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On Corporate Borrowing, Credit Spreads and Economic Activity in Emerging Economies: An Empirical Investigation*

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Abstract

We document a considerable increase in foreign financing by the corporate sector in emerging economies (EMEs) since the early 2000s, mainly in the form of bond issuance, and claim that it has opened up an important channel by which external financial factors can drive economic activity in these economies. Such claim is substantiated by a strong negative relationship between economic activity and an external financial indicator that we construct for several EMEs using micro-level data on spreads of bonds issued by EMEs' corporations in foreign capital markets. Three salient features characterize such a negative relationship. First, the financial indicator has considerable predictive power on future economic activity in these economies, even after controlling for other potential drivers of economic activity such as movements in sovereign risk and global financial risk, among others. Second, on average, an identified adverse shock to the financial indicator generates a large and protracted fall of real output growth in these economies, and between 11 to 20 percent of its forecast error variance is associated to this shock. Lastly, fluctuations in this indicator also respond strongly to shocks in global financial risk emanating from world capital markets, thereby implying that changes of our indicator also serve as a powerful propagating mechanism to changes in global investors' appetite for risk.

Keywords: Corporate bond issuance; spreads; economic activity; emerging economies
JEL Classification: E32, E37, F34, F37, G15

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1 Introduction

One of the most important macroeconomic developments in emerging market economies (EMEs) since the turn of the XXI century is the considerable increase in the reliance of foreign debt by their *corporate* sectors. This has made the stock of international debt issued by these economies nearly quadruple in about a little over a decade. As documented below, for a pool of 18 small EMEs, their outstanding stock of private international debt grew from about 600 billion USD in the early 2000s to 2.4 trillion USD by the end of 2014; and has created an intense debate about its macroeconomic implications and desirability. A benign view posits that for EMEs, often portrayed as credit constrained small open economies, access to international capital markets by the corporate sector is essential for sustaining long-run economic growth, as it can provide domestic entrepreneurs with needed funds to finance new investment projects that would otherwise not be available from local sources. However, the costly crises of the 90s and, more recently, the global financial crisis of 2008/2009, have taught us that greater access to capital markets entails also risks for EMEs; particularly stemming from abrupt changes in the amount and the cost of international capital available. This has placed at center stage, yet again, the role of external financial conditions as important drivers of economic activity in EMEs, although with a novel twist relative to previous episodes of surges in external debt that were mostly linked to sovereigns: the role of corporate external debt.

This paper aims at shedding new light on the role that external financial factors play when accounting for economic activity in emerging economies, through their effects on debt issued by their corporates in international capital markets. Our particular interest is to quantify the extent to which changes in the lending conditions faced by the *corporate* sector of EMEs in world capital markets are related to economic activity in these economies. For that purpose we build an external financial indicator for several EMEs using individual bond-level data on spreads from corporate bonds issued in foreign capital markets and traded in secondary markets. We then quantify how much information does this indicator contain in terms of future fluctuations in economic activity in these economies, how this activity responds to shocks in the indicator, and how such indicator serves also as propagating mechanism for shocks in global capital markets. Our focus is on bond issuance because, as we document for the pool of EMEs studied, it is this form of finance the one that corporates have preferred the most when increasing their reliance on international sources of funding.

We find strong evidence that the external financial indicator that we construct contains information on future economic activity in EMEs, after controlling for other sources of risk, and other domestic and external factors that may also drive aggregate fluctuations in these economies. Results from panel forecasting regressions indicate that, on average, an increase of 100 basis points in the external financial indicator is correlated with a decrease in real output growth of 0.23 percentage points in the following quarter, and up to 0.37 percentage points three quarters ahead. Furthermore, a shock to the external financial indicator, identified with structural vector autoregressive (SVAR) models, generates a large and protracted fall in economic activity. On average, a one standard deviation shock in the external financial indicator, equivalent to an increase of 150 basis points, leads to a fall in real output growth three quarters ahead of nearly half of a percentage point, relative to its historic mean, and long run mean growth is reached again only 3 years after the shock. Lastly, between 11 and 20 percent of the forecast error variance in real output growth is accounted by these shocks.

A key challenge of our approach is to properly disentangle corporate risk from sovereign risk in EMEs. We proxy the latter using JP Morgan's $EMBI$, and find that, in terms of the forecasting information content on economic activity, it does not come out as statistically significant, once we control for our measure of corporate risk, regardless of the forecasting horizon considered. It only does when we deliberately omit our indicator from the forecasting regressions. Furthermore, from the estimated SVAR models, we find that the variance share of real GDP growth associated to $EMBI$ shocks, when not controlling for shocks to corporate risk, is 19%, but it reduces by about a third of that, to 13%, when one controls for it. In contrast, the variance share associated to shocks to our indicator of corporate risk remains unchanged at 20 percent, even after we control by $EMBI$. Overall we view this evidence *not* as pointing that sovereign risk does not matter when accounting for business cycles in EMEs. Instead, we view it as signalling that researchers ought to take into account *both* corporate and sovereign risk when accounting for driving forces of aggregate fluctuations in EMEs, as there appears to be some market segmentation between the two debt instruments.

Another finding of interest is the preponderant role of global financial risk, for which we use two alternative proxies, the VIX and the US corporate BAA spread. Both turn out as statistically significant controls in our forecasting regressions of economic activity. Moreover, identified shocks to both proxies in the estimated SVAR models account for a sizeable share of the variance of real economic activity: between 20 and 36 percent. The role of shocks to global risk further increases when it comes to accounting for the variance of our measure of corporate risk. Notably, US BAA shocks account for 60 percent of the variability of our index of corporate risk, turning fluctuations in corporate risk a propagating mechanism of global financial risk into EMEs. We quantify such propagation force by establishing that the share of real GDP growth variance associated with US BAA shocks falls by a half, from 36 to 18 percent, when, the linkages from global risk to corporate risk are counterfactually turned off. $EMBI$, on the other hand, serves much less of a propagating mechanism for these shocks: the share of US BAA shocks falls only by about a fifth, to 31 percent.

This paper is related to and contributes to four different strands of literature. The stylized facts that we document in terms of the patterns in external financing by EMEs contribute to the work by Shin (2013), Turner (2014) and Powell (2014), among others, on how corporations from emerging economies have stepped up their financing in international capital markets. Our work complements this literature by providing a systematic analysis of the external financing patterns exhibited by several EMEs, particularly the large increase by non-financial corporations (NFCs) in international bond issuance.

Our work also relates to a long standing literature that studies the relevance of external financial factors for aggregate fluctuations in EMEs.[1] External financial factors in this literature are typically proxied by U.S. interest rates or spreads of EMEs' *sovereign* debt (see e.g., Canova, 2005 and Uribe and Yue, 2006),[2], finding that they explain a sizeable proportion of business cycles. Akinci (2013)

[1] At least since Diaz-Alejandro (1985) the literature has explored how international financial conditions affect EMEs. A strand of the literature focuses on the role of capital flows in driving economic conditions or the incidence of crises, either because of surges in inflows (see e.g., Calvo et al., 1993, Fernandez-Arias, 1996, Reinhart and Reinhart, 2009, and Caballero, 2016) or because sudden stops in inflows (see e.g., Calvo, 1998, and Calvo et al., 2008). Another strand of the literature studies the effects of international interest rates and global risk aversion on EMEs' business cycles (see references in main text). Our paper contributes to the latter literature.

[2] Several subsequent papers have followed the works of Canova and Uribe and Yue, including the papers by Mackowiak (2007), Agénor et al. (2008), and Österholm and Zettelmeyer (2008). Izquierdo et al. (2008) take a different modelling approach, estimating a Vector Error Correction Model (VECM). Recently, a new vintage of papers using a GVAR approach have studied the global spillovers from U.S. monetary policy, including Chudik and Fratzscher (2011), Chen et al. (2012), Feldkircher and Huber (2015), and Georgiadis (2015). Despite the use of different samples, identifying assumptions and estimation techniques, they all find that external factors explain a sizeable proportion of business cycles in EMEs, ranging from 20 to 60 percent of the variability of economic activity. Neumeyer and Perri (2005) is an early paper showing that sovereign spreads in EMEs behave in a countercyclical manner, which is what subsequent

further shows that the effect of international financial conditions on EMEs is also largely driven by risk aversion in global financial markets and propagated by its effect on sovereign spreads.[3] We contribute to this literature by paying particular attention to the role of *corporate* debt when quantifying the role of external financial factors.

The kind of empirical work we undertake when constructing an external financial indicator directly from bond spreads is mostly inspired by Gilchrist et.al. (2009) and Gilchrist and Zakrajsek (2012) on the effects of credit market shocks and economic fluctuations in the U.S. (subsequently extended to Western Europe by Gilchrist and Mojon, 2014). Our work expands their analysis to the case of EMEs, while simultaneously providing an analysis of the patterns of foreign finance in these economies.

The paper is also related to a new vintage of dynamic and stochastic equilibrium models aimed at accounting for business cycles in EMEs through financial shocks and the amplifying effects of financial frictions (Fernández and Gulan, 2015).[4] Our work contributes to this literature by providing empirical evidence of the hypotheses derived from these models regarding the links between corporate bond spreads and economic activity, while providing support that external financial factors are a key determinant of economic activity in EMEs through their effect on the corporate sector.

The rest of this work is divided into six sections, including this introduction. Section 2 presents the stylized facts on international corporate borrowing in these economies. Section 3 describes how we construct the external financial indicator and provides descriptive statistics on its business cycle dynamics. Section 4 presents our benchmark forecasting regression results with emphasis on the information content of the indicator and the macro dynamics following a shock to it. Section 5 presents various extensions and robustness checks. Concluding remarks are presented in Section 6. An online appendix gathers further technical material as well as more robustness analysis.

work shows.

[3]The effect of global risk aversion on EMEs' economic fluctuations have also been highlighted by Matsumoto (2011) and Swallow and and Céspedes (2013); although, these papers are silent on its effect on country spreads. On the effects of global factors on EMEs' sovereign spreads, Arora and Cerisola (2001), González-Rozada and Levy-Yeyati (2008), and Ciarlone et al. (2009) show that EMEs' sovereign spreads depend negatively on global financial conditions, such as U.S. interest rates, U.S. high-yield corporate spreads, and the volatility of U.S. stock prices, respectively.

[4]This research agenda was started by the contributions of Céspedes et.al (2004), Neumeyer and Perri (2005), and Uribe and Yue (2006). Subsequent works are Gertler et.al (2007), García-Cicco et.al. (2010), Fernández- Villaverde et.al. (2011), Chang and Fernández (2013), Fernández, et.al (2015). In a recent theoretical contribution, Chang et.al. (2017) study the business cycle effects of the endogenous choice of finance modes for emerging economies.

2 External Corporate Borrowing in EMEs: Stylized Facts

This section documents the key stylized facts surrounding the access to international capital markets by the corporate sector of EMEs since the turn of the century.

2.1 Sample of Countries and Data

When selecting the pool of EMEs studied we use two filters. First, we select all economies that have been included in the most recent peer-reviewed studies of EMEs' business cycles, or that have been classified as emerging economies by multilateral organizations or rating agencies.[5] Second, we discard those countries that have had a history of high pervasive capital controls, as they may have had an impact in the extent to which corporations in EMEs financed themselves abroad.[6] This leaves us with a total of 18 EMEs that can be split into four geographical regions[7]:

(i) **Latin America**: Brazil, Chile, Colombia, Ecuador, Mexico and Peru.

(ii) **East Asia and Pacific**: Indonesia, Korea, Malaysia, Philippines, and Thailand.

(iii) **Eastern Europe and Central Asia**: Czech Republic, Hungary, Poland, Russia, and Turkey.

(iv) **Other Regions**: South Africa, and Israel.

In addition to these four subgroups, we consider a fifth one that includes some of the countries in the other subgroups. This fifth group is defined based on the data availability of an external financial indicator (EFI) and other crucial control variables to be discussed in the following Section:

(v) **EFI-5**: Brazil, Chile, Mexico, Malaysia, and Philippines.

For each of these economies we construct quarterly measures of corporate debt in international capital markets. We use data on stocks and flows of corporate debt. For stocks we use the data reported by the Bank of International Settlements (BIS). For flows, we construct a measure of gross bond issuance using information on the universe of bonds reported by Dealogic DCM, a leading data provider that tracks global debt capital markets. The period of analysis goes from 2000 to

[5]The academic literature that we use is: Neumeyer and Perri (2005), Uribe and Yue (2006), Aguiar and Gopinath (2007), Fernandez and Gulan (2015), and Fernandez et.al. (2015). The multilateral organizations and rating agencies that we look at are (i) the IMF; (ii) MSCI; and (iii) JPMorgan.

[6]We use the recent index on *de jure* measures of capital controls by Fernandez et.al. (2016) which provides a quantitative measure of the existence of capital controls in both inflows and outflows separately, across various asset categories, for 100 economies between 1995 and 2013. The index is defined between zero (absence of controls in all asset categories) and one (controls in all categories). We define a country to have had a history of high capital controls if the average index over the 19 years is higher than one and a half standard deviations of the median across countries.

[7]Out of a total of 21 EMEs first identified in the first filter, Argentina, China and India were not considered because they surpass the threshold of capital controls defined earlier (second filter).

2015, consistent with the period for which data on bond spreads exist (see next Section).

2.2 Stylized Facts

The total stock of international corporate debt is presented in Figure 2.1. We disaggregate the stocks between debt between bonds and bank loans. The upper left plot aggregates debt across all 18 EMEs considered while the remaining five plots disaggregate the numbers across the five sub groups defined above. The numbers reported are in current USD Billions. The data are taken from the information on the BIS's website and is collected on a nationality basis.[8] The stock of bond debt aggregates non-financial corporates, banks and other financial institutions and excludes sovereign bond issuance. The stock of loan debt includes banks and non-banks.[9]

There are two salient stylized facts coming out of Figure 2.1. One is the considerable increase in the stock of corporate debt by EMEs' corporations since the early 2000s, which quadrupled from an initial level of about USD 600 billion to 2.4 trillion by the end of 2014. The sharpest increase started in the mid 2000s and suffered a reversal during the onset of the Global Financial Crisis in 2008. Such reversal was, however, short-lived and the accumulation of debt continued with a vigorous pace afterwards. The other stylized fact is that the lion's share of this increase in corporate debt comes from bond issuance, particularly in the post-crisis period. Debt from loans also increased but less proportionately than that from bond issuance. These two stylized facts hold across all five sub-groups considered.

Given the relative importance of bonds in the accumulation of debt in EMEs, we turn to a closer look at bond issuance in Figure 2.2. It documents the value of total corporate bond issuance for the period considered, in current USD, for each of the subgroups considered, plus each of the EFI-5 countries separately. The figure divides gross bond issuance on a nationality basis into domestic and international issuance. Aggregation is done using transaction-level data for all bonds

[8]Shin (2013), among others, suggests debt on a nationality basis is more accurate than on a residence basis due to the increase of debt issues by offshore affiliates of corporates in emerging market.

[9]Although BIS data on cross-border bank loans does not decompose the stock of loans into private sector and government, we assume in Figure 2.1 that cross-border bank loans to sovereigns of EMs are negligible. We double-checked this assumption based on data collected from national sources for the largest five Latin American economies and found that for the period 2006-2014 the mean ratio of cross-border loans made to governments to total cross-border loans was less than 1% (see Appendix). In countries with higher levels of development of local bond markets, such as Chile and Mexico, this figure is 0%. We feel it is safe to assume that this pattern is also found in other emerging economies. Lastly, geographical aggregation of debt does not net out debt with other EMEs in the sample.

available.[10] Again, the most salient stylized fact that comes out of Figure 2.2 is that corporate bond issuance has increased considerably since the early 2000s, across all EMEs considered and, importantly, the lion's share of this increase comes from bonds issued in international markets. Even though this trend started before the onset of the Global Financial Crisis, most of the expansion occurred afterwards and holds across all countries/regions considered.

There are four additional stylized facts related to the issuance of debt securities in EMEs that we summarize in Figure 2.3, which focuses on EFI-5 countries.[11] First, the top-left subplot of this figure shows that international bond issuance has been a corporate phenomenon, as sovereigns in EMEs have instead substituted foreign for domestic financing. Second, the top-right subplot describes how the increase in international bond reliance by the corporate sector has taken place with relatively more strength in non-financial corporations relative to financial corporations. Third, the increase in foreign bond issuance by corporates in EMEs exceeds the recorded growth in economic activity in the post-financial crisis period as ratios of gross bond issuance to GDP raised throughout the period studied. Fourth, the vast majority of international bond issuance is denominated in foreign currency, most of which is denominated in US dollars (more than 60 percent, on average) or other non-local currency (20 percent), regardless of whether the period is pre- or post-crisis.

3 An External Financial Indicator of Credit Spreads on Corporate Bonds in Emerging Economies

3.1 Constructing an External Financial Indicator

We now describe the methodology and data sources that we use to construct the external financial indicator (EFI) for emerging economies based on the bonds issued in international markets by their corporate sectors. We focus on these bonds since our goal is to capture international financial forces that affect economic activity in these economies.

We construct the external financial indicator for the emerging economy k at quarter t (EFI_t^k) by taking a weighted average of option-adjusted spreads (OAS) across a sample of bonds issued by the corporate sector of economy k. The concept of OAS is suitable for our purpose because it provides

[10] The Appendix contains further details about the criteria used when determining if a bond is issued in foreign capital markets, and other details of the dataset. It also documents how the stylized facts are, to a large degree, robust to measuring international bond issuance on a residence basis.

[11] The Online Appendix describes the same patterns across the remaining four subgroups.

a way to homogenize spreads across a variety of bonds of different characteristics.[12] Formally:

$$EFI_t^k = \sum_i w_{it}^k s_{it}^k \tag{1}$$

where s_{it}^k is the OAS for bond i at time t and w_{it}^k its relative weight. The latter is computed as

$$w_{it}^k = \frac{Bond\, Size_i^k}{\sum_{j=1}^{NB_t^k} Bond\, Size_j^k} \tag{2}$$

where NB_t^k denotes the number of bonds issued by the corporate sector in economy k whose OAS is available at time t, and $Bond\, Size_i^k$ refers to the size of bond i measured in constant USD.

Because Dealogic, our data source for bond issuance presented in the previous section, lacks information on bond prices, in particular spread measures, we switch to Bloomberg when computing the external financial indicator. Bloomberg provides OAS for a large pool of bonds issued by corporates in emerging market economies since the late 1990s. When choosing the sample of bonds to compute the external financial indicator we follow a set of criteria. Among the universe of corporate bonds available in Bloomberg, we choose only those with at least one corresponding OAS value at a quarterly frequency for their life time. We also drop bonds from the sample if information is not available on either date of issuance, bond size, industry that issuers belong to, maturity date, or currency of denomination. Among this pool of bonds, we focus only on USD denominated corporate bonds that have been issued in foreign capital markets.[13] [14]

[12]The terminology "option" originally refers to the callability or puttability of the bond. The concept of OAS is introduced to account for a potential stop of cashflow as a result of call- and put options being exercised. It also takes into account default risk since all possible future states of cashflow are considered in calculating OAS. Formally, let r_t and $r_t^{i,k}$ denote, respectively, the (time varying) yield curves of the safe asset and the bond i in economy k, so that $s_{it}^k = r_t^{i,k} - r_t$. An OAS s_{it}^k is a solution to the following equation (omitting the k index for simplicity)

$$p_t^i = \sum_{n=1}^{N} \prod (n) \sum_{\tau=t}^{M} \frac{C_\tau^i\,(n)}{(1 + r_\tau + r_t^i)}$$

where p_t^i is the bid price of the risky bond i; $\prod(n)$ denotes the probability of n^{th} path of the economy being realized; M stands for maturity; and $C_\tau^i\,(n)$ denotes the cashflow in the path n. See Okane and Sen (2004) and Gabaix, Krishnamurthy and Vigneron (2007) for the further explanations on the OAS.

[13]Given limitations in Bloomberg to obtain data on governing law and listing place for each bond, we relied on information on ISIN and country of incorporation of the bond issuer to make sure that we kept only international debt securities in our sample. See Appendix for further details on the definition of international debt securities used in our work.

[14]Even though Bloomberg does not allow to download data on the specific treasury used for the OAS computation, we manually checked the Bloomberg screen for a selected number of bonds and found that, in all cases with available

The subset of bonds with spreads in Bloomberg is a representative sample of the universe of bonds in Dealogic. The main stylized facts from Dealogic and presented in the previous Section, i.e., the large surge in bond issuance from corporations in the post financial crisis, is also reproduced with the subset of OAS-bonds from Bloomberg. The Online Appendix reproduces this with the Bloomberg subsample. We decided to present stylized facts with Dealogic because it is a much more comprehensive dataset in terms of bond coverage.

After dropping outliers (top and bottom 0.5 percentile of OAS for the entire bond-quarter observations at the country level), we were left with a total of 2638 corporate bonds and 30189 (unbalanced) bond-quarter observations for the sample period 1999Q2-2017Q1 and across five emerging economies: Brazil, Chile, Mexico, Malaysia, and Philippines. Among the 18 EMEs considered in the previous section, this subgroup of five countries, labelled EFI-5 then, was the one with countries for which at least one bond per quarter was observed for every quarter in the sample starting in 1999Q2. The latter is the earliest quarter when OAS data from Bloomberg becomes available. In a subsequent robustness analysis we will present results with a larger pool of countries, although with shorter times series coverage.[15]

The summary statistics of the dataset used to construct the external financial indicators are presented in Table 3.1. The average number of bonds per quarter is just over 400, and also differs between countries. Brazil and Mexico exhibit the largest shares of the total number of bonds considered, ranging between 709 to 1399 bonds, followed by Chile with 315. In contrast, Malaysia and Philippines, exhibit fewer bonds with 129 and 86, respectively. In all countries, the number of bond-quarter observations remains stable until 2009 and then steadily increases until the end of the sample period (not reported in the table).

The row labelled "size of bond" in Table 3.1 refers to total proceeds (i.e., the dollar amount raised by the firm by issuing the bond), measured in 2010 US dollars. The average size of bonds is about 329 millions but its size distribution is highly (positively) skewed akin to that documented in Gilchrist and Zakrajsek (2012) for US corporate bonds. Maturity at issue and terms to maturity

data, it is a U.S. Treasury.

[15]Korea and Peru are two additional countries for which an EFI can be constructed since 1999.Q2. but that we opted not to report them in our baseline results. For the case of Korea, it is excluded from the EFI-5 as data on other crucial control variables are limited, namely EMBI. For the case of Peru we opted not to include it in our baseline as there are several domestic USD bonds and it makes it difficult to separate them from those issued in Intl. capital markets. We will nonetheless include Peru in the robustness with more EMEs.

represent years left to the maturity at issue date and at observation date, respectively. The mean is close to seven years for both variables. On average, they are 2 to 3 years shorter than the case of U.S. corporate bonds reported in Gilchrist and Zakrajsek (2012). Arguably, this reflects the ability of US firms to issue bonds at longer maturities than firms in EMEs.[16]

The mean OAS spread is 411 basis points (bp) for the sample period, and it is positively skewed, with a large standard deviation of 509 bp. The same pattern is observed across all countries in the sample, although considerable differences in the average OAS can be seen. Brazil and Mexico are the countries with the highest average OAS, 479 and 474 bp, respectively. While Chile (248 bp) and Malaysia (194 bp) exhibit the lowest levels, nearly half of those in Brazil and Mexico, and Philippines is in the middle of the two groups (368bp).

3.2 Dynamics of the External Financial Indicator

We now document the time series dynamics of EFI, paying close attention to its comovement with real economic activity as well as other macro variables. The left column in Figure 3.1 plots, for each of the EFI-5 countries considered, the time series of EFI together with real annual GDP growth, between 1999Q2 and 2017Q1. It can easily be seen that the two variables exhibit a negative comovement. In most of the years before the Global Financial Crisis, the EMEs considered experienced sustained economic growth while simultaneously EFI displayed long and protracted reductions. The negative comovement is also evident during the fall in economic activity around the crisis of 2008/9, characterized by spikes in all the EFI's. Lastly, EFI fell to near pre-crisis levels as the EMEs considered recovered from the crisis, and for some countries, e.g., Brazil, EFI increased again as economic activity deteriorated in the last years of the sample.

The degree of cyclicality of our measures of EFI is further assessed by computing its unconditional serial correlation with real GDP growth, as reported in the right column of Figure 3.1 and Table 3.2 (first row). Results corroborate the negative contemporaneous correlation between the two variable. Moreover, they indicate that EFI is a leading indicator of economic activity in these countries (i.e., GDP growth today commoves the most, and in opposite direction, with lagged changes in EFI).

[16]It is important to note, however, that the comparison of our dataset to that in Gilchrist and Zakrajsek (2012) is, at best, crude since the sample periods are not identical, nor are their sources.

More descriptive statistics on the dynamics of EFI are reported in Table 3.2. EFI commoves with other known measures of corporate and sovereign risk at the country level such as JP Morgan's $CEMBI$ and $EMBI$. We note, however, that the correlation is not perfect signalling that EFI includes, on the margin, different information from these indices. In subsequent analysis we will explore the marginal information content of EFI relative to these two indicators of risk. Another distinctive property of the EFIs is their strong comovement with two proxies of global risk: the VIX and the $US\ BAA$ spread. Lastly, the EFI's constructed exhibit a strong comovement between them: the ten country pair correlations reported are all above 0.56 and range up to 0.87. The first principal component of the five EFIs accounts for 85 percent of the sample variance. Likewise, 63 percent of the variance in GDP growth is associated to the first principal component.

4 The External Financial Indicator and Economic Activity

Motivated by the strong negative comovement observed between spreads on bonds issued by *corporates* of EMEs in international capital markets and economic activity in these economies, we turn now to a more formal analysis of this interaction. Before that, however, we discuss some of the main theoretical considerations underpinning such analysis.

4.1 A Theoretical Framework

When modeling the behavior of the (gross) interest rate at which debt with the rest of the world is issued by agents in EMEs, R, be it for investment and/or consumption needs, the literature has always assumed the EME is too small to affect the world interest rate R^*. In the canonical small open economy model of Mendoza (1991), it was simply stated that the two rates were identical and time invariant, $R = R^*$, although an extension considered the case in which R^* varied exogenously as a simple autoregressive process whose shocks aimed at capturing changes in the risk aversion of foreign lenders/investors.

Subsequent contributions aimed at quantifying the role of interest rates in business cycles of emerging economies included the possibility of country-specific spreads playing also a role in shaping aggregate fluctuations in these economies (Neumeyer and Perri, 2005; Uribe and Yue, 2006). Formally, the (gross) interest rate at which debt with the rest of the world is issued by agents in economy j is determined by R^* and a (country-specific) spread S_t^j

$$R_t^j = S_t^j R_t^*$$

Hence, movements in R^j can be traced back to movements in spreads and/or fluctuations in world interest rates. The implicit assumption often used is that there is a large mass of foreign investors willing to lend to the emerging economy any amount at rate R_t. Loans to the EME are risky assets because there can be default on payments to foreigners. Time variation in this risk is captured by fluctuations in S_t.

An immediate challenge arises in terms of how to model properly the dynamics of spreads, taking into account the empirical regularity documented above in terms of the negative comovement between spreads (as captured by EFI) and economic activity. Which is the causality behind this result? Do spreads drive business cycles or vice versa? Or both? Identification of shocks to spreads is therefore challenging insofar as it needs to disentangle how much fundamentals are affecting spreads, and how are spreads affecting fundamentals.

Three alternatives have been explored in practice to achieve identification. First, using a semi-structural approach, several previous works have postulated a link between spreads and (latent or observed) country fundamentals modeled as exogenous state variables in a structural DSGE model, e.g., future expected productivity or the price of commodities exported by EMEs. Such linkages are then calibrated (or estimated) within the context of the calibration (or estimation) of a dynamic, stochastic, general equilibrium model (Neumeyer and Perri, 2005; Chang and Fernández, 2013; Fernández et.al., 2015). Formally, an *ad hoc* equation such as:

$$S_t = \widetilde{\eta}_1 E_t TFP_{t+1} + \widetilde{\eta}_2 E_t P_{t+1}^{co} + \varepsilon_t^S$$

is introduced, where TFP_{t+1} and P_{t+1}^{co} capture future productivity and commodity prices; ε_t^S are exogenous and country-idiosynchratic perturbations to spreads; and the $\widetilde{\eta}$'s are reduced-form parameters that capture the elasticity of spreads to these variables and are either estimated or calibrated to match some empirical regularities.[17]

[17] If investors are risk averse, shocks ε_t^S could be thought of as a way to capture changes in investors' risk tolerance for

An evident caveat of this semi-structural approach is the fact that microfoundations of spread behavior are absent. For this reason, a second approach in the literature has been characterized by the effort to provide such microfoundations. Mendoza and Yue (2012) does so by embedding an optimal default problem by the government into an equilibrium business cycle model of a small open economy, though they do not model the decisions of the corporate sector. Fernández and Gulan (2015) focus on corporate bankruptcy in an environment where a financial contract is stipulated between (corporate) borrowers in an EME and external investors. A financial accelerator endogenously generates a spread process that depends upon financial variables, namely entrepreneurial leverage. Hence domestic or external shocks that affect the value of entrepreneurial's net worth will influence spreads.[18]

As in most structural approaches, a rigid structure is imposed on the data. For that reason, the third approach in the literature has been more agnostic and has tried to put as little structure as possible in the data, when trying to identify shocks to spreads. This is the approach that we follow in this work. It postulates modeling a process for spreads jointly with country "fundamentals" (e.g., output.) and proxies for global financial risk in world capital markets in the context of SVAR models. Uribe and Yue (2006) pioneered such approach by using a recursive identification implying that innovations in world interest rates and in country spreads percolate into domestic fundamentals with a lag, and that world interest rates are exogenous to developments in the EMEs considered. Akinci (2013) extended this setup to account for global financial risk and finds that sovereign spreads in EMEs are a powerful propagation mechanism of fluctuations in global financial risk. In the following subsections we will extend this setup to account for EME's corporate risk. Doing so will imply additional hurdles. On one hand, it involves properly disentangling sovereign from corporate risk. Additionally, it faces the challenge of quantifying the extent to which corporate risk in EMEs has been itself the source of uncertainty or, instead, has served as a propagating vehicle for changes in the global appetite for risky assets.

risky assets such as bonds issued by EMEs. If investors are assumed to be risk neutral, these shocks are a way to break the natural endogeneity in spreads given that they are an equilibrium outcome of an arbitrage between a risk free bond and a risky bond.

[18]Formally, this is obtained by deriving the function $S(\bullet)$ which maps the value of net worth to spreads, e.g., $S_t = S(q_t k_{t+1}/n_{t+1})$, where qk is the market value of assets held by entrepreneurs in EME and n is their equity. It is derived that $S'(\bullet) > 0$, which then implies that, highly leveraged entrepreneurs, when faced with a positive windfall (e.g. a boost in productivity), will de-leverage on the margin, hence driving interest rate down and generating countercyclical interest rates.

With these considerations in the background, the next two subsections will aim at exploring further the documented negative comovement between spreads on bonds issued by *corporates* of EMEs in international capital markets and aggregate economic activity in these economies. The key difference between the two approaches will rest on the varying degree of economic structure imposed on the data. First, we will quantify the information content and predictive ability of credit spreads on these bonds on economic activity without the need to identify structural shocks. Next, by imposing enough structure so as to identify exogenous perturbations to these spreads we will quantify their impact on *future* economic activity.

4.2 Forecasting Information Content of the External Financial Indicator

We assess the information content of EFI on *future* economic activity in emerging economies by extending Gilchrist and Zakrajsek (2012)'s forecasting specification to a multi-country panel setting tailored for EMEs. Formally, we estimate a dynamic panel regression of future real GDP growth against current changes in EFI:

$$\Delta GDP^k_{t+h} = \alpha_k + \sum_{j=0}^{p} \beta_j \Delta GDP^k_{t-j} + \gamma \Delta EFI^k_t + \delta \Delta EMBI^k_t + \psi GR_t + \Gamma \Omega^k_t + \epsilon^k_{t+h}, \quad \text{for } h \geq 1 \quad (3)$$

where index k denotes each of the five emerging economies considered and $h \geq 1$ is the forecast horizon. We will consider the cases of $h = 1, 2, 3, 4$. Variables ΔEFI and ΔGDP are annual changes in EFI and the (log of) real GDP, respectively.[19] The estimated period starts in 1999.Q2, when our EFI series begin, and covers until 2016.Q4. We estimate the dynamic panel regression with country fixed effects (α_k) and lag length equal to one ($p = 0$).[20]

We control for several other variables that may influence economic activity in EMEs beyond EFI, of both domestic and global nature. First, we include the country-specific sovereign risk, as proxied by $EMBI$, as a way to account for potential spillovers from sovereign risk to corporate

[19] We will refer to annual real GDP growth and ΔGDP interchangeably form now on.

[20] A potential concern emanating from the type of fixed effect panel that we use here is the inconsistency of the least squares parameter estimates. Such bias, however, has been shown to decrease as the time dimension gets large (Judson and Owen, 1999), as in our empirical exercise. Still, we tested how robust our panel forecasting estimates are using the Anderson-Hsiao estimator. The results are reported in the Appendix and are qualitatively similar to those found in our benchmark case.

risk.[21] Second, following the influential work by Rey (2013), which identifies a strong effect of a global financial cycle on small open economies, we include a proxy for global financial risk, GR. We use two proxies: the VIX - a measure of uncertainty and risk aversion coming from the implied volatility of S&P 500 index options- as this variable is identified in Rey's work one that commoves strongly with the global financial cycle in cross border capital flows; and the $US\ BAA\ spread$, following Akinci (2013) who finds that shocks to this variable account for a considerable share of movements in aggregate economic activity in a pool of emerging economies.

Third, we include in vector Ω^k two variables that are common across the countries and that aim at capturing the role of foreign factors beyond those already captured in GR: the (annual) changes in term spreads of 3-month and 10-year US Treasury yields, $\Delta USYield\ Curve$; and the (annual) changes in the US real Federal Funds Rate, ΔRFF_t. As additional country-specific controls in Ω^k, we include the (annual) change in the real monetary policy rate, $\Delta RLocalRate$; and (annual) changes to a country-specific commodity price index that uses as weights the share of the commodities exported by each emerging economy, $\Delta RPcom$.[22]

The estimated coefficients are reported in Table 4.1. Numbers in parenthesis are t-statistics adjusted for standard errors clustered by country. Each of the four panels presents results for alternative forecasting horizons (h). The columns in each panel report results according to 5 alternative specifications that vary according to the set of controls used in GR. In the first column, no controls are used for GR. The second and third columns report results where we add, separately, the two proxies for GR that we consider, VIX, BAA. The fourth one reports results when both variables are included. The fifth specification in the last column reports results when we deliberately exclude EFI. In all five cases the full set of additional controls (Ω^k) is included, but not reported for the sake of space.

There are three results of interest. First, EFI is a statistically significant predictor of economic

[21] Of course, the causality may go the other way around too, i.e. from corporate to sovereign risk. The case of several crises in Asia in the 90s (e.g. Korea) and the more recent experience in Ireland or Spain show how the deterioration of corporate balance sheets may turn into higher sovereign risk as the public sector absorbs much of the private iliquid debts.

[22] $\Delta RPcom$ is computed by weighting the international prices of 44 distinct commodities goods in international markets by their country-specific (constant) weights computed as their share in total commodity exports. The source (and motivation) for using $\Delta RPcom$ comes from Fernández et.al. (2015) who found that exogenous fluctuations in the price of commodities that emerging economies export are an important driver of their business cycles. See this work for further details about the contruction of this variable.

activity in these countries for any forecasting horizon considered when no controls in GR are considered. Our estimated coefficient for γ increases with h from $\widehat{\gamma} = -0.000023$ for $h = 1$ to $\widehat{\gamma} = -0.000037$ for $h = 3$, where it peaks, then slightly decreases to $\widehat{\gamma} = -0.000034$ for $h = 4$. The coefficients are not only of statistical significance, but their size is also of economic relevance. According to the estimated coefficient with $h = 3$, an increase in EFI of 100 basis point in the current quarter is correlated with a reduction of 0.37 percentage points in output's growth rate three quarters ahead. This is a considerable reduction considering that such an increase is common in the data, e.g., a one standard deviation in ΔEFI is 183 basis points.

Second, the size and (in some cases) also the statistical significance of the estimated coefficient of EFI is reduced when the two alternative controls for GR are included. However, this offsetting effect is milder the longer the forecasting horizon considered. Indeed, even when both controls in GR are included (spec. 4) EFI continues to have statistical power and information on future economic activity for $h > 2$. For $h = 3, 4$, $\widehat{\gamma} = -0.000029, -0.000018$ and both are statistically significant at 5 and 1 percent significance levels, respectively, even after incorporating both VIX and $BAA\ spread$.

Third, our proxy for sovereign risk, $EMBI$, does not come out as statistically significant under any of the first four specifications that we try, regardless of the forecasting horizons considered. The only specification where this variable is significant is the fifth one, where we deliberately omit EFI from the forecasting regressions. Sovereign risk does not possess information that is useful for forecasting future economic activity over and above that already contained in EFI.

4.3 Macroeconomic Effects of Shocks to the External Financial Indicator

4.3.1 A Baseline Structural Model with VIX as Proxy for Global Risk

We turn now to examining the dynamic macroeconomic consequences of shocks to EFI in the five EMEs considered in our baseline. We do so by running a series of quarterly SVAR models with which we identify shocks to EFI and then assess their effects on GDP growth using variance decomposition and impulse response analysis. Formally, the baseline SVAR model for each country k that we run is

$$\mathbf{A}\mathbf{Y}_t^k = \mathbf{C}^k + \mathbf{B}_1\mathbf{Y}_{t-1}^k + ... + \mathbf{B}_p\mathbf{Y}_{t-p}^k + \varepsilon_t^k \tag{4}$$

where

$$\mathbf{Y}_t^k = \left[\Delta GDP_t^k; GR_t; EFI_t^k\right] \tag{5}$$

$$\varepsilon_t^k = \left[\varepsilon_t^{GDP^k}; \varepsilon_t^{GR}; \varepsilon_t^{EFI^k}\right] \tag{6}$$

and, as before, ΔGDP_t^k is the change in (the log of) real GDP for k and GR is a proxy for global risk. In the baseline case we consider VIX as that proxy, following the work by Rey (2013). We identify the shock to EFI by imposing two restrictions. First, we assume $\mathbf{A}$ to be lower triangular with unit diagonal elements. Second, we assume that GR is exogenous to economy k.[23] Hence, we identify the shock to EFI by assuming that it percolates into domestic real variables (ΔGDP^k) with a one-period lag and that neither EFI^k nor GDP^k influence the dynamics of VIX. At the same time, the identification scheme implies that real domestic shocks ($\varepsilon_t^{GDP^k}$) affect EFI contemporaneously. This identification strategy has been used by Gilchrist and Zakrajsek (2012) for the case of the U.S.; and in the context of EMEs by Uribe and Yue (2006) and Akinci (2013). It formalizes the idea that financial variables (e.g., asset prices) react faster than real variables (e.g. production and investment decisions) due to various adjustment costs. The second identifying assumption is that the k^{th} EME considered is a small player in world capital markets. We call this baseline set up Model A.

A potential caveat to Model A is that we are not taking into account the role of sovereign risk when identifying shocks to EFI. Doing so is not trivial, however, as one needs to take a stance in terms of the ordering of this variable in the recursive formulation, and hence on the lag with which corporate and sovereign risk affect each other. We decided to take an agnostic approach and consider three distinct extensions to account for sovereign risk. In Model B we extend $\mathbf{Y}_t^k$ to include $EMBI$, our proxy for sovereign risk, ordered last in $\mathbf{Y}_t^k$:

$$\mathbf{Y}_t^k = \left[\Delta GDP_t^k; GR_t; EFI_t^k; EMBI_t^k\right]; \tag{7}$$

$$\varepsilon_t^k = \left[\varepsilon_t^{GDP^k}; \varepsilon_t^{GR}; \varepsilon_t^{EFI^k}; \varepsilon_t^{EMBI^k}\right]; \tag{8}$$

[23] Formally, this implies that $\mathbf{A}_{2,1} = \mathbf{A}_{2,3} = \mathbf{B}_{1,2,1} = \mathbf{B}_{1,2,3} = ... = \mathbf{B}_{p,2,1} = \mathbf{B}_{p,2,3} = 0$, where element (X, Y) of Matrices $\mathbf{A}$ and $\mathbf{B}_p$ are denoted as $\mathbf{A}_{X,Y}$ and $\mathbf{B}_{p,X,Y}$, respectively.

thereby assuming that shocks to EFI affect sovereign spreads contemporaneously, but shocks to sovereign spreads only affect EFI with a lag.

In the last two extensions, Models C and D, we run the same analysis as in Models A and B, except that $EMBI$ substitutes EFI. Formally, Model C postulates that

$$\mathbf{Y}_t^k = \left[\Delta GDP_t^k; GR_t; EMBI_t^k\right] \tag{9}$$

$$\varepsilon_t^k = \left[\varepsilon_t^{GDP^k}; \varepsilon_t^{GR}; \varepsilon_t^{EMBI^k}\right] \tag{10}$$

While Model D assumes:

$$\mathbf{Y}_t^k = \left[\Delta GDP_t^k; GR_t; EMBI_t^k; EFI_t^k\right] \tag{11}$$

$$\varepsilon_t^k = \left[\varepsilon_t^{GDP^k}; \varepsilon_t^{GR}; \varepsilon_t^{EMBI^k}; \varepsilon_t^{EFI^k}\right] \tag{12}$$

The set of four models is useful insofar as it allows various informative comparisons. First, comparing models A and B allows to gauge the extent to which including sovereign risks diminishes the role of EFI shocks when accounting for economic activity in EMEs. Likewise, comparing Models C and D allows to do the same but giving EFI the least chance to have an impact.

Results in terms of variance decomposition and impulse response functions are summarized in Table 4.2 and Figure 4.1, respectively. Numbers reported are simple averages across the EMEs considered. The following five results are worth stressing:

1. The share of GDP growth variance associated to EFI shocks is 20 percent from Model A, five points higher to that linked to VIX shocks. The impulse response function of GDP growth displays a long and protracted slump after a one S.D shock to EFI, that achieves its trough three quarters ahead, falling nearly half of a percentage point. Long run mean growth is reached again only 3 years after the shock. This IRF is of similar size to that coming from a VIX shock.

2. The share associated to EFI shocks when accounting for GDP variance as well as the shape and size of GDP's IRF following this shock remains the same in Model B when $EMBI$ shocks

are also identified. The latter account only for about 5 percent of GDP growth variability and the IRF of this variable is relatively milder and statistically less robust following a shock to $EMBI$.

3. The GDP variance share associated to $EMBI$ shocks when not controlling for EFI (Model C) is 19 percent. Moreover, when one controls for EFI but ordered last in $\mathbf{Y}_t^k$ (Model D), such share reduces by about a third, to 13 percent, while that of EFI shocks is 11 percent.

4. The role of VIX shocks when accounting for GDP variance is between 15 to 25 percent across the four Models considered. In contrast they account for the lion's share of EFI variability, e.g. 56% in Models A and B. They are also of importance when accounting for the dynamics of $EMBI$ although relatively less compared to that of EFI, between 44 and 56 percent in Models C and D.

5. Despite the fact that GDP shocks account for more that half of GDP variability in all four cases considered, they account for a much lower share of the variance of $EMBI$ and EFI. In none of the four cases considered this share increases above 7 percent.

To sum up, the results presented across the four cases considered point to a non-trivial role of EFI shocks when accounting for macroeconomic fluctuations in EMEs, even after controlling for the potential spillovers from sovereign risk. We view this evidence as pointing into the direction of some market segmentation between corporate and sovereign bonds in EMEs, with spreads on corporate bonds incorporating new information of economic activity in these economies over and above the one contained in spreads of sovereign bonds. Lastly, to a large extent, EFI is also determined by external global risk. For that reason it is of interest to expand the set of variables considered as proxies for GR and to explore how their effects on EMEs operates indirectly through their impact on EFI. We turn to this analysis next.

4.3.2 Global Risk and its Propagation Mechanism

We explore two extensions now. First, we assess how results from Models A-D change when the $US\ BAA$ spread is taken as alternative proxy for global financial risk, GR. We also explore the propagation mechanism of shocks to (both proxies of) GR, by quantifying the extent to which movements in $EFI/EMBI$ triggered by shocks to GR help amplify the role of global financial shocks onto EMEs.

Results of the first extension, in terms of variance decomposition and impulse response functions, are summarized in Table 4.3 and Figure 4.2, respectively. Two additional results are worth stressing:

6. Using the $US\ BAA$ as proxy for global risk increases the role of GR shocks when accounting for real economic activity. Indeed, the share of GDP variance that is accounted for by shocks to $US\ BAA$ spreads is between 35 to 39% across the four Models. In turn, using $US\ BAA$ as proxy for GR decreases considerably the GDP variance share associated to shocks in both sovereign and corporate risk measures, though the effect is relatively more severe for corporate risk. The (mean) share of GDP growth accounted for by EFI shocks is now 4 percent (Model A), while the one by $EMBI$ shocks is 7 (Model C). Both shares remain somewhat similar in the expanded models B and D. Likewise, the protracted fall in economic activity that follows a one S.D shock to both spreads is not only shorter but also its magnitude reduces to about half of the one considered before.

7. The relevance of shocks to GR further increases when it comes to accounting for the variance of both EFI and $EMBI$. However, the relatively stronger influence over EFI prevails, as in the previous case. Notably, $US\ BAA$ shocks account now for 60 percent of the variability of EFI, and 52 of that in $EMBI$.

These two observations can be rationalized by the fact that the types of corporate bonds included in the $US\ BAA$ spread index are substitutes to bonds issued by EMEs. It is therefore of interest to investigate the extent to which movements in corporate and sovereign risk in EMEs have helped propagate GR shocks. This is achieved by means of counterfactual experiments on the SVAR estimated coefficients whereby we turn off the effect of GR on our measures of country/corporate risk. Results are reported in Table 4.4. The right column contains the counterfactual variance shares for Models A and C and for both proxies of GR, and for comparison the left column present the benchmark ones. Likewise, the dotted/red lines in Figures 4.1 and 4.2 display the IRF of GDP to a GR shock when, counterfactually, we turn off the feedback from GR onto EFI and

$EMBI$. The following additional result emanates from inspecting them:

8. The share of shocks to GR that accounts for GDP fluctuations reduces to about a half when their spillover onto EFI is turned off as additional propagation mechanism, regardless of the proxy for GR used. This is quantitatively more important when GR is proxied by $US\ BAA$ as the effect is the largest: the share of GDP variance associated with $US\ BAA$ shocks falls from 36 to 18 percent. $EMBI$ serves much less as propagating mechanism for these shocks: the share of $US\ BAA$ shocks falls only about a fifth, from 39 to 31 percent. This is mirrored in the counterfactual IRFs in Figures 4.1 and 4.2 where the GDP's response after a GR shock reduces to the baseline case more when the effect on EFI is turned off, relative to that one gets when the effect in $EMBI$ is turned off.

5 Extensions and Robustness

5.1 Country-Specific Results

Our benchmark results from SVARs were presented as averages across the country-specific estimated models. We now present the country-specific results. For the sake of space, we focus only on the IRFs from Model A with VIX as proxy for global risk, but the remaining country-specific results are all reported in the Online Appendix. The top-left plot of Figure 5.1 presents each of the five impulse responses of GDP growth to a one S.D in EFI across the EFI-5 countries. Solid lines represent impulses that are statistically significant at 95 percent according to bootstrapped confidence intervals. While, qualitatively, all IRFs behave in a similar fashion, there are nonetheless considerable quantitative differences across countries. The fall in economic activity in Brazil and Mexico is the mildest, although for these countries the shock is relatively more long lasting. On the opposite extreme, the fall in economic activity following an EFI shock in Malaysia is the strongest, nearly three times as much as the one in Brazil and Mexico, with economic activity falling as much as 0.7 percentage points below the average. Its effect is, however, much short lived than the other cases. The case of Chile and Philippines fall somewhere in between these two extremes.

5.2 Removing Financial Corporations' Bonds

Motivated by the large increase in bond issuance by non-financial corporates, documented in Section 2, we now test how much do the benchmark results hold if we remove the bonds issued by financial corporations in each of the EMEs considered when constructing the EFI. This entails removing roughly half of the total number of bonds considered in the construction of the benchmark EFI. With this modified EFI, labelled $EFI - NFC$, we re-run the SVAR models and compare the new impulse responses of output growth to those from the benchmark case. The top-right plot of Figure 5.1 reports the results, with the green/triangle line depicting the simple average across the new five country-specific IRFs of GDP following a one S.D. shock to $EFI - NFC$. Results are quite close to those coming from the benchmark case (solid line). There continues to be a large and protracted fall in economic activity following an orthogonal one S.D. shock to $EFI - NFC$, only slightly below the one in the benchmark case.

5.3 The Role of the World Financial Crisis and Subsequent Recovery

In this subsection we investigate how much the 2008/9 Global Financial Crisis matters for our benchmark results. To do so we reestimate (3) from the beginning of our sample, 1999.Q2, until 2007.Q4, three quarters prior to the collapse of Lehman Brothers. We then sequentially reestimate (3), for the four forecasting horizons considered, by adding to the sample one more observation at a time (keeping the starting period fixed at 1999.Q2). For each h's we document the estimated values of γ, the coefficient that links ΔEFI with future states of economic activity. Results are reported in the bottom-left plot of Figure 5.1. The plot shows that, as data of the crisis and the post-recovery are added, the coefficient further decreases, particularly during the last three years of the sample (2014-2016).[24] We view this as indicating that the crisis and, more importantly, the post-recovery period account for most of the large information content of EFI in terms of economic activity in emerging economies, although there is evidence that some of the predictive power pre-dates the crisis.

[24]The decrease in the p-values is, however, not monotonic. Results available in the Online Appendix.

5.4 A Larger Sample of Countries

As mentioned before, one of the restrictions that we imposed for a country to have an EFI was that at least one corporate bond from that country had to be observed at every quarter in the sample *starting in 1999Q2*, the earliest quarter when OAS data become available. This left us with the five countries in the EFI-5 group that we have been studying as benchmark. We now relax this restriction and allow the earliest date to vary across the remaining countries considered in Section 2, while keeping the requirement that at least one corporate bond from that country had to be traded. This allowed us to construct EFI's for as much as five additional countries (with the initial date in parenthesis): Colombia (2003.Q1), Peru (1999.Q1), Russia (2003.Q1), South Africa (2005.Q4), and Turkey (1999.Q2).[25] Forecasting regressions results are reported in Table 5.1, middle panel (baseline results are in the top panel) - Online Appendix presents also results from SVARs. Results are largely robust in that EFI does incorporate information on future GDP growth, particularly at longer horizons than a quarter, although the estimated coefficient is slightly lower in absolute value than those in the benchmark.

5.5 Alternative Measures of Corporate Risk

An alternative proxy for spreads faced by corporates in EMEs is the Corporate Emerging Market Bond Index ($CEMBI$) produced by JP Morgan which, as documented earlier, commoves with EFI. A valid question is then why don't we use this alternative index instead of EFI. A first reason is that $CEMBI$ is a product that JPMorgan sells via specialized distributors (e.g. Bloomberg) and hence it is not entirely replicable as not all its details for its construction are revealed. One cannot know, for instance, the number of bonds used, their average face value, maturity, etc., as we do/report for EFI (Table 3.1). Furthermore, $CEMBI$ does not inform the types of sectors that are included in the index, a particularly unattractive property given the nature of our investigation, which postulates the relevance of non-financial corporate's bond issuance. Last, but not least, for the countries considered in the EFI-5 subgroup, EFI has better coverage in the time series di-

[25]For Peru and Turkey our time series of EFI begin from 1999.Q2, but we do not include them in the baseline group of countries studied. For the case of Turkey, we do so because of several missing values for the sample period 2001Q1-2007Q4 and 2008Q4-2009Q1. In the case of Peru we decided to take it out since it contains several domestic bonds in USD. Baseline results hold if Peru is added to EFI-5 countries. Korea is another country among the initial 18 countries studied in Section 2 for which we could contruct an EFI from 1999.Q2. Yet lack of data availability of $EMBI$ unable us to present results including Korea.

mension. While EFI begins in 1999.Q1, $CEMBI$ does not begin before 2002.Q1. The series of $CEMBI$ are also sparse and irregular. For example, in the case of Peru, $CEMBI$ series begin only in 2005.Q3, unlike ours that begin in 1999.Q1.

With these caveats in mind, we nonetheless compare the performance of the two indicators, EFI and $CEMBI$, in terms of the two metrics that we have analyzed (forecasting regressions and SVAR results) across the countries in our baseline and over the same period of time. Results of the forecasting regressions are presented in Table 6.1, bottom panel. They indicate that EFI outperforms $CEMBI$, which does not turn out to be significant predictor under any of the forecasting horizons considered and, in fact, its point estimate is of the opposite sign. Results on the SVAR point in the same direction and are reported in the Online Appendix.

5.6 Alternative Lag Order

In the benchmark SVAR specification we arbitrarily set the number of lags to be one, $p = 1$. We now consider alternative lag specifications.[26] Results are reported in the bottom-right plot of Figure 5.1, with impulse responses of output growth for the alternative lags. They are qualitatively similar to the benchmark case. A S.D shock to EFI leads to a protracted fall in economic activity for all lag specifications considered. The trough continues to lie also between three and four quarters after the shock. Quantitatively, the depth of the trough is abut the same magnitude, between 0.4 and 0.5 percent below average.

6 Concluding Remarks

Access to world capital markets by the corporate sector may be viewed as a necessary condition for emerging economies to achieve sustainable long run growth. However, this also entails the risk that changes in the financial conditions at which the private sector borrows in these markets may carry destabilizing consequences for real economic activity. In light of these considerations and the fact that corporate sectors in emerging markets have largely increased their reliance of foreign debt, particularly in the form of larger corporate bond issuance denominated in USD, quantifying how much do changes in these lending conditions impact economic activity is an important question for international macroeconomists.

[26] The Appendix contains also extensions of the forecasting panel regression (3) with additional lags.

Motivated by this observation, our work has tried to shed light onto this question. We construct an indicator of external financial conditions for several emerging economies using spreads from bonds issued in foreign capital markets by the corporate sector that are traded in secondary markets. We show that changes in this indicator are strongly correlated with future economic activity in EMEs and that identified shocks to the indicator entail large and protracted falls in economic activity, even after controlling for other potential drivers of economic activity such as movements in sovereign risk and global financial risk. Fluctuations in this indicator also respond strongly to shocks on world capital markets, implying that changes in such indicator have also served as a powerful propagating mechanism to changes in risk appetite by global investors.

While we have been silent about the policy implications of our analysis, the results we have presented do warrant a more normative analysis of the extent to which policy actions can (or should try to) mitigate the effects that changes in foreign financing conditions by corporate sector in EMEs may have on economic activity in these economies. The large increase in the stock of foreign debt in the balance sheet of EMEs' corporates will certainly keep this question at the forefront of international macroeconomics for the years to come. Hopefully the results in this paper motivate further subsequent work to shed light on this question.

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Technical Appendix: Data Sources and Definitions

1 Description of Bonds from Dealogic's DCM Database and Definition of International and Domestic Debt Securities

The bond issuance data used in this paper are sourced from Dealogic DCM database. The figures show country aggregations of transaction-level data. The database includes a total of 625,074 bond tranches (479,678 unique bond deals). The totals shown in Figures A2-A5 and A6-A7 of the Appendix are aggregations for all non-government bonds for the 17 countries in the sample (a total of 13,287 bond tranches). The figures include issuance of government-owned companies (such as utilities, oil companies, universities, and transport systems).

The definition of an international debt security (IDS) used in the paper follows the new methodology implemented by the Bank for International Settlements to define international debt securities. This methodology compares the location where the bond is issued with the residence of the issuer. Following the BIS' practice, the place of residence of a firm is considered to be the jurisdiction where it is incorporated. To identify the place where the bond is issued we use information on the country where the security (or securities as a bond may be composed of multiple individual securities) is listed, the ISIN number (or numbers) assigned to the security (or securities), and the governing law.

A bond is classified as an IDS if it is listed in multiple countries, or if it is listed with an international central depository, or if it includes securities that have been issued ISIN numbers in multiple countries. A security is also considered an IDS if the residence of the issuer is different from the country where the security is issued an ISIN, or if it is different from the security's governing law. Bonds with incomplete information on listing place, ISIN number, and governing laws are classified as international securities if the data provider classifies the bond as foreign by market type.

Similar rules are applied to classify a security as domestic for cases in which the residence of the issuer is the same as the governing law, or the same as the ISIN nationality, or the same as the listing place, or all three conditions apply at once (and given no contradiction with classification as international security, and a unique listing place and/or unique ISIN nationality). Given lack of information on ISIN number, listing place, and governing law, the bond is classified as domestic if the vendor designated by Dealogic is domestic by market type.

Applying these rules, we are able to correctly classify all bonds in our sample of 17 EMs.

2 OAS data

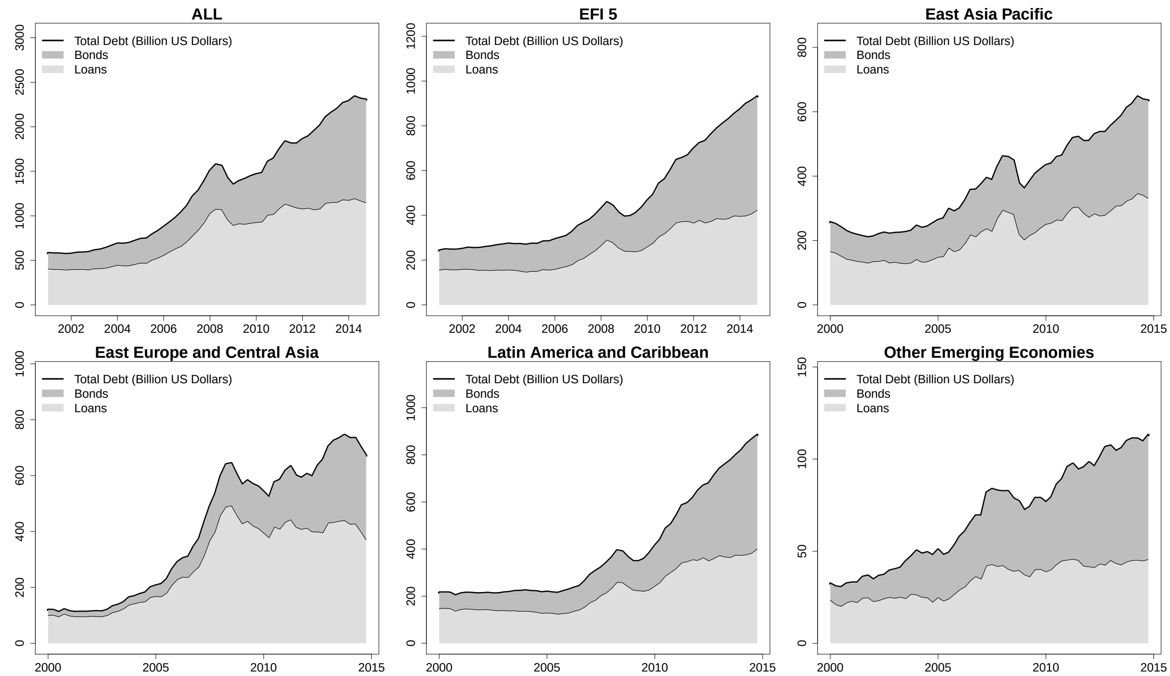
We use data on option-adjusted spreads from Bloomberg. We specifically used the mnemonic `OAS_SPREAD_BID` to retrieve quarterly spreads for all corporate bonds with available OAS data in Bloomberg for the seven countries in our sample. The Bloomberg tickers of the bonds in our sample are available upon request.

3 Other data

We use data on outstanding stocks of international and domestic debt securities from the BIS' Securities Database. We also employ data on cross-border loans from the BIS' Locational Banking Statistics database. For GDP data we collected data from the IMF's International Financial Statistics database. We also used data on sovereign debt held by private banks for five Latin American countries, sourced from the Inter-American Development Bank (IDB) LAC Debt Group database. Data used in the panel regressions and SVAR models are from Fernandez et.al. (2015) (domestic GDP, consumption and investment; U.S. yields, interest rates, and GDP growth; and commodity prices; see that paper for more details).

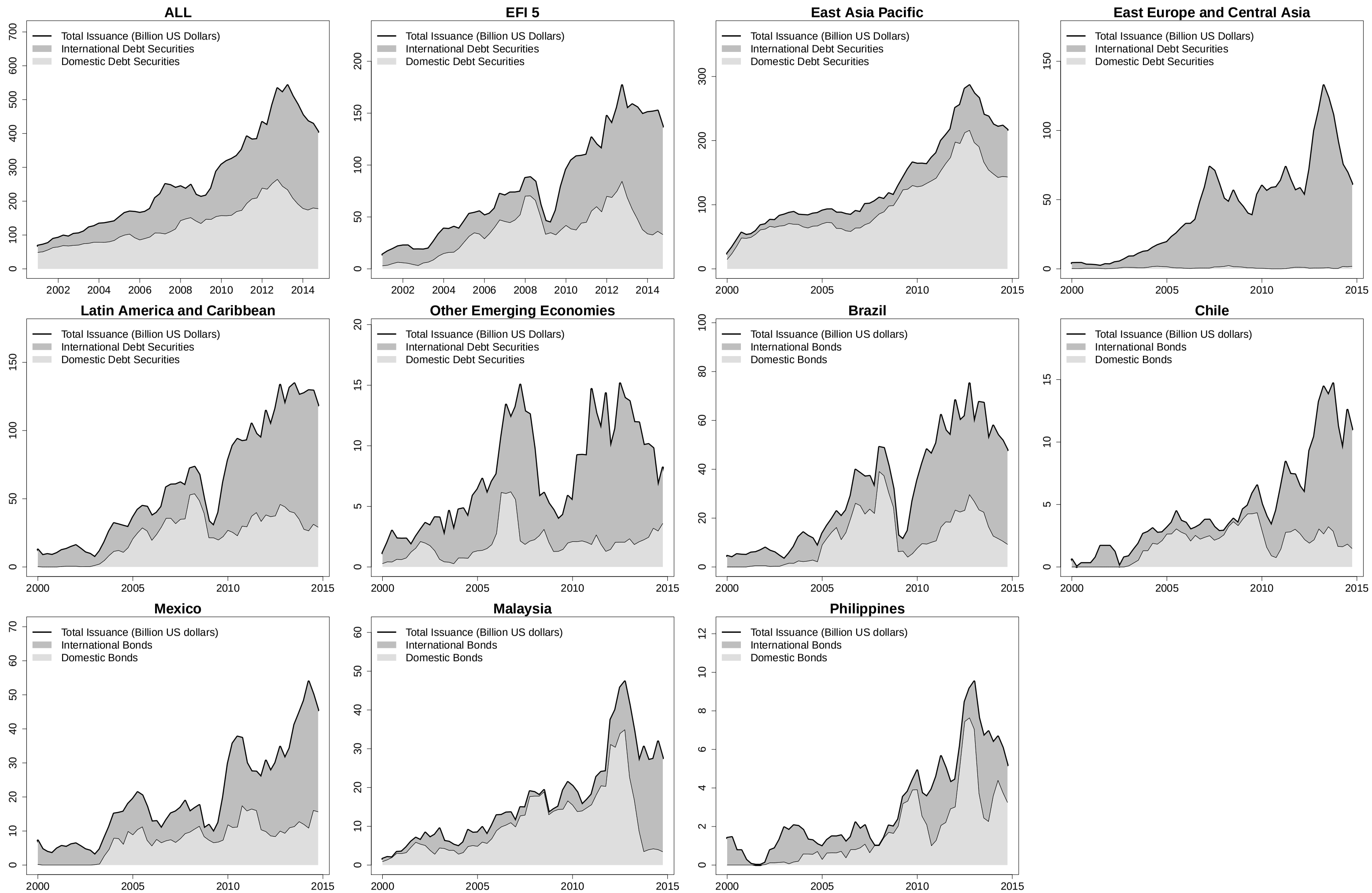
A.1 Figures and Tables

Figure 2.1: Stock of Private Sector International Debt in EMEs (by Regional Aggregates)



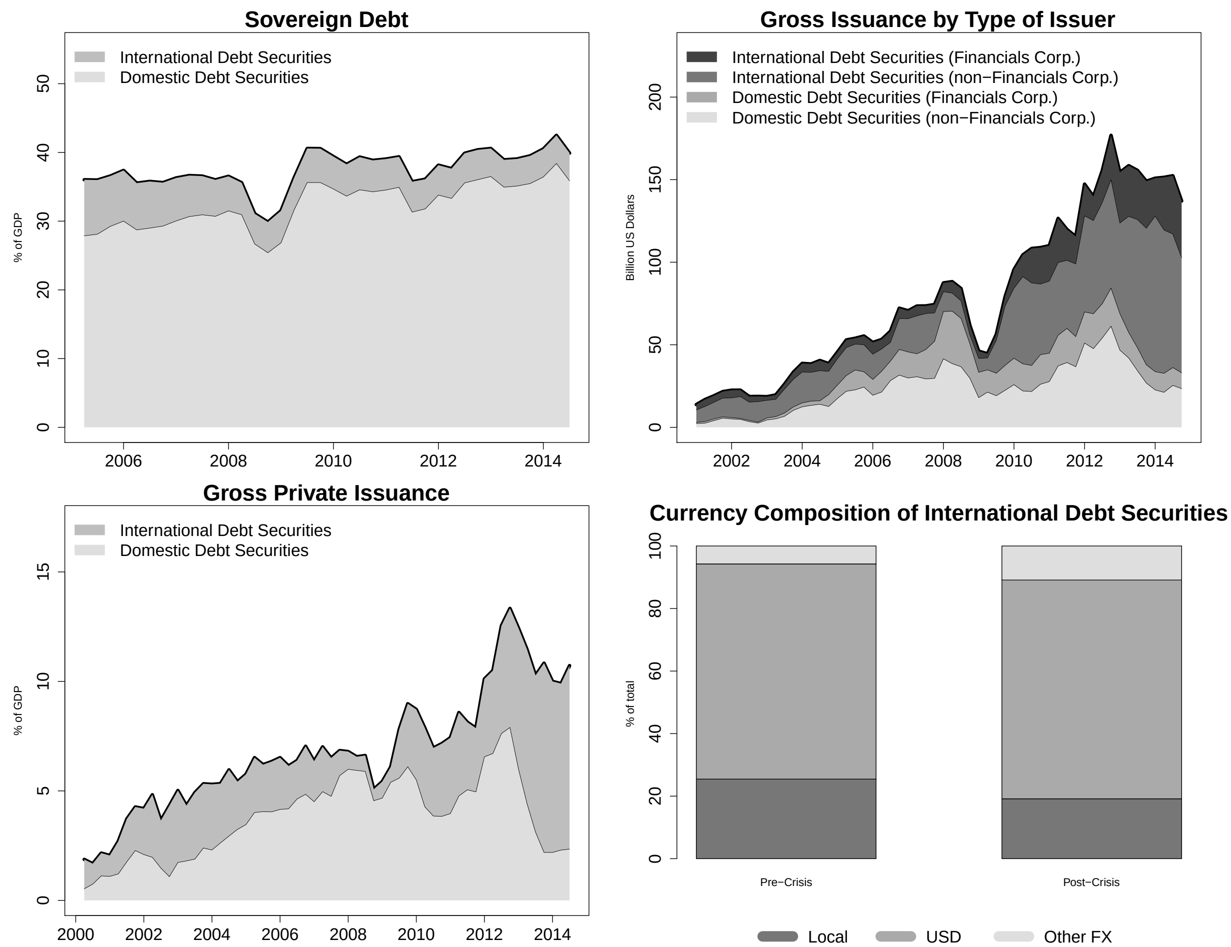
This figure shows the aggregate stock of private sector international debt for 18 emerging economies (EMEs), decomposing the outstanding stock into cross-border bank loans and international debt securities (bonds). The stock of securities is on a nationality basis. The private sector includes all financial institutions and nonfinancial corporations. The figure shows the total stocks over the following regional aggregates: EFI 5: Brazil, Chile, Malaysia, and Philippines. East Asia and Pacific: Indonesia, Korea, Malaysia, Philippines, and Thailand. East Europe and Central Asia: Czech Republic, Hungary, Poland, Russia, and Turkey. Latin America: Brazil, Chile, Colombia, Ecuador, Mexico and Peru. Other Regions: South Africa, and Israel. Geographical aggregation does not net out debt with other EMEs in the aggregate. The data are presented in billions of current U.S. dollars and sourced from the BIS Locational Banking Statistics and BIS Securities Statistics databases.

Figure 2.2: Corporate Gross Bond Issuance in EMEs (by Regional Aggregates and by Country)



This figure shows gross issuance of international and domestic debt securities (bonds) by regional aggregates and for EFI-5 countries on a nationality basis. The data are presented in billions of current U.S. dollars and sourced from Dealogic's DCM database. See the Appendix for a description of how the country aggregates are obtained from transaction-level data and for a definition of international and domestic debt securities. The figure shows the country total or the total over the regional aggregates detailed in the note to Figure 2.1.

Figure 2.3: Other Stylized Facts on International Debt in EMEs



This figure presents four plots with stylized facts on international debt in EMEs, for the aggregate of five emerging economies studied in the paper (EFI 5): Brazil, Chile, Malaysia, Mexico, and Philippines. (i) The plot in the upper left shows the average aggregate stock of sovereign debt, decomposing the outstanding stock of debt into international and domestic debt securities. The average for EFI 5 is obtained after first scaling end-of-year debt stocks by annual GDP at the country level. Data on stocks are from the BIS Securities Statistics database and data on GDP are from the IMF International Financial Statistics Database. (ii) The plot in the upper right shows total gross issuance of international and domestic debt securities by region based on a nationality basis, decomposing issuance by issuer into non-financial and financial corporations. Financial corporations include issuance by any firm classified by the data vendor as operating in the "Finance" and "Insurance" sectors, and issuance by Closed End funds and Holding Companies. The figure shows the total over all EFI 5 economies. The data are presented in billions of current U.S. dollars and sourced from Dealogic's DCM database. See the Appendix for a description of how country aggregates are obtained from transaction-level data and for a definition of international and domestic debt securities. (iii) The plot in the lower left shows average gross issuance of international and domestic debt securities based on a nationality basis scaled by GDP. The average for EFI 5 is obtained after first scaling annual gross issuance by annual GDP at the country level. Data on gross issuance are sourced from Dealogic's DCM database and data on GDP are from the IMF International Statistics Database. (iv) The plot in the lower right shows the currency composition of total issuances of international debt securities by country based on a nationality basis. The figure shows the total over all EFI 5 economies, decomposing issuance into local currency, U.S. dollars (USD), and other foreign currencies. The data are sourced from Dealogic's DCM database.

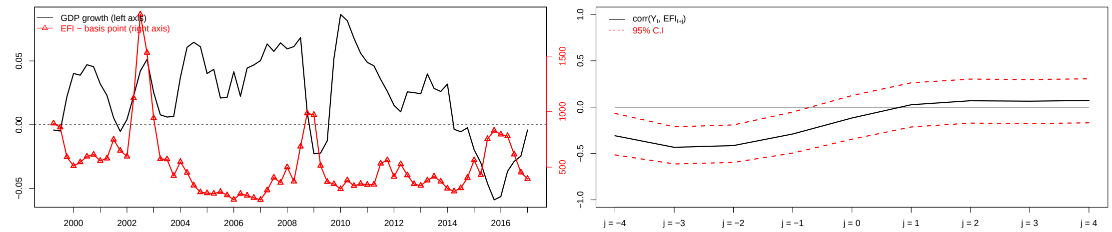
Table 3.1: Dataset on Corporate Spreads from Emerging Economies: Summary Statistics

Country	N.of.Bonds	N.of.obs	Statistics	Mean	SD	Min	Median	Max
All Countries	2638	30189	Number of bonds per quarter	419.2917	220.4797	163	290.5	934
			Size of bond ($ mil)	328.9172	445.5294	0.10006	200.1201	4027.377
			Maturity at issue (years)	6.943328	7.971787	0.083333	5	100.0833
			Term to maturity (years)	6.931208	7.895964	0	5	96.25
			OAS spread (basis point)	411.3479	509.2326	30.45	282.39	6767.17
Brazil	1399	10486	Number of bonds per quarter	145.6389	89.38511	57	101	507
			Size of bond ($ mil)	164.2011	288.1113	0.10006	36.82902	1814.155
			Maturity at issue (years)	3.62086	4.365172	0.083333	1.5	39.83333
			Term to maturity (years)	4.069998	4.375333	0	3	39.75
			OAS spread (basis point)	479.1067	562.0786	36.47	338.935	6144.54
Chile	315	5532	Number of bonds per quarter	76.83333	50.03576	14	54	204
			Size of bond ($ mil)	387.752	274.0932	4.46628	387.4995	1834.526
			Maturity at issue (years)	10.50741	10.69155	0.166667	10	100.0833
			Term to maturity (years)	8.229483	9.053388	0	6.5	96.25
			OAS spread (basis point)	277.672	247.5311	31.12	229.755	2959.21
Malaysia	129	2415	Number of bonds per quarter	33.54167	10.44629	9	32	72
			Size of bond ($ mil)	562.4242	552.9139	13.39884	446.628	3037.667
			Maturity at issue (years)	11.46705	13.5558	1	10	100
			Term to maturity (years)	9.435921	13.19718	0	6	95.25
			OAS spread (basis point)	194.4531	149.037	34.14	164.55	2162.35
Mexico	709	10028	Number of bonds per quarter	139.2778	77.85201	58	89	290
			Size of bond ($ mil)	585.3315	590.9284	0.194526	382.0074	4027.377
			Maturity at issue (years)	10.71415	7.318829	0.416667	10	32
			Term to maturity (years)	8.643398	7.454656	0	6.5	32
			OAS spread (basis point)	473.9276	610.6245	30.45	316.025	6767.17
Philippines	86	1728	Number of bonds per quarter	24	5.181223	14	24	33
			Size of bond ($ mil)	328.7382	236.1686	39.82219	276.3528	1184.582
			Maturity at issue (years)	10.06395	11.16683	2	7.666667	100
			Term to maturity (years)	6.70081	8.002002	0	4.75	88.5
			OAS spread (basis point)	368.0779	217.1292	55.16	315.275	1998.7

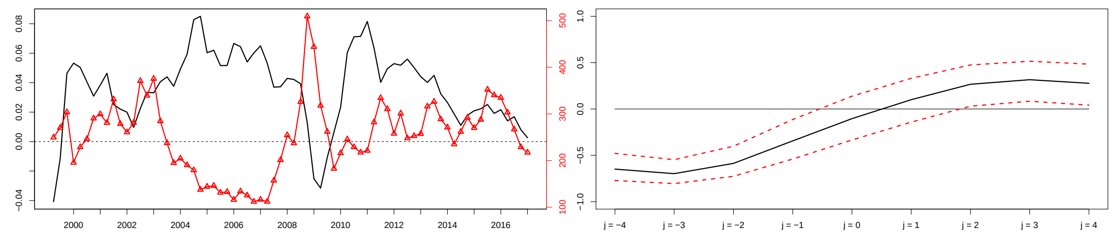
This table reports summary statistics of the bonds in our dataset. The columns N. of Bonds and N. of Obs. report the number of bonds and the number of OAS-quarter observations in the sample for each country for the entire sample period of 1999.Q2-2017.Q1, respectively. Number of bonds per quarter refers to the number of bonds with an OAS observation at a given quarter. Size of bond is measured in real U.S. dollars (2010.Q3 = 100). OAS spread is the option-adjusted spread of a bond in basis points at a given quarter. Maturity at issue refers to the remaining years of a bond from its issuance date to its maturity date. Terms to maturity refers to the remaining years of the bond from a given quarter to its maturity date. We exclude from the sample OAS observations that are below (above) the country-specific 0.5^{th} (99.5^{th}) percentiles of OAS-quarter observations of all USD denominated bonds available in Bloomberg for the country (including sovereign bonds).
Source: Bloomberg, Federal Reserve Economic Data (FRED), authors' calculation.

Figure 3.1 Real GDP and the External Financial Indicator

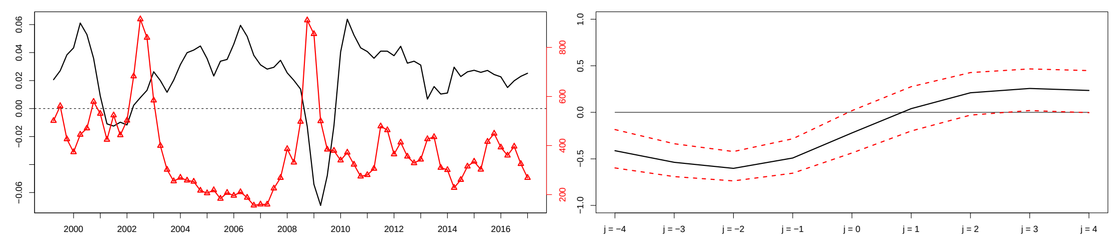
Brazil



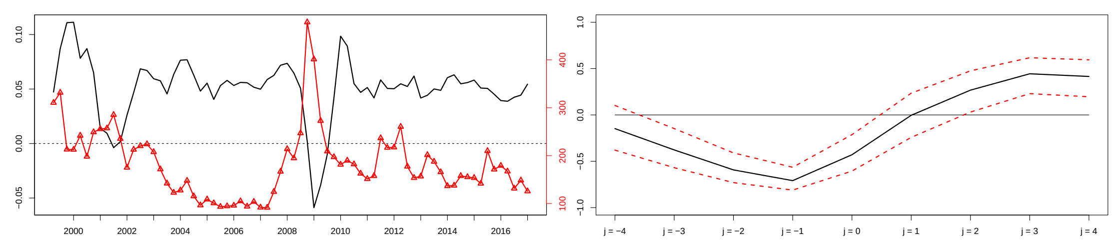
Chile



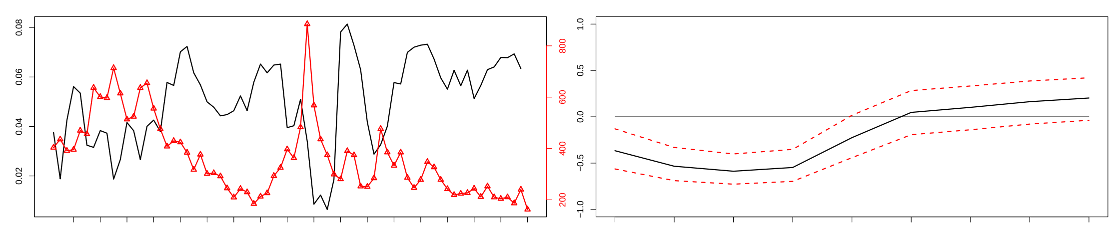
Mexico



Malaysia



Philippines



These figures show the time series dynamics of the external financial indicators (EFI) we constructed for each country in our sample with corporate spreads data and their comovement with real economic activity. The left column presents the times series of EFI in levels (diamond/red) and of annual real GDP growth (solid/black), both at a quarterly frequency. The right column presents the correlation between real GDP growth and changes in EFI at different lags ($corr\ (RGDP\ growth_t,\ \Delta EFI_{t+j})$) for $j = -4, \cdots, 4$. Red dotted lines represent a 95% confidence interval. The sample period is 1999.Q2-2017.Q1.

Source: Bloomberg, Haver Analytics, authors' calculation.

Table 3.2: Correlation between EFI and other variables

Variable	Brazil	Chile	Mexico	Malaysia	Philippines
Real GDP growth	-0.26	-0.50	-0.48	-0.39	-0.55
CEMBI	0.92	0.94	0.74	0.94	0.68
EMBI	0.82	0.87	0.78	0.87	0.81
VIX	0.61	0.70	0.83	0.86	0.80
Baa	0.53	0.84	0.76	0.77	0.54
EFI-Brazil	1.00	0.67	0.87	0.57	0.62
EFI-Chile		1.00	0.82	0.78	0.56
EFI-Mexico			1.00	0.83	0.78
EFI-Malaysia				1.00	0.74

This table reports the (contemporaneous) correlation between the EFI and other real and financial variables for the sample period 1999.Q2-2017.Q1. CEMBI and EMBI refer to Corporate Emerging Market Bond Index and Emerging Market Bond Index respectively. VIX refers to CBOE Volatility Index. “Baa” refers to a spread between the Moody’s Seasoned Baa Corporate Bond and the 10-Year constant maturity Treasury Bond. “EFI-country” refers to an EFI for a specific country. See the main text for more details.

Table 4.1: Benchmark Forecasting Regressions

One Quarter Ahead Forecasting Horizon ($h = 1$)

	Spec 1	Spec2	Spec 3	Spec 4	w.o EFI
	$RGDP\ growth_{t+1}$	$RGDP\ growth_{t+1}$	$RGDP\ growth_{t+1}$	$RGDP\ growth_{t+1}$	$RGDP\ growth_{t+1}$
$RGDP\ growth_t$	0.70***	0.70***	0.69***	0.70***	0.69***
	(13.60)	(13.11)	(12.50)	(12.55)	(12.14)
$\Delta\, EFI_t$	-0.000023**	-0.0000079	-0.0000084	-0.0000058	
	(-4.45)	(-1.62)	(-1.63)	(-1.10)	
$\Delta EMBI_t$	0.00030	-0.00020	-0.00014	-0.00024	-0.00083**
	(0.35)	(-0.44)	(-0.43)	(-0.70)	(-2.84)
ΔVIX_t		-0.00048**		-0.00021	-0.00024
		(-3.44)		(-1.22)	(-1.59)
$\Delta\, US\, Baa - Spread_t$			-0.0059***	-0.0044**	-0.0045**
			(-6.21)	(-4.57)	(-4.58)
R^2	0.749	0.763	0.766	0.768	0.767
Adjusted R^2	0.744	0.757	0.760	0.761	0.761
Observations	334	334	334	334	334

Two Quarters Ahead Forecasting Horizon ($h = 2$)

	Spec 1	Spec2	Spec 3	Spec 4	w.o EFI
	$RGDP\ growth_{t+2}$	$RGDP\ growth_{t+2}$	$RGDP\ growth_{t+2}$	$RGDP\ growth_{t+2}$	$RGDP\ growth_{t+2}$
$RGDP\ growth_t$	0.35**	0.35**	0.34*	0.34*	0.33*
	(2.83)	(2.79)	(2.58)	(2.52)	(2.33)
$\Delta\, EFI_t$	-0.000035**	-0.000026**	-0.000018**	-0.000022*	
	(-4.20)	(-3.03)	(-2.89)	(-2.29)	
$\Delta EMBI_t$	-0.00010	-0.00041	-0.00064	-0.00047	-0.0027***
	(-0.21)	(-0.89)	(-0.79)	(-0.51)	(-6.82)
ΔVIX_t		-0.00028*		0.00033	0.00020
		(-2.76)		(1.71)	(1.22)
$\Delta\, US\, Baa - Spread_t$			-0.0072**	-0.0096**	-0.010**
			(-4.16)	(-3.59)	(-3.92)
R^2	0.460	0.465	0.485	0.489	0.482
Adjusted R^2	0.448	0.451	0.472	0.474	0.469
Observations	329	329	329	329	329

Three Quarters Ahead Forecasting Horizon ($h = 3$)

	Spec 1	Spec2	Spec 3	Spec 4	w.o EFI
	$RGDP\ growth_{t+3}$	$RGDP\ growth_{t+3}$	$RGDP\ growth_{t+3}$	$RGDP\ growth_{t+3}$	$RGDP\ growth_{t+3}$
$RGDP\ growth_t$	0.074	0.074	0.060	0.052	0.045
	(0.39)	(0.39)	(0.30)	(0.26)	(0.21)
$\Delta\, EFI_t$	-0.000037***	-0.000035***	-0.000020***	-0.000029**	
	(-4.79)	(-5.00)	(-8.27)	(-3.93)	
$\Delta EMBI_t$	-0.00093	-0.0010	-0.0015	-0.0011	-0.0040***
	(-1.31)	(-1.53)	(-1.70)	(-1.20)	(-7.40)
ΔVIX_t		-0.000090		0.00071*	0.00053
		(-1.42)		(2.49)	(1.96)
$\Delta\, US\, Baa - Spread_t$			-0.0074*	-0.013*	-0.013**
			(-2.69)	(-2.76)	(-2.99)
R^2	0.277	0.277	0.303	0.319	0.307
Adjusted R^2	0.261	0.259	0.286	0.299	0.289
Observations	324	324	324	324	324

Four Quarters Ahead Forecasting Horizon ($h = 4$)

	Spec 1	Spec2	Spec 3	Spec 4	w.o EFI
	$RGDP\ growth_{t+4}$	$RGDP\ growth_{t+4}$	$RGDP\ growth_{t+4}$	$RGDP\ growth_{t+4}$	$RGDP\ growth_{t+4}$
$RGDP\ growth_t$	-0.13	-0.13	-0.15	-0.16	-0.17
	(-0.63)	(-0.62)	(-0.66)	(-0.69)	(-0.72)
$\Delta\, EFI_t$	-0.000034**	-0.000035***	-0.000018***	-0.000029***	
	(-3.76)	(-5.98)	(-4.86)	(-5.75)	
$\Delta EMBI_t$	-0.00075	-0.00072	-0.0012	-0.00081	-0.0037**
	(-0.67)	(-0.65)	(-1.15)	(-0.84)	(-4.60)
ΔVIX_t		0.000030		0.00080***	0.00062**
		(0.15)		(4.73)	(3.48)
$\Delta\, US\, Baa - Spread_t$			-0.0063	-0.012*	-0.013**
			(-1.62)	(-2.71)	(-3.02)
R^2	0.163	0.163	0.182	0.202	0.190
Adjusted R^2	0.144	0.141	0.161	0.178	0.169
Observations	319	319	319	319	319

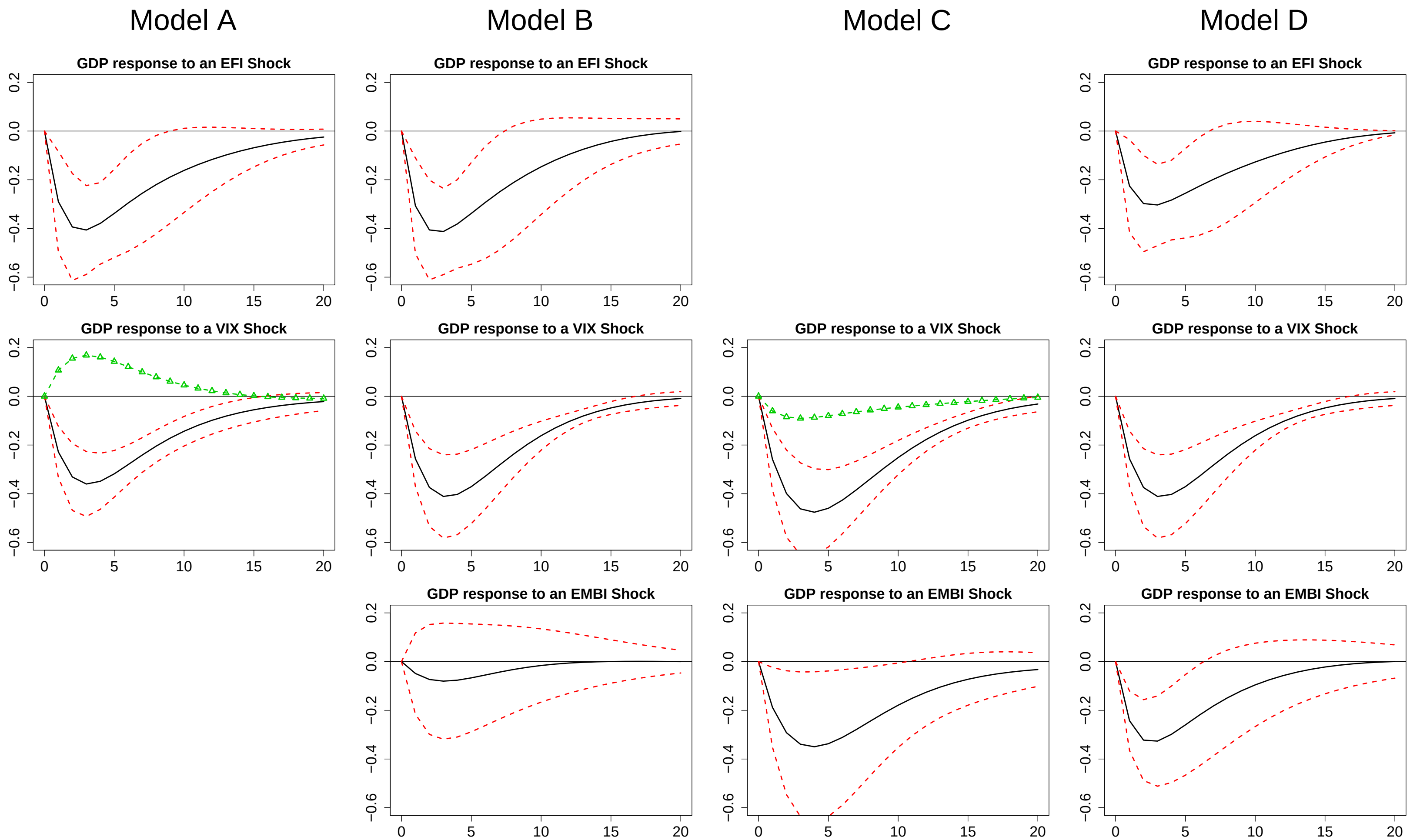
This table presents the benchmark results of country fixed-effect panel regressions for different forecasting horizons ($h = 1 \sim 4$). The dependent variable is the h-quarter ahead annual real GDP growth at a quarterly frequency. ΔEFI (measured in basis points) refers to annual changes in the external financial indicator. $\Delta EMBI$ refers to annual changes in Emerging Market Bond Index (EMBI) published by JP Morgan (measured in percentage points). ΔVIX refers to annual changes in the CBOE Volatility Index (VIX). $\Delta USBaa - Spread$ refers to annual changes in the spread between BAA corporate bond and 10-year constant maturity Treasury (measured in percentage points). All forecasting regressions include (but not report) the following variables as controls: $\Delta USYield$, ΔRFF, $\Delta R\, Local\ Rate$, $\Delta R\, Pcom$. $\Delta USYield$ (measured in percentage points) represents annual changes in the termspreads of 3-month and 10-year US treasuries. ΔRFF (measured in percentage points) is the annual changes in the real Federal Funds rate, which is the effective nominal Federal Funds Rate minus U.S. core personal consumption expenditure(PCE) inflation. $\Delta R\, Local\ Rate$ (measured in percentage points) is the annual changes in the domestic real monetary policy rate (which is computed as the domestic nominal policy rate minus the domestic inflation rate). We use as a proxy for the policy rate the money market rate or the monetary-policy related interest rate. $\Delta R\, Pcom$ refers to annual changes in the composite commodity index of Fernandez et al. (2015) (see the main text for details on the construction of this index). The sample includes 5 emerging economies (EFI-5: Brazil, Chile, Malaysia, Mexico, Philippines) and the period of analysis is 1999.Q2-2017.Q1. Numbers in parentheses are t-statistics adjusted for standard errors clustered by country. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

Table 4.2: Variance Decomposition of Real GDP Growth

	3-variable SVAR Models			4-variable SVAR Models			
	Model A			*Model B*			
	GDP Shock	VIX Shock	EFI Shock	GDP Shock	VIX Shock	EFI Shock	EMBI Shock
Variance Share of GDP	0.64	0.15	0.20	0.57	0.19	0.20	0.05
Variance Share of VIX	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Variance Share of EFI	0.04	0.56	0.41	0.04	0.56	0.38	0.02
Variance Share of EMBI				0.07	0.40	0.31	0.22
	Model C			*Model D*			
	GDP Shock	VIX Shock	EMBI Shock	GDP Shock	VIX Shock	EMBI Shock	EFI Shock
Variance Share of GDP	0.56	0.25	0.19	0.56	0.19	0.13	0.11
Variance Share of VIX	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Variance Share of EFI				0.07	0.40	0.47	0.06
Variance Share of EMBI	0.07	0.44	0.49	0.04	0.56	0.17	0.23

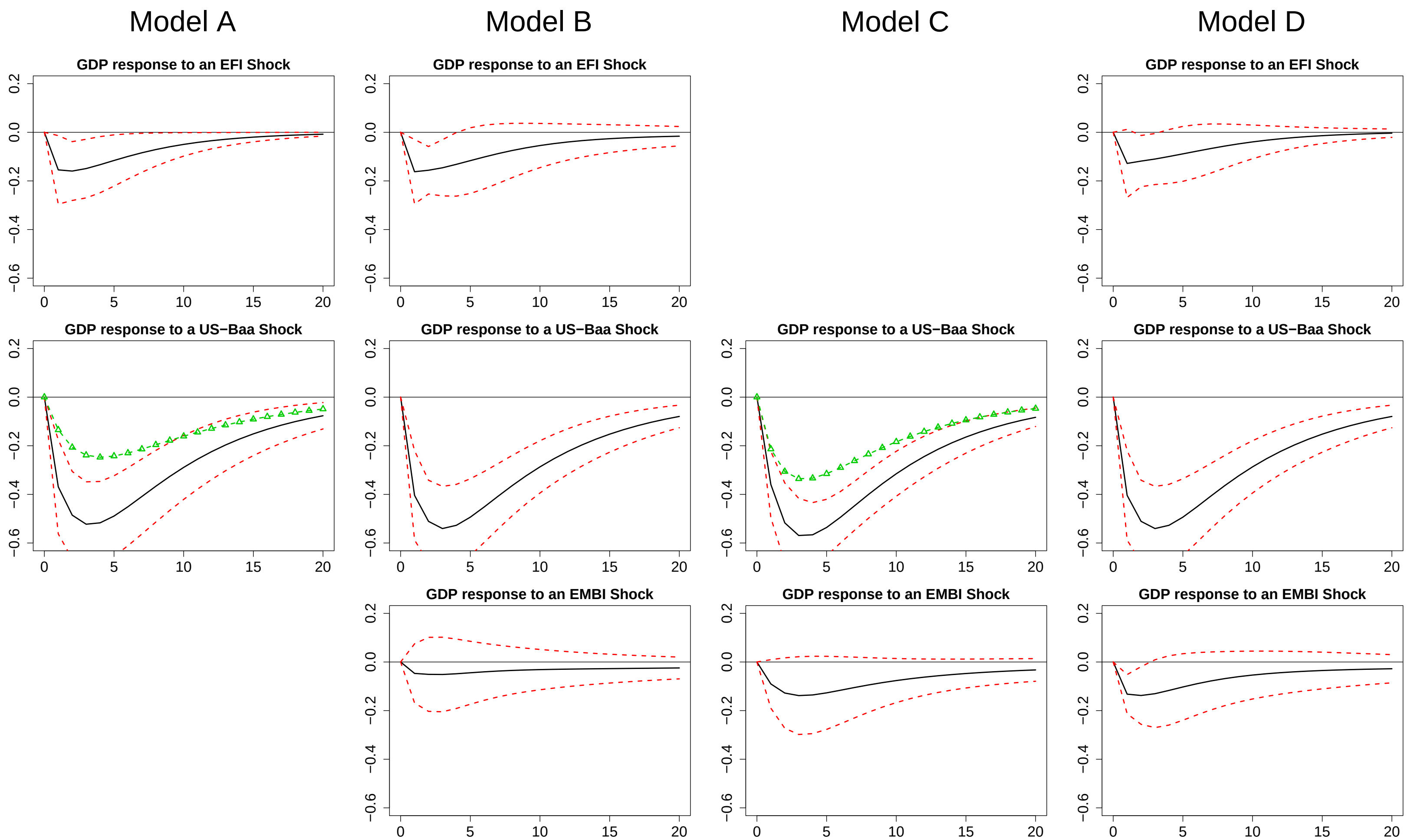
This table presents a (mean) variance decomposition of four different structural VAR specifications. All models are estimated for the sample period 1999.Q2-2017.Q1 for EFI-5 countries. We impose a recursive ordering assumption to identify structural shocks. In addition, we further assume that the global risk proxied by VIX is exogenous to emerging economies (e.g., it follows single-variable AR process). Model A (baseline) includes three variables: real GDP growth, VIX, and EFI. Model B adds one addition variable, EMBI, into Model A. The ordering of variables in Model A and B is identical to the ordering of variables shown in the table. In Model C, we replace EFI with EMBI from Model A. Model D adds one additional variable, EFI, into Model C. In Model D, we assume that EMBI is ordered first, before EFI.

Figure 4.1 Impulse Response Function of Real GDP Growth



This figure presents the (mean) impulse response function of annual real GDP growth. The first, second, and third row summarizes the impulse response functions to 1 standard deviation shock to EFI, VIX, and EMBI, respectively. Each column represents Model A-D, respectively. Red dotted lines represent a 1 standard deviation confidence interval where 1 S.D is calculated across country-specific impulse response functions. Green-triangular dotted lines present (mean) impulse response of real GDP growth to 1 standard deviation VIX shocks when the EFI or EMBI is counterfactually assumed not to respond directly to VIX.

Figure 4.2: Impulse Response Function of Real GDP Growth with an Alternative Measure of Global Risk: US BAA Spread



This figure reproduces Figure 4.1 replacing VIX with an alternative measure of global risk: US BAA spread. This figure presents the (mean) impulse response function of annual real GDP growth. The first, second, and third row summarizes the impulse response functions to 1 standard deviation shock to EFI, US BAA spread, and EMBI, respectively. Each column represents Model A-D, respectively. Red dotted lines represent a 1 standard deviation confidence interval where 1 S.D is calculated across country-specific impulse response functions. Green-triangular dotted lines presents (mean) impulse response of real GDP growth to 1 standard deviation US BAA spread shocks when the EFI or EMBI is assumed not to respond directly to VIX.

Table 4.3: Variance Decomposition with an Alternative Measure of Global Risk: US BAA Spread

	3-variable SVAR Models			4-variable SVAR Models			
	Model A			*Model B*			
	GDP Shock	USBAA Shock	EFI Shock	GDP Shock	USBAA Shock	EFI Shock	EMBI Shock
Variance Share of GDP	0.60	0.36	0.04	0.56	0.35	0.05	0.03
Variance Share of US Baa	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Variance Share of EFI	0.04	0.60	0.35	0.04	0.62	0.30	0.05
Variance Share of EMBI				0.03	0.48	0.24	0.25
	Model C			*Model D*			
	GDP Shock	USBAA Shock	EMBI Shock	GDP Shock	USBAA Shock	EMBI Shock	EFI Shock
Variance Share of GDP	0.54	0.39	0.07	0.56	0.35	0.06	0.03
Variance Share of US Baa	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Variance Share of EFI				0.03	0.48	0.47	0.02
Variance Share of EMBI	0.03	0.52	0.45	0.04	0.61	0.18	0.17

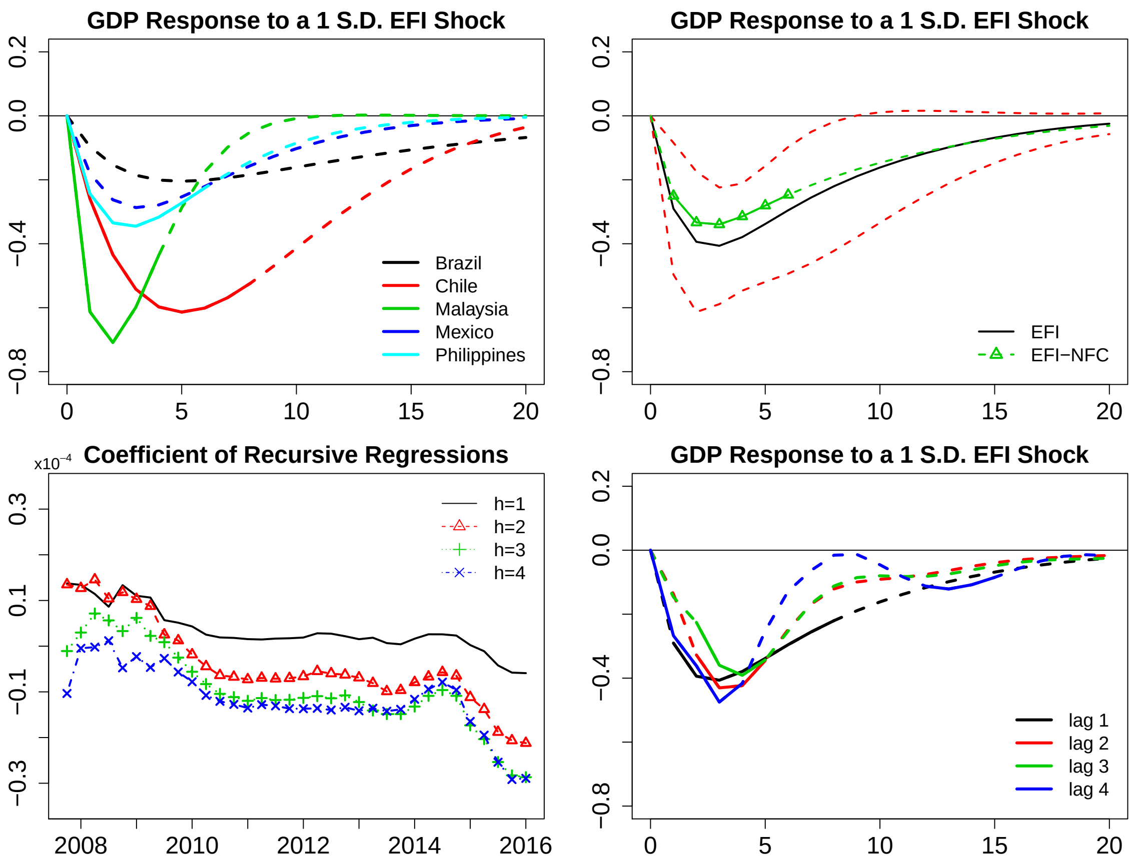
This table reproduces Table 4.2 replacing VIX with an alternative measure of global risk: US BAA spread. All models are estimated for the sample period 1999.Q2-2017.Q1 for EFI-5 countries. We impose a recursive ordering assumption to identify structural shocks. In addition, we further assume that US BAA spread is exogenous to emerging economies. Model A (baseline) includes three variables: real GDP growth, US BAA spread, and EFI. Model B adds one additional variable, EMBI, into Model A. The ordering of variables in Model A and B is identical to the ordering of variables shown in the table. In Model C, we replace EFI with EMBI from Model A. Model D adds one additional variable, EFI, into Model C. In Model D, we assume that EMBI is ordered first, before EFI.

Table 4.4: Transmission of Global Risks: A Counterfactual Analysis

	3-variable SVAR Models			*3-variable SVAR Models (Counterfactual)*		
	Model A - VIX			*Model A - VIX - Counterfactual*		
	GDP Shock	VIX Shock	EFI Shock	GDP Shock	VIX Shock	EFI Shock
Variance Share of GDP	0.64	0.15	0.20	0.71	0.08	0.20
Variance Share of VIX	0.00	1.00	0.00	0.00	1.00	0.00
Variance Share of EFI	0.04	0.56	0.41	0.07	0.01	0.93
	Model C - VIX			*Model C - VIX - Counterfactual*		
	GDP Shock	VIX Shock	EMBI Shock	GDP Shock	VIX Shock	EMBI Shock
Variance Share of GDP	0.56	0.25	0.19	0.68	0.09	0.24
Variance Share of VIX	0.00	1.00	0.00	0.00	1.00	0.00
Variance Share of EMBI	0.07	0.44	0.49	0.11	0.03	0.86
	Model A - BAA			*Model A - BAA - Counterfactual*		
	GDP Shock	USBAA Shock	EFI Shock	GDP Shock	USBAA Shock	EFI Shock
Variance Share of GDP	0.60	0.36	0.04	0.76	0.18	0.06
Variance Share of US Baa	0.00	1.00	0.00	0.00	1.00	0.00
Variance Share of EFI	0.04	0.60	0.35	0.09	0.07	0.84
	Model C - BAA			*Model C - BAA - Counterfactual*		
	GDP Shock	USBAA Shock	EMBI Shock	GDP Shock	USBAA Shock	EMBI Shock
Variance Share of GDP	0.54	0.39	0.07	0.62	0.31	0.08
Variance Share of US Baa	0.00	1.00	0.00	0.00	1.00	0.00
Variance Share of EMBI	0.03	0.52	0.45	0.05	0.06	0.89

This table presents a (mean) variance decomposition of four different structural VAR specifications under normal and counterfactual scenarios. The left half of the table reports (mean) variance decompositions of Model A and C already shown in Table 4.2 and 4.3 for a comparison purpose. The right half of the table reports counterfactual (mean) variance decompositions of Model A and C where the EFI or EMBI is assumed not to respond directly to global risks proxied VIX or US BAA spread. All models are estimated for the sample period 1999.Q2-2017.Q1 for EFI-5 countries.

Figure 5.1: Extensions and Robustness Checks



This figure presents different robustness checks to our baseline results. The top-left panel presents country-by-country impulse response functions of real GDP growth to a 1 standard deviation EFI shocks from Model A with VIX. The top-right panel presents the impulse response function of real GDP growth where EFI is calculated after excluding bonds issued by financial corporations (Green-triangular line), along with the benchmark result (black-solid line). The bottom-left panel presents the estimated coefficients of EFI (spec 4 in Table 4.1) from rolling regression for different forecasting horizons. The bottom-right panel presents impulse response functions of real GDP growth to a 1 standard deviation shock to EFI shocks from Model A with VIX for various lag order specifications. Solid lines represent statistically significant responses at the 95% confidence level.

Table 5.1: Forecasting Regression Results with Broader Set of Countries and an Alternative Measure of Corporate Spread

Baseline Specification

	$h=1$ $RGDP\,growth_{t+1}$	$h=2$ $RGDP\,growth_{t+2}$	$h=3$ $RGDP\,growth_{t+3}$	$h=4$ $RGDP\,growth_{t+4}$
$RGDP\,growth_t$	0.70***	0.34*	0.052	-0.16
	(12.55)	(2.52)	(0.26)	(-0.69)
$\Delta\,EFI_t$	-0.0000058	-0.000022*	-0.000029**	-0.000029***
	(-1.10)	(-2.29)	(-3.93)	(-5.75)
$\Delta EMBI_t$	-0.00024	-0.00047	-0.0011	-0.00081
	(-0.70)	(-0.51)	(-1.20)	(-0.84)
ΔVIX_t	-0.00021	0.00033	0.00071*	0.00080***
	(-1.22)	(1.71)	(2.49)	(4.73)
$\Delta\,US\,Baa-Spread_t$	-0.0044**	-0.0096**	-0.013*	-0.012*
	(-4.57)	(-3.59)	(-2.76)	(-2.71)
R^2	0.768	0.489	0.319	0.202
Adjusted R^2	0.761	0.474	0.299	0.178
Observations	334	329	324	319

Extended Sample of countries to EFI-10

	$h=1$ $RGDP\,growth_{t+1}$	$h=2$ $RGDP\,growth_{t+2}$	$h=3$ $RGDP\,growth_{t+3}$	$h=4$ $RGDP\,growth_{t+4}$
$RGDP\,growth_t$	0.73***	0.36***	0.030	-0.23*
	(21.47)	(5.70)	(0.31)	(-2.09)
$\Delta\,EFI_t$	-0.000011	-0.000020*	-0.000021*	-0.000016*
	(-1.67)	(-2.00)	(-2.25)	(-1.97)
$\Delta EMBI_t$	0.00031	-0.00048	-0.0015	-0.0014
	(0.45)	(-0.43)	(-1.05)	(-1.08)
ΔVIX_t	-0.000086	0.00038**	0.00066**	0.00069***
	(-0.62)	(2.48)	(2.95)	(3.61)
$\Delta\,US\,Baa-Spread_t$	-0.0034**	-0.0087***	-0.011***	-0.0100***
	(-2.89)	(-4.76)	(-3.81)	(-3.91)
R^2	0.782	0.524	0.358	0.291
Adjusted R^2	0.778	0.516	0.347	0.279
Observations	550	541	532	523

Using CEMBI instead of EFI-5

	$h=1$ $RGDP\,growth_{t+1}$	$h=2$ $RGDP\,growth_{t+2}$	$h=3$ $RGDP\,growth_{t+3}$	$h=4$ $RGDP\,growth_{t+4}$
$RGDP\,growth_t$	0.71***	0.39*	0.14	-0.071
	(12.20)	(2.59)	(0.61)	(-0.27)
$\Delta CEMBI_t$	0.000069	0.000095	0.0012	0.0011
	(0.19)	(0.09)	(0.53)	(0.35)
$\Delta\,EFI_t$				
$\Delta EMBI_t$	-0.0016**	-0.0043*	-0.0077*	-0.0071
	(-3.09)	(-2.46)	(-2.38)	(-1.64)
ΔVIX_t	-0.00031	0.000099	0.00046	0.00050*
	(-1.84)	(0.66)	(1.91)	(2.72)
$\Delta\,US\,Baa-Spread_t$	-0.0033**	-0.0073**	-0.0098**	-0.0089*
	(-3.25)	(-3.81)	(-2.95)	(-2.75)
R^2	0.783	0.524	0.384	0.263
Adjusted R^2	0.776	0.508	0.363	0.237
Observations	279	274	269	264

This table presents forecasting regression results with a broader set of sample countries and an alternative measure of corporate spread: CEMBI. The top panel shows the benchmark forecasting regression results (spec 4) reported in Table 4.1. The middle panel shows the forecasting results with a broader set of sample countries. Colombia, Peru, Russia, South Africa, and Turkey are added as we allow each countries to have an incomplete time-series of the EFI. The bottom panel reports forecasting regression results replacing EFI with CEMBI for the EFI-5 countries. The sample period is 1999.Q2-2017.Q1 for all forecasting regressions. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

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