



# Crowding-Out Effect: The Impact of Government Debt on Corporate Leverage

Inês Silvério

Dissertation written under the supervision of Professor Diana Bonfim

Dissertation submitted in partial fulfilment of requirements for the International  
MSc in Finance, at the Universidade Católica Portuguesa, January 2025.

# Crowding-Out Effect: The Impact of Government Debt on Corporate Leverage

Inês Silvério

## Abstract

The objective of this master's thesis is to investigate the crowding out effect, that is, the impact that increasing government debt has on corporate leverage. This relation is studied in 40 countries between 1990 and 2024. This research has Government Debt-to-GDP as the main variable of interest Government Debt-to-GDP. Additionally, the regression analysis also includes macroeconomic variables, as GDP per capita, unemployment rate and consumer price index, firm-specific control variables, including firm size and ROA leverage. Time and country fixed effects are also considered. The analysis is split into two phases: country level and firm level. In the first regressions with country data, the results show no significant relationship between public and private debt. However, when the timeframe is shortened to 1990-2014, significance emerges. As such, an investigation is conducted to identify whether extraordinary measures that happened after 2014, such as quantitative easing policies (QE) and the COVID-19 pandemic, could be impacting the results. Interaction regressions show that for countries implementing QE, the negative link between government and corporate debt is no longer statistically significant. A similar result is found for the pandemic period. This thesis concludes that Government Debt-to-GDP has a crowding-out effect on corporate leverage but is highly muted by monetary and fiscal policy, more specifically, the ones that took place following the Global Financial Crisis and during COVID-19.

Keywords: Government Debt, Corporate Leverage, Crowding-Out Effect

# Efeito de *Crowding-Out*: O Impacto da Dívida Pública na Alavancagem Financeira Empresarial

Inês Silvério

## Resumo

O objetivo desta tese de mestrado é investigar o efeito de *crowding-out*, isto é, o impacto do aumento da dívida pública na alavancagem financeira das empresas. Esta relação é estudada em 40 países entre 1990 e 2024. Este estudo tem como principal variável de interesse a dívida pública sob o PIB. Além disso, as regressões também incluem variáveis macroeconômicas, como o PIB per capita, a taxa de desemprego e o índice de preços ao consumidor, bem como variáveis de controlo das empresas, incluindo o tamanho da empresa e o ROA. Os efeitos fixos de tempo e país também são considerados. A análise é dividida em duas fases: ao nível dos países e ao nível das empresas. Ao nível dos países, as primeiras regressões não mostram uma relação significativa entre a dívida pública e a dívida privada. No entanto, quando o período é reduzido para 1990-2014, surge significância. Assim, é realizada uma investigação para identificar se medidas extraordinárias que ocorreram após 2014, como políticas de flexibilização quantitativa (QE) e a COVID-19, poderiam estar a afetar os resultados. As regressões mostram que, para os países que implementaram QE, a relação negativa entre a dívida pública e a corporativa deixou de ser estatisticamente significativa. Um resultado semelhante foi encontrado para o período da pandemia. A conclusão desta tese é que a dívida pública tem um efeito de *crowding-out* na alavancagem empresarial, sendo atenuada pela política monetária e fiscal, mais especificamente pela que ocorreu após a Crise Financeira Global e a pandemia.

Palavras-chave: Dívida Pública, Dívida Empresarial, Efeito de *Crowding-Out*

## Acknowledgements

Firstly, I would like to express my gratitude to my supervisor, Professor Diana Bonfim, for her support and guidance throughout the development of this thesis.

À minha família, agradeço de coração todo o apoio e paciência ao longo deste percurso. Um agradecimento especial aos meus avós, por terem sempre abraçado os meus sonhos e celebrado as minhas conquistas como se fossem vossas. Obrigada pelo apoio constante e o amor incondicional, não só nesta etapa, mas em todas as fases da minha vida. Avó Bi e Avô Cá – já está, conseguimos!

To my close friends, a big thank you for reminding me to enjoy everything that lies beyond writing a master thesis. Above all, thank you for your support and for patiently listening to my many debriefs about the thesis.

## Table of Contents

<i>1. Introduction</i>	6
<i>2. Literature Review</i>	7
<i>3. Methodology</i>	10
3.1. Sample	10
3.2. Country-Level Variables	10
3.3. Firm-Level Variables	11
3.4. Data	12
3.5. Summary Statistics	13
3.6. Debt Levels in the US and Japan	15
<i>4. Country-Level Analysis</i>	16
4.1. Baseline Analysis	17
4.2. Alternative Specifications	19
4.3. External versus Domestic Government Debt	20
4.4. Maturity of Debt	21
4.5. Dynamic Leverage Effects	23
<i>5. Time-Varying Effects of Government Debt on Corporate Leverage</i>	24
5.1. Pre and Post 2015 Analysis	25
5.2. Possible Reasons	27
<i>6. Firm-Level Analysis</i>	32
6.1. Baseline Analysis	32
6.2. Firm Characteristics	34
<i>7. Robustness Tests</i>	36
<i>8. Limitations and future research</i>	37
<i>9. Conclusion</i>	38
<i>Appendix</i>	40
<i>References</i>	50

## **1. Introduction**

In a global economy shaped by rising public debt, financial uncertainty and crises, understanding how firms finance themselves has become more complex and crucial than ever. Over the last decades, countries have experienced several crises, such as the Global Financial Crisis (GFC) and Sovereign Debt Crisis (SDC), as well as unique events, like the COVID-19 pandemic. In these periods, financial and monetary interventions were implemented, together with rising government borrowing, to support economic recovery and the stability of financial markets.

In corporate finance, capital structure decisions, this is, how much debt a company chooses to hold, are central to firm value, financial flexibility and investment capacity. Traditionally, these decisions have been studied as being primarily dependent on internal characteristics such as profitability, size, and growth opportunities (Frank & Goyal, 2009). However, empirical studies also indicate that there are factors outside the firm that shape its leverage policy, such as industry average leverage and the economic environment. In addition to the latter, variations in the institutional environment across countries, such as legal, fiscal and different types of capital providers, have also been found to be determinants of the capital structure.

Today's financial environment, together with recent years developments, has shown that macroeconomic factors, institutional conditions and fiscal policy have a direct influence on both a firm's ability to raise funds and its incentives to do so. One important mechanism through which this can be studied is the crowding-out effect. This effect was first introduced by the economist Milton Friedman, who argued that when government borrowing increases, it can absorb available financial resources in the economy, reducing the supply and raising the cost of debt for private companies.

This issue was highlighted during the European SDC, when highly indebted countries like Greece and Italy saw banks redirect lending capacity toward government bonds, limiting credit available for firms. Similar patterns occurred in Latin America during periods of fiscal distress, such as Argentina and Brazil's early-2000s defaults. More recently, the rising public debt and government deficits of the United States and Japan have raised concerns, particularly about their long-term feasibility.

Following the GFC, monetary conditions and regulations changed across the globe. With the introduction of Basel III, banks became more restrictive with their lending patterns and were incentivized to hold high-quality liquid assets, such as government bonds. Further, several central banks employed quantitative easing practices during these crises. As a consequence, the traditional crowding-out effect may have been impacted and muted.

This master's thesis contributes to the literature by investigating the crowding-out effect between government and corporate debt. With a cross-country sample of 40 countries, the international data allows for a thorough study, underlined by large variation in government debt as well as cross-country differences in institutional environments.

With the main variable of interest as Government Debt-to-GDP, the analysis also includes macroeconomic variables, as GDP per capita, unemployment rate and consumer price index, and firm-specific control variables, including firm size and ROA leverage. Time and country fixed effects are also considered. The study is split into country level and firm level. While the first regressions with aggregated country data show no significant relationship between public and private debt, significance emerges when the timeframe is shortened to 1990-2014. To investigate what could be potentially impacting the results, additional analysis is conducted for quantitative easing policies (QE) and the COVID-19 pandemic, as these were extraordinary events that occurred after 2014. These regressions show that, for countries implementing QE, the negative link between government and corporate debt is no longer statistically significant, with a similar result obtained for the pandemic period.

This thesis is organized in the following way. Section 2 provides an overview of the literature regarding government debt, corporate leverage and the crowding out effect. Section 3 describes the methodology and data used. Sections 4 and 5 present the country-level analysis. Section 6 presents the firm-level analysis. Section 7 includes the robustness tests performed and Section 8 includes the limitations. Section 9 contains the conclusion.

## **2. Literature Review**

The factors influencing firms capital structure, decisions between debt and equity, have been a core topic in corporate finance. The initial irrelevance proposition by Modigliani and Miller (1958) suggests that, in the presence of perfect market conditions, the capital structure is

irrelevant to firm value. Other theories introduce conditions present in the real world. The trade-off theory assumes that firms balance the tax benefits of debt with the costs of financial distress. According to the pecking-order theory (Myers & Majluf, 1984), asymmetric information causes firms to prefer internal financing and debt to the use of external equity. The market-timing theory (Baker & Wurgler, 2002) stated that managers issue securities strategically to take advantage of market conditions. More recent empirical work focuses on the actual determinants that shape capital structure, like profitability, asset tangibility and growth opportunities (Frank & Goyal, 2009; Goyal, 2009). All these theories share a micro-level orientation.

However, major economic crises, such as the Great Depression, the Sovereign Debt Crisis (SDC) and the Global Financial Crisis (GFC), have highlighted a relation between corporate financing choices and macroeconomic variables. In the case of the GFC, it revealed how credit market disturbances can spread quickly from banks to firms. In the European SDC that followed, it was shown that this transmission occurs through the government sector as well. During this period, governments were increasing their debt levels and facing higher borrowing costs. As banks hold a significant amount of domestic sovereign bonds, they are tied up in fragile sovereign debt, having less to lend to companies and causing tighter borrowing conditions. These events resulted in a worsening of the dependence between financial institutions and governments.

The connection between government debt and corporate leverage can be traced back to 1978. Milton Friedman argued that, when an economy is running with fully employed resources, heavy government borrowing tends to crowd out private investment, a phenomenon he denoted “real crowding out”. Nevertheless, in financial systems, crowding out not only occurs in this way. As Friedman (1986) pointed out, when government deficits are financed by issuing interest-bearing debt, the expected return on government debt securities and other securities that are close substitutes increases, as a result of the rise in supply of long-term government bonds. Consequently, this leads investors to trade out of these securities and trade into others, such as equity, decreasing the spread between equity and debt securities. Friedman’s ideas provide a bridge between fiscal policy and corporate finance, as when governments increase debt issuance, they can affect private borrowing, raise the cost of capital for firms and ultimately influence their leverage choices.

More recently, empirical research began examining how shifts in public debt and sovereign risk affect firm financing decisions. For instance, Krishnamurthy et al. (2015) looked at US treasuries and found that, when the government issued more short-term debt, investors pulled back from private short-term instruments, revealing a crowding-out effect. They argued that treasury securities carry a “moneyness premium” because they are safe and liquid, and when the supply grows, that premium falls, making financial intermediaries less eager to create near-money substitutes.

Some research suggests that monetary policy can offset this, at least temporarily. Foley-Fisher et al. (2016) studied the Federal Reserve’s Maturity Extension Program (MEP), which swapped short-term for long-term treasuries, intending to lower long-term interest rates. Firms that relied on long-term debt appear to have benefited the most, as their stock prices rose and they issued more long-term debt, which was used to increase investment. Although this is not a permanent fix, it shows that central banks can help offset the tightening caused by high government debt, at least temporarily.

Additional evidence can be found in the paper by Becker and Ivashina (2018). They explored how the growing holdings of domestic sovereign debt by European banks, a policy frequently induced during crisis, impacted their lending behavior towards firms. They characterized the phenomenon as financial repression. As banks were incentivized to direct capital towards government debt, this crowded out private credit. In a European Central Bank study from 2019, Kalemlı-Ozcan et al. found that heavily indebted firms in the Eurozone cut their investments substantially during the GFC, stressing how vulnerabilities in the banking and sovereign sectors are connected with constraints in corporate financing.

Apart from crises, the fiscal environment has a decisive impact on corporate financing choices as well. Greenwood et al. (2010) confirm that firms adjust the maturity profile of their borrowing in response to the government borrowing patterns, shifting towards short-term borrowing when governments issue more long-term securities and vice versa. Moreover, evidence from Graham et al. (2014) indicates that the increase in American corporate leverage since the Second World War cannot be explained by firm-specific factors. Instead, the key determinants are government borrowing, macroeconomic uncertainty and changes in financial markets, once again showcasing the important role macroeconomic conditions play in corporate financing decisions.

Following on from the previous work of Graham et al. (2015), Demirci et al. (2019) made a thorough analysis, covering 40 nations between 1990 and 2014. Their findings demonstrate that rising sovereign debt is consistently linked with declining firm leverage. The cross-country study reveals that this effect is strongest for government debt financed domestically, for larger and more profitable firms and in countries with developed equity markets and lower financial openness.

### **3. Methodology**

#### 3.1. Sample

The sample covers the period between 1990 and 2024, consisting of 49,869 firms from 40 countries belonging to Europe, Asia, North America and South America. There are a total of 463,826 firm-year observations and 1,203 country-year observations. Since the objective of this thesis is to study the impact of changes in government debt on firms' financing decisions, both country-level and firm-level variables were retrieved.

#### 3.2. Country-Level Variables

The main variable of interest in this dissertation is the *Government Debt-to-GDP* ratio, defined as general government gross debt, consisting of all liabilities that require future payments of interest or principal by the general government, as a percentage of GDP. The general government sector consists solely of entities that implement public policy, as public corporations whose main purpose is to participate in commercial activities are excluded.

The general government is composed of three subsectors: central, state and local governments, and social security funds. Therefore, *General Government Gross Debt* is calculated based on the consolidation of debt within these subsectors, which involves the elimination of transactions that occur between these general government subsectors. However, the difference between the consolidated general government debt and the unconsolidated, given by the sum of the debt from all subsectors, is significantly small.

Further, government debt is split into *External Government Debt* and *Domestic Government Debt* using the IMF concept. Gross external debt is the outstanding amount of liabilities that

are owed to non-residents by residents of an economy. Domestic government debt is given by total government debt minus external debt.

Apart from these three main government debt variables, country characteristics were also obtained, including *GDP per capita* (measured in current US Dollars), *GDP* (measured in current US Dollars), *CPI* (the level of consumer prices), *S&P Global Index* (the level of equity prices), the *Exchange Rate* and the *Unemployment Rate*. The level of equity prices is calculated by converting each country's return on its S&P Global Equity Index into a variable that tracks the index level, assuming that the base year is the first year in the sample. The nominal exchange rate is the value of the local currency relative to one US dollar, calculated yearly based on monthly averages. The unemployment rate is defined as the number of unemployed relative to the labor force.

Consistent with the Demirci et al. (2019) approach, government debt data were obtained primarily from the IMF's World Economic Outlook (WEO) database. *Government Debt-to-GDP* was collected for each country-year. Since some countries had limited data for the early years of the sample, national central bank sources or the World Bank data were used to complete these existing gaps. Other country-level control variables, including *GDP per capita*, *CPI*, *S&P Index*, *Unemployment Rate* and *Exchange Rate*, were gathered from a combination of World Bank databases, the IMF and the European Central Bank. In case multiple sources reported a given indicator, the source providing the longest time series was used to ensure consistent definitions over the entire sample.

### 3.3. Firm-Level Variables

For the firm-level analyses, three leverage measures were used. Two traditional measures were considered: the *Book Leverage*, given by the total book debt over total book value of assets, and the *Market Leverage*, calculated as the total book debt over market value of assets. Following Welch (2011), a third measure was used, the *Debt-to-Capital* ratio, defined as the book value of debt divided by the sum of book equity and book debt. The key distinction from the *Book Leverage* ratio is that the *Debt-to-Capital* ratio is unaffected by changes in non-financial liabilities. The book leverage is based on the book value of assets, which includes non-financial liabilities such as trade credit, alongside book debt and equity. Consequently, an

increase in accounts payable will lower book leverage, even when the firm's total financial debt remains unchanged, whereas the debt-to-capital ratio remains unchanged.

In line with the literature, additional firm-level variables that relate to corporate leverage were computed (Goyal, 2003). *Tangibility* is measured as the ratio of property, plant and equipment (PPE) to total assets. The book value of total assets is included to control for the effect of firm size on leverage. Return on assets, *ROA*, is calculated as operating income divided by total book assets. The *Market-to-Book* ratio is computed as the market value of total assets relative to their book value.

Firm-level financial data were extracted from Compustat. For the United States (US) and Canada, Compustat North America was used to collect annual firm fundamentals as well as market pricing data, used to compute market capitalization and market-based ratios. For the remaining countries, Compustat Global was used to retrieve annual fundamentals and market pricing data were drawn from Compustat Global Security Daily. Each country's firm data was downloaded individually from Compustat Global to ensure full coverage. In cases where the financial data was reported in local currencies, the Compustat exchange rate data was used to convert all values into US dollars for consistency. This currency conversion was applied to non-ratio variables such as total assets and debt amounts, to allow variables to be comparable across countries and to be aggregated.

### 3.4. Data

After gathering and merging all the variables, detailed data cleaning and screening steps were performed to achieve an analytically comparable sample. Firstly, leverage variables and other financial ratio variables were winsorized to the first and ninety-ninth percentiles. Secondly, data points with missing or invalid data were removed. In particular, any firm-year with missing data for total assets, total debt or book equity variables was removed. Firm-year observations with a negative book value of equity were also removed, since this suggests data errors or other significant inconsistencies in balance sheet data.

At the level of country-year, additional restrictions were applied. Firstly, country-years that had fewer than ten firms per observation were omitted to avoid unbalanced averages. Secondly, based on information from the World Bank and the Harvard Dataverse, 19 country-year

observations with sovereign debt default or restructuring events were identified and excluded, given these events are associated with large fluctuations in government debt-to-GDP ratios.

The empirical analyses have been done in two phases: Country-level and Firm-level. Firstly, a country panel dataset was constructed to perform the Country-Level analysis, where firm-level variables were aggregated by year and country. For each country-year, aggregate leverage measures were obtained by summing the numerators and denominators across all firms and then taking their ratio. For instance, book leverage at the country-year level was calculated as the total debt across all firms in that country-year and was then divided by the total assets. All country averages were subject to the data cleaning described above. As for the Firm-Level analysis, the full firm-level data was used, allowing to control for firm-specific determinants of leverage. This separation allows for a complete analysis of the dataset, as it aggregates both macroeconomic and accounting variables. Lastly, the country-level analysis attributes the same weight to each country-year observation, while the firm-level analysis weights more toward countries with a larger number of firm observations.

### 3.5. Summary Statistics

Tables 1 and 2 report summary statistics for the country and firm-level variables in the extended sample, which covers 40 countries over the period 1990–2024.

Table 1 indicates that the average ratio of corporate debt to total assets, *Book Leverage*, is 24.7%. The *Debt-to-Capital* ratio, defined as book debt divided by the sum of book debt and book equity, is higher, with a mean of 39.7%. In contrast, *Market Leverage* is lower than both of these measures, averaging 21.3%. The mean *Government Debt-to-GDP* ratio is 62.9%, with an interquartile range from 38.0% to 80.6%. Several economies in the sample, such as Belgium, Greece, Italy and Japan, record average government debt levels above 100% of GDP, whereas others, including Chile and Hong Kong, maintain averages below 20%. Public debt is predominantly domestically financed, with about one-third of the average government debt being held by domestic investors. The median *GDP per capita* is approximately \$25,770 and the average *Unemployment Rate* is 7.0%.

Table 1

Summary statistics (Country characteristics)

<i>Dependent variables</i>	Mean	St. Dev	p25	Median	p75	N
Book leverage <sub>t</sub>	0.247	0.096	0.191	0.253	0.313	1203
Debt-to-capital <sub>t</sub>	0.397	0.128	0.339	0.404	0.476	1203
Market leverage <sub>t</sub>	0.213	0.112	0.139	0.208	0.275	1203
Corporate debt-to-GDP <sub>t</sub>	0.188	0.088	0.103	0.198	0.280	1203
Ln(Corporate debt <sub>t</sub> )	11.647	1.519	10.579	11.645	12.596	1203
Short-term leverage <sub>t</sub>	0.084	0.036	0.058	0.079	0.103	1203
Long-term leverage <sub>t</sub>	0.207	0.064	0.163	0.204	0.250	1203
<i>Government debt variables</i>	Mean	St. Dev	p25	Median	p75	N
Gov. debt-to-GDP <sub>t-1</sub>	0.629	0.389	0.380	0.554	0.806	1144
Ln(Gov. debt <sub>t-1</sub> )	24.304	1.611	23.235	24.100	25.843	1144
Domestic gov. debt-to-GDP <sub>t-1</sub>	0.311	0.167	0.191	0.280	0.438	1144
External gov. debt-to-GDP <sub>t-1</sub>	0.076	0.027	0.088	0.088	0.088	1144
<i>Control variables</i>	Mean	St. Dev	p25	Median	p75	N
Ln(GDP per capita <sub>t-1</sub> )	9.874	1.057	9.321	10.157	10.672	1144
ln(CPI <sub>t-1</sub> )	0.957	0.936	0.473	0.979	1.551	1144
Ln(S&P Index <sub>t-1</sub> )	3.602	1.139	2.922	3.958	4.545	1144
Unemployment rate <sub>t-1</sub>	0.070	0.044	0.039	0.062	0.087	1144
Ln(Exchange Rate <sub>t-1</sub> )	1.411	1.874	0.253	0.459	1.955	1144
Tangibility <sub>t-1</sub>	0.394	0.129	0.298	0.395	0.481	1144
Ln(Assets <sub>t-1</sub> )	13.233	2.009	11.813	12.932	14.445	1144
ROA <sub>t-1</sub>	0.113	0.035	0.090	0.108	0.134	1144
Market-to-Book <sub>t-1</sub>	1.391	1.118	0.990	1.182	1.406	1144
Book value of assets-to-GDP <sub>t-1</sub>	0.300	0.279	0.123	0.321	0.517	1144

This table shows the summary statistics for all country-level variables. *Book leverage* is defined as the ratio of total book debt of all firms in a country to total book assets. *Debt-to-capital* is the ratio of total book debt to total capital (book debt plus book equity) in each country. *Market leverage* is defined as the ratio of total book debt to total market value of assets. *Ln(Corporate debt)* is the natural logarithm of total debt (in dollars) summed over all firms in a country and year. *Corporate debt-to-GDP* is the ratio of Corporate debt to GDP. *Long-term (Short-term) leverage* is defined as the ratio of corporate debt with an original maturity of more (less) than one year to total book assets.

*Gov. debt-to-GDP* is gross government debt divided by GDP. *Ln(Gov. debt)* is the natural logarithm of the dollar value of government debt outstanding. *External gov. debt-to-GDP* is government debt owed to nonresidents. *Domestic gov. debt-to-GDP* is Gov. debt-to-GDP net of external debt.

*GDP per capita* is measured in current US dollars, *Unemployment* is measured as a proportion of the labor force. *Ln(S&P index)*, *Ln(CPI level)*, and *Ln(Exchange rate)* are calculated by taking the natural logarithm of the level of S&P Global Equity Index, the level of CPI, and the level of Exchange rate that is denoted in local currency units per US dollar.

Table 2 summarizes the distribution of firm-level characteristics. The average values of *Book Leverage*, the *Debt-to-Capital* ratio, and *Market Leverage* are 25.1%, 36.6% and 27.0%, respectively. In line with findings in the capital structure literature, asset tangibility varies considerably across firms, as the mean *Tangibility* is 30.8%, with an interquartile range of roughly 12% to 45%. Most firms are profitable, as suggested by a median return on assets, *ROA*, of about 8%. Notably, the unweighted firm-level mean *ROA* (7.2%) is substantially lower

than the country-level average *ROA* (11.3%). This indicates that, in most countries, larger firms tend to be more profitable than smaller firms. Finally, the median firm's market value is approximately 1% lower than its book value, as reflected in a median *Market-to-Book* ratio of 0.99.

Table 2  
Summary statistics (Firm characteristics)

	Mean	St. Dev	p25	Median	p75	N
Book leverage <sub>t</sub>	0.251	0.175	0.106	0.231	0.367	463 826
Debt-to-capital <sub>t</sub>	0.366	0.238	0.169	0.352	0.537	463 826
Market leverage <sub>t</sub>	0.270	0.217	0.087	0.221	0.412	463 826
Tangibility <sub>t-1</sub>	0.308	0.226	0.119	0.272	0.454	396 628
Ln(Assets <sub>t-1</sub> )	5.934	2.157	4.468	5.838	7.293	396 628
ROA <sub>t-1</sub>	0.072	0.118	0.036	0.081	0.128	396 628
Market-to-Book <sub>t-1</sub>	1.322	1.187	0.745	0.986	1.436	396 628

This table reports the summary statistics for the firm-level variables. *Book leverage* is defined as the ratio of total book debt to total book assets. *Debt-to-capital* is the ratio of total book debt to total capital (book debt plus book equity). *Market leverage* is the ratio of total book debt to the total market value of assets. *Tangibility* is defined as the ratio of property, plant, and equipment (PPE) to total assets. *Ln(Assets)* is the natural logarithm of the book value of total assets (in millions of US dollars). *ROA* is operating income divided by total assets. *Market-to-book* is defined as the ratio of the market value of assets to the book value of assets.

### 3.6. Debt Levels in the US and Japan

Japan and the US are two of the countries in the sample with the largest average *Government Debt-to-GDP*. Further, the large government debt of these countries has been talked about for several years and more recently, regarding the feasibility of such levels in the long-term. Hence, before starting the formal analysis, Figure 1 shows the time-series relation between corporate and government debt in these two countries.

The US government debt saw an increase between 2002 and 2024, from around 50% to 120% of GDP. On the contrary, book leverage of US firms declined from 18% to 13%. In Japan's case, the country showed the largest increase in government debt from the sample, with the peak occurring from 2020 to 2022, when sovereign debt stood at 248% of GDP. Between 1990-2024, government debt had a steep increase from 63% to 236% of GDP. Simultaneously, book leverage in Japan declined from 35% to 22%. In both cases, a negative correlation between corporate and government debt is exhibited, consistent with both Graham et al. (2014) and Demirci et al. (2019).

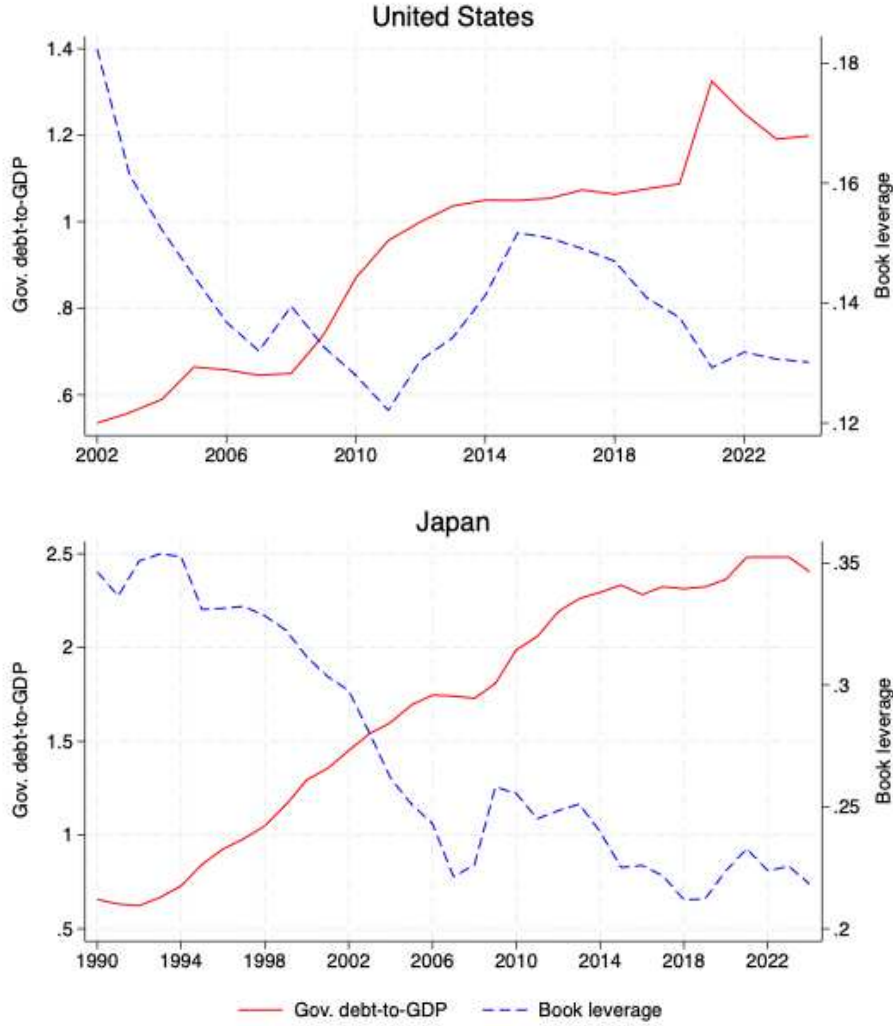


Figure 1: Time-series relation between *Government Debt-to-GDP* and *Book Leverage* for the US and Japan

#### 4. Country-Level Analysis

As described before, this thesis objective is to test the crowding-out hypothesis, relating government debt to corporate leverage. To test this, regressions are used to estimate the country-level corporate leverage, using the *Government Debt-to-GDP* ratio and macroeconomic variables, as well as time-fixed effects and country-fixed effects. Specifically, the regression equation for the country-level analysis is given by:

$$Leverage_{c,t} = \beta_1 Gov. Debt - to - GDP_{c,t-1} + \beta_2 X_{c,t-1} + \beta_3 Y_{c,t-1} + \eta_c + \delta_t + \varepsilon_{c,t} \quad (1)$$

Equation 1 is estimated separately for the three leverage ratios considered: *Book Leverage*, *Debt-to-Capital* and *Market Leverage*. *Gov. Debt - to - GDP<sub>c,t-1</sub>* is the total government debt as a percentage of GDP. *X<sub>c,t-1</sub>* denotes country-level macroeconomic variables, as the

natural logarithm of GDP per capita and the unemployment rate.  $Y_{c,t-1}$  denotes financial variables, aggregated at the country-level, namely tangibility and ROA. Lastly  $\eta_c$  and  $\delta_t$  represent, respectively, country and year-fixed effects.

#### 4.1. Baseline Analysis

To start, a simple robust regression was done with the three leverage ratios as the dependent variable and *Government Debt-to-GDP* as the independent variable (Table 3).

Table 3  
Simple Robust Regression

	(1) Book leverage	(2) Debt-to-Capital	(3) Market Leverage
Gov. debt-to-GDP <sub>t-1</sub>	-0.049*** (0.007)	-0.015 (0.010)	-0.053*** (0.008)
Constant	0.277*** (0.005)	0.406*** (0.007)	0.244*** (0.006)
Year FE	No	No	No
Country FE	No	No	No
Observations	1144	1144	1144
R-squared	0.0409	0.002	0.035
Adj. R-squared	0.0401	0.001	0.034

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Both the constant and the *Government Debt-to-GDP* variables are significant at 1% level, except for *Debt-to-Capital*, while *Government Debt-to-GDP* is not significant. In line with the hypothesis, all three regressions show a negative coefficient for *Government Debt-to-GDP*. For instance, the *Book Leverage* regression shows that a 10 percentage point increase in *Government Debt-to-GDP* is associated with a decrease of book leverage by 0.49 percentage points. However, as suggested by the reduced R-Square, other variables might be affecting this result.

Therefore, a new regression was performed (Table 4), including macroeconomic and financial variables, as well as yearly and country fixed effects. The standard errors are reported in parentheses and were clustered both at the country and year levels, in line with Demirci et al (2019).

For the dependent variables *Debt-to-Capital* and *Book Leverage*, the negative association between government debt and aggregate corporate leverage remains, although it is only significant for *Debt-to-Capital*, at a 10% level. For this case, controlling for country and year

fixed effects, a 10 percentage point increase in government debt relative to GDP is associated with a decrease of the Debt-to-Capital ratio of 0.52 percentage points. The results are similar to *Book Leverage*, with a reduction of 0.32 percentage points for a 10 percentage point increase in government debt to GDP. The natural logarithm of GDP per capita, total assets and ROA are consistently significant determinants of these two leverage measures.

On the contrary, for the dependent variable *Market Leverage*, the negative relationship between government debt and aggregate corporate debt is no longer present. This same effect occurs when the regression is performed without country fixed effects.

Table 4  
Baseline Regression

	(1) Book leverage	(2) Debt-to-Capital	(3) Market leverage
Gov. debt-to-GDP <sub>t-1</sub>	-0.032 (0.020)	-0.052* (0.029)	0.002 (0.018)
Ln(GDP per capita <sub>t-1</sub> )	0.038* (0.020)	0.086** (0.032)	0.022 (0.017)
Ln(CPI <sub>t-1</sub> )	0.004** (0.002)	0.004 (0.003)	0.005** (0.002)
Ln(S&P Index <sub>t-1</sub> )	0.002 (0.001)	0.002 (0.002)	0.003* (0.002)
Ln(Exchange Rate <sub>t-1</sub> )	0.021 (0.013)	0.037* (0.020)	0.016 (0.013)
Unemployment rate <sub>t-1</sub>	0.105 (0.145)	0.199 (0.211)	0.124 (0.143)
Tangibility <sub>t-1</sub>	0.011 (0.056)	-0.078 (0.082)	0.119 (0.074)
Ln(Assets <sub>t-1</sub> )	-0.041*** (0.004)	-0.062*** (0.007)	-0.037*** (0.003)
ROA <sub>t-1</sub>	-0.413*** (0.148)	-0.600*** (0.205)	-0.663*** (0.188)
Market-to-Book <sub>t-1</sub>	-0.004* (0.002)	-0.005 (0.003)	-0.014*** (0.003)
Constant	0.432** (0.185)	0.419 (0.298)	0.478*** (0.176)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Observations	1144	1144	1144
R-squared	0.810	0.777	0.782
Adj. R-squared	0.795	0.759	0.765

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

This table reports the estimation results for the fixed-effects specification using the country panel. Leverage denotes one of the following debt measures: *Book leverage* is defined as the ratio of total book debt of all firms in a country to their total assets; *Debt-to-capital* is the ratio of total corporate debt to total corporate capital (book value of debt plus equity) in each country; and *Market leverage* is defined as the ratio of total book debt of all firms in a country to their market value of assets. The remaining variables are defined in the legend of Table 1. All regressions include country- and year-fixed effects. The standard errors are clustered at both the country and year level.

## 4.2. Alternative Specifications

Using *Government Debt-to-GDP* as the independent variable in the regressions raises a possible concern within this thesis, as the relation between government and corporate debt may be driven by changes in GDP, instead of changes in the actual amount of government debt outstanding.

Table 5  
Alternative Specifications

	(1) Ln(Corporate Debt)	(2) Corporate debt-to-GDP <sub>t</sub>
Ln(Gov. debt <sub>t-1</sub> )	-0.034 (0.101)	
Gov. debt-to-GDP <sub>t-1</sub>		-0.082*** (0.027)
Ln(GDP per capita <sub>t-1</sub> )	0.597** (0.233)	0.010 (0.021)
Ln(CPI <sub>t-1</sub> )	-0.002 (0.012)	0.001 (0.002)
Ln(S&P Index <sub>t-1</sub> )	-0.006 (0.008)	-0.001 (0.001)
Ln(Exchange Rate <sub>t-1</sub> )	0.281** (0.116)	0.017 (0.013)
Unemployment rate <sub>t-1</sub>	0.604 (0.980)	0.293* (0.150)
Tangibility <sub>t-1</sub>	-0.158 (0.620)	-0.087 (0.104)
Ln(Assets <sub>t-1</sub> )	0.425*** (0.072)	0.022*** (0.006)
ROA <sub>t-1</sub>	1.576 (1.396)	0.013 (0.147)
Market-to-Book <sub>t-1</sub>	0.007 (0.018)	0.002 (0.002)
Constant	0.470 (2.503)	-0.162 (0.224)
Year FE	Yes	Yes
Country FE	Yes	Yes
Observations	1,144	808
R-squared	0.947	0.843
Adj. R-squared	0.943	0.828

Robust standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

This table reports the estimation results for the fixed-effects specification using alternative variable definitions. Corporate debt is calculated by summing the dollar values of debt over all firms in a country and year. Ln(Gov. debt) is the natural logarithm of the dollar value of government debt outstanding. Corporate debt-to-GDP is the ratio of Corporate debt to GDP. The remaining variables are defined in the legend of Table 1. All regressions include country- and year-fixed effects. The standard errors are clustered at both the country and year level.

To alleviate this concern, some additional regressions were estimated (Table 5). Firstly, the natural logarithm of corporate debt was regressed on the natural logarithm of lagged government debt (Column 1). Secondly, the *Corporate Debt-to-GDP* ratio was regressed with the *Government Debt-to-GDP* (Column 2), as standardizing the two variables by GDP allows for a more direct estimation of the economic magnitude of the crowding out effect. Hence, the first column analyses the crowding out effect in absolute terms, while the second analyses it in a relative way.

Although the first column does not show a significant negative relation between corporate debt and government debt, this relation is confirmed by the relative analysis in the second column, as a 10 percentage point increase in government debt to GDP is associated with a 0.82 percentage point decrease in the corporate debt to GDP. Consequently, government debt appears to be linked to a significant relative decrease in corporate leverage.

#### 4.3. External versus Domestic Government Debt

As explained in the methodology, the main variable in this thesis, *Government Debt*, includes both external and domestic government debt. As the crowding out effect can be affected by this debt composition, the baseline analysis was repeated by replacing *Government Debt-to-GDP* by *Domestic Government Debt-to-GDP* and *External Government Debt-to-GDP* (Table 6).

In case the government debt's supply is absorbed by external investors or institutions, domestic funds remain available for corporations. As such, a weaker crowding-out effect is expected in this case, compared to if it were held by domestic investors.

In line with the baseline analysis, the coefficient estimates for the domestic government debt and external debt to GDP still lack significance, indicating they are not statistically different from zero. Although the signs of the estimates for domestic and external government debt are in line with what is expected, these coefficients cannot be meaningfully interpreted, given that they are not statistically significant.

Table 6  
External versus Domestic Government Debt

	(1) Book leverage	(2) Debt-to-Capital	(3) Market leverage
Domestic gov. debt-to-GDP <sub>t-1</sub>	-0.046 (0.056)	-0.069 (0.084)	0.012 (0.057)
External gov. debt-to-GDP <sub>t-1</sub>	0.438 (0.410)	0.334 (0.598)	0.742 (0.465)
Ln(GDP per capita <sub>t-1</sub> )	0.039* (0.020)	0.094*** (0.032)	0.013 (0.019)
Ln(CPI <sub>t-1</sub> )	0.004** (0.002)	0.004 (0.003)	0.005** (0.002)
Ln(S&P Index <sub>t-1</sub> )	0.002* (0.001)	0.002 (0.002)	0.003* (0.002)
Ln(Exchange Rate <sub>t-1</sub> )	0.023 (0.015)	0.041* (0.024)	0.014 (0.013)
Unemployment rate <sub>t-1</sub>	0.055 (0.169)	0.137 (0.248)	0.066 (0.166)
Tangibility <sub>t-1</sub>	0.009 (0.056)	-0.085 (0.084)	0.126* (0.070)
Ln(Assets <sub>t-1</sub> )	-0.041*** (0.004)	-0.062*** (0.007)	-0.037*** (0.003)
ROA <sub>t-1</sub>	-0.394** (0.157)	-0.579** (0.215)	-0.636*** (0.197)
Market-to-Book <sub>t-1</sub>	-0.003 (0.002)	-0.004 (0.003)	-0.014*** (0.003)
Constant	0.380** (0.169)	0.316 (0.275)	0.512*** (0.171)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Observations	1,144	1,144	1,144
R-squared	0.809	0.775	0.783
Adj. R-squared	0.794	0.757	0.766

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

This table reports the estimation results from our baseline specification after decomposing Gov. debt-to-GDP as Domestic gov. debt-to-GDP and External gov. debt-to-GDP. External gov. debt-to-GDP is government debt owed to nonresidents. Domestic gov. debt-to-GDP is Gov. debt-to-GDP net of External gov. debt-to-GDP. The remaining variables are defined in the legend of Table 1. All regressions include country- and year-fixed effects. The standard errors are clustered at both the country and year level.

#### 4.4. Maturity of Debt

In this section, corporate leverage was decomposed into long-term and short-term, to explore whether there is a difference in the crowding-out effect between different debt maturities.

Table 7 reports results for two different dependent variables, Short-term leverage and Long-term leverage. A significant negative relation between Government Debt-to-GDP and Long-term leverage is found, indicating that a 10 percentage point increase in government debt is

associated with a 0.41 percentage point decrease in long-term corporate debt, at a 5% significance level.

Table 7  
Separation by Maturity of Corporate Debt

	(1) Long-term leverage <sub>t</sub>	(2) Short-term leverage <sub>t</sub>
Gov. debt-to-GDP <sub>t-1</sub>	-0.041** (0.017)	-0.014 (0.013)
Ln(Gov. debt <sub>t-1</sub> )	-0.010 (0.011)	0.001 (0.006)
Ln(GDP per capita <sub>t-1</sub> )	-0.010 (0.020)	0.007 (0.008)
Ln(CPI <sub>t-1</sub> )	0.003** (0.001)	0.000 (0.001)
Ln(S&P Index <sub>t-1</sub> )	0.002 (0.001)	0.000 (0.001)
Ln(Exchange Rate <sub>t-1</sub> )	0.015 (0.009)	0.003 (0.005)
Unemployment rate <sub>t-1</sub>	0.073 (0.132)	0.008 (0.053)
Tangibility <sub>t-1</sub>	0.160*** (0.053)	0.017 (0.031)
Ln(Assets <sub>t-1</sub> )	-0.013*** (0.003)	0.003* (0.002)
ROA <sub>t-1</sub>	-0.389** (0.151)	-0.112** (0.052)
Market-to-Book <sub>t-1</sub>	-0.001 (0.002)	-0.001 (0.001)
Constant	0.689** (0.332)	-0.032 (0.175)
Year FE	Yes	Yes
Country FE	Yes	Yes
Observations	1,144	1,144
R-squared	0.696	0.680
Adj. R-squared	0.671	0.655

Robust standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

This table investigates the crowding out effect for different maturities of corporate debt. Long-term (Short-term) leverage is defined based on the amount of long-term debt outstanding as a percentage of total book assets. The remaining variables are defined in the legend of Table 1. All regressions include country- and year fixed effects. The standard errors are clustered at both the country and year level.

There is no significant relation between government debt and short-term corporate leverage, which may reflect that government debt primarily captures long-term fiscal conditions, while short-term responds to short-term liquidity considerations. These findings are consistent with Greenwood et al. (2010), who show a negative relation between corporate debt and government debt, as well as Foley-Fisher et al. (2016), who identify a stronger crowding-out effect in corporate leverage with longer maturities.

#### 4.5. Dynamic Leverage Effects

To examine the cross-country variation in how corporate leverage responds over time to changes in government debt, a dynamic specification was estimated. The specification includes contemporaneous and lagged changes in the *Government Debt-to-GDP* ratio.

Table 8

Dynamic Relation

	$\Delta$ Book leverage			
$\Delta$ Gov. debt-to-GDP $_{t-1, t-2}$	-0.036 (0.023)			-0.018 (0.022)
$\Delta$ Gov. debt-to-GDP $_{t-2, t-3}$		-0.057** (0.022)		-0.023 (0.020)
$\Delta$ Gov. debt-to-GDP $_{t-3, t-4}$			-0.076*** (0.022)	-0.062*** (0.021)
$\Delta$ Ln(GDP per capita $_{t-1}$ )	-0.022* (0.013)	-0.031** (0.014)	-0.028** (0.013)	-0.032** (0.014)
$\Delta$ Ln(CPI $_{t-1}$ )	-0.000 (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)
$\Delta$ Ln(S&P Index $_{t-1}$ )	0.001* (0.001)	0.001* (0.001)	0.001* (0.001)	0.001* (0.001)
$\Delta$ Ln(Exchange Rate $_{t-1}$ )	-0.025 (0.028)	0.005 (0.025)	-0.006 (0.025)	-0.009 (0.026)
$\Delta$ Unemployment rate $_{t-1}$	-0.138* (0.082)	-0.159** (0.071)	-0.178** (0.068)	-0.139* (0.072)
$\Delta$ Tangibility $_{t-1}$	-0.019 (0.040)	-0.018 (0.045)	-0.022 (0.045)	-0.022 (0.045)
$\Delta$ Ln(Assets $_{t-1}$ )	-0.004 (0.005)	-0.004 (0.005)	-0.004 (0.005)	-0.004 (0.005)
$\Delta$ ROA $_{t-1}$	0.037 (0.143)	0.057 (0.147)	0.072 (0.147)	0.071 (0.148)
$\Delta$ Market-to-Book $_{t-1}$	-0.001 (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.002 (0.001)
Constant	0.009** (0.005)	-0.002 (0.004)	-0.011 (0.007)	-0.010 (0.007)
Year FE	Yes	Yes	Yes	Yes
Observations	1,046	1,003	964	964
R-squared	0.108	0.113	0.120	0.121
Adj. R-squared	0.0702	0.0753	0.0814	0.0809

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

This table shows the impact of further lags of changes in Gov. debt-to-GDP ratio on the current change in *Book leverage*. The remaining variables are defined in the legend of Table 1. All regressions include year-fixed effects and the standard errors are clustered at both the country and year level.

The results reported in Table 8 show that changes in government debt-to-GDP are associated with subsequent changes in corporate leverage, with the most negative coefficients concentrated in the less recent lags. In particular, increases in government debt-to-GDP are followed by statistically significant declines in corporate leverage over the following years, while the earliest lagged changes do not appear to be significant. This indicates that increases in government debt-to-GDP are associated with subsequent significant declines in corporate leverage at the  $t - 2$  to  $t - 4$  horizons. No positive and statistically significant coefficients appear in later windows, showing no evidence of an offsetting increase in leverage following the initial negative response and therefore no reversal in crowding out.

## 5. Time-Varying Effects of Government Debt on Corporate Leverage

In contrast with the results of Demirci et al. (2019), the baseline regression of this thesis does not show a statistically significant relationship between government debt and corporate leverage. Despite some limitations, which are discussed in the limitations section, the main difference between the samples is the sample period.

Based on this, the analysis was first restricted to the timeframe 1990-2014, as examined in Demirci's paper (Table 9). In this subsample, the negative and statistically significant effect of government debt on leverage is confirmed, with the dependent variables *Book Leverage* and *Debt-to-Capital*, respectively significant at 5% and 10%.

In the case of *Book Leverage*, a 10 percentage point increase in government debt relative to GDP reduces the book leverage ratio by 0.55 percentage points. The natural logarithm of total assets and ROA are consistently significant determinants of these two leverage measures. The dependent variable *Market Leverage* continues not to be significant, meaning this coefficient cannot be interpreted.

This subsample baseline regression presents higher coefficients, in absolute terms, for the independent variable *Government Debt-to-GDP*. For instance, the full sample indicates a 10 percentage point increase in government debt to GDP is associated with a 0.52 percentage point decrease in debt-to-capital, whereas the reduced timeline indicates a 0.78 percentage point decrease.

Table 9  
Baseline Regression (1990-2014)

	(1) Book leverage	(2) Debt-to-Capital	(3) Market leverage
Gov. debt-to-GDP <sub>t-1</sub>	-0.055** (0.025)	-0.078* (0.039)	-0.040 (0.028)
Ln(GDP per capita <sub>t-1</sub> )	0.030 (0.033)	0.064 (0.056)	0.026 (0.029)
Ln(CPI <sub>t-1</sub> )	0.003 (0.002)	0.003 (0.004)	0.006** (0.002)
Ln(S&P Index <sub>t-1</sub> )	0.001 (0.002)	0.001 (0.002)	0.002 (0.002)
Ln(Exchange Rate <sub>t-1</sub> )	0.017 (0.036)	0.035 (0.055)	-0.036 (0.036)
Unemployment rate <sub>t-1</sub>	0.238 (0.244)	0.272 (0.355)	0.427* (0.220)
Tangibility <sub>t-1</sub>	-0.026 (0.060)	-0.070 (0.079)	0.080 (0.076)
Ln(Assets <sub>t-1</sub> )	-0.042*** (0.004)	-0.063*** (0.007)	-0.037*** (0.003)
ROA <sub>t-1</sub>	-0.531*** (0.172)	-0.763*** (0.238)	-0.705*** (0.227)
Market-to-Book <sub>t-1</sub>	-0.007* (0.004)	-0.006 (0.006)	-0.022*** (0.005)
Constant	0.573* (0.298)	0.694 (0.507)	0.564** (0.262)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Observations	769	769	769
R-squared	0.816	0.786	0.804
Adj. R-squared	0.797	0.763	0.783

Robust standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

This table reports the estimation results for the baseline regression with the country panel, using a shorter timeline, from 1990 until 2014. The variables are defined in the legend of Table 1. All regressions include country and year-fixed effects. The standard errors are clustered at both the country and year level.

### 5.1. Pre and Post 2015 Analysis

To investigate a possible reason for these significant differences across samples, a new regression was estimated to understand whether this relationship changes over time. This regression contains an interaction between government debt and a post-2015 dummy:

$$\begin{aligned}
 Leverage_{c,t} = & \beta_1 Gov. Debt\_to\_GDP_{c,t-1} \\
 & + \beta_2 (Gov. Debt\_to\_GDP_{c,t-1} \times Post2015_t) + Controls_{c,t-1} + \eta_c + \delta_t \\
 & + \varepsilon_{c,t} \quad (2)
 \end{aligned}$$

Equation 2, like Equation 1, is estimated separately for two leverage ratios: *Book Leverage*, and *Debt-to-Capital*.  $Gov. Debt - to - GDP_{c,t-1}$  is the total government debt as a percentage of GDP. Controls denote country-level macroeconomic variables and firm-level leverage determinant variables, while  $\eta_c$  and  $\delta_t$  represent, respectively, country and year-fixed effects, as explained in depth in Equation 1.

This specification includes an interaction between the  $Post2015_t$  dummy and the government debt variable. In this case,  $\beta_1$  represents the effect of government debt on leverage before 2015 and  $\beta_2$  represents how this association changes after 2015.

Table 10  
Post 2015 Interaction

	(1) Book leverage	(2) Debt-to-Capital
Gov. debt-to-GDP <sub>t-1</sub>	-0.039* (0.023)	-0.055 (0.035)
Gov. debt-to-GDP <sub>t-1</sub> * Post_2015	0.011 (0.013)	0.005 (0.018)
Constant	0.419** (0.178)	0.413 (0.287)
Control Variables	Yes	Yes
Year FE	Yes	Yes
Country FE	Yes	Yes
Observations	1,144	1,144
R-squared	0.810	0.777
Adj. R-squared	0.795	0.759

Robust standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 11  
Linear Combination Test

$\beta_1 + \beta_2$	Coefficient	Standard Error	P-Value
Book Leverage	-0.0281	0.017	0.11
Debt-to-Capital	-0.0496	0.024	0.05

Table 10 reports the estimation results for the Pre-Post 2015 interaction regression, using the country panel. *Book leverage* is defined as the ratio of total book debt of all firms in a country to total book assets. *Debt-to-capital* is the ratio of total book debt to total capital (book debt plus book equity) in each country. *Gov. debt-to-GDP* is gross government debt divided by GDP. *Post\_2015* is a dummy and equals 1 in case the observation occurred after 2015. Control Variables are explained in Table 1. All regressions include country and year-fixed effects. The standard errors are clustered at both the country and year level. Table 11 displays the linear combination test for  $\beta_1 + \beta_2$ .

The coefficient on *Government debt-to-GDP* remains negative and statistically significant at the 10% level for *Book Leverage*. Even though the interaction term,  $\beta_2$ , is positive (0.011), it is not significant and no reliable interpretation can be made.

Interestingly, when evaluating the full sample (1990-2024), only the regression using *Debt-to-Capital* as the dependent variable shows a statistically significant relationship with government debt. Although neither the pre-2015 coefficient nor the post-2015 interaction term are individually statistically significant, a test of the post-2015 slope indicates statistical significance at the 5% level. This is likely just a reflection of variation, in how different leverage measures respond to government debt over time, rather than a strengthening of the relationship. Hence, these findings do not contradict the broader suggestion that the negative association between government and corporate debt seems to weaken or become less robust in the post-2015 period.

## 5.2. Possible Reasons

The loss of statistical significance in the government debt and corporate leverage relationship after 2015 suggests that the macroeconomic scenario changed in ways that weakened this relation, which was previously observable. There are several events that happened after 2014 that could plausibly help explain why this change rose.

Firstly, a key factor is the substantial shift in monetary conditions after the Global Financial Crisis. Major central banks undertook exceptional quantitative easing and sustained super-low, even negative, interest rates during this period. These policies kept government bond yields historically low while maintaining liquidity, even as public debt rose.

In effect, central banks absorbed much of the sovereign debt supply and maintained cooperative actions. In advanced economies, central banks implemented large-scale asset purchase programs as part of quantitative easing, resulting in them absorbing much of the sovereign debt that was being issued. In some countries, quantitative easing practices even included the purchase of corporate bonds. For example, the European Central Bank (ECB) launched, in 2016, the Corporate Sector Purchase Programme, although it was only implemented in very few Eurozone countries. By directly buying corporate bonds, the ECB was able to lower corporate yields by approximately 20-30 basis points and also stimulate debt issuance.

As a result, the traditional crowding out effect, where higher government debt issuance drives up interest rates and makes corporate borrowing more expensive, may have been impacted and muted. Given that these monetary interventions were performed by several countries in the

sample, such as the United States, Japan, the United Kingdom and the Eurozone, it is important to analyze whether such an event is a possible reason for the insignificance issue.

Therefore, in line with the pre-post 2015 analysis, a new regression was built. This regression includes an interaction between government debt and a *QE*, a dummy that identifies which countries in the sample have employed quantitative easing.

$$\begin{aligned} Leverage_{c,t} = & \beta_1 Gov. Debt\_to\_GDP_{c,t-1} \\ & + \beta_2 (Gov. Debt\_to\_GDP_{c,t-1} \times QE_c) + Controls_{c,t-1} + FE_t + \varepsilon_{c,t} \quad (3) \end{aligned}$$

Equation 3, as the previous equation, is run separately for *Book Leverage* and *Debt-to-Capital*. Controls denotes country-level macroeconomic variables and firm-level leverage determinant variables, as explained in depth in Equation 1. FE represents year-fixed effects to control for common global shocks.

Here,  $\beta_1$  shows the effect of government debt on leverage in non-QE countries and  $\beta_2$  represents how this relation changes for QE countries.

The coefficient on *Government debt-to-GDP* remains negative for both leverage ratios and all coefficients show significance at 1% level. In non-QE countries, a 10 percentage point increase in government debt is associated with a reduction of book leverage by 0.49 percentage points. The interaction term between government debt and the QE term is positive and statistically significant, indicating that the correlation between government debt and leverage differs between QE and non-QE countries. As such, a 10 percentage point increase in government debt is followed by a 0.75 percentage point increase in book leverage, significant at a 1% level. The same relation occurs for the ratio *Debt-to-Capital*, although it is stronger.

Furthermore, the test of the post-QE slope indicates that the association between government debt and leverage in QE countries is statistically different from zero.

This indicates that quantitative easing measures diminish the crowding-out effect. This is in line with the initial idea, as quantitative easing is expected to soften financial constraints that would otherwise arise from increasing government debt.

Table 12  
Quantitative Easing Interaction

	(1)	(2)
	Book leverage	Debt-to-Capital
Gov. debt-to-GDP <sub>t-1</sub>	-0.049*** (0.013)	-0.107*** (0.019)
Gov. debt-to-GDP <sub>t-1</sub> * QE	0.075*** (0.014)	0.148*** (0.021)
Constant	0.767*** (0.035)	1.129*** (0.054)
Control Variables	Yes	Yes
Year FE	Yes	Yes
Country FE	No	No
Observations	1,144	1,144
R-squared	0.610	0.493
Adj. R-squared	0.593	0.472

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 13  
QE - Linear Combination Test

$\beta_1 + \beta_2$	Coefficient	Standard Error	P-Value
Book Leverage	0.0260	0.006	0.00
Debt-to-Capital	0.0411	0.009	0.00

Table 12 reports the estimation results for the Quantitative Easing (QE) interaction regression, using the country panel. *Book leverage* is defined as the ratio of total book debt of all firms in a country to total book assets. *Debt-to-capital* is the ratio of total book debt to total capital (book debt plus book equity) in each country. *Gov. debt-to-GDP* is gross government debt divided by GDP. *QE* is a dummy and equals 1 in case the country performed QE. Control Variables are explained in Table 1. All regressions include year-fixed effects. Table 13 displays the linear combination test for  $\beta_1 + \beta_2$ .

Another important event was the COVID-19 pandemic, which occurred in the full sample timeline. During this period, extraordinary measures were introduced by both governments and firms. The COVID shock in 2020 saw an exceptional jump in public debt ratios, while corporate debt patterns varied, with some firms borrowing heavily to build cash buffers and others reducing debt as a means of protection. For instance, countries like China, India and Japan saw rapid corporate debt growth alongside rising government debt. Hence, the pandemic may also be weakening the corporate-government debt relationship being studied.

To test this, a similar regression to the quantitative easing analysis was constructed. This regression includes an interaction between government debt and Covid, a dummy that identifies the observations that occur between 2020 and 2023. This time period was chosen in accordance

with the World Health Organization, since COVID-19 was declared a Public Health Emergency of International Concern (PHEIC), from January 2020 to May 2023.

$$\begin{aligned} \text{Leverage}_{c,t} = & \beta_1 \text{Gov. Debt\_to\_GDP}_{c,t-1} \\ & + \beta_2 (\text{Gov. Debt\_to\_GDP}_{c,t-1} \times \text{Covid}_t) + \text{Controls}_{c,t-1} + FE_c + \varepsilon_{c,t} \quad (4) \end{aligned}$$

Equation 4, like the previous equations, is run separately for *Book Leverage* and *Debt-to-Capital*. Controls denotes country-level macroeconomic variables and firm-level leverage determinant variables, as explained in depth in Equation 1. FE represents country-fixed effects to absorb time-invariant country characteristics.

Here,  $\beta_1$  shows the effect of government debt on leverage in non-COVID years, while  $\beta_2$  represents how this relation changes during 2020-2023, the pandemic years.

For non-COVID years, an increase in government debt to GDP is associated with a significant decrease in both *Book Leverage* and *Debt-to-Capital*, at a 1% significance level. This aligns with the original hypothesis and earlier findings. As for the interaction term, it is positive but insignificant in both regressions. Further, a linear combination test indicates that the implied association during the COVID period remains statistically different from zero.

This suggests that the relationship between sovereign debt and corporate leverage did not meaningfully change during the pandemic, despite the rise in public debt. This is likely due to the extraordinary monetary and fiscal measures that were introduced during this period. For example, several countries included in the QE analysis applied these measures during the COVID period. Thus, even though the pandemic marked a period of extraordinary government borrowing, it only weakened the relation with corporate debt slightly.

Overall, the two regressions indicate that quantitative easing programs and the COVID-19 pandemic diminish the crowding-out effect. More specifically, the quantitative easing results appear to be explanatory of the loss of significance in the baseline regression of this study.

Table 14  
COVID-19 Interaction

	(1)	(2)
	Book leverage	Debt-to-Capital
Gov. debt-to-GDP <sub>t-1</sub>	-0.043*** (0.008)	-0.074*** (0.030)
Gov. debt-to-GDP <sub>t-1</sub> * Covid	0.009 (0.009)	0.008 (0.013)
Constant	0.563*** (0.047)	0.746*** (0.069)
Control Variables	Yes	Yes
Year FE	No	No
Country FE	Yes	Yes
Observations	1,144	1,144
R-squared	0.797	0.761
Adj. R-squared	0.787	0.750

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 15  
Covid - Linear Combination Test

$\beta_1 + \beta_2$	Coefficient	Standard Error	P-Value
Book Leverage	-0.0349	0.009	0.00
Debt-to-Capital	-0.0657	0.014	0.00

Table 14 reports the estimation results for the COVID-19 interaction regression, using the country panel. *Book leverage* is defined as the ratio of total book debt of all firms in a country to total book assets. *Debt-to-capital* is the ratio of total book debt to total capital (book debt plus book equity) in each country. *Gov. debt-to-GDP* is gross government debt divided by GDP. *Covid* is a dummy and equals 1 in case the occurred between 2020 and 2023 (inclusive) Control Variables are explained in Table 1. All regressions include country-fixed effects. Table 14 displays the linear combination test for  $\beta_1 + \beta_2$ .

Lastly, there are other hypotheses for this change in the relation between public and private debt, although these are harder to study empirically. Following the GFC, the near-zero interest rate period may have altered investor behavior. Government bonds, often seen as safer assets, were yielding very little, leading investors to reallocate funds from these to higher return securities, like corporate bonds. In fact, a 2020 OECD report finds that, since 2008, the annual global corporate bond issuance averaged \$1.8 trillion, more than double the average between 2000 and 2007. Hence, this increase in demand allowed firms to raise debt capital more easily than before. Furthermore, after the GFC and the Sovereign Debt Crisis (SDC), there was a significant shift in bank behavior and regulations. Apart from the quantitative easing measures, the post-crisis banking regulation, such as Basel III, introduced liquidity and capital rules that

incentivized banks to hold high-quality liquid assets, mostly government bonds. Hence, these new rules may have also had an impact on the crowding-out effect being studied.

## 6. Firm-Level Analysis

In this section, the second phase of the empirical analyses is done. Specifically, firm-level data will be used, allowing to control for firm-specific determinants of leverage as well as controlling for possible changes in the composition of firms.

### 6.1. Baseline Analysis

Consistent with the country-level analysis performed before, a similar regression framework was employed, using the *Government Debt-to-GDP* ratio and macroeconomic variables. In this case, firm-fixed effects are used instead of country-fixed effects:

$$Leverage_{i,t} = \beta_1 Gov. Debt - to - GDP_{c,t-1} + \beta_2 X_{c,t-1} + \beta_3 Y_{i,t-1} + \eta_i + \delta_t + \varepsilon_{i,t} \quad (5)$$

Equation 5, like Equation 1, is also estimated separately for the three different definitions of leverage (*Book Leverage*, *Debt-to-Capital* and *Market Leverage*).  $X_{c,t-1}$  denotes country-level macroeconomic variables, as the natural logarithm of GDP per capita and the unemployment rate.  $Y_{i,t-1}$  denotes firm-level leverage determinant variables, namely tangibility and ROA. Lastly,  $\eta_i$  and  $\delta_t$  represent, respectively, firm and year-fixed effects.

In line with the first analysis, a regression was performed (Table 9), including macroeconomic and financial variables, as well as yearly and firm fixed effects. The standard errors are reported in parentheses and were clustered both at the country and year levels.

Across the three leverage ratios, a negative relation between government and firm debt can be observed. For the dependent variables *Debt-to-Capital* and *Book Leverage*, such relation is significant at a 1% significance level. As for *Market Leverage*, no significant relation was found. For the case of *Book Leverage*, a 10 percentage point increase in government debt relative to GDP is associated with a decrease of the *Book Leverage* ratio of 0.40 percentage points. The results are similar to *Debt-to-Capital*, with a reduction of 0.56 percentage points following a 10 percentage point increase in government debt to GDP.

Opposite to the country-level analysis, the firm-level control variables are consistently significant at a 1% level. As such, leverage increases with both tangibility of assets and firm size (proxied by total assets) and decreases with ROA and market-to-book ratio.

Without firm fixed effects, the same negative effect is present, as well as insignificance in the regression with *Market Leverage* as the dependent variable.

Table 16  
Baseline Regressions (Firm panel)

	(1) Book leverage	(2) Debt-to-Capital	(3) Market leverage
Gov. debt-to-GDP <sub>t-1</sub>	-0.040*** (0.006)	-0.056*** (0.007)	-0.011 (0.009)
Ln(GDP per capita <sub>t-1</sub> )	-0.011*** (0.004)	-0.005 (0.006)	-0.007 (0.008)
Ln(CPI <sub>t-1</sub> )	0.002** (0.001)	0.003** (0.001)	0.002* (0.001)
Ln(S&P Index <sub>t-1</sub> )	0.002** (0.001)	0.002** (0.001)	0.003** (0.001)
Ln(Exchange Rate <sub>t-1</sub> )	0.012*** (0.003)	0.020*** (0.005)	0.004 (0.003)
Unemployment rate <sub>t-1</sub>	-0.369*** (0.058)	-0.386*** (0.077)	-0.330*** (0.100)
Tangibility <sub>t-1</sub>	0.160*** (0.009)	0.188*** (0.012)	0.155*** (0.008)
Ln(Assets <sub>t-1</sub> )	0.026*** (0.002)	0.034*** (0.003)	0.037*** (0.003)
ROA <sub>t-1</sub>	-0.211*** (0.008)	-0.330*** (0.011)	-0.205*** (0.010)
Market-to-Book <sub>t-1</sub>	-0.003*** (0.001)	-0.004*** (0.001)	-0.023*** (0.001)
Constant	0.207*** (0.037)	0.208*** (0.053)	0.133* (0.078)
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	384,068	384,068	384,068
R-squared	0.722	0.707	0.769
Adj. R-squared	0.690	0.674	0.743

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

This table reports the estimation results from firm-fixed effects regressions. The variables are defined in the legend of Table 1. All regressions include firm- and year-fixed effects. The standard errors are clustered at both the firm and year level.

## 6.2. Firm Characteristics

This section examines the firms' characteristics to investigate whether the relationship between government debt and corporate leverage varies across firms with different features.

In accordance with the baseline regression, *Government Debt-to-GDP* is interacted with indicators for firm size, profitability and asset tangibility:

$$\begin{aligned} \text{Leverage}_{i,t} = & \beta_1 \text{Gov. Debt\_to\_GDP}_{c,t-1} \\ & + \beta_2 (\text{Gov. Debt\_to\_GDP}_{c,t-1} \times \text{FirmType}_{i,t}) + \text{Controls}_{i,t-1} + \eta_i + \delta_t \\ & + \varepsilon_{i,t} \quad (6) \end{aligned}$$

Equation 3, like the others, is also estimated separately for the three different definitions of leverage (*Book Leverage*, *Debt-to-Capital* and *Market Leverage*). Controls include country-level macroeconomic variables and firm-level leverage determinant variables, while  $\eta_i$  and  $\delta_t$  represent, respectively, firm and year-fixed effects.

For the firm size, a dummy was created,  $X\_Large$ . This variable will equal 1 if the firm belongs in the top 20% of assets within its country-year. This means that large firms are defined relative to their peers in the same country and year. For profitability,  $X\_Profitable$  was created, which identifies firms as profitable if they are above the median ROA in their country-year. Lastly, for Tangibility, firms above the median asset tangibility in country-year equal 1 in the dummy  $X\_Tangible$ . The results are given by the interaction coefficients, which show how the effect changes for the firms belonging to each firm characteristic.

The results show that the negative relation between government debt and corporate leverage is present with different magnitudes across all firm types. Specifically, the interaction terms across the three leverage measures suggest that profitable firms react more to changes in government debt. This finding is intuitive, as profitable firms are expected to have more financial flexibility, allowing them to adjust their capital structure more easily. Moreover, profitable firms may use their internal funds initially and may also face lower costs in switching between equity and debt financing, explaining why they are able to adjust more, compared to less profitable firms, when government borrowing increases.

Table 17

## Interaction with firm characteristics

	Book Leverage (1)-(3)			Debt-to-Capital (4)-(6)			Market Leverage (7)-(9)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Gov. debt-to-GDP <sub>t-1</sub>	-0.0410*** (0.0036)	-0.0379*** (0.0034)	-0.0403*** (0.0035)	-0.0566*** (0.0051)	-0.0540*** (0.0048)	-0.0594*** (0.0049)	-0.0148*** (0.0036)	-0.0109*** (0.0034)	-0.0166*** (0.0036)
X I(Large)	0.0037 (0.0032)			0.0024 (0.0045)			0.0109*** (0.0032)		
X I(Profitable)		-0.0055*** (0.0013)			-0.0063*** (0.0018)			-0.0029** (0.0013)	
X I(Tangible)			0.0028 (0.0021)			0.0084*** (0.0029)			0.0114*** (0.0021)
Country-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	384,068	384,069	384,070	384,071	384,072	384,073	384,074	384,075	384,076
Adj. R-Square	0.7219	0.7240	0.7224	0.7074	0.7096	0.7079	0.7696	0.7728	0.7698

Standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

This table reports the results from firm-panel regressions with firm size, profitability and tangibility interactions. *X\_Large* is a dummy and equals one if a firm's lagged book assets is in the top 20 percentile of its country-year distribution. *X\_Profitable* is a dummy and equals 1 if a firm's lagged ROA is above its country median in a given year. *X\_Tangible* is a dummy that equals 1 for firms above the median asset tangibility in country-year. The remaining variables are defined in the legend of Table 1. All regressions include firm- and year-fixed effects. The standard errors are clustered at both the firm and year level.

As for tangibility, the positive interaction coefficients indicate that more tangible firms are less sensitive to shifts in public debt. This is in accordance with capital structure studies, as companies with more tangible assets generally use more debt financing, as these assets are easier to pledge as collateral and often reassure lenders of financial stability. Hence, the crowding out effects appear to be stronger for firms with low asset tangibility, likely because these firms face tighter borrowing conditions when public debt rises, as lenders become more cautious and their assets cannot be used as collateral.

Although the results for firm size do not show significance, large firms appear to be less responsive to increases in government debt. Typically, larger firms have greater access to sources of funding, as they may be perceived with higher creditworthiness and stronger financial positions. As a result, larger firms may find it easier to raise debt, even when public borrowing intensifies, indicating that sovereign debt does not constrain their leverage decisions to the same extent as it does for smaller firms.

Thus, these results show that the negative relation between corporate and government debt holds for the entire sample but with different strengths depending on the firm characteristics, highlighting heterogeneity in the crowding-out effect. Particularly for this thesis sample, firms with more profitability appear to respond more to changes in government debt, while firms with more tangible assets appear to be less sensitive.

## 7. Robustness Tests

As a robustness test, the baseline regressions, both at the country and firm level, were run for OECD countries. Since the sample includes emerging economies, and these may skew results due to weaker financial systems, restricting to OECD removes this possible noise. Further, the OECD countries represent a more homogeneous institutional environment, as they share more stable monetary policies and stronger financial markets.

In both regressions, which can be found in the Appendix, the coefficients for *Government Debt-to-GDP* are very similar to the full sample. This indicates that the baseline results are most likely driven by OECD countries and not skewed by emerging economies. Moreover, as observed before, the country-level regression does not show significance, while the coefficients are significant at a 1% level in the firm-level analysis for *Book Leverage* and *Debt-to-Capital*.

Additionally, a dynamic test was also performed for the OECD sample. As before, the results indicate that variations in government debt to GDP are associated with subsequent changes in corporate leverage. No positive coefficients appear in the analysis, reinforcing that there is no reversal of the crowding-out effect in the following years. The lag  $t - 3$  to  $t - 4$  horizon is significant at a 10% significance level.

Lastly, an important concern about the crowding-out effect is that government debt is endogenous. This means that firms might adjust their capital structure in response to economic circumstances, which are correlated with the supply of government debt, and not directly due to sovereign debt itself. Throughout this thesis, the endogeneity concern was mitigated by including year-fixed effects and country-level variables in the regressions. The fixed effects help capture the impact of the global business cycle, while the macroeconomic variables capture the local business environment. However, it is important to note that including these fixed effects alone is insufficient to completely address the endogeneity problem. Hence, causality cannot be inferred from the results shown. In future research, to ensure causality, a quasi-natural experiment should be considered. Further, the main regressions were also done without fixed effects and can be found in the Appendix.

## **8. Limitations and future research**

Firstly, studies on capital structure often exclude firms in the financial, public administration and utility sectors. Although a similar approach was intended in this thesis, the Compustat Global database was found to contain missing and/or inconsistent industry identifiers for some cross-border firms, making it unreliable to apply these exclusions. To limit the risk of misclassification, these sectors were kept in the final sample. Hence, it must be noted that their inclusion may influence the overall leverage levels, but, given the data limitations, applying a consistent treatment of industries across all countries was considered the more appropriate approach.

Secondly, this study explores heterogeneity across firm characteristics such as size, profitability and tangibility. In future research, if reliable information is available for industries and firm sectors, it could be investigated whether the relationship varies more strongly within specific sectors or industries.

Thirdly, another limitation of this research is that the distribution of observations is not the same across all countries. The United States, Japan, China and India hold the largest number of observations, representing approximately 50% of the total observations. Moreover, given that the sample includes both developed and emerging economies, it is crucial to consider that results may reflect each country's regulation of firms.

Fourthly, despite the use of fixed effects and macroeconomic variables, government debt and corporate leverage may be jointly influenced by factors that were not considered. Empirical studies often employ the use of instrumental variables in these cases. Although it was not done in this thesis, it could be employed in future research, as it could help to isolate exogenous variation in government debt.

## 9. Conclusion

The objective of this thesis was to examine how changes in government debt impact firm capital structures. With a sample of 40 countries and a timeline between 1990 and 2024, the study aimed at determining whether higher sovereign debt is associated with lower leverage ratios, while also analyzing how this relation changes with firm characteristics and macroeconomic conditions.

The firm-level results indicate a significant negative relationship, with higher government debt levels being associated with lower corporate debt. This indicates a financial crowding-out effect. Moreover, this effect showed to be heterogeneous across firms, as small firms and firms with low tangible assets show a stronger adjustment in leverage when government debt rises. Firms with these characteristics are likely more affected as they probably do not have easy access to other capital types (i.e. issuing equity or internal financing) when faced with higher funding costs. Even when focusing on a restricted sample of OECD economies, the negative relation holds.

As for the country-level analysis, to address macroeconomic questions, additional regressions were performed. Government debt was split between domestic and external, to test whether the crowding-out effect differed. The results show the effect is stronger for domestic government debt, since in the case government debt's supply is absorbed externally, domestic funds remain available for firms. Further, corporate leverage was split between long and short-term. A significant relation between government debt and long-term corporate leverage was found, which may reflect that government debt primarily captures long-term fiscal conditions, consistent with previous empirical studies.

On the other hand, the baseline regressions on the country level showed little to no significance, contrary to prior literature on the crowding-out effect. Hence, an investigation was performed and it was found that, after 2015, the crowding out effect was significantly diminished, whereas before there was a significant negative effect of government debt on corporate debt. Notably, further research highlighted the crowding-out effect changes during exceptional periods. During the Covid-19 pandemic and under aggressive quantitative easing (QE) regimes, the negative link between government debt and firm leverage appears to be muted. This suggests that extraordinary monetary policy can offset traditional crowding-out.

These conclusions contribute to the literature on fiscal and corporate finance interactions. In line with Demirci et al. (2019), this thesis's results support the idea that government debt crowds out corporate debt. This literature was extended by incorporating recent data, including the post-2015 period, as well as pandemic shocks and QE regimes. By showing that QE and COVID conditions weaken the traditional sovereign debt and corporate debt relationship, this study underscores the importance of fiscal and monetary interactions.

In summary, this thesis validates that high government debt is linked to lower corporate leverage but such an effect can be severely diminished with monetary intervention, such as quantitative easing practices.

## Appendix

Table 0: OECD Countries & Reestructuring Events

OECD Countries	Membership Year	Country	Event Year
Australia	1971	Argentina	2001
Austria	1961	Argentina	2002
Belgium	1961	Argentina	2003
Canada	1961	Argentina	2004
Chile	2010	Argentina	2005
Denmark	1961	Argentina	2014
Finland	1969	Argentina	2020
France	1961	Brazil	1990
Germany	1961	Brazil	1994
Greece	1961	Brazil	1998
Ireland	1961	Greece	2012
Israel	2010	Greece	2015
Italy	1962	Indonesia	1998
Japan	1964	Indonesia	1999
South Korea	1996	Indonesia	2000
Mexico	1994	Philippines	1991
Netherlands	1961	Philippines	1992
New Zealand	1973	Philippines	1993
Norway	1961	Russia	1998
Poland	1996		
Portugal	1961		
Spain	1961		
Sweden	1961		
Switzerland	1961		
Turkey	1961		
United Kingdom	1961		
United States	1961		

*19 Events*

*27 / 40 Countries*

Table A: Sample Overview I

Country	Number of Years	Number of Firms	Number of Observations	Minimum	Maximum
Argentina	17	75	665	1997	2024
Australia	36	2 358	16 042	1989	2024
Austria	36	131	3 042	1989	2024
Belgium	36	187	4 834	1989	2024
Brazil	24	413	4 461	2001	2024
Canada	36	2 699	17 948	1989	2024
Chile	32	186	2 824	1993	2024
China	29	5 191	42 468	1995	2024
Denmark	33	236	2 552	1992	2024
Finland	36	248	3 208	1989	2024
France	36	1 179	13 618	1989	2024
Germany	34	1 035	11 580	1991	2024
Greece	27	254	2 933	1996	2024
Hong Kong	21	171	1 931	2004	2024
India	29	4 213	36 335	1996	2024
Indonesia	24	747	6 303	2001	2024
Ireland	30	114	1 028	1995	2024
Israel	25	492	4 333	2000	2024
Italy	36	619	5 863	1989	2024
Japan	36	4 487	72 133	1989	2024
Malaysia	35	1 270	17 299	1990	2024
Mexico	28	144	1 965	1997	2024
Netherlands	36	299	3 430	1989	2024
New Zealand	34	197	1 839	1991	2024
Norway	36	415	3 203	1989	2024
Peru	25	99	1 225	2000	2024
Philippines	30	200	2 430	1995	2024
Poland	28	766	6 823	1997	2024
Portugal	31	83	1 083	1994	2024
Russia	25	272	2 362	1999	2024
Singapore	35	812	9 967	1990	2024
South Africa	25	352	3 693	2000	2024
South Korea	32	2 493	24 284	1993	2024
Spain	35	271	3 332	1990	2024
Sweden	32	939	7 299	1993	2024
Switzerland	35	302	4 228	1990	2024
Thailand	14	789	4 248	1996	2024
Turkey	14	472	2 681	2002	2024
United Kingdom	36	2 766	24 265	1989	2024
United States	24	11 893	84 069	2001	2024
Total	1 203	49 869	463 826	1989	2024

Table B: Sample Overview II

Country	Book Leverage	Debt-to-Capital	Market Leverage	Gov. Debt to GDP	Ln(GDP Per Capita)	Ln(CPI)	Ln(S&P Index)	Unemployment	Ln(Exchange Rate)
Argentina	0,28	0,42	0,22	0,60	9,36	2,18	4,21	0,09	1,78
Australia	0,27	0,38	0,20	0,28	10,47	0,86	3,44	0,06	0,31
Austria	0,23	0,41	0,21	0,71	10,50	0,66	3,55	0,05	0,25
Belgium	0,14	0,28	0,12	1,10	10,44	0,72	3,42	0,08	0,26
Brazil	0,24	0,39	0,39	0,72	8,93	1,76	4,17	0,10	0,50
Canada	0,14	0,52	0,16	0,87	10,42	0,63	3,48	0,08	0,19
Chile	0,31	0,47	0,49	0,17	9,10	1,35	3,97	0,08	5,73
China	0,28	0,41	0,26	0,39	8,24	0,90	3,92	0,01	1,27
Denmark	0,27	0,39	0,19	0,49	10,76	0,32	3,54	0,05	1,93
Finland	0,28	0,41	0,18	0,51	10,49	0,57	3,53	0,09	0,14
France	0,21	0,43	0,16	0,75	10,38	0,34	3,54	0,09	0,21
Germany	0,17	0,38	0,09	0,63	10,52	0,47	3,24	0,07	0,25
Greece	0,30	0,44	0,26	1,39	9,85	1,00	3,90	0,13	0,51
Hong Kong	0,17	0,29	0,14	0,01	10,54	0,82	3,33	0,04	1,76
India	0,33	0,47	0,24	0,75	7,20	1,77	3,84	0,02	2,70
Indonesia	0,32	0,44	0,18	0,37	7,90	1,66	3,59	0,07	8,03
Ireland	0,32	0,44	0,21	0,59	10,78	0,99	3,68	0,08	0,24
Israel	0,35	0,57	0,27	0,71	10,37	0,78	3,37	0,08	1,33
Italy	0,17	0,31	0,14	1,20	10,25	0,91	3,57	0,10	0,40
Japan	0,27	0,45	0,25	1,68	10,52	1,04	3,35	0,04	4,90
Malaysia	0,31	0,42	0,24	0,50	8,79	0,91	3,91	0,03	0,34
Mexico	0,32	0,47	0,26	0,45	9,11	1,63	3,71	0,04	1,94
Netherlands	0,14	0,30	0,12	0,59	10,56	0,54	3,30	0,06	0,22
New Zealand	0,34	0,44	0,25	0,35	10,17	0,75	3,32	0,06	0,31
Norway	0,29	0,45	0,26	0,38	10,91	0,78	3,66	0,04	2,13
Peru	0,25	0,34	0,23	0,32	8,44	0,95	3,89	0,08	0,44
Philippines	0,37	0,53	0,33	0,52	7,58	1,40	3,63	0,08	2,84
Poland	0,22	0,31	0,21	0,48	9,22	1,25	3,64	0,10	0,53
Portugal	0,33	0,53	0,28	0,91	9,80	0,91	3,90	0,09	0,57
Russia	0,17	0,23	0,30	0,22	8,90	2,08	3,70	0,07	2,62
Singapore	0,11	0,16	0,08	0,99	10,48	0,76	3,48	0,02	0,10
South Africa	0,21	0,31	0,18	0,43	8,69	1,65	3,64	0,22	1,61
South Korea	0,31	0,47	0,34	0,28	9,93	0,89	3,81	0,04	6,72
Spain	0,22	0,40	0,16	0,70	10,02	1,34	3,70	0,16	0,47
Sweden	0,26	0,39	0,21	0,48	10,67	0,44	3,75	0,08	2,18
Switzerland	0,22	0,34	0,13	0,46	11,01	0,55	3,36	0,03	0,32
Thailand	0,37	0,48	0,28	0,42	8,20	0,99	3,04	0,01	2,44
Turkey	0,25	0,39	0,21	0,39	9,15	2,24	4,49	0,10	0,53
United Kingd	0,18	0,31	0,11	0,60	10,44	0,77	3,22	0,06	0,41
United States	0,14	0,39	0,16	0,93	10,88	0,85	3,29	0,06	0,00
Total	0,25	0,40	0,22	0,61	9,75	1,03	3,63	0,07	1,49

Table C: Country Level Analysis – Baseline Regression, without Country Fixed Effects

	(1) Book leverage	(2) Debt-to-Capital	(3) Market leverage
Gov. debt-to-GDP <sub>t-1</sub>	0.020 (0.017)	0.028 (0.026)	0.001 (0.019)
Ln(GDP per capita <sub>t-1</sub> )	-0.004 (0.006)	0.001 (0.010)	-0.002 (0.009)
Ln(CPI <sub>t-1</sub> )	0.004 (0.003)	0.006 (0.005)	0.009** (0.004)
Ln(S&P Index <sub>t-1</sub> )	0.003** (0.001)	0.004* (0.002)	0.006** (0.002)
Ln(Exchange Rate <sub>t-1</sub> )	0.010*** (0.003)	0.011** (0.004)	0.017** (0.008)
Unemployment rate <sub>t-1</sub>	-0.144 (0.152)	-0.004 (0.271)	0.091 (0.175)
Tangibility <sub>t-1</sub>	-0.016 (0.067)	-0.265** (0.103)	0.134* (0.076)
Ln(Assets <sub>t-1</sub> )	-0.035*** (0.003)	-0.040*** (0.006)	-0.026*** (0.004)
ROA <sub>t-1</sub>	-0.483** (0.217)	-1.135*** (0.299)	-0.935*** (0.322)
Market-to-Book <sub>t-1</sub>	-0.001 (0.003)	-0.003 (0.004)	-0.023*** (0.006)
Constant	0.769*** (0.078)	1.127*** (0.095)	0.598*** (0.076)
Year FE	Yes	Yes	Yes
Country FE	No	No	No
Observations	1,144	1,144	1,144
R-squared	0.586	0.450	0.544
Adj. R-squared	0.570	0.428	0.526

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table D: Country Level Analysis – Domestic vs External Gov. Debt Regression, without Country Fixed Effects

	(1) Book leverage	(2) Debt-to-Capital	(3) Market leverage
Domestic gov. debt-to-GDP <sub>t-1</sub>	0.047 (0.053)	0.098 (0.080)	0.002 (0.054)
External gov. debt-to-GDP <sub>t-1</sub>	-0.111 (0.402)	-0.540 (0.549)	-0.035 (0.601)
Ln(GDP per capita <sub>t-1</sub> )	-0.001 (0.010)	0.014 (0.014)	-0.001 (0.011)
Ln(CPI <sub>t-1</sub> )	0.004 (0.003)	0.007 (0.005)	0.009*** (0.003)
Ln(S&P Index <sub>t-1</sub> )	0.003** (0.001)	0.003 (0.002)	0.006*** (0.002)
Ln(Exchange Rate <sub>t-1</sub> )	0.011*** (0.004)	0.014*** (0.004)	0.017** (0.007)
Unemployment rate <sub>t-1</sub>	-0.151 (0.163)	-0.036 (0.300)	0.091 (0.185)
Tangibility <sub>t-1</sub>	-0.007 (0.066)	-0.235** (0.109)	0.135* (0.077)
Ln(Assets <sub>t-1</sub> )	-0.035*** (0.003)	-0.041*** (0.006)	-0.026*** (0.004)
ROA <sub>t-1</sub>	-0.508** (0.218)	-1.229*** (0.278)	-0.943*** (0.279)
Market-to-Book <sub>t-1</sub>	-0.001 (0.003)	-0.004 (0.004)	-0.023*** (0.006)
Constant	0.749*** (0.086)	1.054*** (0.113)	0.594*** (0.099)
Year FE	Yes	Yes	Yes
Country FE	No	No	No
Observations	1,144	1,144	1,144
R-squared	0.586	0.460	0.544
Adj. R-squared	0.569	0.438	0.526

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table E: Country Level Analysis - Dynamic Relation, with Change in Debt-to-Capital

	$\Delta$ Debt-to-Capital			
$\Delta$ Gov. debt-to-GDP <sub>t-1, t-2</sub>	-0.049 (0.034)			-0.017 (0.033)
$\Delta$ Gov. debt-to-GDP <sub>t-2, t-3</sub>		-0.098*** (0.031)		-0.051* (0.030)
$\Delta$ Gov. debt-to-GDP <sub>t-3, t-4</sub>			-0.104*** (0.031)	-0.079** (0.029)
$\Delta$ Ln(GDP per capita <sub>t-1</sub> )	-0.019 (0.018)	-0.035* (0.018)	-0.030 (0.018)	-0.037* (0.018)
$\Delta$ Ln(CPI <sub>t-1</sub> )	0.001 (0.001)	0.000 (0.001)	0.001 (0.001)	0.000 (0.001)
$\Delta$ Ln(S&P Index <sub>t-1</sub> )	0.001* (0.001)	0.001* (0.001)	0.001* (0.001)	0.001* (0.001)
$\Delta$ Ln(Exchange Rate <sub>t-1</sub> )	-0.030 (0.047)	0.015 (0.039)	0.005 (0.035)	-0.000 (0.036)
$\Delta$ Unemployment rate <sub>t-1</sub>	-0.202* (0.116)	-0.207* (0.105)	-0.256** (0.101)	-0.196* (0.106)
$\Delta$ Tangibility <sub>t-1</sub>	-0.047 (0.068)	-0.049 (0.078)	-0.054 (0.078)	-0.054 (0.078)
$\Delta$ Ln(Assets <sub>t-1</sub> )	-0.009 (0.008)	-0.009 (0.008)	-0.009 (0.008)	-0.009 (0.008)
$\Delta$ ROA <sub>t-1</sub>	0.160 (0.251)	0.197 (0.259)	0.214 (0.261)	0.215 (0.263)
$\Delta$ Market-to-Book <sub>t-1</sub>	-0.001 (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.002 (0.001)
Constant	0.012 (0.009)	-0.002 (0.006)	-0.017 (0.011)	-0.015 (0.010)
Year FE	Yes	Yes	Yes	Yes
Observations	1,046	1,003	964	964
R-squared	0.134	0.146	0.152	0.155
Adj. R-squared	0.098	0.109	0.115	0.116

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table F: Firm Level Analysis – Baseline Regression, without Firm Fixed Effects

	(1) Book leverage	(2) Debt-to-Capital	(3) Market leverage
Gov. debt-to-GDP <sub>t-1</sub>	-0.007** (0.003)	-0.008** (0.003)	-0.005 (0.004)
Ln(GDP per capita <sub>t-1</sub> )	-0.010*** (0.002)	-0.012*** (0.003)	0.006* (0.003)
Ln(CPI <sub>t-1</sub> )	0.006** (0.002)	0.010*** (0.004)	0.013*** (0.005)
Ln(S&P Index <sub>t-1</sub> )	0.004** (0.002)	0.004 (0.003)	0.007** (0.003)
Ln(Exchange Rate <sub>t-1</sub> )	0.004*** (0.001)	0.003** (0.001)	-0.005*** (0.001)
Unemployment rate <sub>t-1</sub>	-0.153*** (0.051)	-0.063 (0.073)	-0.014 (0.070)
Tangibility <sub>t-1</sub>	0.201*** (0.005)	0.139*** (0.008)	0.243*** (0.006)
Ln(Assets <sub>t-1</sub> )	0.011*** (0.000)	0.025*** (0.001)	0.009*** (0.001)
ROA <sub>t-1</sub>	-0.089*** (0.013)	-0.197*** (0.024)	-0.107*** (0.013)
Market-to-Book <sub>t-1</sub>	-0.008*** (0.001)	-0.010*** (0.001)	-0.061*** (0.003)
Constant	0.248*** (0.022)	0.355*** (0.033)	0.158*** (0.048)
Year FE	Yes	Yes	Yes
Firm FE	No	No	No
Observations	388,855	388,855	388,855
R-squared	0.117	0.096	0.228
Adj. R-squared	0.117	0.0958	0.228

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table G: OECD Countries – Baseline Regression, Country Level Analysis

	(1) Book leverage	(2) Debt-to-Capital	(3) Market leverage
Gov. debt-to-GDP <sub>t-1</sub>	-0.026 (0.020)	-0.038 (0.030)	0.001 (0.018)
Ln(GDP per capita <sub>t-1</sub> )	0.057* (0.030)	0.133** (0.048)	0.037 (0.037)
Ln(CPI <sub>t-1</sub> )	0.001 (0.002)	-0.001 (0.003)	0.002 (0.002)
Ln(S&P Index <sub>t-1</sub> )	0.002 (0.002)	0.001 (0.003)	0.003 (0.002)
Ln(Exchange Rate <sub>t-1</sub> )	-0.023 (0.022)	-0.002 (0.034)	-0.032 (0.029)
Unemployment rate <sub>t-1</sub>	0.103 (0.197)	0.213 (0.294)	0.075 (0.181)
Tangibility <sub>t-1</sub>	-0.068 (0.058)	-0.158* (0.087)	0.047 (0.094)
Ln(Assets <sub>t-1</sub> )	-0.045*** (0.003)	-0.072*** (0.006)	-0.041*** (0.002)
ROA <sub>t-1</sub>	-0.602*** (0.105)	-0.837*** (0.174)	-0.738*** (0.189)
Market-to-Book <sub>t-1</sub>	-0.004 (0.002)	-0.006* (0.003)	-0.012*** (0.003)
Constant	0.379 (0.297)	0.170 (0.506)	0.466 (0.370)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Observations	714	714	714
R-squared	0.825	0.803	0.801
Adj. R-squared	0.807	0.782	0.781

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table H: OECD Countries – Dynamic Relation, Country Level Analysis

	$\Delta$ Book leverage				$\Delta$ Debt-to-Capital			
$\Delta$ Gov. debt-to-GDP <sub>t-1, t-2</sub>	-0.029 (0.031)			-0.003 (0.029)	-0.049 (0.039)			-0.012 (0.037)
$\Delta$ Gov. debt-to-GDP <sub>t-2, t-3</sub>		-0.036 (0.027)		-0.014 (0.023)		-0.070* (0.035)		-0.030 (0.029)
$\Delta$ Gov. debt-to-GDP <sub>t-3, t-4</sub>			-0.052* (0.027)	-0.046* (0.026)			-0.084** (0.035)	-0.068** (0.032)
$\Delta$ Ln(GDP per capita <sub>t-1</sub> )	-0.022 (0.020)	-0.029 (0.022)	-0.029 (0.023)	-0.031 (0.023)	-0.030 (0.027)	-0.045 (0.029)	-0.042 (0.030)	-0.047 (0.029)
$\Delta$ Ln(CPI <sub>t-1</sub> )	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	0.000 (0.001)	-0.000 (0.001)	0.000 (0.001)	0.000 (0.001)
$\Delta$ Ln(S&P Index <sub>t-1</sub> )	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.002 (0.001)	0.002 (0.001)	0.002 (0.001)	0.002 (0.001)
$\Delta$ Ln(Exchange Rate <sub>t-1</sub> )	-0.013 (0.055)	-0.060 (0.057)	-0.071 (0.049)	-0.071 (0.048)	0.016 (0.075)	-0.063 (0.083)	-0.071 (0.060)	-0.072 (0.059)
$\Delta$ Unemployment rate <sub>t-1</sub>	-0.193 (0.115)	-0.213** (0.101)	-0.196* (0.101)	-0.181 (0.109)	-0.206 (0.157)	-0.245* (0.133)	-0.277** (0.133)	-0.237 (0.151)
$\Delta$ Tangibility <sub>t-1</sub>	-0.027 (0.068)	-0.038 (0.076)	-0.039 (0.074)	-0.038 (0.074)	-0.047 (0.091)	-0.054 (0.103)	-0.052 (0.102)	-0.051 (0.102)
$\Delta$ Ln(Assets <sub>t-1</sub> )	-0.005 (0.005)	-0.005 (0.005)	-0.005 (0.005)	-0.005 (0.005)	-0.011 (0.009)	-0.011 (0.010)	-0.010 (0.010)	-0.010 (0.010)
$\Delta$ ROA <sub>t-1</sub>	0.033 (0.214)	0.047 (0.220)	0.053 (0.221)	0.053 (0.222)	0.230 (0.321)	0.275 (0.326)	0.279 (0.329)	0.279 (0.331)
$\Delta$ Market-to-Book <sub>t-1</sub>	-0.002 (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.002 (0.001)
Constant	0.009 (0.005)	-0.001 (0.005)	-0.012 (0.008)	-0.012 (0.008)	0.016 (0.010)	-0.001 (0.007)	-0.017 (0.011)	-0.016 (0.011)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	660	636	613	613	774	746	719	719
R-squared	0.166	0.169	0.178	0.178	0.180	0.187	0.196	0.196
Adj. R-squared	0.109	0.112	0.120	0.117	0.133	0.140	0.148	0.147

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table I: OECD Countries – Baseline Regression, Firm Level Analysis

	(1)	(2)	(3)
	Book leverage	Debt-to-Capital	Market leverage
Gov. debt-to-GDP <sub>t-1</sub>	-0.048*** (0.006)	-0.067*** (0.007)	-0.015 (0.009)
Ln(GDP per capita <sub>t-1</sub> )	0.020*** (0.006)	0.031*** (0.008)	0.023** (0.009)
Ln(CPI <sub>t-1</sub> )	0.002** (0.001)	0.004** (0.001)	0.002 (0.001)
Ln(S&P Index <sub>t-1</sub> )	0.001 (0.001)	0.002 (0.001)	0.003* (0.001)
Ln(Exchange Rate <sub>t-1</sub> )	0.018*** (0.004)	0.026*** (0.006)	0.011*** (0.004)
Unemployment rate <sub>t-1</sub>	-0.052 (0.079)	0.028 (0.101)	-0.065 (0.115)
Tangibility <sub>t-1</sub>	0.170*** (0.012)	0.201*** (0.016)	0.173*** (0.011)
Ln(Assets <sub>t-1</sub> )	0.022*** (0.003)	0.029*** (0.003)	0.030*** (0.003)
ROA <sub>t-1</sub>	-0.187*** (0.009)	-0.299*** (0.012)	-0.176*** (0.011)
Market-to-Book <sub>t-1</sub>	-0.001 (0.001)	0.001 (0.001)	-0.020*** (0.002)
Constant	-0.123* (0.071)	-0.159* (0.093)	-0.173 (0.110)
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	275,469	275,469	275,469
R-squared	0.729	0.709	0.780
Adj. R-squared	0.700	0.677	0.756

Robust standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

## References

Becker, B. and Ivashina, V. (2017) “Financial repression in the European sovereign debt crisis”, *European Finance Review*, 22(1), pp. 83-115. <https://doi.org/10.1093/rof/rfx041>.

BIS Quarterly Review (September 2025), International finance through the lens of BIS statistics: bond markets, domestic and international, pp. 67-83. Available at: [https://www.bis.org/publ/qtrpdf/r\\_qt2509e.pdf](https://www.bis.org/publ/qtrpdf/r_qt2509e.pdf)

Çelik, S., G. Demirtaş and M. Isaksson (2020), “Corporate Bond Market Trends, Emerging Risks and Monetary Policy”, OECD Capital Market Series, Paris. Available at: [https://www.oecd.org/content/dam/oecd/en/publications/reports/2020/02/corporate-bond-market-trends-emerging-risks-and-monetary-policy\\_06c7e4f2/9bb44a6b-en.pdf](https://www.oecd.org/content/dam/oecd/en/publications/reports/2020/02/corporate-bond-market-trends-emerging-risks-and-monetary-policy_06c7e4f2/9bb44a6b-en.pdf)

*COVID-19 IHR Emergency Committee*. Available at: <https://www.who.int/groups/covid-19-ihr-emergency-committee> [Accessed: 17 December 2025]

Demirci, I., Huang, J. and Sialm, C. (2019) “Government debt and corporate leverage: International evidence”, *Journal of Financial Economics*, 133(2), pp. 337-356. <https://doi.org/10.1016/j.jfineco.2019.03.009>.

Foley-Fisher, N., Ramcharan, R. and Yu, E. (2016) “The impact of unconventional monetary policy on firm financing constraints: Evidence from the maturity extension program”, *Journal of Financial Economics*, 122(2), pp. 409-429. <https://doi.org/10.1016/j.jfineco.2016.07.002>.

Frank, M.Z. and Goyal, V.K. (2007) “Trade-Off and pecking order theories of debt”  
<https://doi.org/10.2139/ssrn.670543>.

Frank, M.Z. and Goyal, V.K. (2009), “Capital structure decisions: Which factors are reliably important?”, *Financial Management*, 38(1), pp. 1–37. <https://doi.org/10.1111/j.1755-053x.2009.01026.x>.

Friedman, B.M. (1978) “Crowding out or crowding in? Economic consequences of financing government deficits”, *Brookings Papers on Economic Activity*, 1978(3), pp. 593-641.  
<https://doi.org/10.2307/3217952><https://www.jstor.org/stable/3217952>.

Friedman, B.M. (1984) “Implications of Government Deficits for Interest Rates, Equity Returns and Corporate Financing”, NBER, pp.67-90. <https://doi.org/10.3386/w1520>.

Graham, J., Leary, M. and Roberts, M. (2014) “How does government borrowing affect corporate financing and investment?”, NBER, <https://doi.org/10.3386/w20581>.

Graham, J.R., Leary, M.T. and Roberts, M.R. (2014) “A century of capital structure: The leveraging of corporate America”, *Journal of Financial Economics*, 118(3), pp. 658-683.  
<https://doi.org/10.1016/j.jfineco.2014.08.005>.

Greenwood, R., Hanson, S. and Stein, J.C. (2010) “A Gap-Filling Theory of Corporate Debt maturity choice”, *The Journal of Finance*, 65(3), pp. 993-1028.  
<https://doi.org/10.1111/j.1540-6261.2010.01559.x>.

Krishnamurthy, A. and Vissing-Jorgensen, A. (2015) “The impact of Treasury supply on financial sector lending and stability”, *Journal of Financial Economics*, 118(3), pp. 571-600.  
<https://doi.org/10.1016/j.jfineco.2015.08.012>.

Miller, F.M. and M.H. (1958) “The cost of capital, corporation finance and the theory of investment”, *The American Economic Review*, 48(3), pp. 261-297.  
<https://www.jstor.org/stable/1809766>.

Myers, S.C. and Majluf, N.S. (1984) “Corporate financing and investment decisions when firms have information that investors do not have”, *Journal of Financial Economics*, 13(2), pp. 187-221. [https://doi.org/10.1016/0304-405x\(84\)90023-0](https://doi.org/10.1016/0304-405x(84)90023-0).

Wurgler, M.B. and J. (2002) “Market timing and capital structure”, *The Journal of Finance*, 57(1), pp. 1-32. <https://www.jstor.org/stable/2697832>.