# The impact of bond market development on economic growth before and after the global financial crisis: Evidence from developed and developing countries

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## Abstract

This paper investigates the impact of bond market development on economic growth before and after the global financial crisis in 44 selected countries. A dynamic model based on endogenous growth theory is employed for the study for the period 1990–2017. We find robust evidence that the global financial crisis has distorted the link between bond market development and economic growth: before the global financial crisis, the bond market's impact on economic growth was positive; after the global financial crisis, the evidence is mixed. The main finance–growth channel by which proceeds from the bond market are eventually allocated to the most productive investments appears to be broken.



*Keywords:* bond market, economic growth, global financial crisis

JEL classifications: G01, G10, O47



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## 1. Introduction

The global financial crisis (GFC) of 2008 has been often described as one of the biggest crises since the great depression of the 1930s in terms of its impact on the world economy (Claessens et al., 2010; Estrada et al., 2010). The effect is seen in the downturn of the world economy's size and growth (see Figure 1). The world's GDP shrank from USD63.6 trillion in 2008 to USD60.3 trillion in 2009 (World Bank, 2019). The world's GDP growth slowed from 4.3% in 2007 to 1.9% in 2008, and then to -1.7% in 2009 (World Bank, 2019).

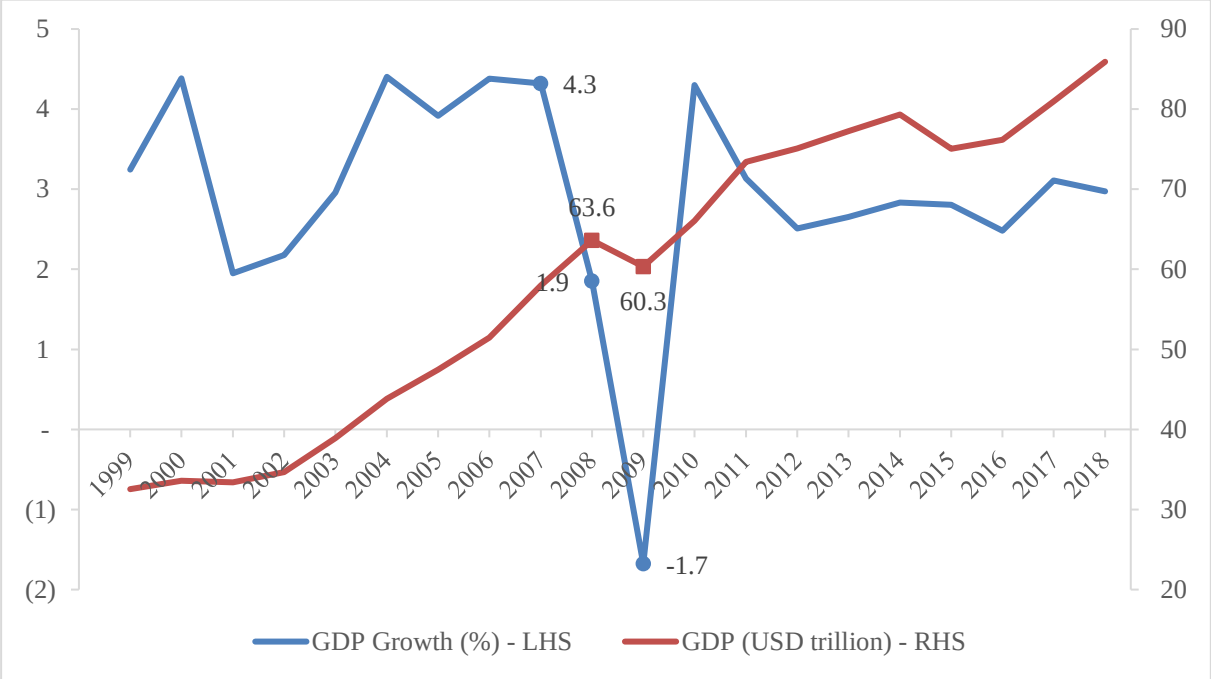


**Figure 1.** World's GDP and GDP Growth from 1999 to 2018
*Source:* World Bank (2019)

The GFC originated from and had a most significant impact on the financial markets (see Figure 2). Equity market capitalization dropped drastically, from USD60.3 trillion in 2007 to USD32.3 trillion in 2008, before partially recovering to USD44.0 trillion in 2009 (World Bank, 2019). In contrast, debt markets maintained steady growth. The global bond market size increased from USD69.0 trillion in 2007 to USD73.7 trillion in 2008, and to USD80.9 trillion in 2009 (Bank for International Settlements, 2019). At the same time, domestic credit to the private sector by banks also recorded a small increase, from USD44.4 trillion in 2007 to USD45.2 trillion in 2008, and further growth to USD48.3 trillion in 2009 (Bank for International Settlements, 2019).

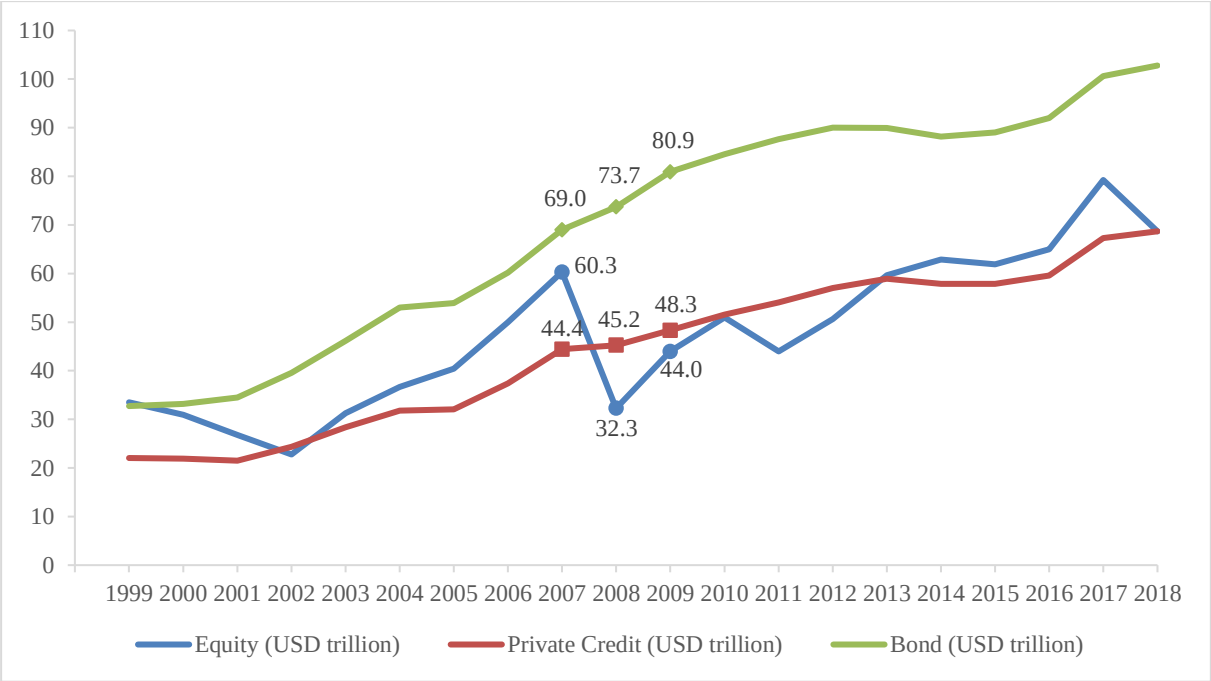


**Figure 2.** World Equity Market, Private Credit by Banks, and Bond Market from 1999 to 2018
*Source:* World Bank (2019) and Bank for International Settlements (2019)

Luintel et al. (2016) suggested that the GFC has caused a regime shift in the relationship between financial markets and economic growth, while recent studies have found that the GFC reduced the impact of financial markets on economic growth. Thus, Ahmad et al. (2016) concluded that the GFC weakened the positive effect of banks and stock market development on economic growth, and Asteriou and Spanos (2019) made a similar finding that, during the GFC, the development of financial markets hindered economic growth. This begs the question of whether this shift extends to the relationship between bond markets and economic growth.

Research into the link between bond markets and economic growth has been limited. Most such studies date from the pre-GFC period. This paper attempts to reassess the link between bond markets and economic growth by considering the effect of the GFC. The study analyses the impact of the bond markets on economic growth before and after the GFC of 2008 and employs the largest international dataset used to date in such a context.

This paper offers four potential contributions to the literature. To start with, this is the first study to investigate the impact of bond markets on economic growth using an endogenous growth model. This model represents the essential roles of physical capital, labour, and human capital in economic growth; it also incorporates bond market proxies. Second, this paper represents the first study to account for the impact of the GFC on the

relationship between bond market development and economic growth. Third, the research uses a data sample from 44 countries, which is the largest sample ever considered in a study into the link between bond market development and economic growth. The sample represents both developed and developing countries with active bond markets. Fourth, the study segregates the data sample into panels of developed and developing countries to identify whether the level of underlying economic development has a bearing on the significance of the bond market–economic growth link.

The rest of the paper is structured as follows: Section 2 introduces the existing literature on the relationship between bond market development and economic growth; Section 3 describes the method, analysis, data, and sources used in this study, and Section 4 presents the empirical results from the analysis. Section 5 discusses the findings and Section 6 concludes the paper.

## 2. Literature Review

The relationship between financial development and economic growth has attracted significant academic and policymaker attention since Schumpeter (1934) highlighted the essential role of banks in promoting economic growth. Subsequently, various researchers supported this observation by providing empirical evidence of a strong association between the financial and the real sectors; for example, Goldsmith (1969), Mckinnon (1973), and Shaw (1973). Other economists, such as Kuznets (1955) and Robinson (1952), affirmed that economic growth drives financial development. By contrast, scholars such as Chandavarkar (1992) and Lucas (1988) have cast doubt on the link between the financial and the real sectors.

The fundamental role of a financial market is as a funding source of economic activities. Levine (1997) described financial markets as fulfilling several essential functions: a facilitator of the trading, hedging, diversifying, and pooling of risk; an allocator of resources; the observer of management and corporate control implementation; a mobilizer of savings; a facilitator of the exchange of goods and services. A financial market's ability to deliver risk diversification increases the availability of funding not only for short-term, liquid, and low-return projects, but also for long-term, illiquid, and high-return projects, including start-up projects that drive technological innovation. These inventive projects lead technological breakthroughs that increase the productivity of the real sector in the long term. The capacity

of financial markets to provide reliable and affordable information on investment opportunities should improve the effectiveness of resource allocation. The competence of the financial market in savings mobilization, followed by the transfer of pooled funds into deficit units in an efficient manner, is a critical channel for the finance–growth nexus. Finally, the capability of financial markets to reduce information and transaction costs make them an essential facilitator of exchange. Thus, a well-functioning financial market can accelerate capital accumulation and technological innovation, which should improve productivity in the real sector.

Before the GFC, most studies of the relationship between financial development and economic growth concluded that the financial sector promotes economic growth. King and Levine (1993) conducted a seminal study on the link between financial development and economic growth using sample data from 80 countries for the period 1960–1989. They found that different indicators of financial development were substantially and positively correlated with economic growth. Similarly, Beck, Levine and Loayza (2000) discovered that the development of financial intermediaries positively impacted on economic growth and productivity growth from 1960 to 1995 in two data samples: one of 63 countries and one of 77. Likewise, Akimov et al. (2009) revealed that financial intermediation promoted economic growth in 27 transition economies during the period 1989–2004. The positive impacts of banks on economic growth are also reported in the studies of Adu et al. (2013), Anwar and Nguyen (2011), Calderón and Liu (2003), Christopoulos and Tsionas (2004), Dawson (2010), Gregorio and Guidotti (1995), Habibullah and Eng (2006), Kazar and Kazar (2016), Rachdi and Mbarek (2011), Vardar and Coskun (2016), and Yu et al. (2012).

Beck and Levine (2004) investigated the impact of banks and stock markets on economic growth in 40 countries for the period 1976–1998, applying a generalized method of moments (GMM) estimation. The authors found that banks and stock markets positively impact on economic growth. Alom (2018), Arestis et al. (2001), Bayar (2014), Bittencourt (2012), Durusu-Ciftci et al. (2017), Ewah et al. (2009), Rajan and Zingales (1996), Rapp and Udoieva (2018), and Wong and Zhou (2011) reached similar conclusions: that banks and equity markets promote economic growth.

As in the case for banks and the stock market, so most existing studies have also revealed a positive link between bond markets and economic growth. Fink et al. (2003) found that the bond market supported economic growth in 7 out of 13 developed countries during the period 1950–2000. Likewise, Pradhan et al. (2015) found that bond market development

promoted the growth of GDP per capita in some G20 countries during the period 1990–2011. Furthermore, Fanta (2017) reported that bond markets positively impacted economic growth in 36 countries during the period 1997–2011. Similar findings were made by Fanta and Makina (2017) in relation to South Africa during the period from 1990 to 2011, Muharam et al. (2018) in relation to eight developing countries during the period 2004–2015, and Said (2013) in relation to East Asian economies in the period 2002–2009.

Employing GMM on a panel dataset of 38 countries for the period from 1989 to 2010, Thumrongvit et al. (2013) found a positive correlation between stock markets and government debt securities, and the growth of real GDP per capita. They also discovered that an improvement in the domestic bond market led to a diminished role for the banking sector. Similarly, Nordin and Nordin (2016) reported that the bond and equity markets positively contributed to the Malaysian economy during the period 1981–2014. Furthermore, Pradhan et al. (2016) reported that, in the long run, the interactions between bond market development, inflation rate, exchange rate, interest rate, and trade openness had an impact on economic growth in 35 countries from 1993 to 2011. Likewise, Pradhan et al. (2020) found a similar result in G20 countries for the period 1991–2016, that is, that debt securities and equity markets are cointegrated with economic growth, inflation and real interest rates.

Financial development may also negatively impact economic growth. Gregorio and Guidotti (1995) found a strong and significant negative relationship between the indicators of financial development and real GDP per capita in Latin America during the 1970s and 1980s. The authors explained that a financial liberalization that was not supported by proper regulation gave rise to a fragile financial market. Ductor and Grechyna (2015) described how financial development could hinder economic growth if it was not accompanied by adequate progress in the real sector, providing fresh empirical evidence that financial development might also be detrimental to economic growth.

Some scholars have found that a high level of public debt harms economic growth. Abbas and Christensen (2010) reported that public domestic debt hinders economic growth when the ratio of such debt to bank deposits is above 35%. Similarly, Presbitero (2012) revealed that public indebtedness of up to 90% of GDP negatively influences economic growth (the effect was irrelevant beyond this threshold).

Other scholars have concluded that financial markets that develop too rapidly also hinder economic growth; for example, Cecchetti and Kharroubi (2012), Law and Singh

(2014), Prochniak and Wasiak (2017), and Rashti et al. (2014). They suggested that one possible cause of this negative effect is that the rapid development of financial markets attracts more talented human resources to work therein, rather than in the real sector. Cecchetti and Kharroubi (2019) reported a similar finding: a more developed financial market is significantly correlated with the lower productivity of workers in the real sector.

Research into the link between financial development and economic growth that accounts for the impact of the GFC has shown that the crisis modified the relationship between the financial and the real sectors. Ahmad et al. (2016) found that bank credit, stock market capitalization, and stock market turnover ratio promoted economic growth in nine African countries between 1987 and 2012. However, the interactive term between the financial indicators and the GFC showed that the crisis simply lessened the otherwise positive effect of the banking sector and equity market development on economic growth. Similarly, Asteriou and Spanos (2019) discovered that bank and equity market development supported economic growth in 26 European Union countries during the period 1990–2016. However, they also revealed that during the GFC, financial development hindered economic growth.

None of these recent studies have focused specifically on the nexus of bond markets and economic growth. Thus, one motivation for this paper is to attempt to fill this gap in the literature; that is, to consider whether the relationship between bond markets and economic growth has changed following the GFC in a similar way to that seen in the rest of the financial market.

## 3. Methodology and Data

In this paper, we use a model based on endogenous growth theory. The endogenous growth theory developed by Lucas (1988) and Romer (1989) emphasizes the importance in economic growth of human capital, in addition to conventional labour and physical capital. All three such components of endogenous growth theory will be controlled in our model. Specifically, gross fixed capital formation, denominated in local currency, is used as a proxy for physical capital, as per Adu et al. (2013) and Vardar and Coskun (2016). Total employment is used as a proxy for labour, while the proxy for human capital is the human development index of the United Nations Development Programme (UNDP). This index is an aggregate measure of average achievement in the essential components of human

development: health, education, and living standards (United Nations Development Programme, 2019).

We incorporate bond market measures into the model using the following proxies:

1. The domestic corporate bond market capitalization.
2. The domestic government bond market capitalization.
3. The total domestic bond market capitalization.

GDP, gross fixed capital formation and all bond market indicators are denominated in the real value of local currency units to ensure that the model is not affected by fluctuations in foreign exchange and inflation rates.

Panel-data econometric techniques are employed to investigate the impact of bond market development on economic growth. We propose the following model:

$$GDP_{it} = \alpha_i + \omega_t + \rho\, GDP_{it\text{-}1} + \beta\, Capital_{it} + \gamma\, Labour_{it} + \delta\, Human_{it} + \theta\, Bond_{it} + \pi\, Bond_{it}{*}GFC_t + \epsilon_{it}$$

where *GDP* is the real GDP denominated in local currency units, *Capital* is the real gross fixed capital formation denominated likewise, *Labour* is the total employment, *Human* is the UNDP human development index, *Bond* is the bond market development indicator, *Bond*×*GFC* is the interaction between this indicator and a dummy variable for the GFC, $\alpha_i$ is the unobserved country-specific factor, $\omega_t$ represents unobserved time effects, $\epsilon_{it}$ is the error term, *i* represents country, and *t* represents time. The values of the dummy variable for GFC are 1 for the period from 2008 to 2017 and 0 for the period from 1990 to 2007.

The dataset reflects 44 developed and developing countries during the period 1990–2017. Bond market data are obtained from the Financial Structure and Development Dataset, October 2019 revision (Beck, Demirgüç-Kunt, & Levine, 2000, 2010; Cihak et al., 2012). It consists of domestic corporate bond market capitalization, domestic government bond market capitalization, and total domestic bond market capitalization. The GDP, gross fixed capital formation, and aggregate employment variables are sourced from World Development Indicators (World Bank, 2019), while the human development index is collected from UN human development reports (United Nations Development Programme, 2019). Data availability is not consistent across all variables and all countries, thus resulting in an unbalanced panel, albeit one with nearly 1000 observations.

The study employs a traditional fixed-effects regression model, which is appropriate for our panel consisting of 28 time periods and 44 cross sections. Roodman (2009) pointed out that fixed-effects regression is more appropriate for panel datasets with a long duration. Moreover, the long period of the panel dataset eliminates the Nickell (1981) bias that exists in a fixed-effects regression for a dynamic model with a short period. The fixed-effects model of the panel data allows for unobserved country-specific and time-specific effects. These omitted variables are likely to correlate with the variables included in the model. Fixed-effects regression provides a means of controlling for these omitted variables. Thus, fixed-effects regression represents a reliable method for this research.

For comparative purposes, because bond market development and economic growth are dynamic processes, this paper also employs the generalized method of moments (GMM) estimation developed by Holtz-Eakin, Newey, and Rosen (1988), Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). Specifically, this study employs a one-step system GMM, which is considered to be more efficient than the traditional first-difference GMM. Such an approach addresses potential simultaneity and endogeneity problems in the relationship between financial development and economic growth (Akimov, Wijeweera, & Dollery, 2009; Beck & Levine, 2004; Rousseau & Wachtel, 2011).

## 4. Empirical Results

### 4.1. Descriptive statistics

Table 1 reports descriptive statistics for the whole sample. Overall, the average size of the government bond market is larger than the average size of the corporate bond market. In developing countries, the government bond market is, on average, 2.5 times larger than the corporate bond market. By contrast, the corporate and government bond markets in developed countries are similar in size.

Table 1. *Descriptive Statistics for Whole Sample*

| Variable | N | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| GDP (billion LCUs) | 1,221 | 180,027.9 | 897,825.3 | 72.99274 | 9,912,704 |
| Physical Capital (billion LCUs) | 1,221 | 53,580.06 | 280,021.7 | 12.77487 | 3,228,763 |
| Labour (million people) | 1,188 | 46.14887 | 120.8723 | .1401224 | 752.756 |
| Human Capital (index) | 1,216 | .7958857 | .1055057 | .427 | .953 |
| Corporate Bonds (billion LCUs) | 1,027 | 30,672.22 | 123,162.3 | .0176527 | 1,087,263 |
| Government Bonds (billion LCUs) | 1,099 | 41,272.32 | 161,420.8 | 2.27508 | 1,498,593 |
| Domestic Bonds (billion LCUs) | 1,088 | 70,641.34 | 260,884.5 | 3.343666 | 2,100,523 |

*Note.* LCU: Local currency unit

### 4.2. Regression results

A dynamic panel model might generate an inconsistent and biased estimation because of non-stationary variables (Pesaran & Smith, 1995). Thus, this study employs the panel unit-root test of Im, Pesaran and Shin (2003) to check the non-stationarity of the dataset. The test finds unit roots in all data series; therefore, first differences are used in subsequent estimations.

Table 2 presents the statistical results from the fixed effects (FE) of corporate, government, and total domestic bond market capitalizations. The results for the GMM regression are presented for comparison and are in line with the results of the FE model. The results show that bond market development is positively linked with economic growth before the GFC. All bond measures – corporate bond, government bond, and the total capitalization of the domestic bond market – have a positive impact on economic growth, at a significance level of 90% or higher.

Table 2. *The Impact of Bond Market Development on Economic Growth*

| Variable | Corporate Bonds | | Government Bonds | | Total Domestic Bonds | |
|---|---|---|---|---|---|---|
| | FE | GMM[1] | FE | GMM[2] | FE | GMM[3] |
| $GDP_{t-1}$ | 0.0852*** | 0.342*** | 0.345*** | 0.528*** | 0.318*** | 0.421*** |
| | (0.00760) | (0.00749) | (0.0535) | (0.00484) | (0.0619) | (0.0150) |
| Physical Capital | 1.267*** | 1.342*** | 1.261*** | 1.274*** | 1.286*** | 1.341*** |
| | (0.0405) | (0.0385) | (0.00701) | (0.0106) | (0.0195) | (0.00567) |
| Labour | 0.000558 | 0.00117 | -4.94e-05 | -0.000469 | -2.85e-05 | 0.000240 |
| | (0.000568) | (0.00142) | (0.000331) | (0.000540) | (0.000345) | (0.000165) |
| Human Capital | 9,049 | 321,756 | 129,612 | 582,679 | 39,976 | 46,204 |
| | (81,351) | (253,673) | (78,179) | (817,106) | (83,746) | (89,013) |
| Bond | 0.510* | 1.214*** | 0.438*** | 0.630*** | 0.354*** | 0.468*** |
| | (0.258) | (0.0648) | (0.0720) | (0.0125) | (0.0812) | (0.0191) |
| Bond×GFC | -0.453** | -1.106*** | -0.268*** | -0.504*** | -0.286*** | -0.384*** |
| | (0.203) | (0.0656) | (0.0493) | (0.0273) | (0.0688) | (0.0115) |
| Constant | 3,452*** | -1,306 | 692.6 | -2,949 | 1,140*** | -270.9 |
| | (315.4) | (1,185) | (560.5) | (3,715) | (294.3) | (920.6) |
| Observations | 948 | 915 | 1,005 | 969 | 995 | 995 |
| R-squared | 0.880 | | 0.939 | | 0.927 | |
| No. of countries | 44 | 44 | 44 | 44 | 44 | 44 |
| No. of instruments | | 30 | | 30 | | 30 |
| ar1p | | 0.151 | | 0.130 | | 0.170 |
| ar2p | | 0.833 | | 0.255 | | 0.277 |
| sarganp | | 0 | | 0 | | 0 |
| hansenp | | 0.144 | | 0.250 | | 0.211 |

Robust standard errors in parentheses; ***p < 0.01; **p < 0.05; *p < 0.1

[1]The instrumental variables are the first lags of physical capital, labour, and human.

[2]The instrumental variables are the first lags of labour and human capital.

[3]The instrumental variables are physical capital, labour, and human capital.

The control variables used in this study that are also main components of the endogenous growth model generally produced results in line with expectations. All but one of the coefficients is positive, albeit not always significantly so. The proxy for physical capital shows consistently strong results, as does the lagged GDP variable, whereas the proxies for labour and human capital are insignificant.

In line with our expectations, the proxies for the bond market in all three forms are positive and significant. For total domestic bonds and government bonds, the coefficients are, respectively, 0.354 and 0.438 and are significant at the 99% level. The coefficient for corporate bonds is slightly higher, at 0.510, but is significant at the slightly lower level of

90%. The coefficient results are generally in line with the theory whereby funds channelled through private businesses typically provide better outcomes in terms of economic growth than funds used by governments. Perhaps the most interesting results we have obtained are those for the interactive term *Bond×GFC*, which are negative and strongly significant in all estimations. The coefficients are substantial, albeit slightly smaller than those for the bond variables. This suggests that the positive impact of the bond market on economic growth has significantly weakened following the GFC. To delve further into the results, we split the dataset into two subsamples: developed and developing countries. This should help us to identify whether this strong negative impact of the GFC on the bond market–economic growth link is homogenous among countries at different levels of development. Tables 3 and 4, respectively, show the results for developed and developing countries.

Table 3. *The Impact of Bond Market Development on Economic Growth in Developed Countries*

| | Corporate Bonds | | Government Bonds | | Domestic Bonds | |
|---|---|---|---|---|---|---|
| Variable | FE | GMM[1] | FE | GMM[1] | FE | GMM[1] |
| $GDP_{t-1}$ | -0.172*** | -0.303*** | -0.199*** | -0.311*** | -0.191*** | -0.296*** |
| | (0.0111) | (0.0758) | (0.0166) | (0.0411) | (0.00407) | (0.0662) |
| Physical Capital | 0.982*** | 0.567*** | 0.972*** | 0.569*** | 0.983*** | 0.593*** |
| | (0.0499) | (0.0196) | (0.0444) | (0.00909) | (0.0508) | (0.0188) |
| Labour | 0.000771 | 0.0192*** | 0.000799 | 0.0251*** | 0.000797 | 0.0216*** |
| | (0.000749) | (0.00251) | (0.000788) | (0.000902) | (0.000781) | (0.00255) |
| Human Capital | 60,809 | 178,185 | 76,398 | 197,884* | 65,151 | 180,195 |
| | (44,400) | (116,388) | (56,032) | (111,667) | (46,646) | (106,557) |
| Bond | 0.0320*** | 0.0110 | -0.00297 | 0.0696*** | 0.0116** | 0.0236*** |
| | (0.00213) | (0.00915) | (0.0317) | (0.0173) | (0.00563) | (0.00213) |
| Bond×GFC | -0.102*** | -0.0863*** | -0.0423 | -0.109** | -0.0475* | -0.0584*** |
| | (0.0231) | (0.0147) | (0.0526) | (0.0516) | (0.0248) | (0.0182) |
| Constant | 1,568*** | -595.7 | 1,533*** | -1,417 | 1,582*** | -942.2 |
| | (264.2) | (1,795) | (348.1) | (1,761) | (294.2) | (1,836) |
| Observations | 593 | 593 | 616 | 616 | 605 | 605 |
| R-squared | 0.720 | | 0.681 | | 0.704 | |
| No. of countries | 28 | 28 | 28 | 28 | 28 | 28 |
| No. of instrument | | 28 | | 28 | | 28 |
| ar1p | | 0.0250 | | 0.0275 | | 0.0226 |
| ar2p | | 0.290 | | 0.266 | | 0.292 |
| sarganp | | 0.0545 | | 0.267 | | 0.120 |
| hansenp | | 0.233 | | 0.249 | | 0.242 |

Robust standard errors in parentheses; ***p < 0.01; **p < 0.05; *p < 0.1

[1]Human capital is used as the instrumental variable in these GMM models.

The effect of the bond market on economic growth in developed countries has been weaker, as indicated by much smaller bond coefficients (see Table 3). For the government bond market proxy, the coefficient is actually negative, albeit insignificantly. This may indicate that prior to the GFC, these economies were saturated with bond financing due to the process of financialization. In developed countries, the interactive term *Bond×GFC* produced large negative and significant results in two out of three estimations. Indeed, the negative coefficients of the interactive terms for the corporate bond market, as well as the total domestic bond market, outweighed the small positive coefficients for the standalone bond variables. This may indicate that the GFC has switched the relationship between bond markets and economic growth in developed economies from positive to negative. These findings are not unusual; they join a growing pool of literature that questions the positive impact of financial markets on economic growth at the current stage of development: see, for example, Cecchetti and Kharroubi (2012), Law and Singh (2014), Prochniak and Wasiak (2017), and Rashti et al. (2014). The GMM results generally confirm those of the FE model. Notable exceptions are the positive and significant coefficients for government bonds pre-GFC, which results are generally consistent with the literature. However, GMM estimations here are less reliable due to an overidentification problem in the model caused by equal numbers of cross sections and time periods in the sample.

Similarly, we test the same relationship in the subsample of developing countries (see Table 4). The results show that the effect of bond market development on economic growth is stronger in developing countries than in developed ones. The coefficients of all of the bond market indicators are larger, and are significant at the 99% confidence level. Again, the coefficient for corporate bonds is higher than that for government bonds. As in the full sample results, the interactive term *Bond×GFC* is negative and significant in all estimations. However, unlike in the sample of developed countries, these negative coefficients do not outweigh the coefficients of the bond market proxies themselves. This suggests that although the relationship between the bond market and economic growth has weakened after the GFC, it remains positive and significant in these economies. The GMM results, despite suffering an overidentification issue (number of cross sections is smaller than number of time periods), support the results from the FE model.

Table 4. *The Impact of Bond Market Development on Economic Growth in Developing Countries*

| | Corporate Bonds | | Government Bonds | | Domestic Bonds | |
|---|---|---|---|---|---|---|
| Variable | FE | GMM[1] | FE | GMM[2] | FE | GMM[3] |
| $GDP_{t-1}$ | 0.0978*** | 0.291*** | 0.391*** | 0.595*** | 0.374*** | 0.484*** |
| | (0.00336) | (0.0118) | (0.00326) | (0.0189) | (0.00286) | (0.00975) |
| Physical Capital | 1.319*** | 1.390*** | 1.266*** | 1.257*** | 1.305*** | 1.455*** |
| | (0.00515) | (0.0209) | (0.00153) | (0.00907) | (0.00378) | (0.00695) |
| Labour | 0.000418 | 0.0177*** | -0.000277 | -0.0138*** | -0.000303 | -0.00803*** |
| | (0.000531) | (0.000824) | (0.000463) | (0.00142) | (0.000467) | (0.00229) |
| Human Capital | -240,020 | -1.463e+06 | 110,288 | 1.429e+06 ** | -173,741 | 399,887 |
| | (249,703) | (1.488e+06) | (106,522) | (575,966) | (189,624) | (846,182) |
| Bond | 0.887*** | 1.227*** | 0.501*** | 0.685*** | 0.433*** | 0.577*** |
| | (0.00270) | (0.0270) | (0.00387) | (0.0216) | (0.00431) | (0.0108) |
| Bond×GFC | -0.771*** | -1.096*** | -0.297*** | -0.587*** | -0.340*** | -0.502*** |
| | (0.00178) | (0.0237) | (0.00408) | (0.0340) | (0.00462) | (0.0141) |
| Constant | 9,117*** | -8,821 | 2,307*** | 8,174* | 3,823** | 6,888 |
| | (936.6) | (13,851) | (328.4) | (3,914) | (1,478) | (7,500) |
| Observations | 355 | 355 | 389 | 389 | 390 | 351 |
| R-squared | 0.907 | | 0.956 | | 0.949 | |
| No. of countries | 16 | 16 | 16 | 16 | 16 | 16 |
| No. of instrument | | 27 | | 28 | | 28 |
| ar1p | | 0.204 | | 0.108 | | 0.268 |
| ar2p | | 0.309 | | 0.265 | | 0.336 |
| sarganp | | 0 | | 0 | | 0 |
| hansenp | | 0.198 | | 0.503 | | 0.885 |

Robust standard errors in parentheses; ***p < 0.01; **p < 0.05; *p < 0.1

[1]No instrumental variable is used in this GMM model.

[2]Human capital is used as the instrumental variable in this GMM model.

[3]The fourth lag of human capital is used as the instrumental variable in this GMM model.

Currently, there appears to be capacity for further development of the bond market in emerging countries. However, at some future point, the trend of financialization in developing countries may turn the bond market–economic growth nexus negative here as well.

## 5. Discussion

Our empirical results show that bond markets have had a positive relationship on economic growth prior to the GFC. This outcome is largely in line with conventional wisdom and with numerous empirical studies that have found a positive link between financial development and economic growth. What has happened since the GFC and why this strong positive relationship has weakened or even turned negative requires further investigation.

To this end, we first disaggregate the bond market into three components: government bonds, corporate bonds of financial corporations, and non-financial corporate bonds. Table 5 shows the structure of the bond market in these terms for the period from 2000 to 2007.

Table 5. *Bond Market Structure from 2000 to 2007 (USD trillion)*

| Indicator | | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | Δ% |
|---|---|---|---|---|---|---|---|---|---|---|
| Developed | G | 13.11 | 12.86 | 14.93 | 17.83 | 20.94 | 20.25 | 21.63 | 23.72 | 81 |
| | FC | 13.39 | 14.75 | 17.21 | 20.36 | 23.21 | 24.40 | 28.24 | 33.32 | 149 |
| | NFC | 4.78 | 4.90 | 5.19 | 5.49 | 5.64 | 5.20 | 5.51 | 6.07 | 27 |
| | Total | 31.28 | 32.52 | 37.34 | 43.68 | 49.79 | 49.86 | 55.37 | 63.11 | 102 |
| Developing | G | 0.42 | 0.40 | 0.54 | 0.66 | 0.89 | 0.94 | 0.99 | 1.33 | 217 |
| | FC | 0.10 | 0.11 | 0.18 | 0.23 | 0.37 | 0.65 | 0.91 | 1.18 | 1,080 |
| | NFC | 0.02 | 0.03 | 0.05 | 0.07 | 0.08 | 0.17 | 0.22 | 0.30 | 1,400 |
| | Total | 0.54 | 0.55 | 0.77 | 0.96 | 1.35 | 1.76 | 2.12 | 2.80 | 419 |

*Note.* Developed is listed as 'Advanced' and Developing as 'Emerging' in the original source. G: government; FC: financial corporations; NFC: non-financial corporations.
*Source:* Bank for International Settlements (2020b) (https://stats.bis.org/)

The eight-year period from 2000 to 2007 has seen a dramatic acceleration in the bond market activities throughout the spectrum of issuers. Notably, bond markets in developing countries have grown much faster than in the developed economies. This is not unexpected because the developed market economies had been much more financialized prior to this period. In developed countries, the engine of bond market growth was financial corporations (banks), which grew much faster than the government and, indeed, non-financial corporations. In developing countries, the entire corporate sector enjoyed extraordinary levels of growth because corporations in many emerging economies were able to access international capital markets for the first time. Both financial and non-financial corporations registered more than tenfold increases in outstanding bond values. Governments in both developed and developing countries have also benefitted from strong bond markets, seeing market increases over the period of 81% and 217%, respectively.

Economic theory and abundant empirical evidence tell us that the private sector is typically much more efficient in utilizing scarce resources and generating economic growth (Chaluvadi et al., 2018; Ferro et al., 2014; Makuyana & Odhiambo, 2018; Reddy & Chary, 2017; Singla & Singh, 2018). By contrast, government borrowing can be inefficiently utilized as a consequence of populist infrastructure investments, social projects with non-positive net present value (NPV), and/or the rolling over of past debts. Our estimations in Table 3 partially confirm such findings, showing no significant link between government bond markets and

economic growth. Borrowing by the private sector should provide a better stimulus to economic growth and is the focus of the discussion that follows.

The role of banks is well-documented in the economic literature. One of their functions is to pool financial resources from net savers and invest the money into the best NPV-positive projects. At the aggregate level, the value of private non-financial sector credit of domestic banks serves as a good proxy for the banks' investments in the economy, while capital raised through the bond market can be utilized to expand lending to the private sector. Table 6 shows that in the eight years prior to the GFC, banks have, indeed, fulfilled their important function of financial intermediation using financial resources from the bond markets. In developed countries, where domestic savings rates have been low and household indebtedness high, bond markets have served as an important source of capital for the banks.[1]

Table 6. *Financial Sector Bonds vs Private Non-Financial Credit of Domestic Banks from 2000 to 2007 (USD trillion)*

| Indicator | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | Δ |
|---|---|---|---|---|---|---|---|---|---|
| Private non-financial sector credit by domestic banks | | | | | | | | | |
| Developed | 18.52 | 18.10 | 20.46 | 23.82 | 26.47 | 26.03 | 29.98 | 34.93 | 16.41 |
| Developing | 3.41 | 3.39 | 3.91 | 4.56 | 5.33 | 6.01 | 7.38 | 9.49 | 6.08 |
| Corporate bond values issued by financial sector | | | | | | | | | |
| Developed | 13.39 | 14.75 | 17.21 | 20.36 | 23.21 | 24.40 | 28.24 | 33.32 | 19.93 |
| Developing | 0.10 | 0.11 | 0.18 | 0.23 | 0.37 | 0.65 | 0.91 | 1.18 | 1.08 |

*Note.* Developed is listed as 'Advanced' and Developing as 'Emerging' in the original source.
*Source:* Bank for International Settlements (2020a, 2020b) (https://stats.bis.org/)

Overall, credit to the private non-financial sector provided by domestic banks and bond markets in developed economies and developing markets have increased significantly. Private credit in advanced economies almost doubled between 2000 and 2007, rising from USD18.52 trillion to USD34.93 trillion (Bank for International Settlements, 2020a). The growth in debt issued from the financial sector of USD19.93 trillion has been channelled almost entirely into increased lending to the private sector (USD16.41 trillion in total). In developing markets, private credit tripled between 2000 and 2007, increasing from USD3.41 trillion to USD9.49 trillion (Bank for International Settlements, 2020a). The growth in lending of USD6.08 trillion was only partially funded through the bond market, which

[1] The gross savings rate in advanced economies fell from 23.764% to 22.711% of GDP between 2000 and 2007, whereas it has grown from 25.333% to 32.807% of GDP in emerging and developing economies (International Monetary Fund, 2019).

registered a USD1.08 trillion increase. Therefore, increased domestic savings rates in emerging and developing countries must have played a significant role.

Non-financial corporations were also the major beneficiary of the improved access to bond markets. This provided a vital and often cheaper alternative to bank debt (International Monetary Fund, 2014). In developed countries, the outstanding bond market debt of non-financial corporations grew by USD1.29 trillion, whereas in developing countries it grew from an almost negligible USD0.10 trillion to USD1.08 trillion, which is a huge, tenfold increase. This additional funding (coupled with the additional bank lending) should have contributed significantly to the investment in productive activities by real-sector firms. On the flip side, there have been reports of increasing investment by non-financial corporations in short-term financial assets in developing countries, drawing funds away from investments in productive real assets (Demir 2009a, 2009b, 2009c; Levy-Orlik, 2012; Seo et al., 2012). Moreover, Kaltenbrunner and Karacimen (2016) suggested that firms, because of their exposure to financial markets, may divert their investments from high-risk R&D-intensive activities with greater long-term growth potential to less risky, more immediately high-yielding assets such as construction, real estate, and services. Hiratuka and Sarti (2011) demonstrated a shift of capital investment from new productive facilities to merger and acquisition (M&A) activity. This trend for financialization is likely to contribute to weakening of the finance–growth link.

In summary, in the eight years prior to the GFC we can see evidence that financial institutions have made good use of additional funding acquired from the bond markets by channelling it into private credit. Moreover, non-financial corporations have benefitted from greater access to the bond market. These findings support our estimations that the bond market has contributed well to the economic growth of the pre-GFC period.

Now, let us examine the data following the GFC more closely (see Table 7). First, we can see that the rate of economic growth for the period 2008–2017 has been much slower, particularly in developed economies. Of the USD16.86 trillion worth of bonds added to the market by developed economies, USD14.99 trillion were attributed to government borrowing (88.9%). In the same period, the outstanding bonds issued by financial corporations in these economies have shrunk by USD1.89 trillion (5%). This might be due in part to the collapse of the mortgage bond market and tighter regulation of the banks post-GFC. In contrast, the direct debt capital raised by non-financial corporations has increased by USD3.75 trillion (60%).

Table 7. *Bond Market Structure from 2008 to 2017 (USD trillion)*

| | Indicator | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Δ% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Developed | G | 26.82 | 30.80 | 35.10 | 38.08 | 39.15 | 39.19 | 38.04 | 37.72 | 38.82 | 41.81 | 56 |
| | FC | 34.43 | 36.83 | 35.21 | 34.76 | 34.57 | 33.43 | 31.54 | 30.63 | 30.41 | 32.54 | -5 |
| | NFC | 6.28 | 6.83 | 7.21 | 7.52 | 8.08 | 8.45 | 8.57 | 8.88 | 9.22 | 10.03 | 60 |
| | Total | 67.53 | 74.46 | 77.52 | 80.36 | 81.79 | 81.07 | 78.14 | 77.22 | 78.45 | 84.39 | 25 |
| Developing | G | 1.36 | 1.57 | 1.80 | 1.97 | 2.16 | 2.41 | 2.61 | 3.38 | 4.34 | 5.61 | 313 |
| | FC | 1.52 | 1.61 | 1.83 | 1.89 | 2.10 | 2.21 | 2.57 | 3.42 | 3.93 | 4.93 | 224 |
| | NFC | 0.38 | 0.58 | 0.79 | 1.04 | 1.56 | 1.87 | 2.23 | 2.59 | 2.91 | 3.29 | 766 |
| | Total | 3.26 | 3.76 | 4.42 | 4.90 | 5.83 | 6.49 | 7.40 | 9.39 | 11.18 | 13.82 | 324 |

*Note.* Developed is listed as 'Advanced' and Developing as 'Emerging' in the original source. G: government; FC: financial corporations; NFC: non-financial corporations.
*Source:* Bank for International Settlements (2020b) (https://stats.bis.org/)

In developing markets, bond markets continued to grow, although at a slower rate than before the GFC. Compared to pre-GFC figures, growth in corporate bonds issued by the financial sector has slowed by a factor of almost five, while the growth rate of non-financial corporate bonds has halved. By contrast, government bond markets in developing countries have grown at a faster rate since the GFC than before it.

We continue the analysis and consider how the decline in the corporate bond market of financial corporations has affected lending to the private sector. We can see that despite the decline, the banks have marginally increased their funding of the private sector, probably utilizing slightly improved savings rates following the GFC.[2] Overall, our findings suggest that the growth of the bond market in developed countries has been largely due to increased government borrowing, which, in highly financialized economies, does not show a positive connection with economic growth. Therefore, our post-GFC results for developed economies are not surprising. They are in line with findings by Reinhart and Rogoff (2010), who suggested that countries with debt-to-GDP ratios of 90% or more (most developed countries) are strongly associated with lower economic growth.

[2] Gross national savings in developed countries have recovered from 21.24% in 2008 to 22.63% in 2018, whereas in emerging and developing countries over the same period, gross national savings declined from 33.63% to 32.93%.

Table 8. *Financial Sector Bonds vs Private Non-Financial Credit of Domestic Banks from 2008 to 2017 (USD trillion)*

| Indicator | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Δ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Private non-financial sector credit by domestic banks | | | | | | | | | | | |
| Developed | 35.00 | 35.62 | 36.14 | 36.48 | 36.75 | 36.28 | 33.92 | 32.92 | 33.41 | 36.88 | 1.88 |
| Developing | 10.24 | 12.70 | 15.43 | 17.57 | 20.29 | 22.66 | 23.94 | 24.97 | 26.15 | 30.38 | 20.14 |
| Corporate bond values issued by financial sector | | | | | | | | | | | |
| Developed | 34.43 | 36.83 | 35.21 | 34.76 | 34.57 | 33.43 | 31.54 | 30.63 | 30.41 | 32.54 | -1.89 |
| Developing | 1.52 | 1.61 | 1.83 | 1.89 | 2.10 | 2.21 | 2.57 | 3.42 | 3.93 | 4.93 | 3.41 |

*Note.* Developed is listed as 'Advanced' and Developing as 'Emerging' in the original source.
*Source:* Bank for International Settlements (2020a, 2020b) (https://stats.bis.org/)

In developing countries (see Table 8), financial corporations have continued to grow their private-sector lending, strongly outpacing the growth in the domestic bond market of non-financial corporations (USD20.14 trillion growth in private credit versus USD3.41 trillion growth in bond issuance). Interestingly, this has happened despite the flattening of the domestic savings rates in those economies. This highlights the increased reliance of developing market corporations on the international bond markets. Overall, in developing economies, the bond market to real investment channel has continued to operate, albeit less efficiently because of the growing trend for financialization. Thus, a positive yet weakened link between bond markets and economic growth could have been anticipated.

Finally, we attempted to further decompose the relative impact of the bonds issued by financial and non-financial corporations on economic growth. In the first case, the funds acquired by banks on the bond market are expected to get channelled into NPV-positive projects in the real sector, whereas in the second case larger non-financial corporations obtain funds for working capital and capital expenditure directly. Because of the limitation on data availability, the sample for analysis in this context is much smaller. Nevertheless, some trends can be identified. As is evident from Table 9, the results generally confirm the positive impact of bond markets on economic growth pre-GFC and the negative impact of the GFC on the bond market–growth relationship. Interestingly, the estimations that involve the non-financial corporate bonds suggest a weak relationship (small coefficient) with economic growth, with no significant impact from the GFC. By contrast, the relationship between bond capital raised by financial corporations and economic growth is more pronounced. This may indicate that financial institutions had been successful in fulfilling their intermediary functions of mobilizing resources by raising debt on the bond market and channelling them into the best projects pre-GFC, but might not be the case since.

Table 9. *Regression Results for Financial and Non-Financial Corporation Bonds in Developed and Developing Countries*

| | Developed Countries | | Developing Countries | |
|---|---|---|---|---|
| Variable | FC | NFC | FC | NFC |
| $GDP_{t-1}$ | 0.859*** | 0.442*** | -0.304*** | -0.273*** |
| | (0.00284) | (0.0130) | (0.0472) | (0.0144) |
| Capital | 0.309*** | 0.798*** | 0.655*** | 0.566*** |
| | (0.0191) | (0.0219) | (0.0726) | (0.0866) |
| Labour | 842.5 | -957.7 | 13,182*** | 12,177** |
| | (732.1) | (1,183) | (2,391) | (3,904) |
| Human | -196,670 | -32,145 | 201,317 | 340,726 |
| | (250,720) | (157,457) | (165,566) | (279,877) |
| Bond | 0.145*** | 0.0127 | 0.144* | 0.000069*** |
| | (0.0154) | (0.0132) | (0.0795) | (2.15e-05) |
| Bond×GFC | -0.274*** | -0.0126 | -0.289*** | -0.000136 |
| | (0.0121) | (0.0131) | (0.0179) | (0.000123) |
| Constant | 2,692** | 8,249*** | 2,867*** | 2,527** |
| | (1,070) | (1,447) | (667.9) | (1,092) |
| Observations | 181 | 158 | 166 | 173 |
| R-squared | 0.905 | 0.727 | 0.642 | 0.488 |
| No. of countries | 13 | 12 | 11 | 11 |

Robust standard errors in parentheses; ***p < 0.01; **p < 0.05; *p < 0.1

*Note.* FC: financial corporations; NFC: non-financial corporations.

*Source:* Bank for International Settlements (2021) (https://stats.bis.org/)

## 6. Conclusion

This study investigates the impact of bond market development on economic growth before and after the GFC in 44 selected countries during the period 1990–2017. Using fixed-effects regressions and GMM estimations, the study finds that the bond market has had a positive impact on economic growth before the GFC both in developed and developing economies. The link has been stronger in developing economies because these were less heavily financialized and had greater capacity to utilize improved access to financial resources.

Following the GFC, the strong positive link between the bond market and economic growth has started to fade away. In developing economies, the rate of growth of the corporate bond market started to slow, while governments increased their rate of borrowing in the markets. With government investments having been historically less efficient in promoting economic growth, and the increased engagement of non-financial corporations in non-productive activities, this weakened link does not come as a great surprise. In addition, it

appears that financial institutions have become less effective in channelling their resources into productive use.

By contrast, in developed economies, financialization of the economies may have been approaching saturation point. With only marginal increases in corporate borrowing, and an actual decline in borrowing by financial corporations and a resultant slowdown in private credit, bond markets contributed very little to promoting real economic growth. Government borrowing in the bond market has continued to rise but appears to make no positive contribution to economic growth.

This study proposes some policy recommendations to help ensure that bond market development will promote economic growth in the future. First, governments must ensure that the cash proceeds generated from the issuance of government debt securities are channelled into productive, NPV-positive projects, including carefully selected infrastructure development, to ensure that bond issuance is effective in supporting economic activity. This policy would create multiplier effects that, in turn, will foster economic growth. Second, governments should also formulate policy that encourages real investment in the economy and better access for corporations to affordable funding. Third, financial institutions should be encouraged to fulfil their important financial intermediation role more effectively.

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# Appendix

Table 10. *List of Countries*

| No. | Country | Group |
|---|---|---|
| 1 | Argentina | Developing |
| 2 | Australia | Developed |
| 3 | Austria | Developed |
| 4 | Belgium | Developed |
| 5 | Brazil | Developing |
| 6 | Canada | Developed |
| 7 | China | Developing |
| 8 | Colombia | Developing |
| 9 | Croatia | Developed |
| 10 | Czech Republic | Developed |
| 11 | Denmark | Developed |
| 12 | Finland | Developed |
| 13 | France | Developed |
| 14 | Germany | Developed |
| 15 | Greece | Developed |
| 16 | Hong Kong SAR, China | Developed |
| 17 | Hungary | Developed |
| 18 | Iceland | Developed |
| 19 | India | Developing |
| 20 | Indonesia | Developing |
| 21 | Ireland | Developed |
| 22 | Israel | Developing |
| 23 | Italy | Developed |
| 24 | Japan | Developed |
| 25 | Korea, Rep. | Developed |
| 26 | Lebanon | Developing |
| 27 | Malaysia | Developing |
| 28 | Mexico | Developing |
| 29 | Netherlands | Developed |
| 30 | Norway | Developed |
| 31 | Peru | Developing |
| 32 | Philippines | Developing |
| 33 | Poland | Developed |
| 34 | Portugal | Developed |
| 35 | Russian Federation | Developing |
| 36 | Singapore | Developed |
| 37 | South Africa | Developing |
| 38 | Spain | Developed |
| 39 | Sweden | Developed |
| 40 | Switzerland | Developed |
| 41 | Thailand | Developing |
| 42 | Turkey | Developing |
| 43 | United Kingdom | Developed |
| 44 | United States | Developed |