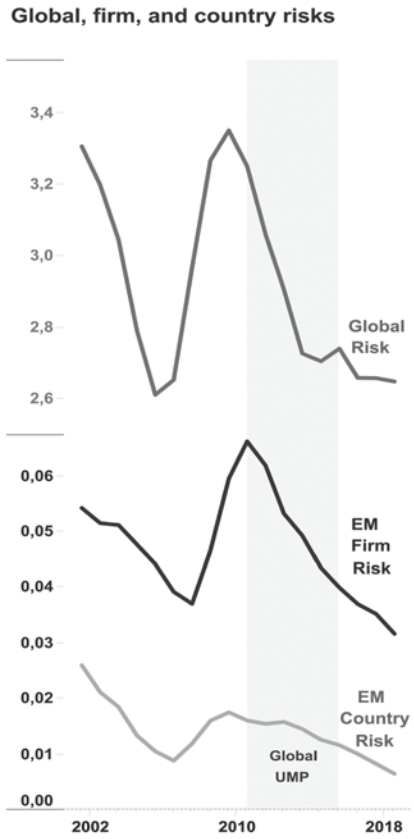
[5] Short-term debt includes short-term debt & current portion of long-term debt. It represents all borrowings due within one year. Long-term debt represents total non-current debt or interest-bearing financial obligations. It includes both convertible and non-convertible debt. $TotalDebt_{i,j,t}$ is the sum of $STDebt_{i,j,t}$ and $LTDebt_{i,j,t}$. Global short-term risk-free rate is proxied by U.S. 3-month Treasury rate; global long-term risk-free rate is proxied by U.S. 10-year Treasury rate. For the calculation of the borrowing spreads, firm-level data is sourced from Eikon and short- and long-term risk-free interest rate data is sourced from DataStream.

we calculated is a *justifiable* risk measure for EM firms. Figure 2 compares our firm-level borrowing spread measure with the global risk and EM country risk [left Panel] and provides its correlations with these aggregated measures, taking different firm types into account [right Panel]. It presents two crucial facts that are worth emphasizing.

Figure 2: Global, firm, and country risks in EMs



|Correlations

EM Firm Risk (Corr.)	EM Country Risk	Global Risk
All Firms	0.7300	0.5600
Small firms with high risks	0.7000	0.7500
Small firms with low risks	0.6100	0.0900
Large firms with high risks	0.5600	0.7000
Large firms with low risks	0.6000	-0.0050

Global Risk (the VIX)
EM Firm Risk (All Firms [Median])
EM Country Risk (EMBI stripped spread)

(Source: DataStream and the Authors' own calculation)

Notes: The top panel displays the moving average for the log of the VIX index (our primary measure of global risk). The bottom panel indicates the moving averages of two measures of EM risk: (1) the firm-level credit risk (the median of the borrowing spreads [the percentage points (pp.)]) and (2) the country-level risk (the average of sovereign spreads of EM countries in our sample [percentage point (pp.)]. The right panel of the figure illustrates the correlation table. This table shows the correlations between EM firm risk and EM country risk/global risk for all firms and each type of firm.

The first is that EM firm risk follows a similar dynamic path to that of the aggregated macro risks at the global and country group (EM) levels over time [left Panel], and the correlation coefficients are positive and high. This fact highlights the reliability of our measure. The second is that the strength of the correlation between EM firm risk and global risk significantly varies across different firm types— *i.e., it is powerful for high-credit risk firms and weak for low-credit risk firms*. This observation provides further supporting evidence about EM firm heterogeneity in the sensitivity of firm credit risk to global factors.

Panel regressions with multi-level data

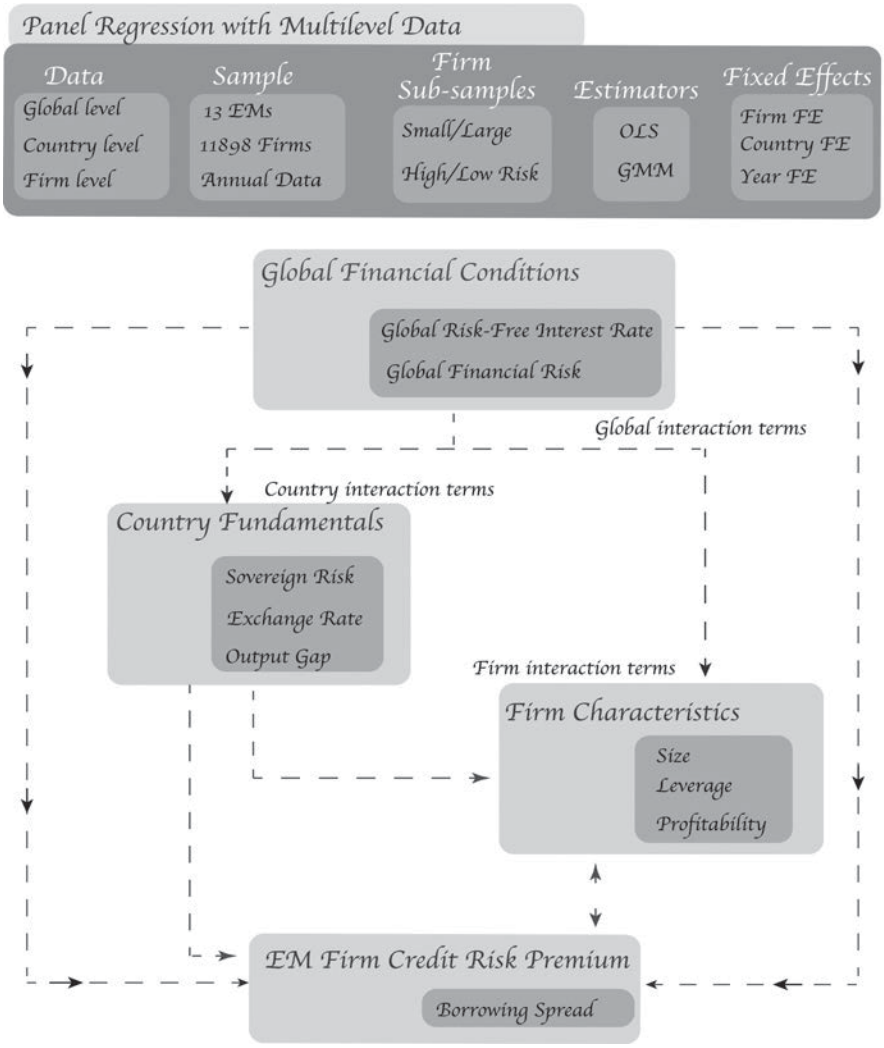
After constructing EM firm-level borrowing spread data and documenting *striking facts about* our spread measure— *(i) a significant variation in its cross-sectional dimension; and (ii) its tight link with global risk (see Figures 1&2)*, we include it in our baseline model to analyze its sensitivity to GFC (see Figure 3 for the schematic illustration of our panel regression analysis with multi-level data). The benchmark specification is as follows:

$$\boldsymbol{BS}_{i,j,t}^{\boldsymbol{EM}} = \alpha_0 + \left(\alpha_{p,1} + \alpha_{p,2} * \boldsymbol{firmsize}_{i,j,t}^{\boldsymbol{EM}}\right) * \sum_{p=1}^{2} \boldsymbol{X}_{p,t}^{\boldsymbol{Global}} + \left(\alpha_3 + \alpha_4 * \boldsymbol{firmsize}_{i,j,t}^{\boldsymbol{EM}}\right) * \boldsymbol{BS}_{i,j,t-1}^{\boldsymbol{EM}} + \varepsilon_{i,j,t} \quad (2)$$

where the dependent variable, $\boldsymbol{BS}_{i,j,t}^{\boldsymbol{EMfirm}}$, is the borrowing spreads of an EM firm "*i*" from an EM country "*j*" at year "*t*"; $\boldsymbol{X}_{p\,t}^{\boldsymbol{Global}}$ is a vector of global variables influencing the borrowing spreads, with p representing each of two global financial variables: *(1) global interest rate* and *(2) global financial risk*; $\boldsymbol{firmsize}_{i,j,t}^{\boldsymbol{EM}}$ denotes a measure of firm size; and $\varepsilon_{j,i,t}$ is the error term. Specifically, this is an annual panel regression specification with an interaction variable— *that is*, firm-level borrowing spreads are regressed on global factors, the first lag of the borrowing spreads[6], and a measure of firm size, which acts as an interaction variable (see Figure 3). We employ firm size as an interaction variable for two reasons. First, firm size is an important source of heterogeneity in firm dynamics such as in

[6] The first lag of the borrowing spreads captures the persistence of the spread. It introduces a dynamic structure to the model, but, at the same time, it brings a serious problem, i.e., the endogeneity bias. To addresses the potential endogeneity due to the presence of the lagged dependent variable, we also use dynamic panel estimators such as the system GMM and the difference-GMM along with the standard panel FE estimator. These results are available upon request.

Figure 3: Schematic illustration of our empirical analysis



leverage, financial fragility, financial constraints, and capital market access. Second, our summary statistics (Panel C of Table 1) direct us to employ firm size as the main source of heterogeneity in our sample. As a result, our baseline model includes global drivers of the borrowing spreads and a single interaction variable.

Our key coefficients of interest are $\alpha_{p,1}$ and $\alpha_{p,2}$. The former coefficient measures the direct effects of global factors on EM firm-level borrowing spreads, while

the latter coefficient measures the effects of such factors on the spreads, conditional on firm size. Given the fact that a sharp decline in EM firm-level borrowing spreads goes hand in hand with a general decline in global interest rate (see, Figure 1), we expect $\boldsymbol{\alpha_{1,1} > 0}$ for the first global driver of the borrowing spreads— *global interest rate (proxied by U.S. shadow rate)*. A similar historical pattern exists in the interaction between the borrowing spreads and its second global driver— *global financial risk (proxied by the VIX)*. That is, *the periods of higher (lower) global risk are typically associated with higher (lower) EM firm risk*. Thus, we expect $\boldsymbol{\alpha_{2,1} > 0}$. On the other hand, in line with the related empirical literature (Alter & Elekdag, 2020; Herwadkar, 2017; among others) we expect the interaction term coefficients of global factors $\boldsymbol{\alpha_{1,2}\ and\ \alpha_{2,2} < 0}$. This means that we expect smaller firms to be more sensitive to changes in global monetary policy and global financial risk than larger firms.

As noted earlier, the borrowing spreads of an EM firm "*i*" from an EM country "*j*" are also influenced by the firm characteristics and country fundamentals as well as global factors. To control for these effects, we incorporate firm-specific characteristics and country-specific macroeconomic factors into our baseline model as follows:

$$\boldsymbol{BS}_{i,j,t}^{\boldsymbol{EM}} = \alpha_0 + \left(\alpha_{p,1} + \alpha_{p,2} * \boldsymbol{firmsize}_{i,j,t}^{\boldsymbol{EM}}\right) * \sum_{p=1}^{2} \boldsymbol{X}_{p,t}^{\boldsymbol{Global}} + \left(\alpha_3 + \alpha_4 * \boldsymbol{firmsize}_{i,j,t}^{\boldsymbol{EM}}\right) * \boldsymbol{BS}_{i,j,t-1}^{\boldsymbol{EM}} + \boldsymbol{Controls}^{\boldsymbol{EM\_Country,Firm}} + \varepsilon_{i,j,t} \quad (3)$$

where $\boldsymbol{Controls}^{\boldsymbol{EM\_Country,Firm}}$ is a vector of control variables consisting of two firm-specific control variables—*(a) leverage* and *(b) ROA* — and three country-specific macroeconomic control variables: *(a) domestic risk; (b) exchange rate*; and *(c) domestic output gap*.

One of the key facts emerging from our data is that *firms' credit risk* degree matters for the impact of global factors on the borrowing spreads, as well as firm size. However, our baseline model does not allow for the impact of such factors to vary, depending on the firm's credit risk. To explain the different patterns across firms in sensitivity of borrowing spreads to global drivers, depending on both firm size and firm risk, we analyze the joint role of firm size and firm credit risk. For this reason, we first classify EM firms into two groups employing a dummy variable— $D_{\boldsymbol{small}}^{\boldsymbol{large}}$ takes the value of 1 if a firm is in the small (large) size group and 0, otherwise. Firms with above median market capitalization are labeled as large firms, whereas firms with below market capitalization are labeled as small firms (see footnote 6 for the process of classification).

We then incorporate *a triple interaction term* by interacting this size dummy with the global factors and the firm-level borrowing spreads from the previous year. This triple interaction term reflects the role of the previous year's firm credit risk in driving the effects of global factors on the borrowing spreads by controlling firm size (through a size dummy). Overall, our final specification with triple interaction terms and a size dummy is as follows:

$$\boldsymbol{BS}_{i,j,t}^{\boldsymbol{EM}} = \alpha_0 + (\alpha_{p,1} + \alpha_{p,2} * \boldsymbol{firmsize}_{i,j,t}^{\boldsymbol{EM}}) * \sum_{p=1}^{2} \boldsymbol{X}_{p,t}^{\boldsymbol{Global}} + (\alpha_3 + \alpha_4 * \boldsymbol{firmsize}_{i,j,t}^{\boldsymbol{EM}}) * \boldsymbol{BS}_{i,j,t-1}^{\boldsymbol{EM}} + \boldsymbol{Controls}^{\boldsymbol{E^{M_{Country,Firm}}}} + \alpha_{p,5} \sum_{p=1}^{2} \boldsymbol{X}_{p,t}^{\boldsymbol{Global}} * D_{\boldsymbol{small}}^{\boldsymbol{large}} * \boldsymbol{BS}_{i,j,t-1}^{\boldsymbol{EM}} + \boldsymbol{globalinteraction} * D_{\boldsymbol{small}}^{\boldsymbol{large}} + \varepsilon_{i,j,t} \quad (4)$$

where $D_{\boldsymbol{small}}^{\boldsymbol{large}}$ is a firm size dummy that takes the value of 1 if an EM firm is in the small (large) size group and 0, otherwise. Global interaction denotes an interaction term that is a product of global rate and global risk. Our key coefficient of interest in this final specification (Equation 4) is $\boldsymbol{\alpha_{p,5}}$ which measures how the sensitivity of the borrowing spread to global factors depends on the previous year's firm credit risk by controlling firm size. In other words, this coefficient captures whether this dependency of the sensitivity of borrowing spreads changes from smaller firms to larger firms. Thus, it addresses the joint role of firm size and the previous year's firm credit risk.

We estimate equations (2) – (4) by using a basic panel estimator — *i.e., fixed effects (FE) estimator*— and dynamic GMM estimators — *namely, the difference GMM* by Arellano & Bond (1991) and *the system GMM* by Blundell & Bond (1998). Our estimation strategy is consistent with (i) the suggestion of Bond (2002) and (ii) the structure of our panel data[7] (long N and short T). Our strategy, thus, addresses potential problems such as endogeneity, omitted variable bias, and reverse causality. In addition, we consider alternative specifications throughout our panel analysis by incorporating the year and country-year fixed effect dummies. By using these dummies, we control for other global and country-specific factors that may affect the firm-level borrowing spreads. The FE estimates are presented in the following section. In contrast, the technical details on GMM estimation, corresponding diff-GMM, and two-step GMM estimates are not reported here but are available upon request.

[7] We check the stationarity of our variables by using the conventional panel unit root tests that uses ADF (Augmented-Dickey Fuller) test including Im, Pesaran, and Shin (2003) and Fisher-type tests, which allow for unbalanced panel. These tests confirm the stationarity of the variables. The results are not reported here but available upon request.

5. Empirical Results

In this section we first look at the effects of global factors on EM firm-level borrowing spreads for all firms in our sample (Table 2). We then make sub-sample analysis by splitting EM firms initially into two categories through firm size (Table 3)—a) small firms b) large firms— and then into four categories through firm size and firm credit risk (Table 4)— (a) small firms with high credit risk; (b) small firms with low credit risk; (c) large firms with high credit risk; (d) large firms with low credit risks— and report the results for these different types of firms.

Analysis for all firms: FE estimates

Table 2 reveals that two global factors have *statistically and economically* significant effects on the borrowing spreads. This key finding holds for all models: Baseline [First Column], baseline with country/firm controls [Second Column], baseline with country/firm controls and size (small) and risk [Third Column]. Baseline Column of Table 2 displays the results based on our benchmark model with three alternative specifications. We find a positive and highly significant estimate for the first global driver's coefficient (5.795), i.e., the global rate [Specification I of the Baseline Column]. This finding implies that an EM firm's credit risk premium heightens if the global monetary policy tightens. Specifically, it suggests that a 100-basis point (bp.) increase in the global rate (tighter global monetary conditions) raises the borrowing spreads by 5.8 bp. This corresponds to a 2.1% increase in the spreads when compared with the median spreads (276 bp.). This finding is consistent with the following two recent studies. Aysun et al. (2018) also find that an increase in the U.S. shadow rate widens the borrowing spreads of several types of U.S. firms after 2009, especially US firms with a low-quality rating that pay a high-risk premium. Similarly, Bräuning & Ivashina (2020) document that a rise in the U.S. federal funds rate significantly increases the interest rate spread paid by EM firms. On the other hand, our result is also in line with the corporate leverage literature focusing on the global effects on EM corporate leverage— *that is, this literature shows the leverage (or foreign currency borrowings) of EM firms exhibits a high sensitivity to GFC (see, for example*, Alter & Elekdag, 2020; Banti & Bose, 2021; Herwadkar, 2017).

Table 2: The Impact of Global Factors on the Borrowing Spreads (All EM firms): FE estimates

	Baseline			Country/Firm Controls			Size (small) and Risk		
Global Drivers	I	II	III	I	II	III	I	II	III
Global rate	5.795**			8.200***			9.965***		
	(2.680)			(2.629)			(3.814)		
Global risk	36.264***			19.249***			15.819***		
	(5.132)			(5.515)			(5.300)		
Global rate X firm size	-0.345**	0.090	-0.163***	-0.447***	-0.046	-0.065**	-0.523***	0.067	-0.093***
	(0.139)	(0.088)	(0.036)	(0.135)	(0.086)	(0.234)	(0.185)	(0.089)	(0.028)
Global risk X firm size	-1.944***	-1.371***	-0.090	-0.874***	-0.474*	0.068	-0.628**	-0.566***	-0.056
	(0.294)	(0.267)	(0.176)	(0.308)	(0.266)	(0.160)	(0.291)	(0.277)	(0.160)
Fundamentals									
Firm —									
Spread (-1)	-7.574***	-7.568***	-7.619***	-3.476***	-3.467***	-7.718***	-1.661***	-1.654***	-6.931***
	(0.080)	(0.080)	(0.080)	(0.140)	(0.140)	(0.080)	(0.160)	(0.159)	(0.087)
Spread(-1) X firm size	0.436***	0.436***	0.438***	0.238***	0.238***	0.443***	0.151***	0.150***	0.405***
	(0.004)	(0.004)	(0.004)	(0.007)	(0.006)	(0.004)	(0.008)	(0.007)	(0.004)
Leverage (-1)				0.000	0.000	0.000	0.000	0.000	0.000
				(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
ROA (-1)				0.394***	0.376***	0.120	0.419***	0.412***	0.146*
				(0.081)	(0.081)	(0.082)	(0.079)	(0.080)	(0.081)
Country —									
Exchange rate (-1)				0.223***	0.205***		0.207***	0.190***	
				(0.055)	(0.069)		(0.056)	(0.069)	
Country risk (-1)				0.154	0.734		0.199	0.997	
				(0.925)	(1.011)		(0.852)	(0.920)	
Output Gap (-1)				-0.730**	-0.979**		-0.704**	-1.150***	
				(0.341)	(0.408)		(0.323)	(0.401)	
Triple Interaction Terms									
Global rate X Ds X spread(-1)							0.067***	0.067***	-0.100***
							(0.006)	(0.006)	(0.006)
Global risk X Ds X spread(-1)							-0.329***	-0.328***	-0.165***
							(0.012)	(0.012)	(0.008)
Global rate X Global Risk X Ds							-0.482*	-0.232	0.389*
							(0.274)	(0.215)	(0.204)
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	NO	YES	NO	NO	YES	NO	NO	YES	NO
Country-Year FE	NO	NO	YES	NO	NO	YES	NO	NO	YES
R2	0.78	0.78	0.78	0.85	0.85	0.85	0.85	0.86	0.86
Observations	61047	61047	61047	46941	46941	46941	46941	46941	46941

Notes: *, **, *** represents significance at 10%, 5%, 1% respectively. Panel corrected standard errors (PCSE) are reported in parentheses. Estimated specifications are as follows:

Column 1 $BS^{EM}_{i,j,t} = \alpha_0 + (\alpha_{p,1} + \alpha_{p,2} * firmsize^{EM}_{i,j,t}) * \sum_{p=1}^{2} X^{Global}_{p,t} + (\alpha_3 + \alpha_4 * firmsize^{EM}_{i,j,t}) * BS^{EM}_{i,j,t-1} + \varepsilon_{i,j,t}$

Column 2 $BS^{EM}_{i,j,t} = \alpha_0 + (\alpha_{p,1} + \alpha_{p,2} * firmsize^{EM}_{i,j,t}) * \sum_{p=1}^{2} X^{Global}_{p,t} + (\alpha_3 + \alpha_4 * firmsize^{EM}_{i,j,t}) * BS^{EM}_{i,j,t-1} + Controls^{EM\_Country,Firm} + \varepsilon_{i,j,t}$

Column 3/4 $BS^{EM}_{i,j,t} = \alpha_0 + (\alpha_{p,1} + \alpha_{p,2} * firmsize^{EM}_{i,j,t}) * \sum_{p=1}^{2} X^{Global}_{p,t} + (\alpha_3 + \alpha_4 * firmsize^{EM}_{i,j,t}) * BS^{EM}_{i,j,t-1}$

$+ Controls^{EM_{Country},Firm} + \alpha_{p,5} \sum_{p=1}^{2} X^{Global}_{p,t} * D^{large}_{small} * BS^{EM}_{i,j,t-1} + global\ interaction * D^{s} + \varepsilon_{i,j,t}$

Country controls are country risk, domestic output gap and exchange rate. Firm controls are leverage and ROA. Global interaction represents Global rate X Global Risk. D^s is the firm size dummy that takes the value of 1 if an EM firm is in the small size group and 0, otherwise.

Turning to the second global driver, we also obtain a positive and highly statistically significant coefficient for global risk (the VIX). Specifically, our global risk estimate is 36.264 (Baseline Column). This result indicates that EM firms experience an increase in the spread once global financial risk heightens. Notably, a 100% increase in the VIX causes a 36 bp. increase in the borrowing spreads of EM firms. This corresponds to a 13% rise in the spreads when compared with the median spreads (for similar findings about the sensitivity of EM firms to global risk, see Alter & Elekdag, 2020; Banti & Bose, 2021). In sum, our results indicate that the borrowing spreads of EM firms exhibit *a significant sensitivity* to global financial factors, which is one of our primary findings. This key finding is also consistent with the stylized fact that indicates *a tight link between the borrowing spreads of EM firms and global factors (see, Figure 1).*

A high sensitivity of EM firm risk premium to GFC can be explained by the rapid financial globalization (see Caprio (2012) for the impacts of the financial globalization). With the financial globalization process, EM firms, on the one side, can borrow directly from global financial markets in foreign currency (i.e., U.S. dollar) by issuing bonds or through direct foreign bank loans, with a lower funding cost (IMF, 2015). On the other side, they can access funds in their local markets and can borrow excessively from domestic banks, especially after the global financial crisis. Financial globalization also allows EM local banks to borrow from international banks to extend their credit to non-financial corporations (Bräuning & Ivashina, 2020). It consequently leads EM firms (financial and non-financial) to have highly dollarized balance sheets. This dollarized balance sheet (i.e., the liability dollarization) makes the credit risk of EM firms more susceptible to GFC and exchange rate depreciations.

Our FE estimates also highlight the critical role of firm size in the sensitivity of the borrowing spreads to global factors. The estimated coefficients of the interaction terms have expected sign (i.e., negative) and are highly statistically significant, implying that the firm size matters when explaining the impact of global factors on the firm-level borrowing spreads. These estimates indicate that smaller EM firms experience *a more significant widening* in their borrowing spreads than larger EM firms, once GFC tighten. They also imply that larger firms are well-equipped to lessen the impact of global factors. Alter & Elekdag (2020) document strong evidence that is in the same direction as ours— *i.e.*, the leverage growth of small EM firms is more sensitive to GFC than do large EM firms.

In specifications II and III of our baseline model (also as of other models), in addition to firm fixed effects, we include year-fixed effects dummies and country-year fixed effects dummies, respectively, to show the robustness of our results to

these alternative specifications. The year fixed effects control for all other global shocks— *such as global demand shocks*, *global commodity price shocks, and global uncertainty shocks*— that may influence the borrowing spreads of EM firms, while the country-year fixed effects control for any country-specific macroeconomic shock that may affect the firm-level spread. We drop two global variables representing GFC in these two specifications as they are entirely absorbed by the year fixed-effect and the country-year fixed-effect dummies, respectively.

The FE estimates reveal some evidence that our results are robust to the presence of year and country-year fixed effects. According to our FE estimates, in the presence of year and country-year FE, the signs of interaction term coefficients remain mostly the same. However, their significance varies across the specifications. Accordingly, after controlling for year and country-year fixed effects, our results *also* highlight *the role of the firm size* in the sensitivity of EM firm borrowing spread to global factors.

In country/firm controls Column, we incorporate firm (specifications 1-3) and country controls (specifications 1-2). With the inclusion of control variables, the global effects on the borrowing spreads are still statistically significant and have the expected sign (i.e., positive) [Specification I of Country/Firm Controls Column]. The role of global rate, on the other hand, strengthens while the role of global risk weakens compared with the baseline model. The significance and the sign of the interaction term coefficients also remain consistent with the baseline model, suggesting that the effects of global factors are more potent for smaller firms. Moreover, all control variables— *irrespective of which specification (I-II) in the Country/Firm Controls Column is considered*— are statistically significant (except for leverage and country risk) and have expected signs. For instance, the exchange rate is a significant driver of the firm-level borrowing spreads, which is consistent with the risk-taking channel of the exchange rate. Specifically, an exchange rate depreciation, i.e., depreciation of an EM currency against the US dollar, widens the borrowing spreads significantly. In other words, currency depreciation raises the credit risk premium of the EM firms. This key finding is in line with the studies looking at the risk-taking (or financial) channel of the exchange rate at the country (aggregate) level, which suggest that local currency depreciation tightens domestic financial conditions by widening the country spreads (see, for example, Bernoth and Herwartz, 2021; Hofmann et al., 2020, 2016). This finding is also consistent with the firm-level studies, documenting that currency depreciation significantly influences EM firm dynamics such as leverage, investment, and credit through the financial channel (see, for example, Avdjiev et al., 2019; Banerjee et al., 2022; Banerjee and Mohanty, 2021; Kalemli-Ozcan et al., 2021). Turning to the country risk, our FE estimates show that a jump in the domestic

risk also increases the firm-level borrowing spreads, but the impact is not statistically significant[8]. In contrast, an expansion in domestic output— *according to the first and second specifications* (Country/Firm Controls Column)— induces a statistically significant decline in the spread, indicating that the borrowing spreads of EM firms exhibit a *countercyclical characteristic*[9] (*the GMM estimates [available upon request] also reveal a similar countercyclical pattern*). On the firm side of our controls, firms' profitability is positively related to the borrowing spreads. However, as in Aysun et al. (2018), we do not find any statistically significant relationship between leverage and borrowing spreads. Finally, in specifications II and III of the Country/Firm Controls Column, we observe a similar pattern to the Baseline Column about the robustness of our results to the presence of the year and country-year fixed effects: *i.e., the interaction term coefficients are still expected signs (i.e., negative) and statistically significant, stressing the role of firm size.*

Size (small) and Risk Column displays the results based on our final model that includes both double and triple interaction terms. By introducing a triple interaction term, we assess the role of firm credit risk in driving the effects of global factors on borrowing spreads by controlling firm size through a size dummy. Firm characteristics — both size and credit risk— seem to play a significant role in shaping the impact of global factors on the borrowing spreads of EM firms. The size (small) and Risk Column indicates that the coefficients of global rate and global risk are significant and have expected signs (positive). On the other hand, the double interactions have coefficients similar to those of the Baseline Column in terms of sign and significance. Turning to triple interaction terms, the estimated coefficients of the triple interaction terms stress that firm credit risk also matters for the impact of global factors on the borrowing spreads, irrespective of which specification of Size (small) and Risk Column is considered. In other words, we find that *the sensitivity of the borrowing spreads to global factors relies significantly on firm credit risk (the GMM estimates [available upon request] also document a similar result).* Specifically, considering a small firm dummy, in Size (small) and Risk Column, we obtain a positive (negative) and statistically significant interaction term coefficient for global rate (global risk) [0.067 (- 0.329)]. This result reveals that EM firms that used more expensive debts exhibit more vulnerability to global rates, while such firms display less sensitivity to global risk. In general, these findings are consistent with the stylized fact based on the lower

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[8] Our GMM analyses (results are available upon request), however, provide statistically significant coefficient estimates for the country risk. Accordingly, an increase in the country risk premium induces a statistically significant increase in the firm-level borrowing spreads, i.e., the credit risk of EM firms.

[9] In a recent work, Aysun et al. (2018) found that the borrowing spreads of US firms also exhibit a countercyclical pattern. Our finding is in line with theirs.

left panel of Figure 1— *that is, the correlation between the borrowing spreads and global risk substantially varies across firm types. Financial constraints, proxied by firm size and credit risk premium, drive this variation.*

Another key finding is the dominance of global factors over country- and firm-specific factors. Specifically, our FE estimates (Table 2) show that global risk factors dominate country risk factors. The corporate finance literature also highlights the relative strength of international factors in driving the corporate leverage of EM firms, especially after the GFC (see, for instance, Alter & Elekdag, 2020; Herwadkar, 2017; IMF, 2015; and among others).

It is important to emphasize that a significant portion of our EM firms (41%) come from China (Mainland). This may raise concerns about potential bias towards the financial dynamics specific to China. To address this potential concern, we exclude Chinese firms from our sample and re-estimate all specifications in Table 2. The results clearly indicate that our findings are applicable to other emerging markets. These results are not reported here to save space but are available upon request.

Sub-sample analysis: FE estimates

Firm size: small firms vs large firms

Our benchmark results highlight the key role of the firm size. We conduct a subsample analysis to further inspect the underlying forces behind the baseline results by dividing the EM firms into two groups according to the size (based on the baseline results): small firms and large firms. We consider the following specification with an interaction variable in which the previous year's firm credit risk (i.e., the past value of the spread) is modeled as an interaction variable:

$$\boldsymbol{BS}_{i,j,t}^{\boldsymbol{EM}} = \alpha_0 + (\alpha_{p,1} + \alpha_{p,2} * \boldsymbol{BS}_{i,j,t-1}^{\boldsymbol{EM}}) * \sum_{p=1}^{2} \boldsymbol{X}_{p,t}^{\boldsymbol{Global}} + \alpha_3 * \boldsymbol{BS}_{i,j,t-1}^{\boldsymbol{EM}} + \boldsymbol{Controls}^{\boldsymbol{EM}_{Country},\boldsymbol{Firm}} + \boldsymbol{globalinteraction} + \varepsilon_{i,j,t} \quad (5)$$

Our key coefficients of interest are $\boldsymbol{\alpha_{p,1}}$ and $\boldsymbol{\alpha_{p,2}}$. The former measures the direct impact of global factors on the borrowing spreads for two types of EM firms. We expect this coefficient to be larger for smaller firms because, by definition, these firms are financially constrained. The latter captures the impact of global factors on the spreads conditional on the firm credit risk profile. The sign of this coefficient, $\boldsymbol{\alpha_{p,2}}$, is expected to be positive: — i.e., we expect riskier firms (i.e., firms

with higher spread) to be more sensitive to global factors than safer firms (i.e., firms with lower spread). In sum, the interaction coefficient measures the role of firm credit risk in the sensitivity of the borrowing spread.

Country-specific fundamentals, especially the country risk, can strengthen (or weaken) the role of the firm credit risk. The sensitivity of the borrowing spreads to global factors depends not only on firms' financial strength (i.e., idiosyncratic risk), but also on the country's strength (i.e., country risk). We thus replace the double interaction variable with a triple interaction term, enabling the interplay among the firm credit risk premium, the country risk premium, and the GFC. Our final specification with a triple interaction term is as follows:

$$\boldsymbol{BS}_{i,j,t}^{\boldsymbol{EM}} = \alpha_0 + (\alpha_{p,1} + \alpha_{p,2} * \boldsymbol{BS}_{i,j,t-1}^{\boldsymbol{EM}} * \boldsymbol{Drisk}_{j,t-1}^{\boldsymbol{EM}}) * \sum_{p=1}^{2} \boldsymbol{X}_{p,t}^{\boldsymbol{Global}} + \alpha_3 * \boldsymbol{BS}_{i,j,t-1}^{\boldsymbol{EM}} + \boldsymbol{Controls}^{\boldsymbol{EM}_{Country},\boldsymbol{Firm}} + \boldsymbol{globalinteraction} + \varepsilon_{i,j,t} \quad (6)$$

where $\boldsymbol{Drisk}_{j,t-1}^{\boldsymbol{EM}}$ denotes the country-specific risk premium (proxied by the country-level EMBI global spread). The key coefficient in this specification is $\boldsymbol{\alpha_{p,2}}$. It measures the joint role of firm credit risk and country risk in the sensitivity of the borrowing spreads to global factors. We expect this coefficient to be positive for both types of EM firms: riskier small (or large) firms in a riskier EM country are expected to exhibit more sensitivity to global factors compared to their counterparts. This coefficient allows us to examine whether the role of firm credit risk depends on the riskiness of the origin country.

Table 3 presents the results for two types of EM firms based on two different specifications: small EM firms and large EM firms. Note that this table highlights the importance of the previous year's firm credit risk in the sensitivity of the spread to global factors, irrespective of which specification is adopted. Column 1 reports the results based on the first specification for small and large firms (Equation 5). This column shows that, after the sample separation, the direct impact of global factors appears to be not statistically significant for both types of firms[10], except for the coefficient of global risk in large firms. However, the coefficients of their interaction with firm credit risk are highly statistically significant, highlighting the importance of a firm credit risk profile. Specifically, we obtain positive interaction term coefficients for small EM firms (0.043 and 0.264). These estimates indicate that financially more constrained firms are more influenced by global

[10] The system-GMM (results are available upon request), however, yields statistically significant estimates of these coefficients for both types of EM firms. These estimates suggest that global factors significantly influence the borrowing spreads of small and large firms.

factors. The interaction term coefficients are also highly statistically significant in large EM firms but, interestingly, have reverse signs (-0.120 and - 2.025). These interaction term coefficients suggest that large EM firms that pay a higher risk premium exhibit less vulnerability to changes in global factors. This asymmetry between small and large firms can be explained by the differences across firms, especially regarding access to credit (see Table 1). All in all, this column documents *a clear role of firm credit risk profile* in driving the sensitivity of the borrowing spread to global financial factors (The GMM estimates [available upon request] also highlight the importance of firm credit risk).

Table 3: The Impact of Global Factors on the Borrowing Spreads (Small vs. Large Firms): FE estimates

	Small Firms		Large Firms	
	I	II	I	II
Global rate	2.520 (2.272)	4.542** (2.281)	2.583 (5.820)	4.265 (6.276)
Global risk	0.818 (1.801)	3.057* (1.766)	16.473*** (3.150)	1.015 (3.359)
Global rate X Spread (-1)	0.043*** (0.002)		-0.120*** (0.003)	
Global risk X Spread (-1)	0.264*** (0.034)		-2.025*** (0.028)	
Global rate X Spread(-1) X Country Risk(-1)		0.016*** (0.001)		-0.065*** (0.001)
Global risk X Spread(-1) X Country Risk(-1)		0.035*** (0.003)		0.027*** (0.003)
Spread (-1)	-0.703*** (0.094)	-0.104*** (0.017)	6.790*** (0.079)	1.205*** (0.018)
Firm FE	YES		YES	
Country Controls	YES		YES	
Firm Controls	YES		YES	
Global Interaction	YES		YES	
R2	0.17		0.90	
Observations	19845		29883	

Notes: *, **, *** represents significance at 10%, 5%, 1% respectively. Corrected standard errors are reported in parentheses. Estimated specifications are as follows:

Specification I:

$$BS_{i,j,t}^{EM} = \alpha_0 + (\alpha_{p,1} + \alpha_{p,2} * BS_{i,j,t-1}^{EM}) * \sum_{p=1}^{2} X_{p,t}^{Global} + \alpha_3 * BS_{i,j,t-1}^{EM} + Controls^{EM_{Country \cdot Firm}} + globalinteraction + \varepsilon_{i,j,t}$$

Specification II:

$$BS_{i,j,t}^{EM} = \alpha_0 + (\alpha_{p,1} + \alpha_{p,2} * BS_{i,j,t-1}^{EM} * Crisk_{j,t-1}^{EM}) * \sum_{p=1}^{2} X_{p,t}^{Global} + \alpha_3 * BS_{i,j,t-1}^{EM} + Controls^{EM_{Country \cdot Firm}} + globalinteraction + \varepsilon_{i,j,t}$$

Country controls are country risk, domestic output gap, and exchange rate. Firm controls are leverage and ROA. Global interaction represents Global rate X Global Risk.

Column 2 presents the results based on the second specification (Equation 6) for small and large firms. In this specification, the coefficients that measure the direct impact of global factors, $\alpha_{1,1}$ and $\alpha_{2,1}$, have expected signs (positive) for both small and large firms. When Column 2 is compared with Column 4, it can be observed that small firms have bigger coefficients for global rate and global risk (4.542 and 3.057) than large firms (4.265 and 1.015), respectively. Furthermore, these estimates are statistically significant only for small firms. This finding supports our hypothesis (the GMM estimates [available upon request] also provide some evidence supporting this hypothesis)— *i.e., small firms exhibit greater sensitivity to GFC, as compared to their counterparts.*

Turning to the triple interaction terms, we obtain positive and statistically significant coefficients for small firms (0.016 and 0.035). These estimates suggest that financially more constrained EM firms — smaller EM firms with higher credit risk — from a risky EM country exhibit especially greater vulnerability to GFC than their counterparts. In other words, the country risk profile, *in addition to the firm credit risk profile, has an amplifying role*[11], i.e. the differential impact is greater in firms from riskier EM countries than firms from EM countries with lower sovereign risk (the GMM estimates [available upon request] present similar results). A similar picture is also observed for large firms when one specific global factor (i.e., global risk) is considered[12]. These findings are consistent with the recent studies of (Kalemli-Ozcan et al., 2021; Li et al., 2020). These studies also report strong empirical evidence for the importance of the country-specific risk factors, such as the foreign currency debt and public debt to GDP ratio, in the sensitivity of EM corporate investment to global shocks and exchange rate depreciations.

[11] The system-GMM also provides strong evidence about the role of the country-specific risk factors in the sensitivity of the firm-level borrowing spreads to GFC (results are available upon request).

[12] The coefficient of the triple interaction term is negative for large firms once global risk-free rate is considered.

Firm size and firm credit risk: small firms with high/low credit risk and large firms with high/low credit risk

Motivated by the abovementioned key finding about the pivotal role of firm risk profile, we dig deeper and first divide our firms into four groups by considering firm credit risk as well as firm size. We then estimate the following specification separately for each group:

$$\boldsymbol{BS}_{i,j,t}^{\boldsymbol{EM}} = \alpha_0 + a_{p,1} * \sum_{p=1}^{2} \boldsymbol{X}_{p,t}^{\boldsymbol{Global}} + a_2 * \boldsymbol{BS}_{i,j,t-1}^{\boldsymbol{EM}} + \boldsymbol{Controls}^{\boldsymbol{E^{M_{Country,Firm}}}} + \boldsymbol{globalinteraction} + \varepsilon_{i,j,t} \quad (7)$$

Our primary interest in Eq. 7 is on the slope coefficients of $\alpha_{p,1}$. We expect positive signed coefficients for all four groups, with the largest value for small firms with high credit risk and the lowest value for large firms with low credit risk. Given the considerable differences in the firm characteristics and credit conditions across different types of EM firms, any different result would not be a surprise.

Table 4 reports the FE results for four types of EM firms[13]. This table indicates that the effects of global factors are statistically significant only for small EM firms. Columns 1 & 2 present that these effects, however, are asymmetric across small firms (the GMM estimates [available upon request] also provide further supporting findings). Specifically, the firm credit risk profile drives *this asymmetry.* All in all, our empirical analysis provides a complete picture of *the resilience of EM firms to global factors. Accordingly, the low credit risk profile and the size give a buffer against global factors.*

Robustness Checks

In this section, we first check the robustness of our results to alternative measures of global rate—including *(i) global shadow rate (G4 shadow rate [Krippner, 2015]); (ii) US long-term (10-year) Treasury Bond yield;* and *(iii) a weighted average of national interest rates on long-term (10-year) government bonds of industrialized countries*, and alternative measures of global risk—such as *(i) U.S. BAA corporate spread, (ii) global financial cycle, and (iii) U.S. high yield spread.* We then

[13] The system GMM estimates for four types of EM firms (results are available upon request) document a similar pattern: i.e., the sensitivity of the borrowing spreads to global factors varies across different firm types.

check the robustness of our key results to alternative panel estimators such as the pooled OLS, the

Table 4: The Impact of Global Factors on the Borrowing Spreads (Low-Risk vs. High-Risk Firms): FE estimates

	Small Firms		Large Firms	
	High Credit Risks	Low Credit Risks	High Credit Risks	Low Credit Risks
Global Drivers				
Global rate	6.074**	-3.993*	-1.787	8.119
	(2.798)	(2.254)	(6.598)	(11.556)
Global risk	6.153***	-7.969**	-1.265	3.721
	(1.988)	(3.156)	(1.626)	(6.338)
Spread (-1)	0.071***	-0.081	1.067***	0.271***
	(0.013)	(0.110)	(0.015)	(0.013)
Firm FE	YES	YES	YES	YES
Country Controls	YES	YES	YES	YES
Firm Controls	YES	YES	YES	YES
Global Interaction	YES	YES	YES	YES
R2	0.18	0.13	0.73	0.21
Observations	14918	4927	20620	9260

Notes: *, **, *** represents significance at 10%, 5%, 1% respectively. Corrected standard errors are reported in parentheses. The estimated specification is as follows:

$$BS_{i,j,t}^{EM} = \alpha_0 + a_{p,1} * \sum_{p=1}^{2} X_{p,t}^{Global} + a_2 * BS_{i,j,t-1}^{EM} + Controls^{EM,Coutnry,Firm} + globalinteraction + \varepsilon_{i,j,t}$$

Country controls are country risk, domestic output gap, and exchange rate. Firm controls are leverage and ROA. Global interaction represents Global rate X Global Risk.

FE, the difference GMM and the two-step system-GMM. Next, we check the sensitivity of our results by incorporating an additional global variable, namely *the global output gap*.

Our final robustness exercise considers a sharp change in global monetary policy after global financial crisis of 2008-09 and during COVİD-19. Specifically, in response to these two, central banks of advanced countries, led by the U.S. Federal Reserve Bank, initially lowered their policy rates to zero quickly and then began to implement UMPs using UMP instruments such as quantitative easing (QE) (Mulaahmetović, 2022; Yildirim & Ivrendi, 2021). However, recently, most of them started to a tightening policy to control inflation through reducing the size of their balance sheets, namely, quantitative tightening (QT) (Gal & Juhasz, 2025). Our benchmark measure of the global rate, the US shadow federal funds rate, takes UMPs into account. However, the relationship between the borrowing

spread and global rate can change as global monetary authorities use different instruments during UMP periods (see, for example, Aysun et al. (2018)). To assess whether the sensitivity of the spread varies across conventional and UMP episodes, we initially incorporate a UMP period dummy into our baseline specification, interact it with global factors, and re-estimate our baseline specification with a UMP dummy. We then use three UMP instruments as a proxy of global monetary policy stance (global rate)— including the Fed balance sheet/GDP, the Fed's balance sheet holdings of MBS, the Fed's balance sheet holding of the TS— instead of the US shadow rate (see, for example, Wang and Shen, 2023).

The number of checks shows that our findings are robust to these factors. The corresponding results are not reported here to save space but are available upon request.

6. Conclusion

Corporate sector borrowings concern both corporate finance and open-economy macroeconomics. Bridging the two, this paper explores the influence of GFC on EM firm-level borrowing spreads in a global economic landscape where dynamics are multifaceted. Using a sample of public non-financial firms from 13 EMs during the period between 2002 and 2019, we find that the global rate and the global risk significantly affect borrowing spreads, i.e., a tightening in the GFC leads to a widening in the spreads. Going deeper, we document that not all EM firms are affected by global factors to the same extent. Our findings suggest that strong country fundamentals and firm characteristics play a key role in strengthening the resilience of EM firms to GFC. The impact of global factors on corporate credit risk premium is significantly lower for large and low credit risk firms and firms from countries with low country risk.

Given this heterogeneity in the sensitivity to GFC, our results imply that the idea of one-size-fits-all policy instruments for financial stability will not be sufficient to create the necessary conditions for EM firms to be better protected from global shocks. What is needed is to tailor and target these tools to address different aspects of firms' financial constraints, as well as the overall stability of an EM economy and particularly effective exchange rate risk management. Our analysis shows that firm size and firm credit risk are particularly important factors in the transmission of global monetary policy and global financial risk to firms' borrowing costs. These results might have some critical implications for stability-oriented corporate risk management. For example, adopting growth as a goal and considering risks as much as costs when using debt seems promising for both

reducing financial constraints and tapping accommodative financial conditions when available.

At the time of this writing, news of company failures from EMs has begun to emerge, leading to a concern about a possible default cycle. A complementary future research agenda includes an analysis of default risk in EM economies.

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Appendix A: Data Appendix

Table A: Variable Definitions and Data Sources

Scope	Variable Name	Proxy Name (frequency: annual)	Description	Source
Global	Global Risk-Free Interest Rate	US shadow federal funds rate (primary measure)	Wu-Xia Shadow Federal Funds Rate (%)	https://www.atlantafed.org/cqer/research/wu-xia-shadow-federal-funds-rate
		Global shadow rate (secondary measure)	Global Shadow Rate (Kripnner, 2015) (%)	https://www.ljkmfa.com/visitors/
		US long-term risk-free rate (secondary measure)	US Treasury 10-year bond rate (%)	LSEG DataStream
		AE long-term risk-free rate (secondary measure)	AE (average) 10-year bond rate (%)	LSEG DataStream
		Fed balance sheet/GDP (unconventional policy instrument)	Fed balance sheet/GDP (%)	LSEG DataStream
		(i) Fed MBS holdings	Fed's security (MBS) holdings (Billion Dollars)	LSEG DataStream
		(ii) Fed Treasury holdings	Fed's security (TS) holdings (Billion Dollars)	LSEG DataStream
	Global Financial Risk	The CBOE Market Volatility Index (primary measure)	The CBOE Market Volatility Index [the VIX] (Unit)	LSEG DataStream
		US BAA Spread (secondary measure)	The difference between US BAA corporate bond and 20-year Treasury bond (%)	LSEG DataStream
		Global Financial Cycle (secondary measure)	Global factor in risky asset prices proposed by Miranda-Agrippino & Rey (2020) (standard deviation)	Miranda-Agrippino & Rey (2020)
		US High Yield Spread	BofA Merrill Lynch US high yield spread	LSEG DataStream
	Global Output	Global output gap	It is calculated by a Hodrick-Prescott filter (from global real GDP) (%)	LSEG DataStream
Country-Specific	Country Risk	Sovereign risk	Country-level JP Morgan Emerging Markets Bond Index Global (EMBIG) stripped spread	LSEG DataStream
	Domestic Output	Domestic output gap	It is calculated by a Hodrick-Prescott filter (from country-specific real GDP) (%)	LSEG DataStream
	Exchange Rate	Exchange Rate (domestic currency units per unit in US dollars)	Change in the US dollar bilateral exchange rate	LSEG DataStream

Firm-Specific	Spread	Corporate Borrowing Spread	The difference between Actual Interest Payments of firms, as a share of their total debt, at a given period and the level they would have paid if they borrowed at a low, risk-free interest rate.	Authors' calculations based on Aysun et al. (2018), using data from LSEG Eikon
	Leverage	Total Debt Percentage of Total Equity	Total Debt divided by the value of Total Shareholders' Equity - including Minority Interest & Hybrid Debt, multiplied by 100	LSEG Eikon
	Firm Size	Market Capitalization	The sum of market value for all relevant issue level share types. The issue-level market value is calculated by multiplying the requested shares type by the latest close price. This item supports Default, Free Float, and Outstanding share types.	LSEG Eikon
	ROA	Return on assets	Income After Taxes for the fiscal period divided by the Average Total Assets and expressed as a percentage. Average Total Assets is the average of Total Assets at the beginning and the end of the year.	LSEG Eikon

Table B: Firm Coverage by Country and by Sector

By Country			By Sector		
Country	Number of companies	Share	NAICS Sector Name	Number of companies	Share
China (Mainland)	4923	41.4%	Manufacturing	7304	61.4%
South Korea	2247	18.9%	Construction	750	6.3%
Taiwan	1630	13.7%	Professional, Scientific, and Technical Services	721	6.1%
Malaysia	826	6.9%	Information	701	5.9%
Thailand	751	6.3%	Wholesale Trade	482	4.1%
Poland	430	3.6%	Utilities	329	2.8%
Turkey	376	3.2%	Retail Trade	311	2.6%
Brazil	295	2.5%	Transportation and Warehousing	294	2.5%
Philippines	179	1.5%	Real Estate and Rental and Leasing	252	2.1%
Mexico	109	0.9%	Administrative and Support and Waste Management and Remediation Services	155	1.3%
Romania	77	0.6%	Mining, Quarrying, and Oil and Gas Extraction	153	1.3%
Colombia	42	0.4%	Accommodation and Food Services	116	1.0%
Hungary	13	0.1%	Agriculture, Forestry, Fishing and Hunting	114	1.0%
			Others	216	1.6%
Total	11898	100.0%	Total	11898	100.0%