

AMERICAN UNIVERSITY OF BEIRUT

PUBLIC SECTOR DEBT AND FINANCIAL DEVELOPMENT

by  
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AMERICAN UNIVERSITY OF BEIRUT

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# ABSTRACT OF THE THESIS OF

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The great financial crisis of 2008 established a new monetary and financial system internationally. The changes manifested itself, in advanced economies, in three relevant aspects an enduring low-interest rates, liquid and deep derivatives and money markets, and an inherited high level of private debt. Therefore, the relationship between financial, monetary, and fiscal variables are subject to foundational changes. The conventional view is that public debt crowds out financial development by raising interest rates. An opposing view is that government debt can enhance the financial underpinning and will eventually improve the financial sector. This paper tests for both views taking into account potential non-monotonic effects in the relationship.

The paper takes annual data for the period of 2010 to 2019 for 31 countries (14 advanced and 17 emerging and low-income economies). Using least square estimator and Simonsohn (2018) two-line test, we found that, for advanced economies, public sector debt always crowds in financial development. However, for emerging and low-income economies, when domestic debt is lower than 30% of GDP it crowds out financial development, but at 30% of GDP or more it can induce developments in the financial sector.

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# CHAPTER I

## INTRODUCTION

The financial crisis of 2008 made a shift in various economic and financial paradigms. Policymakers became more prudent and academics found themselves lacking in comprehensively understanding the financial market, the macroeconomic fundamentals, and their synergies. In the two decades before the crisis and the one after it, the international monetary and financial systems encountered several structural changes, but the perception of economists of it did not change as much. Three main changes are of concern for this paper, the increase in financial globalization and market integration, the persistence of very low-interest rates, and the increase in the speculative customs among investors and their acceptance from policymakers. With such changes, the modes of financing and signaling of credit information changed also. For example, for emerging markets, since the early 90s, the bonds market became the second largest form of financing (Muharam et al., 2018).

In the light of these changes, the understanding of how public sector debt and the financial sector interact should change. In this paper, I want to provide empirical evidence for the effect of domestic debt on the development of the financial markets and institutions in a cross-country regression from 2010 to 2019.

The pertinent literature is divided into two. One strand state that an increase in government primary balance and increase in debt will increase the interest rates and reduce the incentives for development of the banking sector which will crowd out financial development. The other strand emphasizes the role of government debt instruments in setting the informational benchmark and improve the trading infrastructure which will crowd in financial development.

Rather than cross-examining the legitimacy of crowding in versus crowding out, this paper will try to find a piece of evidence for the adjacency of the two divergent views. The claim this paper holds, which is embedded in Hauner (2009), is that although these views are contrasting, they're not individually restrictive. The results suggest that the main driver of crowding-out is the underdevelopment of the government bond market. The least-square estimator implies that for advanced economies, the effect of public sector debt is positive on financial development for all specifications. However, for emerging markets and low-income economies, the relationship is parabolic. It showed that public debt crowds out financial development for low levels of domestic debt to GDP. Nonetheless, when domestic debt reaches 30% of GDP the parameter changes sign to become positive so that public sector debt crowds in developments in the financial sector. These results suggest that the changes in the financial architecture over the past 30 years have altered the dynamics of how fiscal policy and monetary policy interact to affect financial development.

The following section presents several theoretical considerations regarding the determinants of financial development, explains the main trade-off between external and domestic debt, and further explains the potential channels through that public sector debt can affect financial development. Section 3 will introduce the data and variables, as well as examine the preliminary findings using a least-square estimator and tests for non-monotonicity. Section 4 will make use of several interaction terms to control for certain macroeconomic and financial conditions that can put a constraint on the relationship. Section 5 will conclude and provide policy implications of the results.

## CHAPTER II

### LITERATURE REVIEW

#### **A. Financial development and Growth**

Financial development is defined as any evolution in the financial instruments, markets, and intermediaries that ultimately reduce the cost of acquiring information, enforcing a contract, or carrying out a transaction (Levine, 2005). This will possibly affect the confidence and willingness of the people to invest in different kinds of markets or securities and affect their savings behavior which will eventually affect growth levels. For example, a more prudent banking sector that signal to depositors that they can pay them back might affect the allocation of their savings. Levine (2005) surveys the empirical and theoretical literature between finance and growth. He explains the main channels that financial development positively affects growth by: (1) produce information ex ante information about possible investments, (2) improve ex post monitoring of investments, (3) improve risk management and diversification, (4) improve mobilizing and pooling of savings, and (5) easing the exchange of goods and services. However, different legal, regulatory, social, and taxation mediums can engender different types of financial markets and intermediaries; different rates of financial development; and different types of contracts, markets, instruments, and intermediaries that affect economic growth.

However, new literature regarding the finance-growth nexus found evidence that the relationship is non-monotonic (Arcand et al., 2015; Samargandi et al., 2015). Their claim is that for high levels of financial development, the marginal effect of financial deepening on growth gradually decreases and eventually becomes negative. This may be due to an increase in macroeconomic volatility and financial fragility that pertains to high

financialization (Acedański & Pietrucha, 2019; Easterly et al., 2001). Moreover, Tobin (1984) hypothesized that a large financial sector may lead to a sub-optimal allocation of talents from a social point of view, and there exists some empirical evidence to support this view (Cecchetti & Kharroubi, 2015; Philippon & Reshef, 2013). Arcand et al. (2015) also argues that the returns to finance depends on the type of financing that specifically pertains to the evolving importance of “credit transfer and repackaging” models vis-à-vis credit origination. This is directly related to the discussion of the effects of derivatives instruments that makes better opportunities for risk diversifying and hedging, but also makes a room for credit bubbles and increased speculations.

## **B. Financial development and macroeconomic fundamentals**

This section discusses several factors that pertains to macroeconomic specifications that can affect the development of financial markets. There exists a long literature that try to explain the determinants of financial development. The ones that are most relevant to our discussion are institutional controls, capital and trade openness, and inflation. These macroeconomic variables have been studied with their relation to both public debt and financial development, thus understanding the relationships are essential to the study.

### ***1. Institutions, capital controls, and interactions***

Chinn and Ito (2006) put forward several arguments regarding the channels that capital openness can affect financial development. The rationale is that financial liberalization can increase competition and investment choices. This puts pressure on inefficient firms, increases diversification opportunities, and sets the real interest rate at

its competitive equilibrium level. Such changes in the financial sector reduces credit market frictions and informational asymmetries.

La Porta *et al.* (1998) sets in motion large literature that relates legal origins with financial development. The key point is that differences in several indicators of legal and institutional controls (proxied by legal origin) can explain cross-country differences in the financial sector. Although there is contradicting results in which legal origin gives better protection to which stakeholder (minority shareholders, debt holders...), but the legal origin had effect on the investor protection and thus financial development (Sarkar, 2011; Spamann, 2011). Along these lines, Chin and Ito (2006) also studied how financial development is affected by the interaction between capital controls and legal and institutional infrastructure. They found out that capital openness can only aid financial development on the condition that the country is equipped with adequate legal and institutional development.

## ***2. Inflation and inflation volatility***

Another important factor that can affect financial development is inflation. Several theoretical models suggest that, in the presence of credit market frictions, inflation will increase information asymmetry, credit rationing, and repress financial intermediation by reducing the real return on monetary assets (Kim & Lin, 2010). Boyd, Levine, and Smith (2001) studies how the performance of the financial sector is affected by inflation level. By exploiting the potential non-linearities in the relationship, the results showed that at low-to-moderate levels of inflation we observe a strong negative relationship between inflation and each of credit to the private sector, liabilities issued by banks, stock market liquidity and volume, and the stability in stock returns.

### **C. Domestic debt and external debt trade-off**

Another important feature for this discussion is presented in Panizza (2008), particularly the controversy related to the trade-off between domestic and external sovereign debt. The trade-off manifests itself mainly in three dimensions: risk, costs, and externalities. The risks facing any indebted sovereign are mainly currency and maturity mismatches (Panizza, 2008). Second, debt issued in domestic markets tends to be more costly than the competitive international capital market (Borensztein et al., 2006). Moreover, the final trade-off is related to externalities. The argument goes as follows, although domestic credit to the public credit can set the needed trading infrastructure for financial development through several channels, yet it may crowd out credit to the private sector and hinder the growth of the corporate bond market.

#### ***1. Risk***

Eichengreen, Hausmann and Panizza (2002) sets the empirical determinants of what they call “original sin”. It is defined by the inability of sovereigns to issue debt in their own currency in international markets. The phenomenon can’t be well explained from domestic specifications like level of development, fiscal fundamentals, trade openness... The main driver is that each additional currency added to a portfolio will have lower marginal benefit for diversification while having higher marginal cost. Therefore, international investors will generally have a set of currencies that are willing to invest in. Consequently, a country will have to issue debt that is denominated in one of these currencies and this will eventually lead to a currency mismatch on the national balance sheet.

Dell'Erba, Hausmann and Panizza (2013) finds an evidence that the sovereign spread does not only increase with debt levels, but also on the composition of debt. Were countries with high net foreign liabilities suffer from higher spreads. This is exacerbated in developing and EU countries in which the central banks do not play the role of lender as last resort as much as standalone developed countries.

Panizza (2008) states that most emerging economies can't issue long-term bonds in domestic markets, although issued in domestic currencies. That will lead to a maturity mismatch between short-term assets and liabilities. If the short-term debt is owned by a domestic resident and denominated in domestic currency, then the country can dilute and repay the debt by merely printing money. However, this will lead to high levels of inflation, output volatility, and general uncertainty which may lead to higher interest rates.

Under the premise that currency mismatch and maturity mismatch are the main risk determinants of public debt, then the first trade-off is clear. Emerging countries should be aware of the optimal debt policy implemented, were external debt may lead to currency mismatch while domestic debt tend to lead to maturity mismatch problems in emerging economies.

## **2. *Costs***

Emerging countries generally face more complicated problems regarding the trade-offs. Borenztein, Levy Yeyati and Panizza (2006) took Brazil, Argentina, and Colombia as a case study. They found that bonds issued in domestic markets face high costs than similar bonds issued in international markets. This is the case for many emerging countries, in which they can't borrow long-term without having substantially high costs.



Low income countries may face the same problems, yet these countries have access for long-term external debt but at concessional rates. Thus, the trade-off may not bind since long-term external debt at concessional rates (even in external currency) will probably be safer than short-term domestic debt with high interest.

It can be argued that for emerging countries, it would be safer for them to issue these long-term domestic bonds even if at higher rates. Panizza (2008) argues that we don't see such cases in practice due to political reasons. Policymakers may either not be willing to pay high premiums that will benefit their successors, or because it is not considered an acceptable practice to pay insurance premiums in good times.

### ***3. Externalities***

The discussion around externalities have long been debated, and there exists mixed results regarding the crowding-out/crowding-in of an increase in domestic government debt. The rationale of crowding-out is that higher debt will lead to higher interest rates and less funds available to the private sector if high share of owners are domestic banks (which is the case for most emerging countries). However, in the case of low demand for bank credit, government debt will make use of idle savings and provide a safe asset on the bank's balance sheets that will consequently increase private demand. This aspect of the trade-off is at the heart of my thesis and will be discussed at length in the next section.

### ***4. Default***

Moreover, the cost of default and the motive behind repaying a sovereign debt may be different between external and domestic debt. One strands of the literature regarding sovereign default argue that countries repay because they will be permanently, or

partially, excluded from international capital markets in case of default (Eaton & Gersovitz, 1981; Sandleris et al., 2004). Even if a defaulter gain access to international markets, it will be with higher borrowing costs. Other strand of literature argues that the cost of default is “direct punishment”, either interference in international payments and trade or sanctions (Fernandez & Rosenthal, 1990). Creditors can interfere with the defaulter’s transactions and force political and financial sanctions and reduce trade with them. Others see the domestic cost of default as the main reason for repayment (Panizza et al., 2009). The third strand view that defaults happen within a context of economic and social disruption and that the default will exacerbate the bad state with lower output and higher volatility, worse internal reputation, and/or political abruptions.

Panizza, Sturzenegger and Zettelmeyer (2009) surveys the theoretical and empirical literature of sovereign default and finds evidence that suggests that all defaulters did gain access to credit markets relatively fast, and that sanctions better explain repayment in previous eras. However, in the current financial and political landscape the sanctions do not play a helpful role, instead their evidence indicates that the main reason for repayment is domestic costs.

This additional dimension should be taken into account by policymakers. Since default on domestic residents will incur higher domestic costs through several channels. Public sector default can lead to spillover effects on the banking and financial sector. Internal reputation and confidence will diminish, and people will hesitate to invest their savings in future periods. Political abruptions can occur, and the policymakers are usually fired or voted out of their offices in the case of default. All these effects are aggravated with higher share of domestic to total debt. For these reasons mainly, it is harder to

restructure and reduce the burden of domestic debt when compared with the alternative (Panizza, 2008).

## **D. Domestic debt and Financial development**

### ***1. Crowding out***

Caballero and Krishnamurthy (2004) claim that an increase in the overall public debt with respect to private assets will lead to crowding-out of private investment through different channels. First, an increased public debt will decrease the liquidity and thus investors will require higher liquidity premium. Second, this increase in public debt will signal fiscal irresponsibility to the specialists and consequently the ratings of government debt and other assets will decrease. Both of which will lead to lower financial development. According to their model, any increase in fiscal expenditure and public debt, especially in times of crisis, will lead to a decrease in the quantity and quality of available credit to the private sector. Therefore, this government expenditure will eventually prove to be contractionary, as opposed to the Keynesian framework.

Others demonstrate similar arguments from different perspectives. For example, Hauner (2008) argues for what he calls the “lazy banks” view. His assertion states that increased dependence of the banking sector to the public lending will decrease the efficiency of the banks. Large public sector lending will change the structural characteristics of the banks, the argument states. The reliable profit from lending the public sector will disincentivize the banks from expanding its activities. The increased profitability comes from the fact that public lending is less risky than private sector lending and thus the refinancing rate will be lower, banks can exploit economies of scale from large public sector demand and consequently decrease its administrative costs, taxes

on interests are generally lower on public debt (Hauner, 2008)... Moreover, Hauner (2008) indicate that this higher profitability may lead the banks to loosen their commitment to profit maximization either by not minimizing costs or by not expanding when it is profitable. This may affect the number of branches the banks have which affects financial development (Demetriades & Luintel, 1996)

The general attitude for Hauner (2008) regarding the reliance of the banking sector on public sector lending is that although the banks are being lazy, but they are being “rationally lazy” (profit maximizing). However, Chronopoulos, Dotsis and Milonas (2020) argue that there are two mechanism that can also explain the phenomenon: Moral suasion and risk shifting. The former implies that the governments use moral suasion to induce home bias in the bank’s balance sheets. This is supported by the evidence they found that domestic private banks have higher home bias that foreign private banks. Reinhart and Sbrancia (2011) plead that moral suasion is more likely to be successful in domestic banks. The evidence also shows that home bias in state-owned banks experience higher home bias than both domestic and foreign private banks, even in times of financial stress. Risk shifting is when banks increase their holding of domestic government bonds since it gives high payoff in the good state and the equity holders are protected by limited liability if the government, and thus probably the bank, defaults (Crosignani, 2017). This will shift the risk onto the depositors in the first place. Moreover, the risk is partially shifted on the central bank since commercial banks can use the bonds for repurchase agreements, which they can’t buy back in a case of sovereign default (Uhlig, 2013).

## *2. Crowding in*

Fundamentally, almost all the arguments regarding the importance of government debt with respect to financial development either relates to its role in developing the desired financial architecture or in providing informational benchmark in some markets. The literature regarding this idea have emphasized that government bond is an attractive “safe asset” that plays a favorable role in an entity’s balance sheet. This is partly why under some legislations assign zero-risk weights to government bonds (for example, EU and basel I). This creates an opportunity for the banks to better meet their capital requirements on the one hand, and it aids the markets in pricing corporate bonds yield curves on the other (Kumhof & Tanner, 2005).

A developed and liquid government bond market can help in expanding the derivatives market that use these bonds as liquid collateral (Hauner, 2008). Consequently, this will help in diversifying and trading risk exposures among and within financial institutions. Furthermore, government bonds play as a collateral in the repo market were the acquisition of the fund is conditional of offering a collateral that is usually in the form of a government bond. This development of the repo market increases short-term liquidity and helps in reaching sustainable financial development (Kiseľáková et al., 2020). Banks also hold high levels of bonds for regulatory treatments. The safe and liquid nature of the bonds facilitates attaining capital or liquidity requirements.

Government bonds can be also utilized as an asset to overcome institutional and legal imperfections. Kumhof and Tanner (2005) imply that the high levels of home bias found in domestic banks was historically due to financial repression. However, they argue that this explanation is outdated, and that the reason of the high levels of home bias is to subdue legal and institutional frictions that makes it costly and timely to securitize real

estate and movable property. This is especially relevant for developing countries, where banks prefer to collateralize in real estate and moveable property, but the institutional weakness makes it hard and costly for potential borrowers to register their physical property. Asian Development Bank (2000) finds evidence that creditors give more credit, lower interest, and higher maturities for borrowers who offer adequate collateral. All this will lead to inefficient allocation of capital, idle savings, less diversification, and less overall credit to the private sector (especially SMEs that do not own lands and other moveable capital). Thus, banks find it useful to give retail credit to the public sector through loans and/or bonds to counterbalance the riskiness inherent in the private borrowers who do not offer acceptable collateral.

The government bonds market, if deep enough, can lay down a benchmark that other private securities can be priced accordingly. A developed public bonds market generates a full yield curve that is nominally riskless (if issued in domestic currency). In the absence of this market, no single investor can issue enough securities to the extent that it performs the informational role the government bonds do. However, sufficient size of the bond market is not the only condition to generate an informationally efficient benchmark. The bonds market must be backed with low inflation volatility so that the yield curve can reflect a reliable information regarding the borrowing cost (Kumhof and Tanner, 2005). Additionally, government bonds held in the bank's balance sheet is considered as an informal collateral for the bank's creditors. Kumhof and Tanner (2005) argue that this safe and liquid asset increases the willingness of people to deposit their savings in a generally riskier economy.

## CHAPTER III

### EMPIRICAL SPECIFICATION AND RESULTS

This section will try to explore the relationship between financial development and domestic debt, exploiting potential non-linearities between the two variables. To do so, the following specification is employed:

$$FinDev_{i,t} = \beta_0 + \beta_1 DomDebt_{i,t} + \beta_2 DomDebt_{i,t}^2 + \gamma Z_{i,t} + \varepsilon_{i,t}$$

Where *FinDev* corresponds to financial development, *DomDebt* is the ratio of domestic debt to GDP ratio, *Z* is a vector of control variables, and  $\varepsilon$  is the error term. The data is annual and spans the period of 2010 to 2019, and 31 countries of all income levels (14 advanced economies and 17 emerging and low-income economies).

#### **A. Data description**

As mentioned, financial development is the decrease of information, transaction, and enforcement cost in the financial sector (Levine, 2005). However, there is no clear-cut index that captures the holistic nature of the concept and every strand of literature uses a certain proxy. Some papers focus on monetary aggregates like M2 or M3 to GDP. The limitation of such proxies is that they capture the level of monetization of the economy which may be an indicator of underdevelopment in the financial sector (Samargandi et al., 2015). Such an indicator better reflects the ability of the sector to perform transactions rather than its ability to link potential borrowers with lenders. Thus, other empirical studies use domestic credit to the private sector as a ratio of GDP. This excludes credit and assets of the central bank and thus better reflects the ability of financial markets and institutions to link agents with surplus to agents with a deficit. Other measures include

stock market capitalization to GDP, stock market turnover, and bond market capitalization. However, none of these measures captures all the normative dimensions of financial development. This paper will use two measures for financial development. The first is the Financial Development Index of the IMF which is constructed to reflect the depth, access, and efficiency of both financial markets and financial institutions. In its construction, they used domestic credit to the private sector and the stock market capitalization to capture the depth of the financial institutions and markets, respectively. The second index is bank credit as a percent of GDP which is the most widely used measure and it has the strongest effect on growth.

Domestic debt is defined as any credit supplied to the general government by residents (IMF, 2014). The control variables include some macroeconomic controls like GDP, log of GDP per capita, gross domestic savings; international openness control like Chinn and Ito (2006) index for capital account openness; institutional quality indicators like the world bank's World Governance Indicators; and financial soundness indicators like the capital adequacy ratio.

## **B. Results**

Column 1 of Table 1 uses specifications like the one represented before but without the quadratic term of domestic debt. In column 2 we start to exploit non-linearities by including both *DomDebt* and *Domdebt*<sup>2</sup>.



Regression on Financial Development Indicator						
Dependent variable:						
FD						
	All Economies		Advanced Economies		Emerging Economies	
	(1)	(2)	(3)	(4)	(5)	(6)
DDG	0.229*** (0.028)	0.419*** (0.079)	0.287*** (0.027)	0.469*** (0.106)	0.003 (0.035)	-0.610*** (0.089)
I(DDG2)		-0.002** (0.001)		-0.001* (0.001)		0.011*** (0.001)
GDP	-0.0001 (0.0002)	0.00001 (0.0002)	-0.001*** (0.0002)	-0.001*** (0.0002)	0.011*** (0.001)	0.011*** (0.001)
log(GDPP)	12.702*** (2.100)	11.350*** (2.146)	23.342*** (5.301)	23.437*** (5.257)	3.494** (1.350)	5.745*** (1.203)
GDPPG	-0.686*** (0.200)	-0.622*** (0.199)	-0.511** (0.212)	-0.450** (0.213)	-0.480*** (0.157)	-0.415*** (0.135)
GDS	0.364*** (0.059)	0.378*** (0.058)	1.010*** (0.181)	0.904*** (0.189)	0.204*** (0.047)	0.139*** (0.041)
TO	-0.151*** (0.014)	-0.154*** (0.013)	-0.215*** (0.021)	-0.205*** (0.021)	0.035*** (0.013)	0.045*** (0.012)
KAO	-1.386** (0.541)	-1.356** (0.536)	0.700 (1.682)	0.499 (1.671)	-0.891** (0.372)	-0.195 (0.334)
GE	-7.995*** (2.729)	-7.836*** (2.704)	0.300 (4.596)	0.708 (4.562)	-6.741*** (1.815)	-5.893*** (1.568)
ROL	-1.032 (2.672)	-1.463 (2.652)	13.916** (5.908)	12.392** (5.921)	6.729*** (1.793)	5.640*** (1.553)
CAR	-0.375*** (0.140)	-0.293** (0.142)	-1.230*** (0.197)	-1.149*** (0.201)	-0.134 (0.103)	-0.238*** (0.090)
Observations	308	308	140	140	168	168
Adjusted R <sup>2</sup>	0.918	0.919	0.948	0.949	0.898	0.924
F Statistic	244.896*** (df = 14; 293)	233.405*** (df = 15; 292)	182.956*** (df = 14; 125)	173.898*** (df = 15; 124)	106.431*** (df = 14; 153)	137.318*** (df = 15; 152)

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 1: Cross-country regression using the Financial Development Index

They include data from all countries and use the financial development index (FDI) as the dependent variable. We find that all the terms are significant but the quadratic term in the 2<sup>nd</sup> regression is small in value. Columns 3 and 4 are specified as columns 1 and 2 respectively, but only for advanced economies. The results are similar but the quadratic term in column 4 loses significance. Finally, columns 5 and 6 repeat the same regressions but for emerging and low-income countries. Column 5 shows that the linear term of domestic debt is not significant but becomes significant in column 6 when we add  $Domdebt^2$ . The shocking result is that in column 6 the sign of  $Domdebt$  has a negative sign and  $Domdebt^2$  has a positive sign. This indicates that the relationship has a non-linear U shape if the assumption of the quadratic specification is true.

**Regression on Domestic credit to the Private sector**

	<i>Dependent variable:</i>					
	DC					
	All Economies		Advanced Economies		Emerging Economies	
	(1)	(2)	(3)	(4)	(5)	(6)
DDG	0.205*** (0.060)	0.260 (0.161)	0.247*** (0.082)	0.422 (0.299)	0.047 (0.091)	-0.220 (0.262)
I(DDG2)		-0.0005 (0.001)		-0.001 (0.002)		0.005 (0.004)
GDP	0.003*** (0.0004)	0.003*** (0.0004)	0.003*** (0.001)	0.003*** (0.001)	0.005** (0.002)	0.005** (0.002)
log(GDPP)	-18.329*** (4.227)	-18.716*** (4.366)	-17.214 (13.932)	-17.639 (13.986)	-23.532*** (3.443)	-22.395*** (3.596)
GDPPG	-2.456*** (0.402)	-2.437*** (0.406)	-2.213*** (0.594)	-2.129*** (0.612)	-2.299*** (0.404)	-2.246*** (0.407)
GDS	-0.299** (0.118)	-0.295** (0.118)	0.046 (0.488)	-0.064 (0.521)	0.170 (0.128)	0.140 (0.131)
TO	-0.132*** (0.027)	-0.133*** (0.027)	-0.132** (0.059)	-0.123** (0.061)	0.154*** (0.039)	0.156*** (0.039)
KAO	-1.382 (1.086)	-1.372 (1.088)	5.646 (4.501)	5.456 (4.524)	-4.333*** (0.951)	-4.001*** (0.999)
GE	-1.274 (5.508)	-1.233 (5.518)	6.397 (13.763)	6.663 (13.806)	-10.788** (4.741)	-10.308** (4.759)
ROL	30.081*** (5.366)	29.958*** (5.385)	33.272** (16.462)	31.688* (16.708)	39.447*** (4.621)	38.854*** (4.650)
CAR	-1.539*** (0.280)	-1.515*** (0.288)	-1.778*** (0.553)	-1.694*** (0.572)	-1.339*** (0.263)	-1.378*** (0.265)
Observations	295	295	137	137	158	158
Adjusted R <sup>2</sup>	0.883	0.883	0.887	0.887	0.740	0.740
F Statistic	160.000*** (df = 14; 280)	148.879*** (df = 15; 279)	77.500*** (df = 14; 122)	71.985*** (df = 15; 121)	32.880*** (df = 14; 143)	30.805*** (df = 15; 142)

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 2: Cross-country regression using domestic credit to the private sector

Table 2 above repeats the same steps but uses domestic credit to the private sector as a ratio of GDP which captures mainly one aspect of the FDI, which is the total depth of the banks and other financial institutions. Columns 2, 4, and 6 which are trying to exploit the non-linearity for all countries, advanced economies, and emerging markets respectively, show that all terms for the domestic debt are not significant. However, columns 1 and 3 have a highly significant domestic debt term. This suggests that a 1 percent increase in domestic debt increases the domestic credit by around 0.25 percent for advanced economies. In column 5 we can see that even without the quadratic condition, domestic debt has no significant effect on financial institutions' depth for emerging economies and LICs.

Trying to exploit non-monotonic effects solely through a quadratic relationship is not conclusive. Since finding a change of sign in the slope is a necessary condition but not sufficient for a non-monotonic relationship. Lind and Mehlum (2010) argue that to test for a U-shaped relationship one should test for decreasing effects at low levels and increasing at high levels. To solve this problem Simonsohn (2018) does a “two-line” method to test for non-monotonicity without strong assumptions about the distribution of the independent variables, the error term, and the functional form of the relationship. The rationale is to find a breakpoint value  $x_c$ , then run an “interrupted regression” around this point. The breakpoint is set by a “Robin Hood” algorithm that maximizes statistical power to the less significant segment of the range. Then they estimate interrupted regression using GLM with heteroscedasticity-robust errors of the form:

$$Y = \alpha + \beta_1 X_{low} + \beta_2 X_{high} + \beta_3 High$$

Where:

- $X_{low} = x_i - x_c$  if  $x_i < x_c$  and 0 otherwise
- $X_{high} = x_i - x_c$  if  $x_i > x_c$  and 0 otherwise
- $High = 1$  if  $x_i > x_c$  and 0 otherwise

This tries to validate, when testing for a U-shape, a slope that is increasing at high values of X and decreasing at low values of X, which is both the necessary and sufficient condition for a non-monotonic relationship. The results of this test at my data are below.

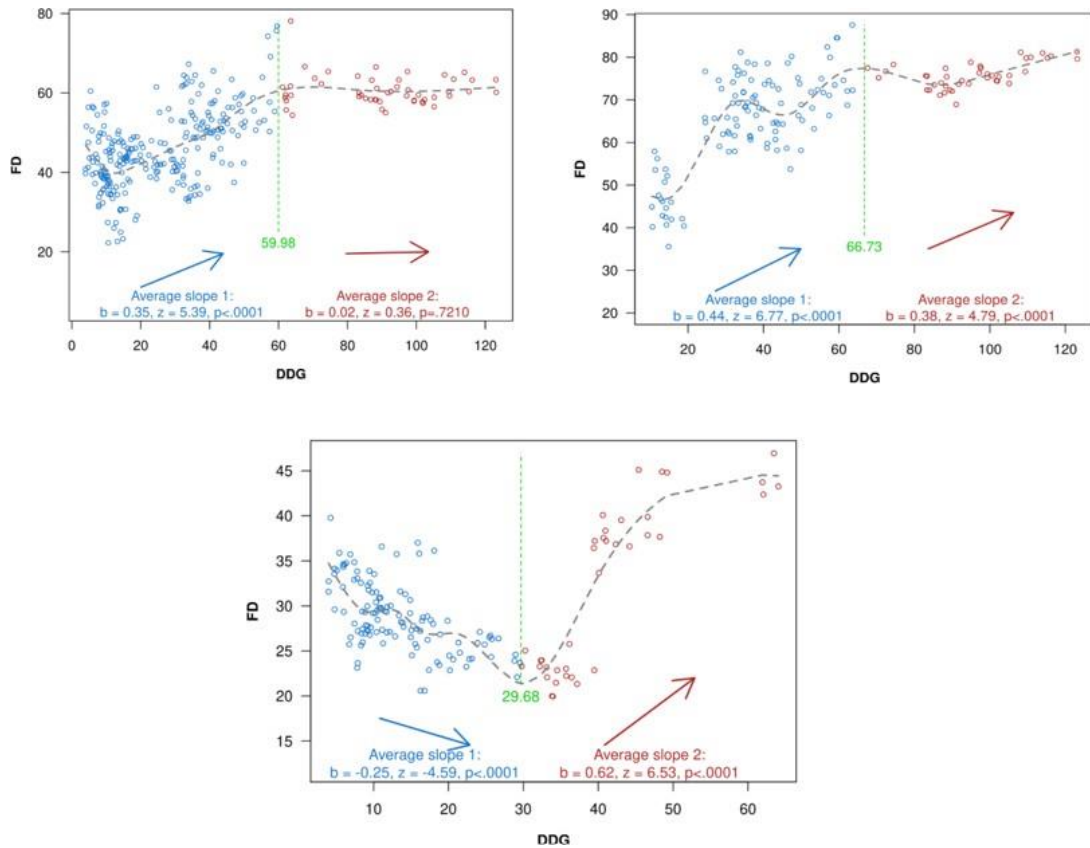


Figure 1: The two-lines test

The upper two graphs are for all countries (left) and advanced economies (right) both have no significant results for non-monotonic relationships. However, the test for the emerging economies (bottom) has a significant negative slope for the left part of the interrupted regression and a significant positive slope for the right part. This is evidence that a parabolic relationship between domestic debt and financial development is only present in emerging and low-income countries. The graph shows that the slope changes sign when domestic debt reaches 30 percent of GDP.

The results of these regressions are novel. The crowding-in of government debt in advanced economies and the U-shaped relationship in emerging and low-income countries are not discussed in the literature, to the best of my knowledge.

One potential explanation for the crowding-in is the unique financial infrastructure that prevailed after the financial crisis. One characteristic is the over-leveraging and speculation of private financial institutions. A second characteristic is the persistent zero lower bound interest rates in advanced economies. The first puts a strong dependence on government bonds to aid in developing a liquid and deep money market and repo market. Moreover, government bonds are necessary for the medium of over-dependence of investors on credit repackaging and derivative markets to satisfy their speculative motive.

The second characteristic can also explain part of this newly evident crowding-in. The constancy of the zero lower bound interest rates puts a constraint on monetary policy to induce growth in the financial sector. With very low-interest rates the conventional monetary channels may be stiff. When low-interest rates are persistent and widely prevalent across countries then the central bank will not have the ability to induce investments through interest, the commercial banks will have lower deposits because people invested in other assets, and the exchange rate channel will not be as effective since the interest rate differentials are small. Thus, when interests are very low and the private institutions are highly indebted, then the government will act as a “borrower of last resort” to make use of savings that would be idle otherwise.

Moreover, Turner (2014) argued that after the financial crisis, the private sector deleveraging was only possible because debt shifted its form, to become leverage on the public sector. When the net worth of the enterprises decreased and they were forced to decrease the scale of production and borrowing, the government was forced to fill the gap by increasing public debt. This shift of leverage from the private sector to the public

sector, in the first five years of this decade, allowed the financial sector to increase development at the expense of fiscal soundness and rising public debt.

The explanation for the newly demonstrated U-shaped relationship among emerging and low-income economies could be mainly explained by the dynamics of the bond market. The underdevelopment of the bond markets in some of the emerging economies is the main driver of the crowding-out. Eichengreen and Luengnaruemitchai (2004) argue that the development of the bonds market can diversify the financial market which leads to better efficiency in capital accumulation and lower financial fragility. It could also lengthen the maturity of corporate debt and increase transparency. Finally, the development of a decentralized government bonds market can reduce the possible political tampering and moral hazard. Countries that have underdeveloped bonds markets have a disadvantage in all those dimensions.

Moreover, these countries are generally more dependent on the banking sector and will, consequently, face a crowding-out in the first stages of developing their bonds market. When banks are faced with a sudden increase in public demand for credit, they tend to be rationally lazy and exploit the high profit by lending, on large scale, to the public sector (Hauner, 2008). The data show that this phenomenon sets in up until domestic debt reaches 30% of GDP. After that, the bonds market will be relatively developed enough to crowd in financial development through the benefits described before.

## CHAPTER IV

### ROBUSTNESS CHECKS

In this section, we want to check whether the relationship holds in the presence of various macroeconomic, financial, and institutional interactive terms. In specific, we want to see if the crowding-in, for advanced economies, and the U-shaped relationship, for emerging countries, still exist after controlling for the average interaction effect of domestic debt with each capital account openness, government effectiveness, and capital adequacy ratios.

#### **A. Interaction with capital account openness**

Table 3 below runs a regression with the same specification as before, but with interaction term of domestic debt and the chin-Ito de facto capital account openness index. The index differs from other capital control measures by trying to capture the extensity of the controls (different types of controls on different types of transactions) rather than the intensity and the stringency of the regulatory controls. Chinn and Ito (2006) argue that the extensity of controls is a good proxy for the stringency of controls. Since countries with liberalized financial systems will probably have some controls on certain types of transactions depending on the direction of the capital flow. On the contrary, countries with repressed financial systems already have stringent controls but might increase the intensity of controls by adding some restrictions on other types of transactions.

Columns 1 and 2, for advanced economies, use financial development indicator and domestic credit to GDP as a measure of financial development. They show that domestic debt to GDP loses significance after controlling for the financial liberalization interaction.

<b>Interaction effects of DomDebt and capital account openness</b>				
<i>Dependent variable:</i>				
	Advanced Economies		Emerging Economies	
	FD (1)	DC (2)	FD (3)	DC (4)
DDG	0.360 (0.314)	-0.432 (0.834)	-0.913*** (0.100)	-0.312 (0.315)
I(DDG2)			0.016*** (0.002)	0.006 (0.005)
GDP	-0.001** (0.0002)	0.003*** (0.001)	0.011*** (0.001)	0.005** (0.002)
log(GDPP)	11.959** (5.237)	-20.125 (14.398)	8.285*** (1.202)	-21.758*** (3.800)
GDPPG	-0.654*** (0.227)	-2.292*** (0.603)	-0.413*** (0.131)	-2.280*** (0.413)
GDS	1.311*** (0.202)	0.241 (0.543)	0.121*** (0.042)	0.140 (0.131)
TO	-0.215*** (0.023)	-0.149** (0.062)	0.020 (0.013)	0.151*** (0.040)
KAO	4.261 (4.200)	-2.764 (11.227)	-1.934*** (0.517)	-4.686*** (1.633)
GE	-0.203 (4.982)	9.252 (14.217)	-8.235*** (1.648)	-11.418** (5.208)
ROL	12.149** (6.142)	31.689* (16.597)	3.059** (1.520)	38.234*** (4.805)
CAR	-1.224*** (0.208)	-1.804*** (0.555)	-0.235*** (0.084)	-1.390*** (0.266)
DDG:KAO	-0.025 (0.138)	0.301 (0.368)	0.114*** (0.024)	0.041 (0.077)
Observations	150	137	158	158
Adjusted R <sup>2</sup>	0.939	0.887	0.933	0.739
F Statistic	155.188*** (df = 15; 134)	72.181*** (df = 15; 121)	136.882*** (df = 16; 141)	28.751*** (df = 16; 141)

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 3: cross-country regression including interaction with capital account openness

Since in a liberalized and developed banking and financial system, the risk-adjusted returns on lending to the private sector are at least equal to that of lending to the public sector (Hauner, 2008). Therefore, for advanced economies, the difference in financial liberalization will not give significant effects since banks and other investors may hold public debt only to the scale that is directly useful for liquidity or useful for operation. Thus, an increase in bond holding will not improve the extent of credit nor other aspects



of financial development, when comparing across financially liberalized advanced economies.

Column 3 show results similar to table 1, we have a negative and significant linear term for domestic debt but a positive significant quadratic term, which is an innuendo to a possible U-shaped relationship. Moreover, the positive and statistically significant interaction terms indicate that the total effect of domestic debt is 0.114 percent on financial development when accounting for the subsample's KAO average which is equal to 0.55. The test for the non-monotonic relationship is presented in figure 2.

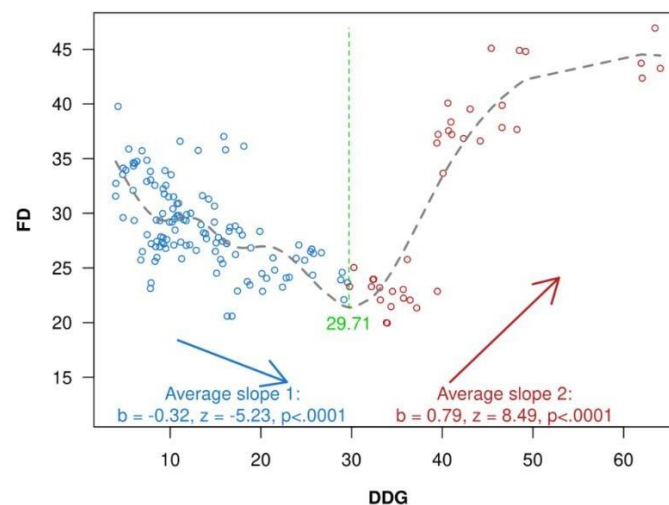


Figure 2: Two-lines test including interaction with capital account openness

The test shows a negative and significant slope for the left part and a positive and significant slope for the right part. This U-shaped relationship shows that the change in the slope's sign happens when domestic debt becomes approximately 30% of GDP, which is similar to the findings of the first test. This shows that even in the presence of interaction terms for capital account openness, crowding-out will still exist if the government's bond market is underdeveloped relative to the financial sector.

## **B. Interaction with government effectiveness**

Kumhof and Tanner (2005) argue that the main reason that banks hold a large share of government bonds is not financial repression but the lack of institutional quality. Underdevelopment in the legal conditions and lack of machination in the public sector may make it hard for potential borrowers to collateralize real estate, which is the banks' most preferred form of collateral. Thus, in the presence of lack of an adequate institution, banks mainly supply credit to the public sector, which may crowd-out credit to the private sector.

Government effectiveness (hereafter GE) captures the perception of the quality of the government's services, their independence from political pressures, and the quality and commitment of the government to its policies. A higher level of government effectiveness index reflects better institutional quality.

For advanced economies, in columns 1 and 2 of table 4, domestic debt is significant and positive for financial development overall but not necessarily for domestic credit to the private sector, after controlling for interaction between GE and public sector debt. This shows that holding government bonds can crowd in financial development in advanced economies with effective governments when compared to those with less effective ones.

Column 3 shows a positive and statistically significant interaction term which means that, when using the emerging economy's mean for GE, a one percent increase in domestic debt will increase financial development by 0.29 percent. Furthermore, the linear and quadratic terms of domestic debt have the expected sign for a U-shaped relationship.

Interaction effects of DomDebt and Government Effectiveness				
Dependent variable:				
	Advanced Economies		Emerging Economies	
	FD (1)	DC (2)	FD (3)	DC (4)
DDG	0.487*** (0.107)	-0.550* (0.302)	-0.701*** (0.079)	-0.300 (0.253)
I(DDG2)			0.013*** (0.001)	0.006 (0.004)
GDP	-0.0005** (0.0002)	0.002*** (0.001)	0.013*** (0.001)	0.009*** (0.002)
log(GDPP)	7.734 (5.501)	0.184 (14.999)	7.866*** (1.096)	-20.009*** (3.523)
GDPPG	-0.602*** (0.224)	-2.421*** (0.584)	-0.258** (0.122)	-2.138*** (0.392)
GDS	1.303*** (0.182)	0.173 (0.477)	0.097** (0.039)	0.100 (0.126)
TO	-0.204*** (0.023)	-0.184*** (0.060)	0.033*** (0.012)	0.153*** (0.037)
KAO	2.518 (1.795)	10.328** (4.710)	0.190 (0.300)	-3.627*** (0.966)
GE	8.070 (6.620)	-25.308 (17.743)	-14.170*** (1.989)	-26.168*** (6.394)
ROL	14.044* (6.148)	22.060 (16.560)	2.144 (1.449)	34.211*** (4.658)
CAR	-1.172*** (0.207)	-2.146*** (0.556)	-0.166** (0.079)	-1.317*** (0.255)
DDG:GE	-0.127* (0.071)	0.577*** (0.212)	0.293*** (0.045)	0.514*** (0.145)
Observations	150	137	158	158
Adjusted R <sup>2</sup>	0.941	0.893	0.940	0.760
F Statistic	159.092*** (df = 15; 134)	76.655*** (df = 15; 121)	155.028*** (df = 16; 141)	32.029*** (df = 16; 141)

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 4: cross-country regression including interaction with government effectiveness

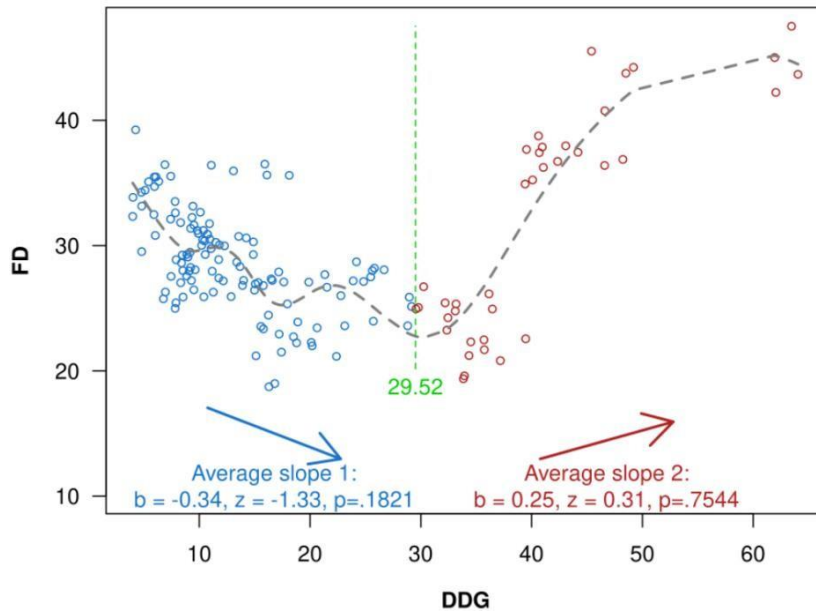


Figure 3: two-lines test including interaction with government effectiveness

Figure 3 shows the results of the two-line test. The signs of the two lines are as expected but the results are no longer significant. Therefore, when controlling for cross-country differences in government effectiveness, the nexus may not be U-shaped. Therefore, the exploration from both column 3 and the test reveals that with improvements in government effectiveness, an increase in domestic debt will increase the level of financial development, holding everything else equal. This affirms Kumhoff and Tanner (2005) argument that an increase in government bond holding, conditional on adequate institutional quality, will increase the willingness of the people to invest their savings in bank deposit that is generally viewed as risky.

### **C. Interaction with capital adequacy ratio**

A third point of view focus on the balance sheet and the capital requirements of a financial entity. It stresses the importance of government bonds to ease the process of meeting capital adequacy requirements or liquidity requirements. Under this view, banks mainly want to hold government bonds to have an abundance of safe assets so that they attain sufficient capital requirements. Moreover, banks with higher capital to assets ratios are required to be efficient to reach a higher return on capital and have a higher return on assets. Thus, government bonds are attractive assets to the banks since they provide low risk and high profitability in normal times. In table 5, we check for the effect of the difference in capital adequacy ratio (CAR) across countries on the relationship between domestic debt and financial development.

Table 5, columns 1 and 2, present a piece of evidence that domestic debt does not have a significant effect on financial development or domestic credit to the private sector, after controlling for the difference in capital adequacy ratios across advanced economies.

<b>Interaction effects of DomDebt and capital adequacy ratio</b>				
<i>Dependent variable:</i>				
	Advanced Economies		Emerging Economies	
	FD (1)	DC (2)	FD (3)	DC (4)
DDG	-0.234* (0.119)	0.317 (0.402)	-1.108*** (0.170)	-0.381 (0.517)
I(DDG2)			0.011*** (0.002)	0.004 (0.005)
GDP	-0.0003 (0.0002)	0.003*** (0.001)	0.012*** (0.001)	0.005** (0.003)
log(GDPP)	13.367*** (4.738)	-17.602 (14.157)	5.615*** (1.221)	-22.713*** (3.713)
GDPPG	-0.653*** (0.208)	-2.208*** (0.597)	-0.351** (0.135)	-2.258*** (0.409)
GDS	1.417*** (0.172)	0.037 (0.492)	0.099** (0.044)	0.132 (0.133)
TO	-0.234*** (0.021)	-0.129** (0.060)	0.034*** (0.013)	0.155*** (0.039)
KAO	4.692*** (1.616)	5.501 (4.592)	-0.029 (0.330)	-4.003*** (1.002)
GE	3.201 (4.600)	6.241 (13.846)	-6.426*** (1.625)	-10.765** (4.939)
ROL	12.891** (5.682)	32.990** (16.603)	6.144*** (1.596)	39.336*** (4.852)
CAR	-2.514*** (0.338)	-1.624 (1.026)	-0.547*** (0.142)	-1.501*** (0.433)
DDG:CAR	0.030*** (0.006)	-0.004 (0.021)	0.029*** (0.009)	0.010 (0.029)
Observations	150	137	158	158
Adjusted R <sup>2</sup>	0.948	0.886	0.927	0.738
F Statistic	181.549*** (df = 15; 134)	71.761*** (df = 15; 121)	125.783*** (df = 16; 141)	28.711*** (df = 16; 141)

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 5: cross-country regression including interaction with capital adequacy ratio

However, for emerging markets and low incomes countries, this effect is significant. Column 3, shows that the financial development index is significantly proportional to domestic debt linearly and quadratically. However, after running the two-lines regression, the result for one of the sides is not significant. Thus, the added dimension of difference in CAR plays a substantial influence on the nexus. Column 3 reveals that the effect of a 1% increase in domestic debt to GDP ratio is a 0.03% increase in financial development, when taking the emerging economies' CAR average of 17.23.

Moreover, column 4 shows, as before, that domestic debt does not have a significant effect on domestic credit to the private sector in emerging economies and low-income countries. This affirms the results found before that public sector debt can induce financial development but not through the credit channel.

## CHAPTER V

### CONCLUSION AND POLICY RECOMMENDATION

The paper's goal is to scrutinize the effect of public sector debt on financial development. The pertinent literature is divided into two categories. The first category considers that increasing public debt will have negative effects on the financial sector by increasing interest, reducing the efficiency of the banking sector, and reducing the rating of government debt (Caballero and Krishnamurthy, 2004; Hauner, 2008). Others view that an increase in public debt can present a safe and liquid asset for the balance sheet of financial institutions, provide the adequate infrastructure for several financial markets, and set the informational benchmark for corporate bond pricing (Kumhof and Tanner, 2005; Kiseřáková et al., 2020). However, the literature does not have, to the best of my knowledge, an empirical study that studies the nexus after the financial crisis of 2008.

The international financial system had some new and unique characteristics that can change the foundation of the relationship. The persistent low-interest rates combined with high private leverage put a constraint on conventional monetary policies to give effective results. This made the financial sector more dependent on government debt, specifically in the form of bonds. Moreover, one can expect that the underdevelopment of the bonds market may be a good indicator of financial development.

The results showed that for advanced economies domestic debt has a significant and positive effect on financial development, but for emerging economies the relationship is not linear. For emerging economies and low-income countries, public sector debt crowds out developments in the financial sector up until it reaches 30% of GDP, after which it starts to have positive effects. After that point, the bond market will, on average,

be developed enough to have the appealing effects. Even for advanced economies, countries that have relatively low domestic debt over this period (average of DomDebt less than 35%) also suffer from an underdeveloped financial sector (average of FD less than 35%), like Latvia, Lithuania, and Slovak Republic. However, the subsample's size is too small for sound inference.

This shows that the new landscape of the international financial sector is more sensitive to the government bond market, and the policies that follow should take that into account. The bonds are becoming more money-like in many markets and financial transactions. So, policymakers should be aware to have a developed market for government bonds to satisfy the financial sector's demand for liquidity and information reference.



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