# Corporate Bond Issuance Over Financial Stress Episodes: A Global Perspective

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# Corporate Bond Issuance Over Financial Stress Episodes: A Global Perspective

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**Abstract**

We use a merged global data set of security-level corporate bond issuance and firm-level financial statement data to show that, in contrast to earlier periods of financial stress, during the COVID pandemic nonfinancial firms around the world were *more* likely to issue bonds, driven by a boom in local-currency-denominated issuance. We observe a distinct cross-regional difference in the characteristics of issuing firms, finding that in advanced economies issuance during COVID was driven by less risky firms, as predicted by existing theories; in emerging markets, only issuance of U.S. dollar denominated bonds came from larger or less risky firms.

*JEL Codes*: F30, G15, G30.
*Keywords*: corporate bonds, issuance, COVID, crises

# 1 Introduction

During periods of financial market stress, investors hoard liquidity, disengage from risk and flock to high-quality assets, making it more difficult for firms to raise capital and secure funding. For example, during the depths of the global financial crisis, only the highest quality firms were able to access external capital markets, and even those firms had to issue bonds that investors deemed as less risky, such as those with shorter maturities and more security (Erel et al., 2012). Such flight-to-quality behavior by bond investors can result in an inefficient allocation of capital to firms, leading to foregone investment opportunities and other social costs (Caballero and Krishnamurthy (2008), Vayanos (2004)).

In contrast, this pattern was not observed during the COVID pandemic, even as the global economy entered into uncharted waters amid unprecedented uncertainty. As documented in Halling et al. (2020) and Becker and Benmelech (2021), issuance of corporate bonds by U.S. firms boomed in spring of 2020, partly reflecting extraordinary monetary and fiscal support. Such resilience of primary corporate bond markets helps alleviate firms' financial constraints, allows them to pursue attractive investment opportunities and better withstand future shocks (Han and Qiu, 2007). However, elevated debt issuance, especially among riskier firms, may precede future credit crunches, significant widening of credit spreads and deterioration of firms' financial health and credit quality (Greenwood and Hanson, 2013). Therefore, it is important to understand how firms' financial ratios have evolved through the pandemic.

Furthermore, financial media and market participants point to a similar bond issuance boom outside of the U.S. (for example, Toole (2021), Lonski (2021), and Wheatley (2020)). Indeed, as shown in Figure 1, comparing cumulative nonfinancial corporate bond issuance by year in different regions from 2015 to 2021, bond issuance boomed everywhere around the world in 2020 despite the pandemic (red lines); almost all regions experienced a record level of annual

issuance, with the only exception being non-China emerging market economies (EMEs), which also saw record issuance but in 2021 (blue lines).

**Figure 1: Total value of corporate bond issuance by year for 2015-2021**

Annual U.S. dollar value of nonfinancial corporate bond issuance for 2015 to 2021. Includes issuance from firms in our matched sample. Source: Refinitiv Workspace.
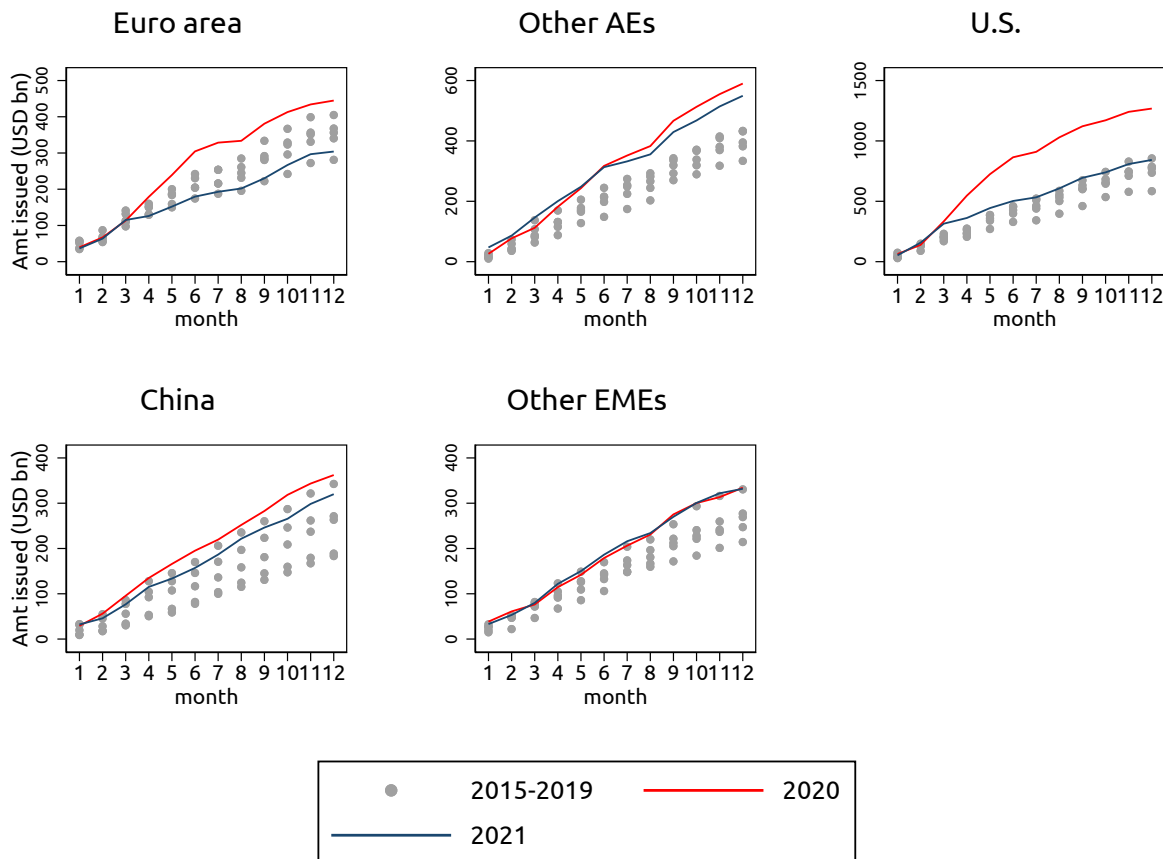


However, academic literature has devoted much less attention to issuance patterns outside of the U.S. and ensuing implications for issuing firms, despite rapidly increasing importance of corporate bond markets abroad over recent decades.[1] In this paper, we attempt to close this gap by using a merged global data set on security-level corporate bond issuance and

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[1]Debt securities of non-financial corporations as a percentage of GDP almost doubled between 2009 and 2020, reaching 6.8% in advanced economies and 2.2% in emerging economies (Aldasoro et al., 2021). Within our sample, the new issue corporate bond market outside the U.S. reached $1.35 trillion in 2021, compared to $830 billion in the U.S.

firm-level financial statements to examine how nonfinancial corporate bond issuance patterns during COVID pandemic compared to those observed in previous periods of financial stress (the global financial crisis and the taper tantrum) across firms and countries. Furthermore, we examine financial health ratios for firms from various regions around the world that issued bonds during COVID and identify how they used the proceeds from such issuance.

In particular, we ask the following questions: How did corporate bond issuance evolve over the COVID pandemic in different regions, and how does such evolution compare to previous periods of financial stress? We then examine the characteristics of firms that issued bonds during COVID, as well as what these firms used the raised cash for and how healthy they look in a post-pandemic world. Comparing the evolution of corporate debt issuance and firm financials across stress periods and countries should help us understand both firms' responses to stress and how government policies helped them cope, as well as how the ongoing removal of policy accommodation may affect the corporate sector around the world.

In order to formally quantify how the different periods of stress impacted the bond market, we examine a global panel of more than 60,000 firms from 45 countries over a 16 year period that includes the three periods of acute economic distress (COVID, taper tantrum and the global financial crisis). We then delve deeper into the subsample of firms that issued bonds during COVID, and compare their characteristics to issuers in the non-stress years leading up to 2020.[2] Finally, we examine the post-COVID outcomes for the sample of firms that contributed to the issuance boom during COVID compared to those that didn't.

We first use this panel data to estimate firms' propensity to issue bonds during normal and stress periods. We find that in contrast to the global financial crisis and the taper tantrum, firms in all regions were *more* likely to access the corporate bond market during COVID relative to non-stress periods. This increased propensity to issue bonds during COVID is

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[2]The definition of the COVID period used throughout this paper aims to capture only an initial, especially uncertain, period of the pandemic (March to June 2020, inclusive) rather than the entire duration of the pandemic.

concentrated in issuance of bonds denominated in local currency, rather than U.S. dollar denominated bonds. Furthermore, the amount issued and number of issued corporate bonds was also higher during COVID relative to preceding years, in contrast to previous periods of stress.

Second, consistent with the theory that capital providers become more cautious in bad times, we find that increased issuance during COVID was driven by less risky firms in advanced economies, as proxied by firm size, leverage and profitability. In non-China emerging markets, issuance of U.S. dollar denominated bonds during COVID was done by larger and less risky firms, similar to the case of advanced economy firms. In contrast, non-China emerging market issuance of local currency bonds (the currency segment where issuance increased significantly) was not done by safer firms during COVID, though they were larger during the taper tantrum.

Third, we explore potential reasons that may explain these corporate bond issuance patterns, with a focus on the unprecedented central bank policy support that occurred globally. Bond-buying programs in many economies expanded central bank balance sheets dramatically, and we show that the addition of proxies for this activity and other macroeconomic conditions dampens the importance of the onset of the COVID pandemic in our regression analysis; in other words, monetary policy support partly explains the boom in COVID issuance.

In our final set of analysis, we examine the evolution of firm financial ratios around the COVID pandemic to identify use of bond issuance proceeds and assess if firms appear over-levered. We show that Chinese firms, in particular, who issued during COVID, have higher leverage than their non-issuing peers.

**Related Literature.** There is a fast-growing literature that examines how firms reacted to the onset of COVID during 2020, including their access to capital and funding markets. After initially relying on credit lines in a "dash for cash" (Acharya and Steffen, 2020), companies

were able to successfully tap capital markets, although less financially constrained and higher-credit-quality companies were, at least initially, more successful in raising capital than others (e.g. Halling et al. (2020)). In addition, bond issuance was more resilient than syndicated loan issuance (Becker and Benmelech, 2021), and debt financing was more prevalent than equity issuance early in the pandemic (Hotchkiss et al., 2020). A smaller number of papers examine what firms did with the proceeds from bonds issued during COVID; Darmouni and Siani (2022) show they used funds to repay loans and hoard cash rather than real investment, likely driven by precautionary motives (Pagano and Zechner, 2022). These cash holdings helped firms keep their net leverage stable even amid a borrowing binge; gross leverage ratios exhibited an increasing trend even prior to the pandemic (Benmelech, 2021). Pagano and Zechner (2022) argue that for listed companies even gross leverage ratios declined as equity capital increases dominated their borrowing-induced balance-sheet expansion.

Our paper examines whether some of these patterns hold around the globe and how they compare to prior periods of financial stress. To our knowledge, non-U.S. evidence on issues related to firms' capital raising and financial decisions during the COVID pandemic is quite scant, with the exception of some analysis of European firms. In particular, Darmouni and Papoutsi (2021) investigate whether in Europe it was corporate bonds of larger safer issuers or those of new market entrants that were subject of sell-off by bond investors and downgrades by rating companies while Pagano and Zechner (2022) examine capital raising activities and financial decisions of firms in both U.S. and Europe and document broadly similar patterns across the two regions.

Our study contributes to the literature along three dimensions. First, to our knowledge, our paper is the first comprehensive examination of COVID-period corporate bond issuance across all regions, including EMEs. While the issuance surge in the U.S. and Europe has been documented and is perhaps not surprising, less is known about EMEs, the governments of which provided less monetary and fiscal support. EMEs are of growing importance in their

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own right. Moreover, issuance patterns in EMEs may help understand cross-border spillovers of advanced economy monetary and fiscal policies.

Second, we compare bond issuance patterns to those observed over earlier periods of financial stress, including the global financial crisis and the taper tantrum, helping shed light on the role unprecedented worldwide policy support distinguishing the COVID pandemic might have played in supporting corporate credit markets. In this respect, the closest study is Becker and Benmelech (2021); it compares capital raising during COVID pandemic to those during the global financial crisis in the context of the U.S.

Third, we examine not only bond issuance but also link firm-level issuance to firm-level financial and real outcomes, again using our comprehensive cross-country firm-level data set.[3] Stabilizing corporate borrowing rates and facilitating firms' access to bond markets is one of the initial steps through which credit market support policies affect the economy. These effects have been studied both in context of COVID policies in the papers cited above and in the context of earlier credit market support programs by ECB and BOE (D'Amico and Kaminska, 2019; Todorov, 2020). However, longer-term macroeconomic and financial-stability implications of such policies will depend on what companies do with the raised funds. Tracking firms' financial and real outcomes over time is the first step to understanding such longer-term effects.

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[3]Other papers that employ issuance-firm matched datasets for firms outside of the U.S. include Gozzi et al. (2010), Gozzi et al. (2015), Cortina et al. (2018), and Didier et al. (2021).

# 2   Empirical Specification

## 2.1   Data and Variables of Interest

We use data on corporate bond issuance transactions from Refinitiv Workspace for Investment Banking for a sample period of January 1, 2005 to December 31, 2021. The database covers transaction-level details for bond offerings from companies around the world. We exclude convertible debentures and preferred shares, as well as $0 issuance and securities with less than 1 year to maturity at issuance.

We then match bond issuance data with firm-level annual financial statements from Refinitiv Worldscope for the years 2004-2020 (financial data is lagged to the fiscal year before bond issuance). We match first based on the ultimate parent's Refinitiv Instrument Code (RIC), which can be found in both Refinitiv Workspace and Refinitiv Worldscope. We then supplement additional matches based on firm name (Issuer/Borrower Name Full in Refinitiv Workspace and Name in Refinitiv). Some of the matches in this second step include subsidiary firms that have financial statements in Worldscope while the ultimate parent does not (e.g. PetroChina).

We focus on bond issuance activity by non-financial corporations by excluding from Worldscope all firms with an SIC code between 6000 and 6999. We also exclude public administration firms with an SIC code above 9000. Finally, we exclude firms in countries with fewer than 10 unique issuers over the sample period.

Our final matched dataset includes 60,421 firms from 45 countries, of which 6,058 issued at least one bond during our sample period (see Appendix A for a breakdown by country). Our matched dataset of 80,375 bonds totals US$25.8 trillion in face value, which represents 75.5% of the number of and 97.3% of the face value of non-financial corporate bonds in Refinitiv Workspace.

Our main variables of interest concern monthly bond issuance at the firm level, comparing issuance decisions and firm characteristics during months with financial stress compared to months with no stress ("normal times"). We define our independent variables of interest as three dummies for the periods of financial stress, which take on a value of 1 in the following months:

- COVID pandemic: March to June 2020, inclusive;

- Taper tantrum: May 2013 to April 2014 inclusive; and

- Global financial crisis: December 2007 to June 2009, inclusive.

These months were chosen based on the likely impact on the bond markets. The GFC months were chosen based on the NBER-defined recession; the taper tantrum includes the May 2013 testimony by Ben Bernanke signaling the unexpected start to the end of quantitative easing, and includes the subsequent slow-down in China and other EMEs; and the COVID months include the four months where the VIX index was at an average monthly level above 30.

We first examine bond issuance decisions, such as the propensity to issue a bond (*issuerdummy*, which takes on a value of 1 if the firm issues at least one bond in a month and 0 otherwise), and the dollar amount and number of bonds issued by a firm in a month. Issuance amounts are measured in constant 2011 U.S. dollars. We then look at the characteristics of the bonds issued, such as the weighted average time to maturity of new bonds issued by a firm in a month, and the proportion of bonds issued by a firm that are rated and investment grade rated.

We then turn to characteristics of bond issuers as of the firm's previous fiscal year end, such as log assets (log of USD total asset value, using 2011 constant U.S. dollars), book leverage (total debt divided by total assets), and profitability (net income divided by total assets). The latter two variables are winsorized at the 5% and 95% level.

We then investigate the time series of macroeconomic variables around our periods of financial stress. At the country-month level, we examine a country's average 10-year government yield, the size of the central bank's balance sheet relative to GDP, and flows into a country's bond mutual funds as a percentage of such funds' assets under management. At the monthly level but with no country variation, we examine the level of the Wu-Xia Shadow Federal Funds Rate (Wu and Xia, 2016), the level of the USD broad dollar index, and the monthly VIX level.

In a final set of analysis, we look at the evolution of firm financial ratios after the onset of the COVID pandemic. In addition to the previously defined book leverage, we also look at the percentage of short-term debt relative to total debt; the proportion of firms with interest coverage ratios (defined as earnings before interest, taxes, depreciation and amortization divided by interest expense) less than 2; and cash, capital expenditures and dividends, all divided by total assets.

We perform our analysis for five separate geographical areas: the euro area, other advanced economies (AEs), the United States, China, and other emerging market economies (EMEs). In China and other EMEs, in addition to looking at all bond issuance, we examine in some tests local currency issuance and USD issuance.

Table 1 shows summary statistics for the full sample period, broken down by region.

In Panel A, we describe the characteristics of bond issuance, including the regional breakdown of the 6,058 unique issuing firms. Our sample includes 17,542 bonds from nonfinancial corporations in the U.S.[4] For firm-months that include issuance, the average amount of bonds issued is largest in the U.S. at approximately $992 million, followed closely by the euro area at $984 million. Other AEs, China and other EMEs are smaller at $579 million,

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[4]This number can be calculated as the number of firm-months with issuance (10,142) multiplied by the average number of bonds when issuing (1.73). Our sample is similar to the 17,379 bonds issued between 2002 and 2020 as described in Becker and Benmelech (2021).

**Table 1: Summary statistics**

| Sample: | Euro area | Other AEs | U.S. | China | Other EMEs |
|---|---|---|---|---|---|
| *Panel A: Bond issuance details* | | | | | |
| Number of unique issuing firms | 468 | 1,286 | 1,499 | 975 | 1,830 |
| Number of firm-months with issuance | 4,713 | 8,964 | 10,142 | 6,821 | 13,420 |
| Average number of bonds | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 |
| Average number of bonds ($>0$) | 1.96 | 2.01 | 1.73 | 1.46 | 1.91 |
| Average bond size ($m) | $10.1 | $2.6 | $8.8 | $3.3 | $1.3 |
| Average bond size ($>$0m) | $1,078.9 | $646.3 | $1,008.3 | $376.8 | $268.3 |
| Weighted average maturity | 8.53 | 8.95 | 11.44 | 6.10 | 5.80 |
| Rated share | 67.2% | 39.9% | 89.1% | 12.2% | 15.8% |
| IG rated share | 54.6% | 32.3% | 53.6% | 4.1% | 10.1% |
| *Panel B: Bond issuer characteristics* | | | | | |
| Log assets | 10.25 | 9.73 | 9.31 | 9.13 | 8.97 |
| Book leverage | 35.6% | 36.8% | 38.3% | 36.6% | 37.1% |
| Profitability | 3.2% | 3.3% | 3.7% | 3.0% | 2.9% |
| *Panel C: All firm characteristics* | | | | | |
| Number of unique firms | 4,043 | 18,360 | 12,073 | 6,407 | 19,538 |
| Number of unique firm-months | 503,946 | 2,257,255 | 1,155,809 | 773,922 | 2,719,365 |
| Log assets | 5.36 | 4.28 | 4.07 | 5.94 | 4.97 |
| Book leverage | 24.8% | 18.7% | 27.3% | 21.1% | 23.9% |
| Tangibility | 23.4% | 30.1% | 24.7% | 26.5% | 31.1% |
| *Panel D: Macroeconomic conditions* | | | | | |
| Level of 10-year yield | 2.88% | 2.12% | 2.92% | 3.45% | 4.76% |
| Change in USD broad index | 0.05% | 0.05% | 0.05% | 0.05% | 0.05% |
| Wu Xia shadow Fed Funds rate | 0.69% | 0.69% | 0.69% | 0.69% | 0.69% |
| Monthly change in VIX | 2.10% | 2.10% | 2.10% | 2.10% | 2.10% |
| Change in 1-mth euro area OIS at ECB ann'ts | 0.19% | 0.19% | 0.19% | 0.19% | 0.19% |
| Flow into bond funds as % of AUM | 0.39% | 0.41% | 0.32% | 5.06% | 0.74% |

$370 million and $242 million, respectively. In terms of number of bonds issued, for months with positive issuance the average number of bonds issued is 2.01 in other AEs, 1.96 in the euro area, 1.91 in other EMEs, 1.73 in the U.S. and 1.46 in China. Average initial time to maturity is longer in advanced economies (U.S. at 11.5 years, other AEs at 9.0 years and euro area at 8.5 years) than in emerging economies (6.1 and 5.8 years in China and other EMEs, respectively). The majority of bonds in the U.S. and euro area are rated, while only 40% of bonds in other AEs are rated. Only 12% and 16% of bonds in China and other EMEs are rated.

Panel B shows characteristics of bond issuing firms whereas Panel C shows characteristics of all firms. Not surprisingly, bond issuers are, on average, larger and more levered than the firms in the full sample. In terms of bond issuers, euro area firms are the largest and least levered, while firms in other EMEs are smallest and have the second highest leverage (U.S. issuers have the highest leverage). In the full sample, Chinese firms are the largest and have the second lowest leverage, while U.S. firms are the second smallest and have the highest leverage.

Finally, Panel D shows that the average 10-year government yields over the sample period are lowest in other AEs, followed by the euro area and the U.S. Non-China EMEs have the highest average sovereign yields. China has experienced the largest average flows into bond mutual funds, although the average is positive across all regions. Over the sample period, the average monthly change in the USD broad dollar index is 0.05%, the average shadow Federal Funds rates is 0.69%, the average monthly change in VIX is 2.10% and the average change in the 1-month euro area overnight index swap around European Central Bank announcements is 0.19%.

## 2.2 Regression specifications

In order to test the relationship between issuance decisions and periods of financial stress, our main regression specification takes on the following form:

$$y_{i,t} = \alpha + \beta * COVID + \delta * TT + \gamma * GFC + \eta_i + \epsilon, \tag{1}$$

where $y_{i,t}$ is one of issuer dummy, dollar amount issued (converted using constant 2011 U.S. dollars), or number of bonds issued. These variables are defined for the full sample of firm-months. We run the analysis on an unbalanced panel, based on the fact that some firms enter and exit the sample, but for robustness we also re-run the analysis using only the firms with data for all years; the results remain qualitatively the same. $\beta$, $\delta$ and $\gamma$ measure whether issuance decisions change during stress months relative to the rest of the sample period. We control for firm fixed effects in all specifications with $\eta_i$. In order to properly account for the cross-sectional dependence in our panel data, we use Driscoll-Kraay standard errors (Driscoll and Kraay, 1998).

We then run Equation 1 on the sample of firm-months with positive issuance. The dependent variables $y_{i,t}$ that we explore are dollar-amount weighted average maturity of bonds issued in a firm-month and share of bonds issued in a firm-month with an investment grade rating.

We next examine whether the characteristics of firms that issue during stress periods are different than firms that issue in non-stress periods, using the following regression specification:

$$y_{i,t} = \alpha + \beta * COVID + \delta * TT + \gamma * GFC + \eta_j + \rho_t + \epsilon, \tag{2}$$

where $y_{i,t}$ is the firm characteristic of interest for firm $i$ that issues a bond in month $t$. The firm characteristics we examine are log assets (in U.S. dollars, converted using constant 2011 exchange rates), book leverage, and profitability. The coefficients $\beta$, $\delta$ and $\gamma$ measure the difference in average firm characteristics in stress periods relative to non-stress periods. We control for industry fixed effects (using 1-digit SIC code) with $\eta_j$ and control for time trend with year fixed effects $\rho_t$. We cluster our standard errors at the industry level.

# 3   Empirical Results

## 3.1   What does corporate bond issuance look like during periods of financial stress?

As shown in Figure 1 in the introduction, total dollar issuance of nonfinancial corporate bonds surged to record or near-record levels in 2020 across all regions, despite the COVID pandemic. After a brief stall in the corporate bond market at the onset of the pandemic early in the year, cumulative dollar issuance in 2020 (red line) exceeded issuance levels from the previous five years (gray dots) in almost all regions, especially in advanced economies. For the U.S., this pattern is particularly pronounced and is in line with findings from previous literature (e.g. Halling et al. (2020) and Hotchkiss et al. (2020)). Issuance in 2021 (blue line) generally remained high in all regions except for the euro area, and actually exceeded 2020 issuance levels in non-China EMEs.

These patterns largely remain if we examine the number of issued bonds rather than the overall issued amounts. In particular, Figure 2 shows that the number of bonds issued peaked in 2020 in other AEs, U.S. and China. The number of bonds is lower than in previous years in the euro area, indicating that the high dollar issuance was partly driven by larger bonds

**Figure 2: Number of corporate bonds issued by year for 2015-2021**

Annual number of nonfinancial corporate bonds issued for 2015 to 2021. Includes issuance from firms in our matched sample. Source: Refinitiv Workspace.
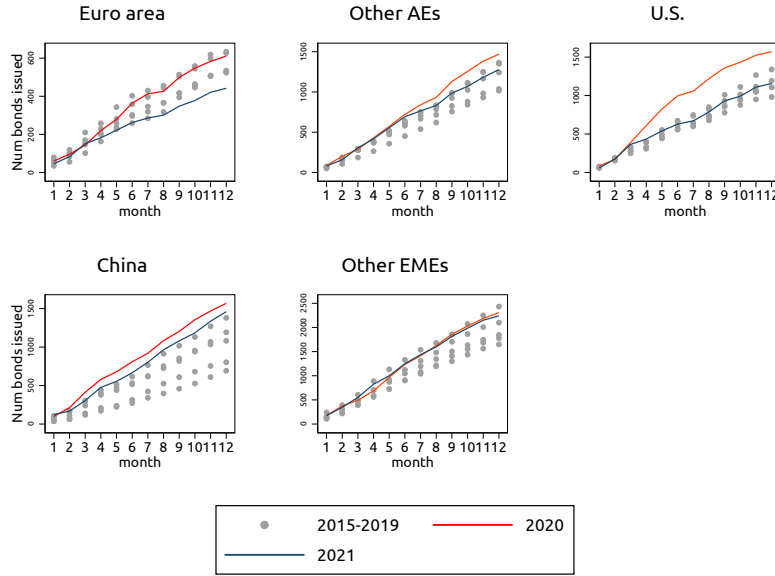


being issued.

To contrast the issuance of corporate bonds during the COVID pandemic to that in other periods of stress, Figure 3 shows the pattern of total dollar issuance around the global financial crisis (top panel) and the taper tantrum (bottom panel). As shown in panel (a), total dollar issuance levels in 2008 were generally in line in previous years, but surged in 2009 in all areas except the U.S. We conjecture that issuance behavior during the taper tantrum to be most affected in China and other EMEs. Indeed, panel (b) shows that while issuance levels for these regions in early 2013 is above previous years (especially in China, which was experiencing significant growth in its bond market), there is a distinct 'flattening' of the issuance curve beginning in May 2013 and continuing into early 2014.

We next formally test whether issuance patterns during COVID are different than non-stress times and other stress episodes using the regression in Equation (1). Table 2 uses the full panel of firm-months and examines as dependent variables bond issuance propensity (issuer dummy), dollar amount issued (adjusted for exchange rate effects), and number of bonds

**Figure 3: Total value of corporate bond issuance by year**

Annual U.S. dollar value of nonfinancial corporate bond issuance for 2005 to 2009 in panel (a) and for 2010 to 2014 in panel (b). Includes issuance from firms in our matched sample. Source: Refinitiv Workspace.

**((a)) 2005-2009**



**((b)) 2010-2014**



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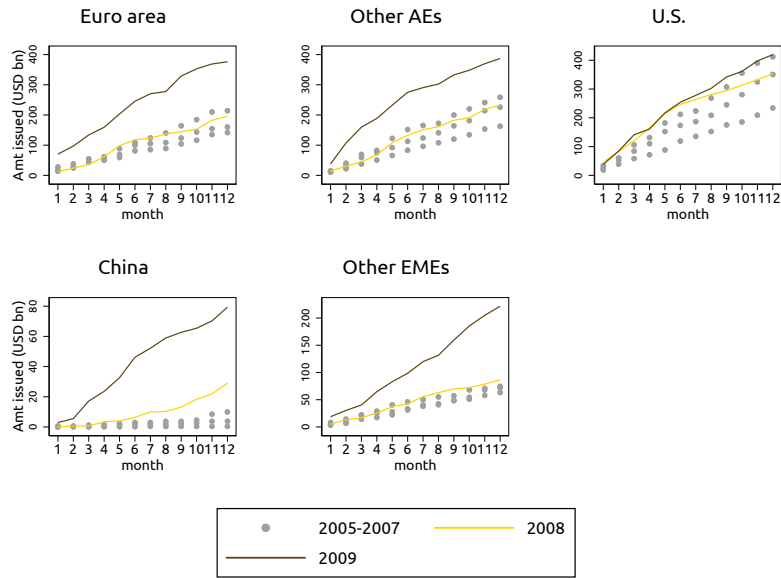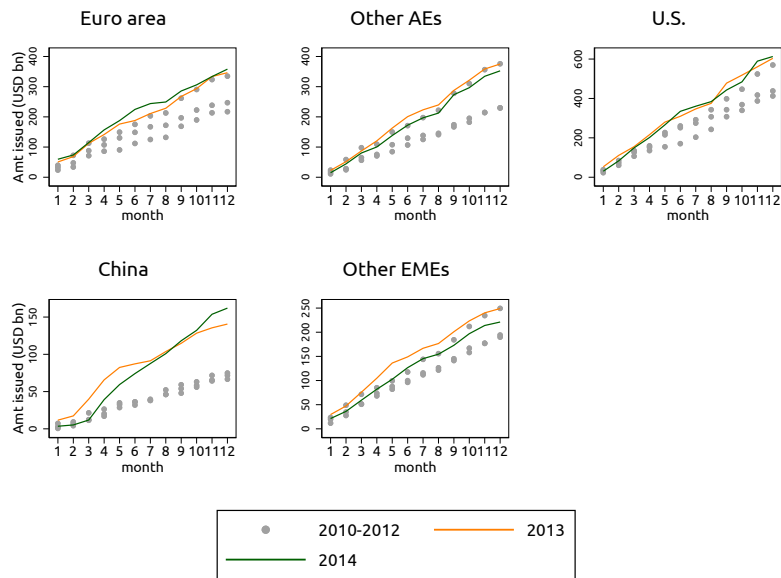
issued. In the first line, we show the mean of each dependent variable over the entire sample period (including stress periods) for the applicable region.

The first panel of Table 2 looks at issuance propensity, which is a dummy that takes on a value of 1 in months when a firm issues at least one bond and 0 otherwise. The first line shows that the average propensity varies between 0.40% to 0.94% depending on the region, with U.S. firms at 0.88%. In other words, out of a time period of 1000 months, an average firm accesses the bond market between 4 times (every 20.8 years) and 9 times (every 9.3 years).[5] The coefficients represent the *change* in issuance propensity during the relevant time periods relative to non-stress periods (the omitted time variable); Table 2 shows that a given firm's likelihood of issuing a bond was significantly increased during the COVID pandemic months. We can estimate economic significance by comparing the level of the coefficient with the sample mean: issuance likelihood in the U.S. was 1.29% higher during the COVID period, which is about 1.5 times higher (an increase of 147%) relative to the sample mean issuance propensity of 0.88%. Calculated similarly, issuance likelihood increased by 92%, 68%, 56%, and 30% in China, euro area, other EMEs and other AEs, respectively. In contrast to the increased issuance likelihood during COVID, issuance propensity decreased significantly in almost all regions during the global financial crisis: issuance propensity was 6%, 18%, 19%, 34% and 111% lower in the euro area, other AEs, U.S., other EMEs and China, respectively.[6] During the taper tantrum, issuance propensity declined 56% and 27% in China and other EMEs, respectively.

The second and third panels of Table 2 show similar results for the dollar amount and number of bonds issued. Both dependent variables include firms that do not issue bonds, which is why the sample means are lower than expected (for example, the average firm-month includes

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[5]This percentage includes all firm-months, even for those firms that never issue a bond. If we restrict the sample to firms that issue at least one bond over our sample period, the average issuance propensity per firm-month is between 4.0% and 5.7%, which corresponds to issuance every 2.1 and 1.5 years, respectively.

[6]Note that we are using a linear probability model, which allows for declines in excess of 100% in contrast to logit or probit models.

## Table 2: COVID is different than previous periods of stress in terms of issuance behavior

This regression examines bond issuance outcomes for 2005 to 2021 for a global sample of public firms in Refinitiv Worldscope. The dependent variables are *issuer_dummy* (a dummy that takes on a value of 1 if a firm issues at least one bond in a month and 0 otherwise), *dollar_amount_issued* (total face value of bonds issued in a month by a firm, including $0, measured in U.S. dollars using constant 2011 exchange rates), and *number_bonds_issued* (total bonds issued in a month by a firm, including no bonds). The independent variables of interest are the stress period dummies, defined in Section 2.1. The regressions include firm fixed effects and Driscoll-Kraay standard errors are shown below the coefficients; *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

| Sample: | Euro area | Other AEs | U.S. | China | Other EMEs |
|---|---|---|---|---|---|
| *Dependent variable* | *Issuer dummy* | *Issuer dummy* | *Issuer dummy* | *Issuer dummy* | *Issuer dummy* |
| Mean | 0.94% | 0.40% | 0.88% | 0.88% | 0.49% |
| COVID pandemic | 0.00640*** | 0.00121** | 0.0129*** | 0.00807*** | 0.00278*** |
| | (0.00156) | (0.000480) | (0.000863) | (0.00137) | (0.000798) |
| Taper tantrum | 0.00204*** | 0.000628* | 0.000253 | -0.00495*** | -0.00133*** |
| | (0.000512) | (0.000319) | (0.000521) | (0.00152) | (0.000321) |
| Global financial crisis | -0.000608 | -0.000721** | -0.00167** | -0.00982*** | -0.00168*** |
| | (0.00126) | (0.000337) | (0.000799) | (0.00173) | (0.000438) |
| *Dependent variable* | *Dollar amount issued* | *Dollar amount issued* | *Dollar amount issued* | *Dollar amount issued* | *Dollar amount issued* |
| Mean | 10.09 | 2.57 | 8.85 | 3.32 | 1.32 |
| COVID pandemic | 16.11*** | 2.901*** | 29.49*** | 3.512*** | 0.744*** |
| | (1.278) | (0.485) | (2.449) | (0.451) | (0.196) |
| Taper tantrum | 2.307 | 0.0995 | -0.315 | -1.309** | -0.00419 |
| | (1.436) | (0.247) | (0.764) | (0.564) | (0.115) |
| Global financial crisis | 0.00139 | 0.0500 | -2.636*** | -2.835*** | -0.704*** |
| | (1.990) | (0.516) | (0.924) | (0.795) | (0.185) |
| *Dependent variable* | *Number of bonds issued* | *Number of bonds issued* | *Number of bonds issued* | *Number of bonds issued* | *Number of bonds issued* |
| Mean | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 |
| COVID pandemic | 0.0107*** | 0.00376*** | 0.0279*** | 0.0155*** | 0.00513*** |
| | (0.00211) | (0.000864) | (0.00191) | (0.00283) | (0.00178) |
| Taper tantrum | 0.00446*** | 0.000743 | -1.87e-07 | -0.00835*** | -0.00250*** |
| | (0.00171) | (0.000563) | (0.000742) | (0.00228) | (0.000742) |
| Global financial crisis | 0.00302 | -0.00129** | -0.00337** | -0.0138*** | -0.00364*** |
| | (0.00196) | (0.000614) | (0.00142) | (0.00246) | (0.000860) |
| Controls (applies to all dependent variables) | | | | | |
| Constant | Yes | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes | Yes |
| # of observations | 503,946 | 2,257,255 | 1,155,809 | 773,922 | 2,719,365 |
| # of firms | 4,043 | 18,360 | 12,073 | 6,407 | 19,538 |

issuance of 0.02 bonds, or \$8.9 million in the U.S. over the entire sample period). During the COVID pandemic period, firms issued significantly more, both in terms of dollar amounts and number of bonds.[7] U.S. firms increased the most (the coefficients imply increases of 333% for dollar amount and 184% for number of bonds)[8], but all regions increased: euro area firms increased 160% in dollar amounts and 58% in number of bonds issued, other advanced economy firms increased 113% and 47%, Chinese firms increased 106% and 121%, and other emerging economy firms increased 56% and 54%. In contrast, most regions saw significantly fewer bonds and lower dollar amounts issued during the global financial crisis, and EME firms issued significantly fewer bonds during the taper tantrum.[9]

Next, we examine whether the surge in issuance is driven by bonds denominated in a firm's local currency or in USD. In Table 3, we replace issuance propensity from the first panel of Table 2 with a propensity to issue in either USD or local currency. The dependent variable in the top panel, USD issuer dummy, takes on a value of 1 if the firm issues at least one bond denominated in USD in a month and 0 otherwise. Likewise, in the bottom panel, the local currency issuer dummy takes on a value of 1 if the firm issues at least one bond in their nation's home currency. Comparing the USD bond issuance propensity with that for overall bond issuance, we observe that the coefficient on the GFC dummy remains negative and significant in most regions, while the coefficient on COVID dummy is only positive and statistically significant in other AEs and the U.S. That said, even though for other regions loadings of USD issuance propensity on the COVID dummy are not statistically significant, they are still positive, suggesting that, in contrast to GFC and normal times, propensity to issue USD bonds did not decline, and in some regions even increased, during COVID. The pattern for local currency issuance propensity, however, mirrors the results for overall bond

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[7]Amounts issued are converted into USD using constant 2011 U.S. dollars.

[8]Calculated as \$29.49 million divided by \$8.85 million, and 0.0279 bonds divided by 0.02 bonds.

[9]While not shown, we also run the regressions for the amount issued for only the subsample of firm-months with bond issuance. Conditional on non-zero issuance, the amount issued is significantly larger during COVID in all regions but China (where it is insignificantly larger). In contrast to Cortina et al. (2021), we find that the amount issued during the GFC is not significantly larger in any region, and is in fact significantly smaller in the U.S. and non-China EMEs.

**Table 3: COVID issuance increases driven by local-currency bonds in euro area and EMEs**

This regression examines bond issuance outcomes for 2005 to 2021 for a global sample of public firms in Refinitiv Worldscope. The dependent variables are *issuer_dummy_USD* (a dummy that takes on a value of 1 if a firm issues at least one USD-denominated bond in a month and 0 otherwise), and *issuer_dummy_local_currency* (a dummy that takes on a value of 1 if a firm issues at least one bond denominated in their hom currency in a month, and 0 otherwise). The independent variables of interest are the stress period dummies, defined in Section 2.1. The regressions include firm fixed effects and Driscoll-Kraay standard errors are shown below the coefficients; *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

| Sample: | Euro area | Other AEs | U.S. | China | Other EMEs |
|---|---|---|---|---|---|
| *Dependent variable* | *Issuer dummy USD* | *Issuer dummy USD* | *Issuer dummy USD* | *Issuer dummy USD* | *Issuer dummy USD* |
| Mean | 0.17% | 0.10% | 0.81% | 0.14% | 0.07% |
| COVID pandemic | 0.000996 | 0.000384** | 0.0128*** | 0.000677 | 0.000139 |
| | (0.000614) | (0.000153) | (0.000804) | (0.000542) | (0.000193) |
| Taper tantrum | 0.000476 | 0.000255*** | 0.000221 | -0.000577* | -7.48e-05 |
| | (0.000376) | (7.50e-05) | (0.000491) | (0.000309) | (7.32e-05) |
| Global financial crisis | -0.000413 | -0.000252*** | -0.00145* | -0.00178*** | -0.000521*** |
| | (0.000252) | (8.52e-05) | (0.000790) | (0.000278) | (0.000101) |
| *Dependent variable* | *Issuer dummy local currency* | *Issuer dummy local currency* | *Issuer dummy local currency* | *Issuer dummy local currency* | *Issuer dummy local currency* |
| Mean | 0.76% | 0.30% | 0.83% | 0.76% | 0.42% |
| COVID pandemic | 0.00648*** | 0.000807** | 0.0126*** | 0.00746*** | 0.00270*** |
| | (0.00102) | (0.000321) | (0.000825) | (0.00172) | (0.000670) |
| Taper tantrum | 0.00197*** | 0.000335 | 0.000186 | -0.00471*** | -0.00129*** |
| | (0.000515) | (0.000261) | (0.000526) | (0.00149) | (0.000285) |
| Global financial crisis | -0.000990 | -0.000580** | -0.00148* | -0.00824*** | -0.00112** |
| | (0.00125) | (0.000232) | (0.000780) | (0.00156) | (0.000435) |
| Controls (applies to all dependent variables) | | | | | |
| Constant | Yes | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes | Yes |
| # of observations | 503,946 | 2,257,255 | 1,155,809 | 773,922 | 2,719,365 |
| # of firms | 4,043 | 18,360 | 12,073 | 6,407 | 19,538 |

issuance shown in the first panel of Table 2 more closely: firms were significantly more likely to issue bonds during COVID in their home currency. In other words, the higher propensity to issue bonds during our COVID period relative to other stress and non-stress periods is to a large extent driven by local-currency bond issuance, particular in euro area and in EMEs.[10]

The final column in the last two tables, which shows results for non-China EMEs, comprises a large variety of countries. In Table 4, we investigate issuance propensity by firms in three sub-regions: Latin America, emerging Asia, and other non-China EMEs.[11] The results are stark: the surge in issuance propensity during the COVID stress period is driven entirely by issuance of local currency bonds by emerging Asian firms, which experienced a 74% increase relative to normal time periods (0.33% higher compared to a full sample mean of 0.45%). In Latin America, issuance of both local currency and USD bonds was significantly lower than in negative times, while in other non-China EMEs issuance in local currency was insignificantly positive and issuance in USD was significantly negative. During the GFC, issuance propensities in all sub-regions were diminished, and during the taper tantrum, issuance propensities by emerging Asian firms were significantly reduced. Combined with the results from the China columns in the previous tables, these results suggest that Asian EMEs experienced a resilience in local-currency bond markets that had not been experienced in previous episodes of financial stress. To our knowledge we are the first to show this. Our results are consistent with the argument in Avdjiev et al. (2024) that local currency credit has recently been serving as a global shock absorber and provide a more detailed view for which countries this is the case.

Overall, these results provide evidence that nonfinancial corporate bond issuance patterns over the onset of the COVID pandemic were different from the global financial crisis and

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[10]The small difference between the top panel (local currency) and bottom panel (USD) for U.S. firms in column 3 is driven by issuance of non-U.S. subsidiaries of U.S. companies. While we roll issuance up at the parent firm level, the classification of local currency is done at the subsidiary level.

[11]Countries by sub-region: (1) Latin America: Argentina, Brazil, Chile, Colombia, Mexico and Peru; (2) emerging Asia: Hong Kong, India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand and Vietnam; and (3) other non-China EMEs: Israel, Russia, Turkey and South Africa.

**Table 4: COVID issuance resilience in non-China EMEs driven by emerging Asian EMEs**

This regression examines bond issuance outcomes for 2005 to 2021 for non-China EME public firms in Refinitiv Worldscope. The dependent variables are *issuer_dummy_USD* (a dummy that takes on a value of 1 if a firm issues at least one USD-denominated bond in a month and 0 otherwise), and *issuer_dummy_local_currency* (a dummy that takes on a value of 1 if a firm issues at least one bond denominated in their hom currency in a month, and 0 otherwise). The independent variables of interest are the stress period dummies, defined in Section 2.1. The regressions include firm fixed effects and Driscoll-Kraay standard errors are shown below the coefficients; *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

| Sample: | Latin America | Latin America | Emerging Asia | Emerging Asia | Other non-China EME | Other non-China EME |
|---|---|---|---|---|---|---|
| *Dependent variable* | *Issuer dummy local curr.* | *Issuer dummy USD* | *Issuer dummy local curr.* | *Issuer dummy USD* | *Issuer dummy local curr.* | *Issuer dummy USD* |
| Mean | 0.69% | 0.33% | 0.45% | 0.05% | 0.12% | 0.05% |
| COVID pandemic | -0.00291*** | -0.00108* | 0.00331*** | 0.000269 | 0.000879 | -0.000222** |
| | (0.000544) | (0.000552) | (0.000742) | (0.000191) | (0.000585) | (8.92e-05) |
| Taper tantrum | 0.00119 | 0.000588 | -0.00160*** | -0.000142* | -0.000710*** | -1.88e-06 |
| | (0.000846) | (0.000497) | (0.000314) | (7.47e-05) | (0.000245) | (0.000204) |
| Global financial crisis | -0.000746 | -0.00220*** | -0.00126** | -0.000407*** | -0.000612*** | -0.000227* |
| | (0.000798) | (0.000350) | (0.000501) | (9.03e-05) | (0.000194) | (0.000131) |
| Controls | | | | | | |
| Constant | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| # of observations | 189,239 | 189,239 | 2,175,927 | 2,175,927 | 354,199 | 354,199 |
| # of firms | 1,375 | 1,375 | 15,550 | 15,550 | 2,613 | 2,613 |

the taper tantrum: despite market turmoil, bond markets did not experience the sustained decline in issuance observed in other episodes of severe stress. In addition, the surge in issuance was driven not by USD issuance, but rather by issuance in firm's home currency.[12] In emerging markets, we see important differences between Asian and non-Asian EMEs; local currency bond markets for firms in Asian EMEs showed a resilience during COVID that was not present during the GFC and the taper tantrum.

## 3.2 Are corporate bonds issued during periods of financial stress different?

The last section shows that in contrast to previous stress episodes, during the COVID pandemic firms were more likely to access the bond market, resulting in higher number and dollar amounts of corporate bonds issued. In this section, we examine the quality of bonds issued, as well as the characteristics of issuing firms, during stress and non-stress periods.

Prior literature has shown that it is higher quality firms that issue during crises. Erel et al. (2012) show that cyclical patterns in capital raising are different for investment and non-investment grade firms: while for non-investment-grade firms external capital raising is procyclical, for investment-grade firms it is countercyclical. This can be partly attributed to investors willingness to supply capital, which becomes more limited or selective during times of stress (as in Caballero and Krishnamurthy (2008)). For this reason, we hypothesize that bonds issued during periods of acute stress would be less risky and come from higher quality firms relative to normal times.

We first examine two indicators of duration and credit risk, respectively, associated with newly issued bonds: time to maturity at issuance and bond rating. Longer term bonds

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[12]The conclusions in this section remain robust when we consider only the subsample of firms that exist in Refinitiv Worldscope for the entire sample of 2004-2021. In other words, the results are not driven by survivorship bias.

expose investors to higher duration risk as well as longer exposure to a given firm's credit risk. As investors seek to lower risk exposures during periods of stress, we conjecture that bonds issued during periods of financial stress would have shorter time to maturity (for example, Cortina et al. (2021) show that bonds issued during the GFC have significantly shorter time to maturity in both advanced and emerging economies). Similarly, investors should be more willing to buy investment grade rated bonds during stress periods relative to normal times. The results of using these dependent variables in the regression in Equation 1 are shown in Table 5, which includes only firm-months with at least one bond issuance. For emerging economies, we show results for issuance in local currency as well as issuance in USD.

Similar to Table 2, the first line in each panel includes the sample mean, and the coefficients can be interpreted as the change during the relevant time periods relative to non-stress periods. The first panel looks at time to maturity, which is on average shorter in China and other EMEs (approximately 6 years) compared to euro area and other AEs (approximately 9 years) and the U.S. (approximately 11 years).

We see some evidence that bonds issued by firms in advanced economies during COVID were safer. The top panel shows that bonds issued during COVID had shorter maturities in euro area and other AEs, with the latter significantly shorter by 1.5 years or 17% compared to the sample mean. The bottom panel shows that the share of investment grade rated bonds increased significantly in all advanced economies, similar to the pattern observed during the GFC. In contrast, we see little significant difference between bonds issued during COVID by firms in emerging economies.[13] Overall, the results from Table 5 show that while bonds issued during COVID in advanced economies are generally less risky relative to normal market conditions, COVID bonds in emerging economies are similar in terms of risk characteristics to those issued in non-stress periods.

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[13]It is important to note that the share of bonds with an external rating (as measured using Refinitiv Workspace) is much lower in EMEs relative to the advanced economies.

## Table 5: Bonds issued during COVID are safer in advanced economies

This regression examines bond characteristics for corporate bonds issued between 2005 and 2021 by a global sample of public firms in Refinitiv Worldscope. The dependent variables are *weighted_average_maturity* (the average time to maturity of bonds issued by a firm in a month, weighted by face value), and *ig_rated_share* (proportion of bonds issued in a firm-month that have an investment grade rating). The independent variables of interest are the stress period dummies, defined in Section 2.1. The regressions include industry (one-digit SIC code), year and nation fixed effects and standard errors clustered at the industry level are shown below the coefficients; *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

| Sample: | Euro area | Other AFE | U.S. | China | China | Other EMEs | Other EMEs |
|---|---|---|---|---|---|---|---|
| | | | | RMB Issuance | USD Issuance | Local curr Issuance | USD Issuance |
| Dependent variable | Weighted average maturity | Weighted average maturity | Weighted average maturity | Weighted average maturity | Weighted average maturity | Weighted average maturity | Weighted average maturity |
| Mean | 8.53 | 8.95 | 11.44 | 6.20 | 5.94 | 5.14 | 9.85 |
| COVID pandemic | -1.412 | -1.507*** | 0.600 | 0.252 | -0.266 | -0.0369 | 0.407 |
| | (1.029) | (0.237) | (0.325) | (0.725) | (0.773) | (0.377) | (0.864) |
| Taper tantrum | -0.311 | 0.108 | -0.750* | -0.343 | 0.545 | 0.268 | -0.224 |
| | (0.364) | (0.251) | (0.373) | (0.203) | (2.042) | (0.364) | (0.532) |
| Global financial crisis | -1.990*** | -1.233 | -1.364 | -0.803 | | -0.0901 | -0.515 |
| | (0.367) | (0.946) | (0.745) | (0.476) | | (0.255) | (0.998) |
| # of observations | 4,691 | 8,933 | 10,125 | 5,742 | 1,083 | 11,332 | 1,937 |
| R-squared | 0.085 | 0.139 | 0.169 | 0.038 | 0.102 | 0.133 | 0.174 |
| Dependent variable | IG rated share | IG rated share | IG rated share | IG rated share | IG rated share | IG rated share | IG rated share |
| Mean | 0.55 | 0.32 | 0.54 | 0.01 | 0.23 | 0.05 | 0.36 |
| COVID pandemic | 0.182*** | 0.0710* | 0.222*** | -0.00137 | 0.0136 | -0.00192 | 0.0915 |
| | (0.0172) | (0.0335) | (0.0254) | (0.00357) | (0.0632) | (0.00679) | (0.0978) |
| Taper tantrum | 0.0128 | 0.0381*** | 0.00622 | 0.00185 | 0.0344 | 0.0299 | 0.106** |
| | (0.0268) | (0.00828) | (0.0313) | (0.0109) | (0.0613) | (0.0178) | (0.0417) |
| Global financial crisis | 0.191*** | 0.0817* | 0.124*** | -0.0117 | | -0.0133 | 0.0935 |
| | (0.0539) | (0.0373) | (0.0173) | (0.0141) | | (0.0268) | (0.0560) |
| # of observations | 4,713 | 8,964 | 10,142 | 5,850 | 1,084 | 11,462 | 1,947 |
| R-squared | 0.164 | 0.153 | 0.112 | 0.005 | 0.198 | 0.135 | 0.165 |
| Controls (applies to all dependent variables) | | | | | | | |
| Constant | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| SIC 1 digit FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Nation FE | Yes | Yes | n/a | n/a | n/a | Yes | Yes |

We now turn to characteristics of firms that issue bonds. We first examine graphically the distribution of firm characteristics of bond issuers in Figure 4, comparing issuers during the relatively calm period of 2015-2019 (gray line) and during the peak market stress period of COVID from March to June 2020 (red line). We show log assets (panel (a)), book leverage (panel (b)), and profitability (panel (c)) of bond issuers by sub-region (euro area and other AEs are combined into AEs in these graphs), and for emerging markets we look at issuers of local currency bonds compared to issuers of USD denominated bonds. Each characteristic is measured using the firm financial statements for the year before bond issuance.

Less risky issuers should generally be larger, less leveraged and more profitable. Panel (a) of Figure 4 shows that issuers during COVID were generally larger than issuers in previous years in AEs, the U.S. and China; this is visualized as the red line (COVID) shifting to the right compared with the gray line (2015-2019). A similar pattern is observed in USD issuance by non-China EME issuers. However, the distributions of firm size of local currency issuers in non-China EMEs show that COVID issuers were not significantly different than issuers during the preceding years. Panel (b) shows that the distribution of book leverage for issuers is lower (i.e., shifted to the left) during COVID compared to the pre-COVID period for the U.S. and for USD issuers in EMEs; in contrast, in AEs and local currency EME issuance, COVID firms are the same or even higher levered than the pre-COVID period.

# Figure 4: Distribution of firm characteristics of corporate bond issuers

Distributions of firm characteristics for firms that issued bonds between 2015-2019 (gray line) and during the initial COVID period of March to June 2020 inclusive (red line). Panel (a) shows the natural logarithm of total assets (converted to USD using constant 2011 U.S. dollars), panel (b) shows book value of debt divided by total assets, and panel (c) shows net income divided by total assets. Source: Refinitiv Worldscope.

((a)) Log assets of issuers
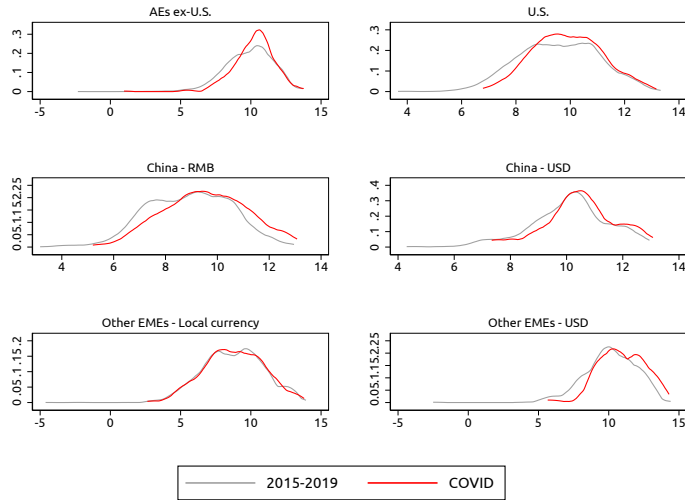
((b)) Book leverage of issuers
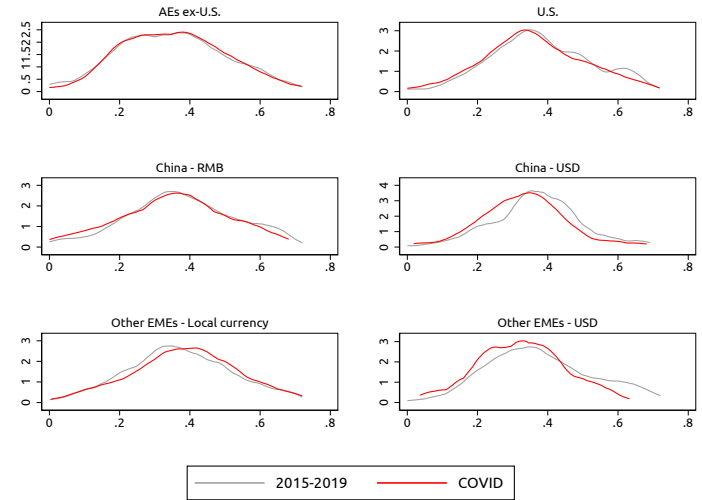


((c)) Profitability of issuers

Finally, panel (c) shows that the distribution of profitability of COVID issuers looks higher (i.e. shift to the right) in advanced econ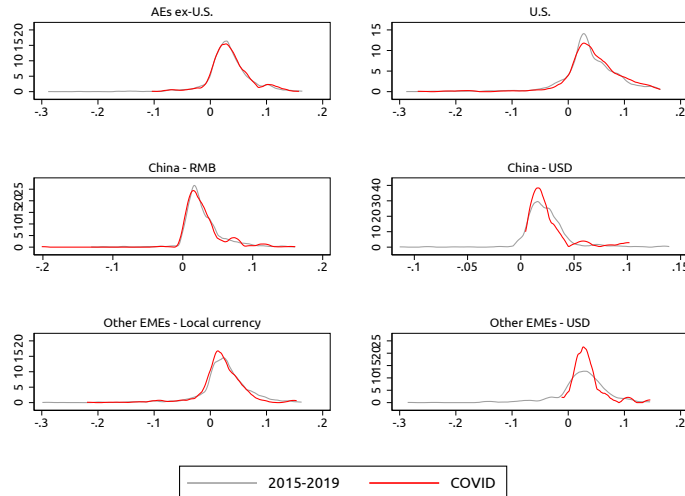omies and USD issuance in emerging economies compared to the pre-COVID period, while it looks the same for local currency issuers in EMs. Taken together, Figure 4 presents visual evidence that bond issuance during COVID followed different patterns in advanced versus emerging economies. In particular, issuance in AEs and USD issuance in EMEs came from less risky firms, while local currency issuance in EMEs did not come from less risky firms (as prior literature would lead us to expect).

We test the relationship formally in regression form using equation 2. In particular, for the sample of firms who issue bonds, we put as dependent variables their characteristics (size, leverage and profitability) as of the year end before issuance. We then compare the characteristics of firms that issue during periods of financial stress (as measured by the stress period dummies) relative to normal times. For the advanced economies, we look at issuance in all currencies. For China and other EMEs, we also break down the analysis into issuance in local currency bonds and USD bonds. In all specifications, we include year and 1-digit SIC code fixed effects. The results are shown in Table 6.

As in the previous tables, the first line in each panel shows the sample average for the dependent variable (including only the firm-months with positive issuance). The first panel shows the results for the advanced economies. During the COVID pandemic and the global financial crisis, firms that issued bonds were generally less risky relative to bond issuers in non-stress periods: they are larger (positive coefficients on the dummies), have lower leverage (negative coefficients) and higher profitability (positive coefficients). In terms of magnitudes, during COVID for example, log assets of issuing firms were 3.6%, 3.5% and 2.3% larger in the euro area, other AEs and U.S., respectively, relative to the sample mean. Similarly, profitability of issuing firms was 23%, 25% and 36% higher. Leverage of issuing firms was 8.1% and 7.8% lower in the euro area and U.S., and insignificantly higher in other AEs.

The second panel shows the results for issuance in China, where bond issuers during COVID

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**Table 6: Issuer riskiness during COVID varies by currency of issuance in emerging markets**

These regressions examine firm characteristics of bond issuers during periods of financial stress, relative to bond issuers during normal market conditions. The regressions include a global sample of public firms in Refinitiv Worldscope who issued bonds between 2005 and 2021. The dependent variables (firm characteristics) are calculated as of the fiscal year end in the year before issuance, and include log assets (natural logarithm of the book value of assets), book leverage (book value of debt divided by book value of assets) and profitability (net income divided book value of assets). The first three panels look at advanced economies, including the euro area, other AEs and the U.S.; issuance in all currencies is included in these panels. The second three panels include issuance by Chinese firms in three sets of currencies: all currencies, Chinese renminbi only, and USD only. The final three panels include issuance by firms in other EMEs in three sets of currencies: all currencies, local currency only and USD only. The regressions include industry (one-digit SIC code), year and nation fixed effects and standard errors clustered at the industry level are shown below the coefficients; *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

| Advanced economies: | Euro area | | | Other AEs | | | U.S. | | |
|---|---|---|---|---|---|---|---|---|---|
| Dependent variable | Log assets | Book leverage | Profit-ability | Log assets | Book leverage | Profit-ability | Log assets | Book leverage | Profit-ability |
| Mean | 10.25 | 0.36 | 0.03 | 9.73 | 0.37 | 0.03 | 9.31 | 0.38 | 0.04 |
| COVID pandemic | 0.379** | -0.0287*** | 0.00745* | 0.340** | 0.00669 | 0.00851 | 0.213* | -0.0299** | 0.0132*** |
| | (0.145) | (0.00697) | (0.00369) | (0.134) | (0.00793) | (0.00474) | (0.0903) | (0.00872) | (0.00283) |
| Taper tantrum | 0.0517 | -0.00334 | 0.00295 | 0.0790 | 0.00178 | 0.00407** | -0.0602 | 0.00326 | -0.00625 |
| | (0.0327) | (0.00629) | (0.00323) | (0.0536) | (0.00320) | (0.00171) | (0.0413) | (0.00830) | (0.00633) |
| Global financial crisis | 0.247 | 0.00657 | 0.00768** | 0.185 | -0.0197*** | 0.00692 | 0.516*** | -0.0437** | 0.0155 |
| | (0.161) | (0.0135) | (0.00296) | (0.125) | (0.00448) | (0.00384) | (0.0818) | (0.0138) | (0.0139) |
| # of observations | 4,713 | 4,707 | 4,713 | 8,962 | 8,963 | 8,964 | 10,141 | 10,140 | 10,138 |
| R-squared | 0.362 | 0.178 | 0.150 | 0.209 | 0.295 | 0.109 | 0.139 | 0.054 | 0.086 |

| China: | All issuers | | | CNY issuers | | | USD issuers | | |
|---|---|---|---|---|---|---|---|---|---|
| Dependent variable | Log assets | Book leverage | Profit-ability | Log assets | Book leverage | Profit-ability | Log assets | Book leverage | Profit-ability |
| Mean | 9.13 | 0.37 | 0.03 | 9.00 | 0.37 | 0.03 | 10.07 | 0.35 | 0.03 |
| COVID pandemic | 0.142 | -0.00678 | 0.00349 | 0.180 | -0.00661 | 0.00454 | 0.130 | 0.000676 | -0.00126 |
| | (0.120) | (0.00828) | (0.00309) | (0.134) | (0.00964) | (0.00421) | (0.237) | (0.0139) | (0.00357) |
| Taper tantrum | 0.152 | -0.00647 | 0.000787 | 0.0385 | -0.00338 | -0.00265 | 0.207 | -0.0202 | 0.00948 |
| | (0.116) | (0.0127) | (0.00278) | (0.150) | (0.0143) | (0.00276) | (0.179) | (0.0181) | (0.00570) |
| Global financial crisis | 0.948** | 0.0230 | 0.00243 | 0.957** | 0.0267 | 0.00369 | | | |
| | (0.346) | (0.0486) | (0.0248) | (0.352) | (0.0486) | (0.0253) | | | |
| # of observations | 6,821 | 6,821 | 6,821 | 5,850 | 5,850 | 5,850 | 1,084 | 1,084 | 1,084 |
| R-squared | 0.218 | 0.130 | 0.068 | 0.211 | 0.128 | 0.056 | 0.203 | 0.198 | 0.251 |

| Other EMEs: | All issuers | | | Local currency issuers | | | USD issuers | | |
|---|---|---|---|---|---|---|---|---|---|
| Dependent variable | Log assets | Book leverage | Profit-ability | Log assets | Book leverage | Profit-ability | Log assets | Book leverage | Profit-ability |
| Mean | 8.97 | 0.37 | 0.03 | 8.82 | 0.37 | 0.03 | 9.99 | 0.36 | 0.03 |
| COVID pandemic | -0.145 | -0.00295 | 0.00307 | -0.105 | 0.00249 | 0.00158 | 0.473** | -0.0671*** | 0.0157*** |
| | (0.0849) | (0.0105) | (0.00261) | (0.0791) | (0.0106) | (0.00306) | (0.143) | (0.0187) | (0.00306) |
| Taper tantrum | 0.319*** | -0.00704 | 0.00118 | 0.353** | -0.00763 | 0.00150 | 0.169 | 0.00374 | -0.00469 |
| | (0.0835) | (0.00775) | (0.00163) | (0.117) | (0.00897) | (0.00194) | (0.174) | (0.0191) | (0.00316) |
| Global financial crisis | -0.00246 | -0.0163 | 0.00755 | 0.0304 | -0.0199 | 0.00831 | -0.109 | -0.0284 | 0.0352 |
| | (0.0778) | (0.0125) | (0.00525) | (0.0625) | (0.0124) | (0.00590) | (0.397) | (0.0252) | (0.0191) |
| # of observations | 13,270 | 13,418 | 13,419 | 11,395 | 11,460 | 11,461 | 1,874 | 1,947 | 1,947 |
| R-squared | 0.209 | 0.127 | 0.095 | 0.211 | 0.125 | 0.096 | 0.357 | 0.214 | 0.166 |
| Controls (applies to all dependent variables) | | | | | | | | | |
| Constant | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| SIC 1 digit FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Nation FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

were larger, less levered and more profitable, although not significantly. The break down by currency shows that it is yuan issuers that follow this same pattern, while USD issuers have insignificantly higher leverage and lower profitability.

Finally, in the third panel we look at characteristics of bond issuers in other EMEs. Issuers of USD bonds are larger than issuers of local currency bonds, and they are also less levered and more profitable. During COVID, issuers of USD bonds in non-China EMEs were 4.7% larger, 19% less levered and 48% more profitable than the sample average, indicating significantly less risky bond issuers during this time period. In contrast, firms that issued local currency bonds had smaller log assets, higher book leverage, and slightly higher profitability, albeit not significant. During the taper tantrum, local currency issuers were significantly larger; they also had lower leverage and higher profitability, although neither difference is significant. In other words, local currency bond issuers in these markets were *not* less risky, as one would conjecture them to be during a period of market turmoil, and as we saw in other regions and in USD issuers from the same region. In addition, Covid was the first considered stress period when characteristics of USD-bond issuers in non-China EMEs exhibited patterns similar to those of AFE firms.

Overall, our results from this section confirm that in most regions, bond issuance during COVID was done by firms that are safer and higher quality, as would be expected during times of stress where investors become more cautious in supplying capital. The notable exception is issuers of bonds in China and other emerging economies, especially firms in non-China EMEs that issued local currency bonds. In these regions, investors did not discriminate bond issuance based on firm quality in these regions.

## 3.3 Policy support and resilience of corporate bond market during COVID

So far we have shown that, in contrast to previous episodes of financial stress, during COVID non-financial corporate bond issuance boomed globally, and for some regions this activity continued even for riskier firms. What might have driven such resilience of primary corporate bond market? One feature that distinguishes COVID and is likely responsible for bond-market resiliency is unprecedented policy stimulus, including policy support measures specifically targeting corporate bond markets and corporate sector more generally, that central banks and governments from around the world introduced following the onset of the COVID pandemic.

Indeed, we show in figure 5 the evolution of the size of central banks' balance sheets (as a portion of GDP) from 2005 through 2021. Although the amounts of central bank assets in all regions increased during GFC and COVID, the speed and size of the increases during COVID is striking, particularly in the U.S., euro area and other EMEs. Such expansion of balance sheets likely drove long-term yields down (figure 6), leading to normalization of bond market functioning and higher demand for riskier bonds. In contrast, during the taper tantrum, central bank balance sheets around the globe, and in particularly in emerging economies (bottom row), did not expand rapidly. Overall, figure 5 shows high-level evidence that monetary policy support likely helped bolster corporate bond markets globally.

Unprecedented size and scale of policy support during COVID pandemic likely contributed to a quick improvement of investor sentiment toward bonds, as well as their willingness to supply capital more generally. In Figure 7, we examine fund flows into bond mutual funds as a percentage of assets under management (AUM). In advanced economies (top row), bond flows experienced outflows for many months during the GFC; the outflows from other AEs during the GFC is especially striking. In contrast, during COVID, although all regions

## Figure 5: Central bank assets as percentage of GDP

Monthly time series from 2005 to 2021 showing the size of central bank assets divided by GDP, with the ratio normalized to 1 as of January 2005. Shaded areas represent the months of the GFC, taper tantrum and COVID as per Section 2.1. Lines for euro area, other AEs and other EMs are calculated as the sum of central bank assets divided by the sum of GDP for the member countries. Source: Haver Analytics.



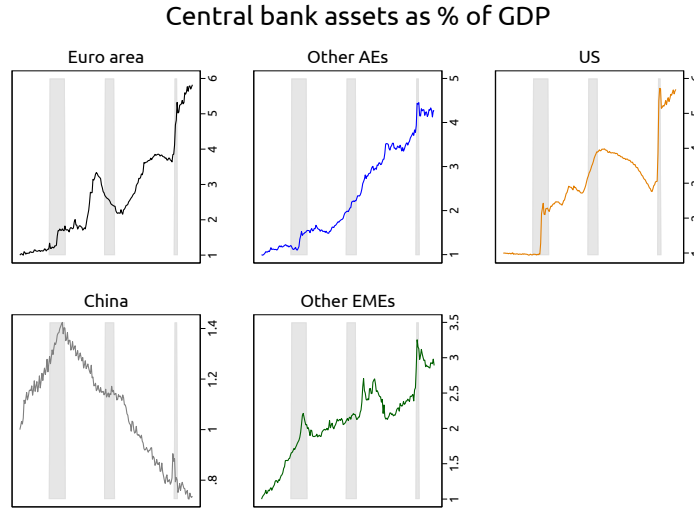Central bank assets as % of GDP

## Figure 6: Yields on 10-year government bonds

Monthly time series from 2005 to 2021 showing the yields on 10-year government bonds. Shaded areas represent the months of the GFC, taper tantrum and COVID as per Section 2.1. Each time series is demeaned, and lines for euro area, other AEs and other EMs are calculated as the mean of the member countries. The euro area calculation excludes the Greece, Ireland, Italy, Portugal and Spain. Source: Haver Analytics.
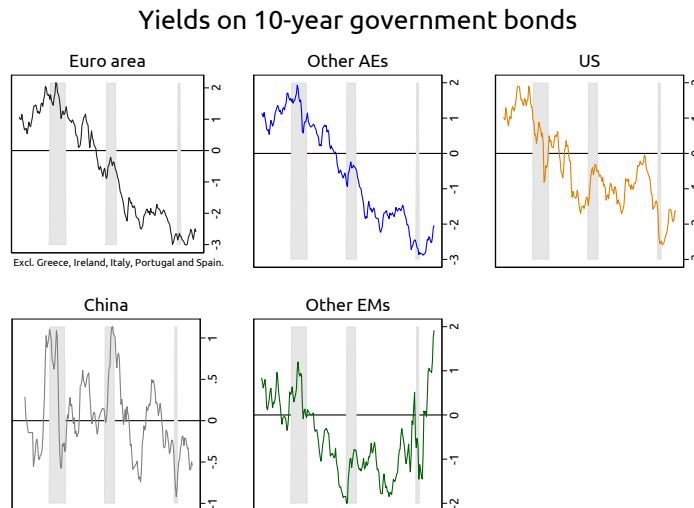


Yields on 10-year government bonds

**Figure 7: Fund flows into bond funds as percentage of assets under management**

Monthly time series from 2005 to 2021 showing the flows into bond mutual funds, divided by the previous month's assets under management. Shaded areas represent the months of the GFC, taper tantrum and COVID as per Section 2.1. Bars for euro area, other AEs and other EMs are calculated as the sum of fund flows divided by the sum of the assets under management. Source: EPFR Global.



Fund flows into bond funds as % of AUM
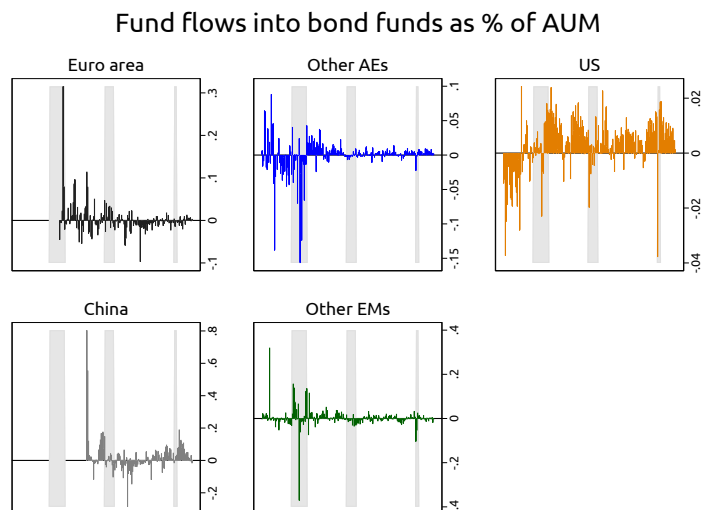
experienced one or two months of large outflows (the outflows in March 2020 in the U.S. were very outsized), the sentiment quickly turned with market participants returning to investing in bonds, a pattern which held up for the post-COVID months of 2020 and 2021. The same pattern exists in emerging economies for the GFC and COVID; the taper tantrum also saw a number of consecutive months of modest outflows from bond funds. Overall, there is some evidence that investors' capital flows were different in COVID compared to previous financial stress episodes.

In order to formally examine the relationship between policy support, as well as changes in macroeconomic environment and firm-level accounting characteristics, and corporate bond issuance patterns in stress periods and normal times, we re-run the regressions from Table 2 with firm characteristics and macroeconomic conditions as controls (some of which are shown in figure 8); the results are shown in Appendix C. Overall, the addition of controls partly explains corporate bond issuance patterns across the world, with the coefficients on

**Figure 8: Other macroeconomic conditions**

Monthly time series from 2005 to 2021 showing the Federal Funds shadow rate (as per Wu and Xia (2016)), the level of the broad dollar USD index, and the level of the VIX. Shaded areas represent the months of the GFC, taper tantrum and COVID as per Section 2.1. The lines for the USD index and VIX are calculated as monthly average of daily values. Source: Federal Reserve Bank of Atlanta and Bloomberg Finance LP.
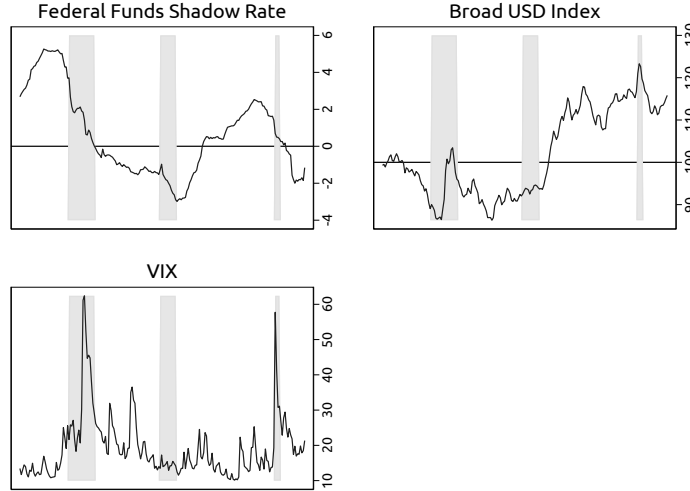


the controls mostly moving in the expected direction in terms of their impact on issuance levels. Importantly, the effect of adding controls is a general dampening of the coefficient on the COVID pandemic period dummy in all regions, with the coefficient for issuance propensity by firms in other AEs even becoming insignificant. This is evidence that some of the patterns in the global corporate bond market that we have documented can be partially explained by firm characteristics and macroeconomic conditions in 2020.

## 3.4 Post-COVID outcomes

In a final analysis, we attempt to answer two questions: (1) did firms who issued during COVID take on excessive leverage? and (2) what did COVID issuers do with the funds raised? In order to answer these questions, we examine the evolution of financial ratios between fiscal years 2015 to 2021 of firms that issued during 2020 compared to firms that did not issue in 2020 (though have issued bonds at least once during our sample period).

We address the first question about firm riskiness in Figure 9. The first set of graphs shows average book leverage for 2020 issuers (green lines) and 2020 non-issuers (orange lines). All regions show a peak of leverage in 2020 with a subsequent decline in 2021, but COVID issuers have relatively higher leverage and saw relatively slower post-peak declines in the U.S., and China and other EMEs. The second panel shows the relatively proportion of short-term debt compared to total debt, which decreased relatively more for 2020 issuers by the end of the sample for all regions, suggesting that bond issuers were able to use the bond market to lock in financing over longer horizons. The third panel shows a measure of debt-at-risk, calculated as the percentage of firms that have interest coverage ratios less than 2, where interest coverage is calculated as earnings before interest, taxes, depreciation and amortization (EBITDA) divided by interest expenses. In most regions, we do not observe strong relative differences in evolution of debt-at-risk measures between 2020 issuers and 2020 non-issuers, except for China, where 2020 non-issuers experienced a sharp decline in riskiness where as 2020 issuers did not. Overall, we provide initial evidence of potential excess risk taken on by COVID issuers in China, based on book leverage ratios and debt-at-risk measures.

We address the second question about what firms did with funds raised in Figure 10. We consider three possibilities: building cash levels, investing in capital assets via capital expenditures, or paying out dividends to equity holders. All variables are scaled by total assets.

The first panel shows that while cash levels have increased in all regions across the sample period, issuers during 2020 did not increase more than non-issuers; in fact, in the euro area and China, these issuers appear to have accumulated less cash on their balance sheets. The second panel looks at capital expenditures and shows little difference between 2020 issuers and non-issuers, with perhaps the exception of U.S. (where issuers invested more in 2021 than non-issuers) and China (where issuers invested less in 2021 than non-issuers). The

## Figure 9: Measures of firm riskiness around COVID

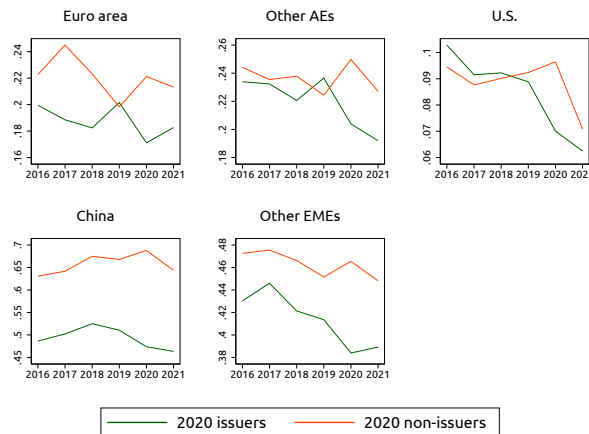Each graph compares the average annual ratio for firms that issued bonds in 2020 (green line) compared to the sample of firms that have ever issued bonds but did not issue in 2020 (orange line). Source: Refinitiv Worldscope.

### ((a)) Book leverage
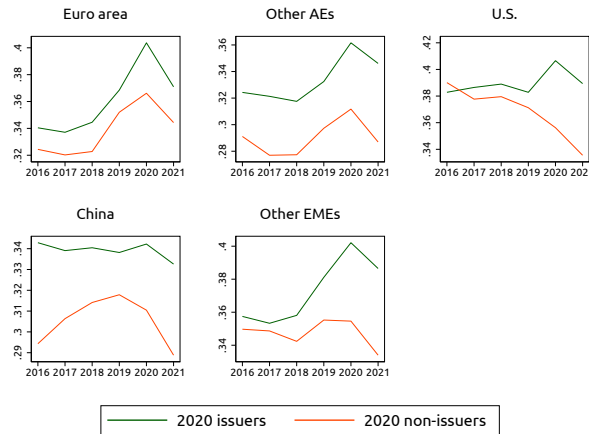


### ((b)) Short-term debt to total debt



### ((c)) Percent of firms with interest coverage ratio less than 2
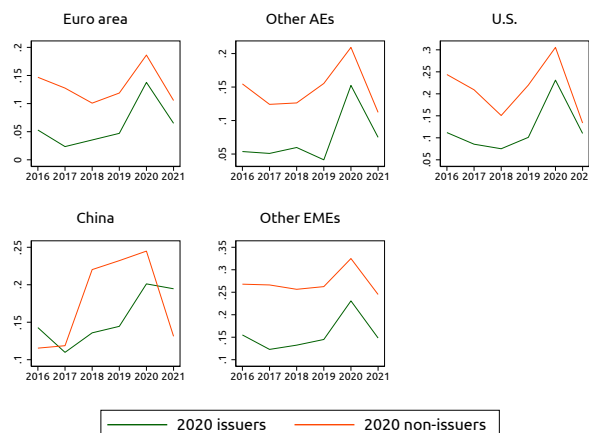
third panel shows similar patterns in dividend payments between issuers and non-issuers in all regions. Overall, the evolution of potential uses of proceeds do not appear visually different for firms that issued bonds during COVID compared to non-issuing peers. One possible explanation could be that firms that did not issue bonds during COVID used other sources of financing.

# 4 Conclusion

It has been widely documented in the media and in academic research that while there was a brief hiatus in primary corporate bond market activity in the first few weeks of COVID, corporate bond issuance in the U.S. subsequently surged as financing conditions improved markedly amid unprecedented monetary and fiscal support measures. Such resiliency of corporate bond markets is at odds with what one might expect based on past financial stress experience and the corresponding research. It is important to understand its causes and implications, including those that benefit the health of the economy and those that could lead to longer-term vulnerabilities. Easy access to bond markets in bad times may help firms sustain their activity, capital investment and employment, but may also facilitate weaker, riskier firms taking on additional financing pushing their solvency problems down the road and, thus, hinder creative destruction. Related economic research has mostly focused on the U.S. and, to a lesser extent, Europe. In this paper, we find that corporate bond issuance surged globally during COVID, not just in the U.S., and that this surge contrasted with issuance behavior observed during other periods of acute financial stress.

In particular, we find that during COVID firms had higher issuance propensity and issued more bonds (both in terms larger number of issues and amounts issued) across the globe. Importantly from a financial stability perspective, issuers in EMEs behaved differently during the COVID compared to previous stress periods, and we do not observe a shift to larger or

**Figure 10: What did firms do with cash raised?**

Each graph compares the average annual ratio for firms that issued bonds in 2020 (green line) compared to the sample of firms that have ever issued bonds but did not issue in 2020 (orange line). Source: Refinitiv Worldscope.
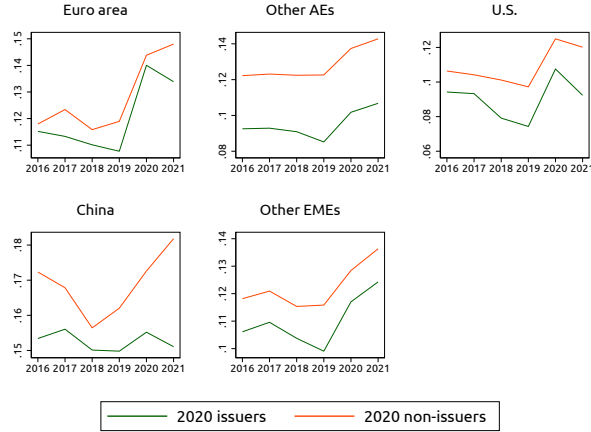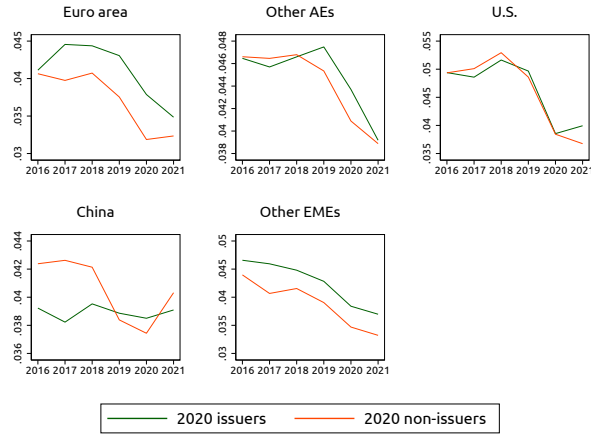
((a)) Cash as a percentage of total assets



((b)) Capital expenditures as a percentage of total assets



((c)) Dividends as a percentage of total assets
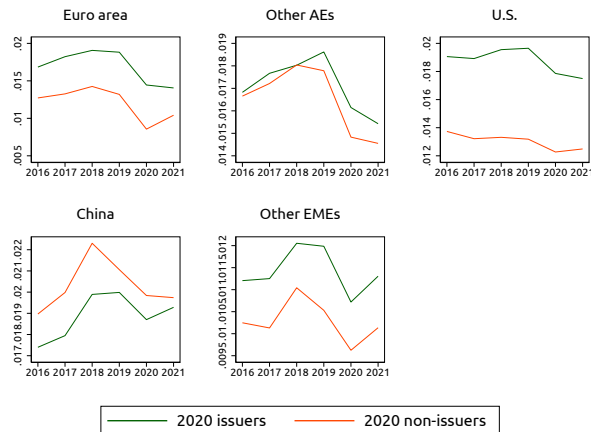
less risky borrowers, though this phenomenon is isolated to issuers of local currency bonds (rather than U.S. dollar bonds). One possible explanation is that depressed bond yields led investors to "reach" for higher-yielding emerging-market assets making them less discerning regarding the riskiness of these assets. Another possibility is that support programs by EME central banks themselves improved financing conditions in emerging markets and corporate bond issuance more attractive.

As a result, leverage and interest coverage ratios of non-financial firms in China and other EMEs have reached potentially concerning levels by the end of 2021 (e.g., see discussion in Box 1.1 of International Monetary Fund (2021)). While outside of the scope of this paper, these vulnerabilities are particularly important in light of increasing inflation and monetary policy tightening experienced beginning in 2022. Any resulting economic slowdown could lower firms' cash flows and undermine their ability to service debt, and less favorable corporate bond markets may make rolling over debt more difficult. On the other hand, firms' hearty cash positions may allow them to weather any turbulence in the bond markets.

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# Appendix A   Issuance by Country

**Table A1: Number of issuers and non-issuers by country**

| Country | Issuers | Non-issuers | Total | Country | Issuers | Non-issuers | Total |
|---|---|---|---|---|---|---|---|
| Argentina | 23 | 92 | 115 | Luxembourg | 19 | 71 | 90 |
| Australia | 90 | 2,696 | 2,786 | Malaysia | 61 | 1,261 | 1,322 |
| Austria | 16 | 81 | 97 | Mexico | 64 | 136 | 200 |
| Belgium | 26 | 140 | 166 | Netherlands | 45 | 215 | 260 |
| Bermuda | 19 | 86 | 105 | New Zealand | 25 | 186 | 211 |
| Brazil | 159 | 400 | 559 | Norway | 54 | 366 | 420 |
| Canada | 226 | 4,376 | 4,602 | Peru | 14 | 151 | 165 |
| Chile | 28 | 222 | 250 | Philippines | 30 | 206 | 236 |
| China | 975 | 5,432 | 6,407 | Poland | 22 | 684 | 706 |
| Colombia | 10 | 76 | 86 | Portugal | 11 | 56 | 67 |
| Denmark | 15 | 211 | 226 | Russian Federation | 58 | 1,041 | 1,099 |
| Finland | 36 | 177 | 213 | Singapore | 98 | 796 | 894 |
| France | 121 | 946 | 1,067 | South Africa | 21 | 400 | 421 |
| Germany | 90 | 946 | 1,036 | Spain | 38 | 199 | 237 |
| Greece | 21 | 333 | 354 | Sweden | 96 | 928 | 1,024 |
| Hong Kong | 129 | 1,504 | 1,633 | Switzerland | 85 | 246 | 331 |
| India | 198 | 3,338 | 3,536 | Taiwan | 113 | 2,350 | 2,463 |
| Indonesia | 79 | 624 | 703 | Thailand | 154 | 652 | 806 |
| Ireland | 29 | 135 | 164 | Turkey | 12 | 389 | 401 |
| Israel | 10 | 682 | 692 | United Kingdom | 209 | 2,529 | 2,738 |
| Italy | 52 | 453 | 505 | United States | 1,499 | 10,574 | 12,073 |
| Japan | 409 | 4,589 | 4,998 | Vietnam | 17 | 1,180 | 1,197 |
| Korea (South) | 552 | 2,208 | 2,760 | | | | |

# Appendix B  Description of Variables

**Table B2: Periods of financial stress**

| Name | Description |
|---|---|
| COVID pandemic | A dummy that takes on a value of 1 in the months of March to June 2020, inclusive. |
| Taper tantrum | A dummy that takes on a value of 1 in the months of May 2013 to April 2014, inclusive. |
| Global financial crisis | A dummy that takes on a value of 1 in the months of December 2007 to June 2009, inclusive. |

**Table B3: Firm characteristics (source: Refinitiv Worldscope)**

| Name | Description |
|---|---|
| Log assets | Log of book value of total assets (converted to USD using constant 2011 U.S. dollars) at the end of the fiscal year ending in the previous calendar year. |
| Book leverage | Book value of total debt divided by book value of total assets, both at the end of the fiscal year ending in the previous calendar year. Winsorized at the 5% and 95% level. |
| Tangibility | Net property, plant and equipment divided by book value of total assets, both at the end of the fiscal year ending in the previous calendar year. Winsorized at the 5% and 95% level. |
| Profitability | Annual net income for the fiscal year ending in the previous calendar year, divided by the book value of total assets at the end of the fiscal year ending in the previous calendar year. Winsorized at the 5% and 95% level. |

## Table B4: Issuance outcomes (source: Refinitiv Workspace)

| Name | Description |
|---|---|
| *Calculated for all firm-months (including those with zero issuance)* | |
| Issuer dummy | A dummy equal to 1 in the months that a firm issues at least one bond, and 0 otherwise. |
| Dollar amount issued | The total amount of issuance (converted to USD using constant 2011 U.S. dollars) in a given firm-month. |
| Number of bonds issued | The number of bonds issued in a given firm-month. |
| Issuer dummy USD | A dummy equal to 1 in the months that a firm issues at least one USD-denominated bond, and 0 otherwise. |
| Issuer dummy local currency | A dummy equal to 1 in the months that a firm issues at least one bond denominanted in their home currency, and 0 otherwise. |
| *Calculated for firm-months with non-zero issuance only* | |
| Weighted average maturity | The average maturity of bonds issued by a firm in a month, weighted by the USD size of each bond. |
| Rated share | Proportion of bonds issued by a firm in a month that have a rating. |
| IG rated share | Proportion of bonds issued by a firm in a month that have an investment grade rating. |

## Table B5: Macroeconomic variables

| Name | Description | Source |
|---|---|---|
| Level of 10-year yield | The monthly average 10-year yield in a firm's country of domicile. | Bloomberg Finance LP |
| Change in USD broad dollar index | The month-over-month difference in the log of the monthly average level of the trade-weighted U.S. dollar index, multiplied by 100. | Bloomberg Finance LP |
| Wu Xia shadow Federal Funds rate | Shadow interest rate calculated when the Federal Funds rate is at the zero lower bound Wu and Xia (2016). | Federal Reserve Bank of Atlanta |
| Change in VIX | The month-over-month difference in the log of the VIX index. | Bloomberg Finance LP |
| Flow into bond funds as % of AUM | Net fund monthly flows into a country's bond mutual funds, divided by the previous month end's assets under management. | EPFR Global |
| Change in central bank assets as % of GDP | The monthly level of the level of a central bank's balance sheet, divided by monthly GDP; where monthly GDP not available, quarterly GDP is used for the three months in that quarter. | Haver Analytics |

# Appendix C   Impact of additional controls

## Table C6: Effect of firm and macroeconomic controls

This regression re-examines bond issuance outcomes for 2005 to 2021 for a global sample of public firms in Refinitiv Worldscope, adding firm characteristics and macroeconomic variables as controls. The dependent variables are *issuer_dummy* (a dummy that takes on a value of 1 if a firm issues at least one bond in a month and 0 otherwise), *dollar_amount_issued* (total face value of bonds issued in a month by a firm, including $0), and *number_bonds_issued* (total bonds issued in a month by a firm, including no bonds). The controls include firm characteristics (log assets, book leverage, and tangibility) and macroeconomic characteristics (level of 10-year yield by country, change in central bank balance sheet as a percentage of GDP, change in USD broad index, Wu Xia shadow Federal Funds rate, the monthly change in VIX, and flows into a country's bond funds as a percentage of those funds assets under management). The regressions include firm fixed effects and Driscoll-Kraay standard errors are shown below the coefficients; *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

| Sample | Euro area | Other AEs | U.S. | China | Other EMEs |
|---|---|---|---|---|---|
| *Dependent variable* | *Issuer dummy* | | | | |
| COVID pandemic | 0.00631*** | 0.000547 | 0.0121*** | 0.00163** | 0.00178*** |
| | (0.00149) | (0.000367) | (0.00123) | (0.000785) | (0.000528) |
| Taper tantrum | 0.000970 | 0.000530*** | 0.000512 | -0.00363*** | -0.00227*** |
| | (0.000706) | (0.000191) | (0.000377) | (0.000557) | (0.000260) |
| Global financial crisis | | -0.000437** | -0.00104*** | | -0.00159*** |
| | | (0.000209) | (0.000270) | | (0.000401) |
| #N/A | 0.000626* | 0.000330*** | 0.000434*** | 0.00568*** | 0.00180*** |
| | (0.000334) | (4.78e-05) | (7.61e-05) | (0.000592) | (0.000215) |
| Book leverage | -0.00147 | -0.000651* | 0.000780 | 0.00242 | 0.00257*** |
| | (0.00161) | (0.000354) | (0.000638) | (0.00247) | (0.000831) |
| Tangibility | 0.00158 | 7.96e-05 | 0.00114 | 0.000187 | 0.000828 |
| | (0.00314) | (0.000324) | (0.000701) | (0.00321) | (0.00108) |
| Level of 10-year yield | 0.0462 | -0.0425*** | -0.175*** | -0.156*** | -0.0618*** |
| | (0.0298) | (0.00953) | (0.0222) | (0.0472) | (0.00869) |
| Chg in central bank assets as % of GDP | 0.000746 | 0.00108 | -0.00360 | -0.00302 | 0.00232*** |
| | (0.00285) | (0.00153) | (0.00408) | (0.00305) | (0.000769) |
| Flow into bond funds as % of AUM | -0.00269** | 0.000517** | 0.0559*** | -0.00219*** | 0.00561*** |
| | (0.00115) | (0.000235) | (0.0104) | (0.000271) | (0.000912) |
| Change in USD broad index | -0.0400** | -0.00606 | -0.0240*** | 0.0141 | -0.0407*** |
| | (0.0174) | (0.00374) | (0.00716) | (0.0124) | (0.00643) |
| Wu Xia shadow Fed Funds rate | -0.00357 | 0.00773* | 0.00955 | 0.0821*** | -0.00274 |
| | (0.0177) | (0.00424) | (0.00783) | (0.0128) | (0.00614) |
| Change in VIX | 0.00517 | -0.000759 | 0.00115 | 0.00713*** | -2.45e-05 |
| | (0.00452) | (0.000942) | (0.00235) | (0.00266) | (0.00153) |
| Controls | | | | | |
| Constant | Yes | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes | Yes |
| # observations | 267,075 | 1,599,047 | 1,095,584 | 576,258 | 1,202,875 |
| R-squared | 0.264 | 0.178 | 0.121 | 0.188 | 0.186 |

## Table C6 (continued): Effect of firm and macroeconomic controls

| Sample | Euro area | Other AEs | U.S. | China | Other EMEs |
|---|---|---|---|---|---|
| *Dependent variable* | *Dollar amount issued* | | | | |
| COVID pandemic | 15.37*** | 2.059*** | 28.39*** | 1.041* | 0.0115 |
| | (3.235) | (0.692) | (4.293) | (0.605) | (0.298) |
| Taper tantrum | 3.039** | -0.0770 | 1.324 | -0.690 | -0.0981 |
| | (1.437) | (0.197) | (0.999) | (0.681) | (0.230) |
| Global financial crisis | | 0.840*** | -1.684*** | | -0.910*** |
| | | (0.306) | (0.490) | | (0.310) |
| #N/A | -0.0985 | 0.243*** | 1.046*** | 1.908*** | 0.469*** |
| | (0.804) | (0.0702) | (0.289) | (0.296) | (0.114) |
| Book leverage | -3.302 | -0.492 | 5.102** | -0.608 | 1.071** |
| | (3.436) | (0.499) | (2.066) | (0.909) | (0.428) |
| Tangibility | -0.631 | -0.121 | -3.160** | 0.530 | -0.133 |
| | (4.336) | (0.421) | (1.589) | (1.827) | (0.465) |
| Level of 10-year yield | -86.76** | -71.78*** | -390.7*** | -87.76*** | -29.78*** |
| | (41.20) | (13.91) | (65.96) | (27.70) | (6.846) |
| Chg in central bank assets as % of GDP | -1.386 | 3.757 | -18.80* | -3.073 | 2.159*** |
| | (6.561) | (2.733) | (11.12) | (1.918) | (0.826) |
| Flow into bond funds as % of AUM | 1.655 | 0.345** | 67.66*** | -0.612*** | 0.767* |
| | (2.048) | (0.134) | (19.07) | (0.156) | (0.459) |
| Change in USD broad index | 3.958 | -7.640 | -0.294 | -10.28 | -13.37** |
| | (35.88) | (5.056) | (15.54) | (6.918) | (5.262) |
| Wu Xia shadow Fed Funds rate | 56.62 | -3.517 | 78.33*** | 26.16*** | -5.998 |
| | (36.21) | (4.408) | (13.39) | (6.955) | (3.706) |
| Change in VIX | 6.196 | 0.475 | 14.30** | 4.124** | 1.732* |
| | (12.65) | (1.294) | (7.158) | (1.917) | (0.984) |
| Controls | | | | | |
| Constant | Yes | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes | Yes |
| # observations | 267,075 | 1,599,047 | 1,095,584 | 576,258 | 1,202,875 |
| R-squared | 0.146 | 0.251 | 0.087 | 0.192 | 0.118 |

## Table C6 (continued): Effect of firm and macroeconomic controls

| Sample | Euro area | Other AEs | U.S. | China | Other EMEs |
|---|---|---|---|---|---|
| *Dependent variable* | *Number of bonds issued* | | | | |
| COVID pandemic | 0.0100*** | 0.00189** | 0.0287*** | 0.00418*** | 0.000828 |
| | (0.00322) | (0.000918) | (0.00337) | (0.00151) | (0.00126) |
| Taper tantrum | 0.00352* | 0.000965** | 0.00182** | -0.00440*** | -0.00444*** |
| | (0.00186) | (0.000386) | (0.000721) | (0.000787) | (0.00103) |
| Global financial crisis | | -8.23e-06 | -0.00235*** | | -0.00225*** |
| | | (0.000802) | (0.000812) | | (0.000799) |
| #N/A | 0.000100 | 0.000457*** | 0.00134** | 0.00914*** | 0.00351*** |
| | (0.00114) | (0.000110) | (0.000569) | (0.00137) | (0.000574) |
| Book leverage | -0.00454 | -0.00257*** | 0.00623 | 0.000935 | 0.00503*** |
| | (0.00441) | (0.000921) | (0.00424) | (0.00375) | (0.00194) |
| Tangibility | -0.00449 | 0.000342 | -0.000957 | -0.00381 | 0.00461 |
| | (0.00779) | (0.000843) | (0.00255) | (0.00863) | (0.00451) |
| Level of 10-year yield | 0.0234 | -0.120*** | -0.311** | -0.453*** | -0.0886*** |
| | (0.0620) | (0.0267) | (0.136) | (0.137) | (0.0237) |
| Chg in central bank assets as % of GDP | 0.000144 | 0.00755* | -0.0223** | -0.00328 | 0.00564*** |
| | (0.00739) | (0.00419) | (0.00934) | (0.00466) | (0.00143) |
| Flow into bond funds as % of AUM | -0.00358* | 0.00159*** | 0.0953*** | -0.00244*** | 0.0138*** |
| | (0.00209) | (0.000582) | (0.0230) | (0.000431) | (0.00365) |
| Change in USD broad index | -0.0157 | -0.0122 | -0.00586 | 0.0178 | -0.0726*** |
| | (0.0595) | (0.00965) | (0.0198) | (0.0179) | (0.0173) |
| Wu Xia shadow Fed Funds rate | 0.00437 | 0.0292** | 0.0693*** | 0.119*** | 0.0223 |
| | (0.0499) | (0.0130) | (0.0165) | (0.0249) | (0.0303) |
| Change in VIX | 0.0147 | -0.000218 | 0.00711 | 0.0166*** | 0.00124 |
| | (0.0111) | (0.00208) | (0.00574) | (0.00481) | (0.00304) |
| Controls | | | | | |
| Constant | Yes | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes | Yes |
| # observations | 267,075 | 1,599,047 | 1,095,584 | 576,258 | 1,202,875 |
| R-squared | 0.363 | 0.571 | 0.164 | 0.339 | 0.389 |