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Master's Thesis of Public Administration

How critical is government debt to economic growth?

– Revisiting the non-linearity literature of OECD
countries –

정부부채가 경제 성장에 미치는 영향
- OECD 국가의 비선형 문헌 재검토 -

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Graduate School of Public Administration
Seoul National University
Public Administration Major

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Abstract

If we were to choose the events that had the most significant economic impact on developed countries in the last two decades, the Global Financial Crisis and the recent COVID-19 pandemic would probably be among the top choices of many people. Its implications on government debt have intensified the debate on whether economic growth could be hampered by excessive debt. To shed light on this debate, the present study analyses the long-run effects that public debt has on economic growth in a sample of 24 developed countries from 1997 to 2021 using dynamic panel data and SGMM estimation methods to control for endogeneity and reverse causality. Controlling for these factors allow determining the causal relationship between growth and debt. In a nutshell, it controls for the possibility of erroneously estimating the effects of growth to debt, rather than debt to growth. Additionally, government competitiveness was included as part of the study to explain how internal factors other than the typical economic variables used in the field of economics affect the economic growth of countries.

The results suggest that high public debt-to-GDP ratios have detrimental effects on growth above a certain threshold – excessive indebtedness leads to debt unsustainability – and thus, we find evidence of non-linearities of debt. In particular, the debt threshold estimated when government competitiveness was included as an independent variable was 128% of the debt-to-GDP ratio. For the sample of 24

OECD countries studied, surpassing this threshold has negative effects on growth that will be visible in the long-run.

Keywords: Public debt, economic growth, fiscal policy, debt threshold

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1. Introduction

The world economy is currently in a very challenging position. Numerous events are having tremendous effects on all economies, from the ongoing Russian war against Ukraine to the worldwide spread of the COVID-19 pandemic. The spillover effects of all these events are already starting to be noticeable in the rise in inflation, income inequality, stagnation of economic growth, and spikes of public debt (Im 2014, The World Bank 2022). Although controlling political conflicts or global pandemics might be out of reach, its effects on the economy can be (to some degree) predicted and mitigated by learning from past mistakes.

For this purpose, it makes sense to study past events that have had similar effects on the economy and derive conclusions that allow us to smooth the degree to which current events will affect our daily lives. Special attention has to be given to economic shocks since they all leave their footprints in the fiscal situation of those countries that go through them. In this regard, we can highlight the Global Financial Crisis (GFC) of 2008 and the COVID-19 pandemic. Their heritage is primarily present in the high levels of public debt, an unavoidable topic in the fiscal literature with significant policy implications.

The criticality of public debt is undeniable, mainly because there is no mutual consensus on its impact on economic growth. However, despite its uncertain effects on the economy, public debt levels of high-income countries have been increasing at a cumulative annual growth rate (CAGR) of 1.8% since 1980, as shown in Graph 1.

That of upper-middle, lower-middle, and low-income countries have decreased at a CAGR of -3.6%, -2.4%, and -1.7%, respectively¹.

Graph 2 shows public debt levels by classifying countries by region. Only two groups of countries have a CAGR that surpasses 1% from 1980 to 2020: Europe & Central Asia² and North America, with a CAGR of 1.5% and 2.6%, respectively.

Altogether, this shows the relevance of studying the public debt of OECD countries since, with the exception of Japan, Korea and New Zealand, all OECD countries have either high income or are in Europe or North America. Although debt is also relevant for all countries, it is becoming more apparent that this topic has to be more urgently discussed in OECD countries.

This trend has been especially noticeable during the recent pandemic. In 2020, debt levels reached unimaginable peaks (IMF 2020). Mandatory quarantine enforcements and other government measures to control the spread of the virus have increased unemployment rates, and uncertainty about the future has hindered consumption and investment (ILO-OECD 2020). Further, to face its effects on economic growth,

¹ Countries are classified following the World Bank's Global Financial Development classification of countries by income. Refer to Appendix 1 to see the countries included in each classification.

² Europe and Central Asia are merged together because the World Bank's Global Financial Development classification of countries by region has been followed.

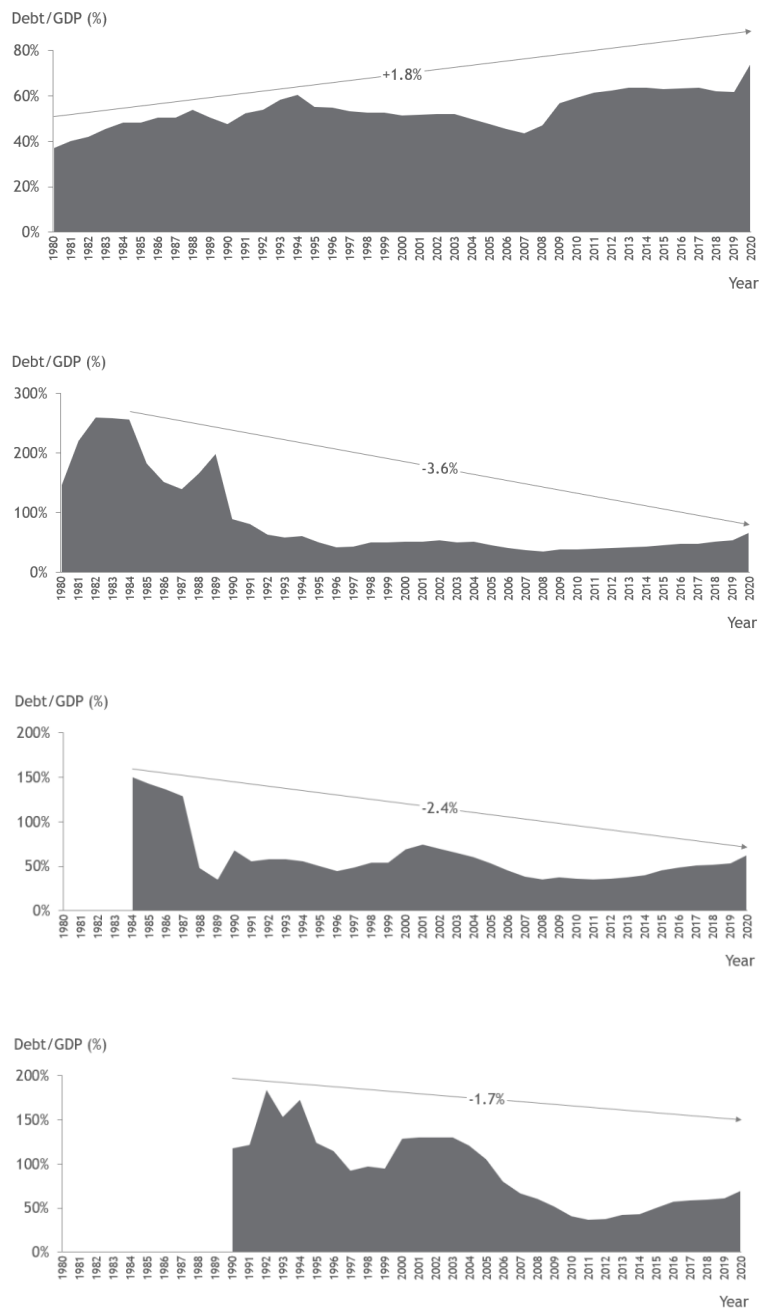
many governments have proposed launching basic income schemes to maintain consumption levels to mitigate the economic damage. All these propositions have a counterpart, requiring large amounts of government spending that put pressure on the already deteriorated fiscal balance of many OCED countries (Molina and Ortiz-Juarez 2020).

This brings us to the following questions: Are current debt levels high? Is high public indebtedness unsustainable in the long run? If so, where is the tipping point?

The following study analyses the effects that public debt has on economic growth, emphasizing two important aspects that the literature highlights. The first is debt nonlinearity, and the second is the causality of debt and growth. Both issues are addressed using System-GMM (SGMM) estimation using data from 24 developed countries from 1997-2021.

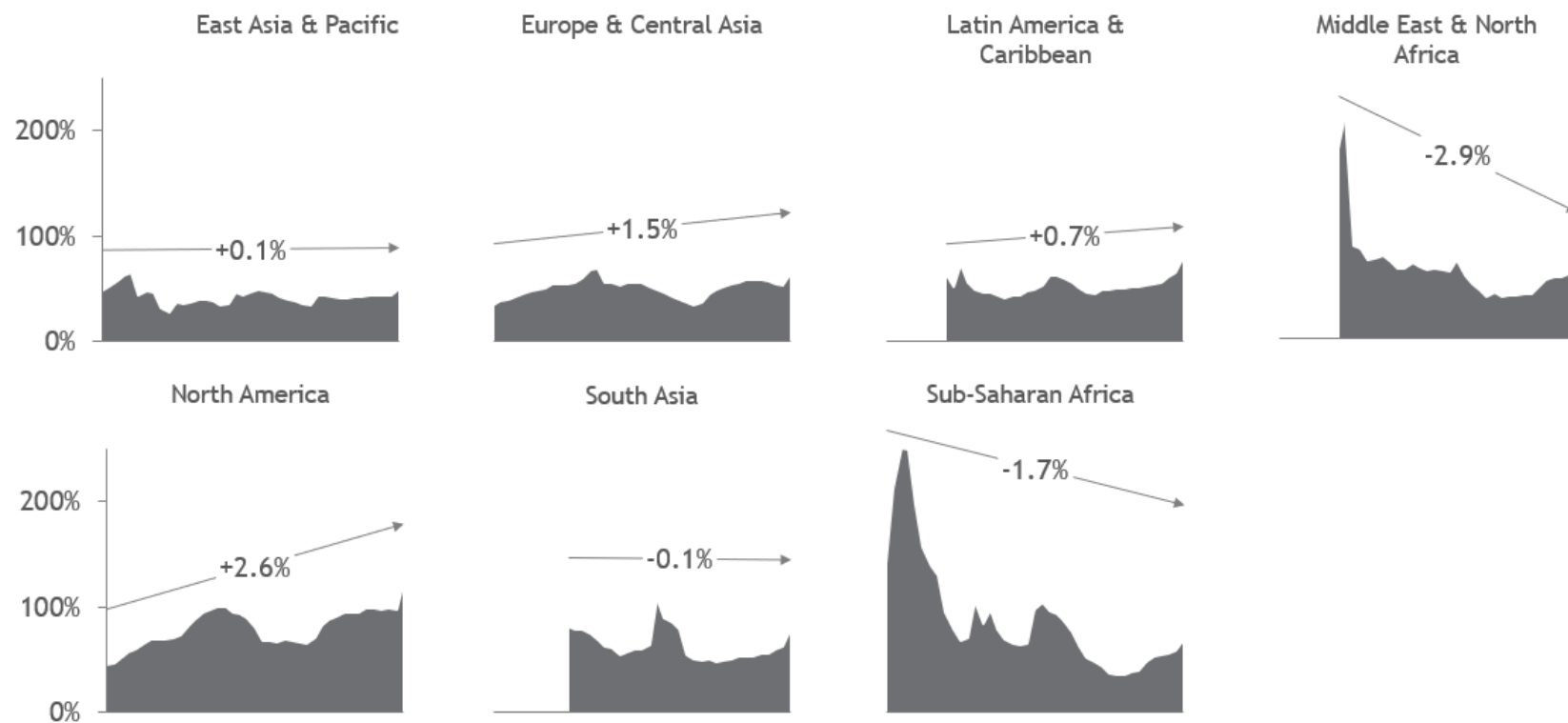
The present study is divided into the following sections: Section 2 presents an overview of the main trends that public debt and economic growth have followed historically; Section 3 describes the theoretical background and summarizes the most relevant literature; Section 4 outlines the econometric model and estimation techniques; Section 5 presents the results; Section 6 draws the main the conclusions and insight of the research.

Graph 1: Public debt-to-GDP ratios of high, upper-middle, lower-middle, and low-income countries



Source: IMF WEO

Graph 2: Public debt-to-GDP ratios of countries by region



Source: IMF WEO

2. Public debt and economic growth: an overview

In recent decades, the historical debt levels of the OECD countries studied in this research (i.e., Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States) have evolved at a considerably steady phase. As shown in Graph 3, the average general government debt-to-GDP ratio of OECD countries³ has had an upward trend with a CAGR of 2.05% from 1980 to 2022. Generally speaking, public debt levels tend to increase during periods of economic recession and stagnation, slowly recovering until the next shock hits the economy and the sequence repeats itself (Salmon 2021).

The most significant public debt ratio increase in modern history occurred during the Global Financial Crisis of 2007, when the debt-to-GDP ratio of OECD countries sample grew at a CAGR of 7.19%.

The second largest batch in terms of magnitude on debt-to-GDP ratios occurred during the 1990s when three historical events took place simultaneously across developed economies around the globe (Graph 3). First is the economic crisis of Nordic countries, notably Finland and Sweden (II–Economic 2009). Second, Japan's asset bubble burst in 1991 – the beginning of the period commonly known as the Lost Decades (Kanaya and Woo 2000). Third, the United States' economic decline

³ Henceforth, OECD countries refers to these 24 sample of countries

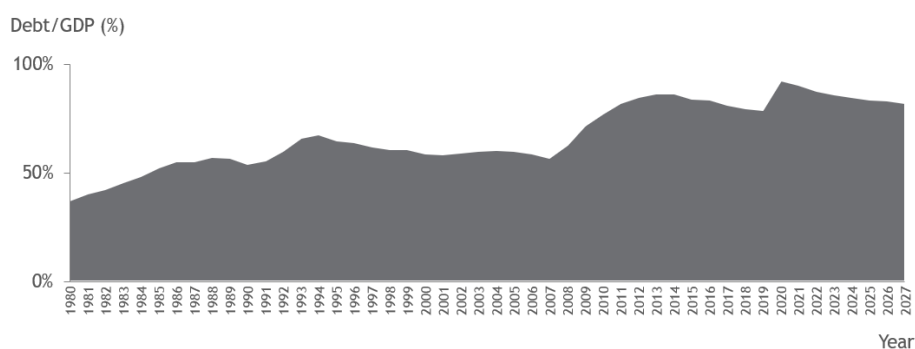
that lasted almost a year (Gardner 1994). From the beginning of the economic downturn of OECD countries until its peak in debt levels in 1994, debt-to-GDP ratios increased at a CAGR of 5.75%.

However, as shown in Graph 3, compared to the ongoing COVID-19 crisis, these two periods only represent the top of the iceberg. In previous economic shocks, debt levels rose steadily in batches. In other words, it took several years to reach peak debt-to-GDP ratios. For instance, during the Global Financial Crisis, it took seven years (from 2007 to 2013) for these OECD countries to go from a public debt-to-GDP ratio of 56.99% to 86.46%, and in the 1990 crisis, it took four years to go from 54.12% to 67.67%. In contrast, debt levels peaked in less than a year from the beginning of the expansion of the pandemic in 2019, growing at a CAGR of 17.16% on average for this sample of OECD countries.

Graph 4 shows the average GDP per capita growth of the sample of OECD countries studied. What is striking from this graph is the exceptionality of COVID-19 in its impact on economic growth. Using the economic shocks mentioned above as examples, note that although the 1990 crisis had detrimental effects on the Japanese and Nordic economies, the scope and magnitude of its impact led to an overall positive GDP per capita growth. The severity of the COVID-19 pandemic is well portrayed in its adverse impact on economic growth. Compared to the Global Financial Crisis, the COVID-19 pandemic led to an additional -0.92% GDP per capita decrease on average (-4.17% during the Global Financial Crisis vs. -5.09% during the COVID-19 pandemic).

What can be noted from the graphs above is that public debt and economic growth do not have an apparent negative relationship, as periods of economic decline do not necessarily translate into debt level rises, nor do debt peaks lead to negative economic growth. In other words, deriving conclusions only based on figures can be misleading (Herndon, Ash et al. 2014).

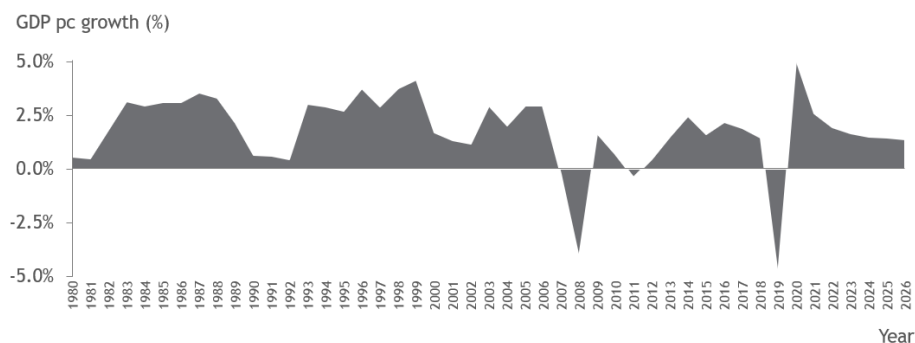
Graph 3. Average debt-to-GDP ratio of the sample of OECD countries studied⁴



Source: IMF WEO (2022)

⁴ Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States

Graph 4. Average GDP per capita growth of sample of OECD countries studied



Source: IMF WEO (2022)

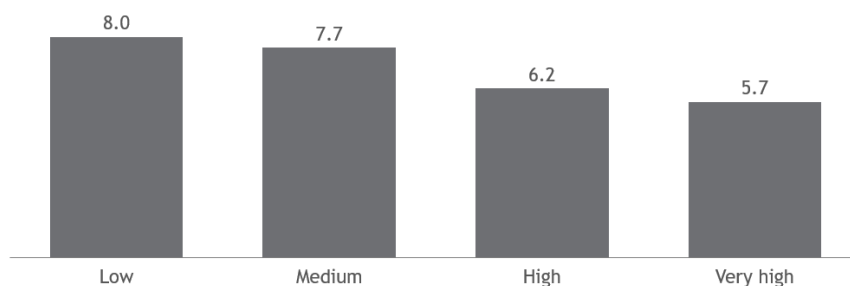
Debt levels have been divided into four different categories, namely, Low, Medium, High, and Very High debt. Each category represents a range of public debt ratios ranging from less than 30% of debt-to-GDP to public debt greater than 90% of the GDP. In a reproduction exercise of the analysis done by Reinhart & Rogoff (Graph 5), as the public debt-to-GDP ratio increases, the five-year cumulative economic growth decreases – we use the cumulative economic growth to see the long-term effects of debt on the economy – going from an average of 8.0% GDP per capita growth when public debt ratios are Low to 5.7% when it is Very High.

Table 1. Public debt classification of R&R (OECD sample studied)

| Classification | Debt-to-GDP ratio criteria | Count |
|----------------|----------------------------|-------|
| Low | $x < 30$ | 63 |
| Medium | $30 \leq x < 60$ | 223 |
| High | $60 \leq x < 90$ | 148 |
| Very high | $x \geq 90$ | 162 |

Source: Own work

Graph 5. 5-year cumulative economic growth of OECD sample studied by public debt-to-GDP ratio classification of Reinhart and Rogoff



Source: own work

However, when another public debt category is added to the classification, the trend shifts in the opposite direction. Table 2 adds one additional classification to the one applied by Reinhard and Rogoff (2010): Extremely High debt for public debt ratios exceeding 120% of the GDP. Interestingly, the associated 5-year cumulative economic growth is 0.5% higher under this classification than in the Very High debt classification, as shown in Graph 6.

Table 2. Public debt classification update (24-country OECD sample)

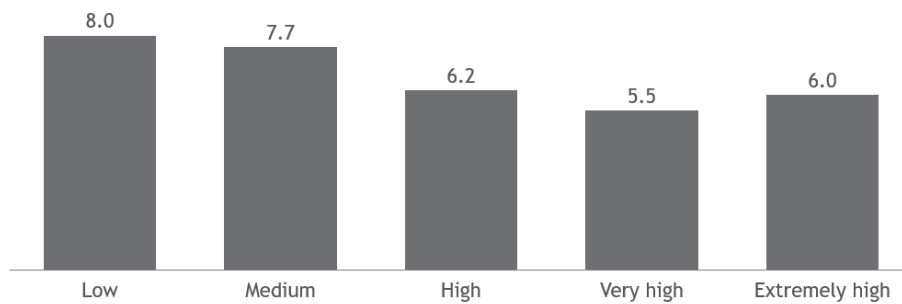
| Classification | Debt-to-GDP criteria | ratio | Count |
|----------------|-------------------------|-------|-------|
| Low | $x < 30$ | | 63 |
| Medium | $30 \leq x < 60$ | | 223 |
| High | $60 \leq x < 90$ | | 148 |
| Very high | $90 \leq x < 120$ | | 98 |
| Extremely high | $x \geq 120$ | | 64 |

Source: Own work

The number of observations included in the new category “Extremely high” debt is 64. One-third of the countries included in the present study have at least one datapoint with debt above 120% of the debt-to-GDP ratio, namely, Belgium, Greece, Iceland, Ireland, Italy, Japan, Portugal, and the United States.

This preliminary observation leads to three important insights about the relationship between public debt and economic growth. First, debt and growth have a non-linear relationship, based on the growth kink when it reaches Extremely High public debt levels. This leads to the second insight of the graph: the possibility of government expenditure being the cause of slow growth rather than the debt itself. Is the government allocating its budget to enhance future growth? Or is it simply spending on short-term investments with no value for future generations? Based on the visual observations in this section, public debt and slow economic growth go hand-in-hand. This brings the following questions: Is public debt putting downward pressure on growth? Or is slow growth putting upward pressure on debt? This leads to the third important insight of the graph: the need for controlling reserved causality and endogeneity issues to make debt the cause and growth the consequence. These three key insights will serve as the building blocks to elaborate the present study.

Graph 6. 5-year cumulative economic growth of OECD sample studied by updated public debt-to-GDP ratio classification



Source: Own work

3. Theoretical background and literature review

On numerous occasions, governments embark on significant spending needs to deal with economic uncertainties, such as the one provoked by the recent global pandemic (IMF 2020). Governments have two choices to collect funds: tax raises and debt issuance. The former has implicit “collection costs and/or indirect misallocation costs that are imposed on the private economy” (Barro 1979). This generates excess burdens and efficiency losses that damage growth (Devarajan, Swaroop et al. 1996). Conversely, public debt has tax-smoothing effects that improve welfare. As a result, it represents the preferred alternative that governments tend to resort to finance their excess expenditure (Fatás, Ghosh et al. 2019). However, being the most appropriate alternative does not necessarily mean that its implications are all positive for the economy. The theoretical literature on public debt and economic growth is divided into two theory strands. First, neoclassicals, advocate for fiscal consolidation to recover medium and long-run growth. And second, Keynesians, who propose supporting aggregate demand through government spending in periods of economic downturn.

Under the neoclassical viewpoint, debt-financed government spending has positive short-term effects. However, it has long-standing effects in the form of decreased private capital stocks for future generations. This inter-generational dynamic also applies inversely, i.e., public debt reductions induced by tax increases shift the burden to the present, relieving future generations simultaneously (Modigliani 1961).

Diamond (1965) argues that the motive for this growth decline relies on the interest rates that accompany debt repayments⁵. Its effects depend on debt ownership. In the case of external debt-servicing tax increases, it reduces the disposable income of individuals – which is composed of the difference between income and taxes – subsequently reducing savings and capital stock. In addition to these effects, a further decrease in the capital stock is produced in the case of internal debt-servicing via the substitution of debt for physical capital in individual portfolios.

Blanchard (1985) developed a similar theoretical structure for the case of an open economy and concluded that government debt was negatively related to the total amount of foreign assets and that aggregate demand did not only depend on the current stock of debt but on deficit expectations as well.

Saint-Paul (1992) extended Blanchard's model for neoclassical endogenous models, arguing that "an increase in public debt reduces the growth rate, so there always exists a future generation that will be harmed by such a measure".

⁵ "Presumably the ever-increasing level of the National Debt resulting from full deficit financing of current expenditure would require raising through taxes an ever-growing revenue to pay the interest on the debt" Modigliani, F. (1961). "Long-run implications of alternative fiscal policies and the burden of the national debt." The Economic Journal **71**(284): 730-755.

Concerning the mechanisms through which public debt affects long-run economic growth, four conventional channels are widely recognized in the literature: (1) investment crowding-out effects, (2) interest rate increase, (3) distortionary taxes, and (4) inflation.

First, in the words of Elmendorf and Mankiw (1999), investment crowding-out effects describe the dynamic between investment and economic growth by making a difference between domestic and foreign investment⁶. The decline of domestic investment affects economic growth by reducing capital stock and, thus, real wages. Foreign investment does so through currency appreciation and loss of competitiveness.

Second, another commonly known channel through which public debt affects economic growth is the increase in interest rates. At its core, this effect is similar to the crowding-out effect of investment. Public debt provides liquidity to the economy through government bonds that should decrease interest rates at first glance. However, very high public debt levels might bring concerns over defaulting on debt repayments, increasing the credit risk premia and interest rates. Depending on where the scale weighs more, high public debt levels can lead to increases in interest rates

⁶ The authors explain this relationship through the the market for loanable funds identity: $S + (T - G) = I + NFI$, where S is private savings, $T-G$ is public savings, I is investment and NFI is the international flow of funds Elmendorf, D. W. and N. G. Mankiw (1999). "Government debt." Handbook of macroeconomics 1: 1615-1669.

that deteriorate economic growth in the long run – “[it is] largely an empirical question on how interest rates react to a deterioration of a country's fiscal position” (Paesani, Strauch et al. 2006).

Third, higher public debt levels can lead to higher levels of taxes. Under the assumption that resource allocation is more efficient in the private sector, increasing taxes to repay debt levels leads to economic distortions. As the debt principal increases, so do taxes and their adverse effects on the economy in the long run to achieve fiscal solvency (Aloui and Eyquem 2019).

Fourth, inflationary effects. Although achieving fast economic growth with low inflation is a crucial milestone for many developed countries, economic growth, fiscal imbalances, and inflation go, to an extent, hand in hand. The mechanism is more straightforward than the rest: fiscal deficits increase the money supply, ultimately accelerating inflation (Fischer, Sahay et al. 2002).

Although these mechanisms are supported by theoretically solid research and numerous empirical case studies, the Great Depression brought skepticism about neoclassical thinking being Keynes at the theoretical upfront.

The Keynesian intuition states that aggregate demand contractions can be leveraged with government consumption in periods of economic downturn, using numerous fiscal policy instruments, namely, taxes, expenditure, and borrowing (Çınar, Eroğlu et al. 2014). More precisely, it is based on restoring the economic activity by filling the immediate investment reductions – mainly because it is the most volatile

component of aggregate demand – caused by economic shocks with government spending.

This entails opposite policy prescriptions to austerity measures embedded in neoclassical thinking, suggesting, instead, fiscal expansion to assist long-run growth (DeLong, Summers et al. 2012, Abubakar 2020).

The Keynesian multiplier is the fundamental pillar of the Keynesian argument, and its understanding is crucial to interpret how positive public debt can be to the economy.

In 1936 John Maynard Keynes published his most influential book, *The General Theory of Employment, Interest and Money*, where he stated the basic presumptions and rationale behind his fiscal policy propositions against austerity. Under the Keynesian view of the economy, economic shocks can be mitigated with shifts in aggregate demand. The Keynesian Cross attempts to model this behavior, and Keynes first differentiates two critical concepts to understand this approach: planned and actual expenditure. Planned expenditure (PE) is composed of the following elements:

Equation 1: Planned expenditure equation of Keynes

$$PE = y = (Y - \bar{T}) + \bar{I} + \bar{G}$$

Source: Mankiw, G. (2016). *Macroeconomics* (9 ed.): New York: Worth Publishers.

Where:

- $(Y-T)$ represents the consumption function, i.e., the disposable income (income minus taxes)
- I is investment
- G is government spending
- And the overline (e.g., \bar{x}) above a component of planned expenditure denotes whether the component is fixed or not. Note that taxes, investment, and government spending are assumed to be fixed.

Since economic expectations do not always meet their targets, both types of spending are not always equal. However, note that if actual expenditure equals planned expenditure, there are no incentives to change spending. Thus, in equilibrium, both are equal. Equation 2 describes this equilibrium.

Equation 2: Keynes Cross equilibrium

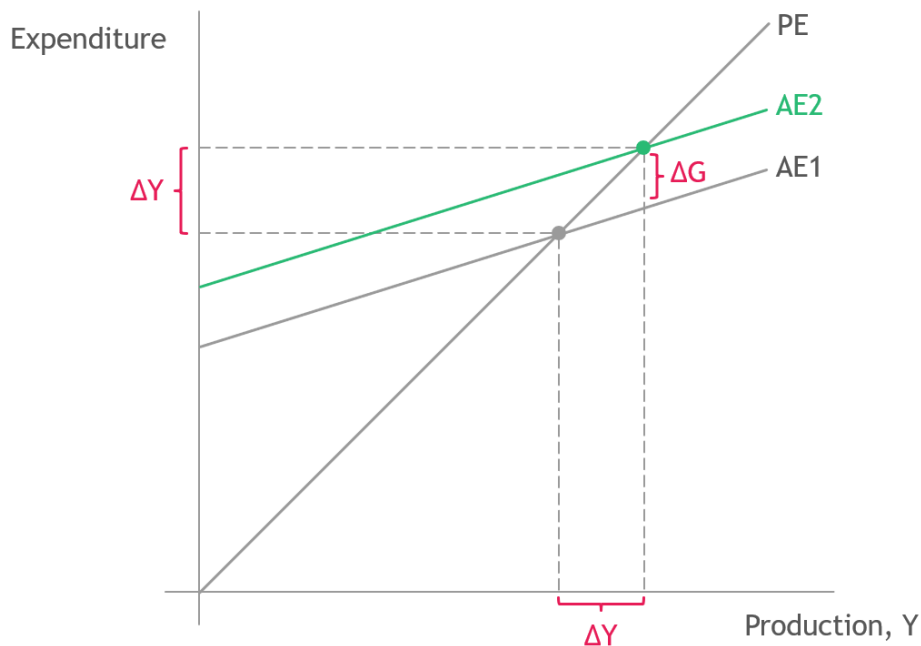
$$\text{Planned expenditure} = \text{Actual expenditure}$$

$$Y = PE$$

Source: Mankiw, G. (2016). Macroeconomics (9 ed.): New York: Worth Publishers.

As shown in Equation 1, government consumption is one of the three components of the planned expenditure equation. This means that changes in government spending affect planned expenditure, thus, the production equilibrium. Keynes' main argument is that increases in government spending have multiplier effects on the actual economy. As shown graphically in Graph 7, an increase in government spending leads to greater increases in production.

Graph 7: Government spending multiplier of Keynes



Source: Mankiw, G. (2016). Macroeconomics (9 ed.): New York: Worth Publishers.

The rationale behind this premise lies in the marginal propensity to consume (MPC), i.e., the slope of the planned expenditure function. It represents “how much planned expenditure increases when income rises by \$1” (Mankiw 2016). Note that PE depends on government spending and consumption, and the latter also depends on production. In other words, an increase in government spending (G), increases production (Y), which increases consumption (C), which further increases production in equilibrium ($PE=Y$).

In mathematical terms, an increase in government spending ΔG increases production by this exact amount, ΔG . This increases consumption by $MPC \cdot \Delta G$, and expenditure

increases by this amount $MPC \cdot \Delta G$. This further affects consumption by $MPC \cdot (MPC \cdot \Delta G)$ and consequently expenditure by $MPC \cdot (MPC \cdot \Delta G)$, and so on. This sequence repeats itself indefinitely, leading to $\Delta G < \Delta Y$ (refer to Equation 3).

Equation 3: Fiscal multiplier of Keynes – The effect of government consumption

$$\Delta Y = (1 + MPC + MPC^2 + MPC^3 + \dots) \Delta G$$

$$\Delta Y / \Delta G = 1 + MPC + MPC^2 + MPC^3 + \dots$$

$$\Delta Y / \Delta G = 1 / (1 - MPC)$$

Source: Mankiw, G. (2016). Macroeconomics (9 ed.): New York: Worth Publishers.

This rationale also applies to taxes since taxes also alter output (refer to Equation 1). A decrease of ΔT leads to an increase in consumption of $MPC \cdot \Delta T$, which consequently increases expenditure by ΔT and $MPC \cdot \Delta T$. This increases consumption again by $MPC \cdot (MPC \cdot \Delta T)$. The same dynamics applied in the case of an increase in government spending are applied (Equation 4) (Mankiw 2016).

Equation 4: Fiscal multiplier of Keynes – The effect of taxes

$$\Delta Y / \Delta T = -MPC / (1 - MPC)$$

Source: Mankiw, G. (2016). Macroeconomics (9 ed.): New York: Worth Publishers.

One of the implicit assumptions of the Keynesian theory is that households perceive government debt as wealth (Marinheiro 2001). However, Barro (1974) states that if this assumption does not hold, the short-run economic stimulus does not affect

households' consumption as they expect future tax increases to service the additional debt. The literature denominates this phenomenon as the Ricardian equivalence. Put simply, under this proposition, debt-financed tax cuts increase savings leaving aggregate demand and interest rates unaltered (Marinheiro 2001).

For the most part, governments must hold to fiscal prudence, in the sense that in periods of economic stability, the fiscal aim should be placed on reducing the debt stock (Grennes, Fan et al. 2019). However, even after the GFC, many developed economies have maintained elevated levels of government spending. Wyplosz (2012) denominates this phenomenon, "deficit bias," and states that it is the inter-generational characteristic of debt that distorts fiscal behavior, giving incentives to policymakers to postpone the burdens to the generations to come. Fatás, Ghosh et al. (2019) attribute two reasons that refrain policymakers from reversing the fiscal trend. First, political incentives impede policymakers from reducing spending, and second, difficulties in foreseeing future economic shocks do not allow for fiscal anticipation.

Excessive fiscal deteriorations resulting from continuous debt increases might lead to a point where "the presence of an existing, inherited debt [is] sufficiently large that creditors do not expect with confidence to be fully repaid" (Krugman 1988). Krugman (1988) denominates this circumstance as "debt overhangs." Probably the most popular research dealing with fiscal unsustainability issues in the contemporary literature is Reinhart and Rogoff's "*Growth in a time of debt*" (Reinhart and Rogoff

2010), where the authors organized data on debt based on different levels of public debt-to-GDP ratio⁷, and contrasted the economic growth rates of 20 developed countries from 1946 to 2009. Below 90% of the debt-to-GDP ratio, debt and growth were positively correlated. Above this threshold, debt was found to be detrimental to growth, i.e., the relationship between debt and growth was found to be nonlinear . Their results were criticized in a methodological replication study, where it was concluded that the use of selective data, spreadsheet errors, unconventional weighting methods (Herndon, Ash et al. 2014), and not controlling for endogeneity (Woo and Kumar 2015) largely influenced their results.

As mentioned in the previous section, the endogeneity and reverse causality issue represent the biggest obstacles in estimating the long-run effects of debt on economic growth. Is slow economic growth the cause of increasing debt ratios, or is excessive debt undermining growth?

Additionally, the economic and political structure difference between developing and developed countries imply that their debt tolerance differ, and their particularities require theoretical and practical differentiation⁸.

⁷ The authors divided the data into four categories of debt/GDP ratios: (1) below 30%, (2) $30\% \leq 60\%$, (3) $60\% \leq 90\%$, (4) above 90% Reinhart, C. M. and K. S. Rogoff (2010). "Growth in a Time of Debt." American economic review **100**(2): 573-578.

⁸ Clements, B., et al. (2003). "External debt, public investment, and growth in low-income countries."

Although several recent studies address endogeneity and reverse causality issues to assess the long-run impact of debt for undeveloped and developed countries, the empirical literature is only substantial for the former.

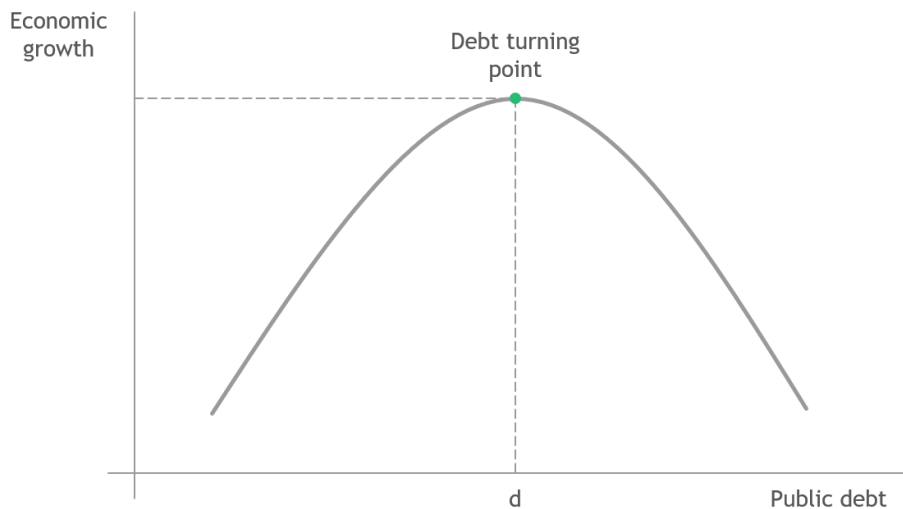
Based on the Keynesian fiscal theory, the expectation is that at low government debt-to-GDP ratios, the effects on growth are positive, as shown at the left-hand side of the debt threshold point d in Graph 8. However, the theoretical approach diverges at high-debt levels, i.e., at the right-hand side of the debt threshold point d . In the view of neoclassicals, high debt levels inevitably lead to slow economic growth. In other words, they support a debt turning point above which government debt becomes adverse to economic growth. Their understanding of the economy is somewhat similar to the idea portrayed in Graph 8.

On the other hand, Keynesians argue that through the fiscal multiplier effects, government debt can help reactivate economic activity and, thus, neglect the existence of a debt threshold above which debt is harmful to economic growth. Based on the data analysis of Section 2, if the idea behind Graph 6 holds, debt is positively correlated to economic growth. Keynes' rationale can serve as a mechanism to explain the channels through which debt affects growth. However, as stated above,

attribute the disparity of debt thresholds between low-income and emerging economies on the difference in economic foundations, transmission channels among others reasons.

endogeneity and reversed causality issues have not been controlled. Thus, a more rigorous econometric analysis has to be elaborated to assess the real effects of debt.

Graph 8: Theoretical expectation between public debt levels and economic growth – One kink



Source: own work

Although the literature is extensive, few papers focus on determining the threshold effects of the public debt of OECD countries, and their focus is not always on long-run growth. The following are the most relevant studies that cover this topic.

Kumar & Woo (2010) found that high indebtedness was more damaging for emerging economies, implicitly suggesting that the fiscal tolerance for developed economies was greater in an analysis of 38 emerging and advanced economies. As

in R-R's study (Reinhart and Rogoff 2010), adverse effects of debt above 90% of debt-to-GDP were found by analyzing different debt ratios.

Caner, Grennes & Koehler-Geib (2010) drew similar conclusions to Kumar & Woo (2010) for 79 developing and 22 developed countries⁹, including private and public debt. The threshold effects found in this paper were above 77% of the debt-to-GDP ratios. In addition, initial GDP levels were an essential indicator of how public debt affects growth levels. Without controlling for initial GDP levels, the threshold increased by +20.6%. Although the authors did not expressly state the implications of this result, the positive correlation between the initial GDP per capita and economic growth in this model, in econometric terms, implies that the large size of the economy per capita helps mitigate the adverse effects of high debt. In other words, strong economies are more resilient to the negative impact of high debt levels. Differences were also found between developing and developed countries, having the former a lower threshold of 64% of the public debt-to-GDP ratio.

Asteriou, Pilbeam et al. (2020) conducted a similar study focusing on Asian countries, concluding that public debt adversely affects economic growth in the short

⁹ The authors estimate threshold effects for (a) both developed and developing economies, (b) developing economies and (c) developed economies. Threshold effects were only found in (b). However, by comparing the estimations of (a) and (b) they conclude that developing countries have lower thresholds Caner, M., et al. (2010). "Finding the tipping point--when sovereign debt turns bad."

and long run. Although their analysis and econometric model do not allow for the estimation of a specific threshold, it does indicate the existence of nonlinearities. The authors conclude that nonlinearities exist in developing countries and indicate heterogeneity in short- and long-run economic growth.

Checherita-Westphal and Rother (2012) analyzed 12 Euro countries from 1970 to 2011 and found a threshold of around 90% of debt-to-GDP.

Cecchetti, Mohanty et al. (2011) studied the effects of different types of non-financial debt on economic growth. Government, private, corporate, and household debt were included in the study. By controlling for banking crises and financial flow variables, the authors found that among the different types of debt, government debt had more robust adverse effects on growth and debt threshold levels around 92 to 99 percent.

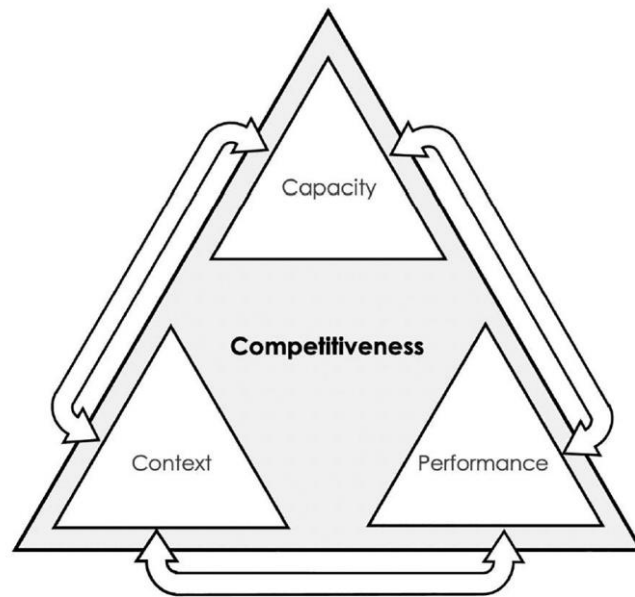
As stated above, there is also skepticism about this negative long-run impact of debt on growth, theoretically and empirically. In particular, Eberhardt (2017) concluded that for four OECD countries (United States, United Kingdom, Sweden, and Japan), there is no evidence of non-linearities, and Jacobs, Ogawa et al. (2020), using a panel VAR model, found no evidence of public debt dragging down economic growth.

Although the debate on government debt is primarily focused on the debt stock as a whole, another strand of the literature states that the effects of government spending on growth can differ by spending category. That is, some spending categories are likely to positively affect the economy in the long run, regardless of the stock of debt.

Under this view of government spending, two countries with the same government debt stock can have wildly divergent futures depending on the investment value of their spending categories (Piras and Marica 2018). In this light, the ‘quality’ of governments can play an essential role in determining the heterogeneity that debt has on growth across countries. Government Competitiveness (GC) is “the power of government to, in light of various constraints, take resources from in and outside of the country and improve social, economic and cultural conditions of the nation to sustainably enhance citizens’ quality of life.” This concept “encompasses an entity’s ability to learn from and adjust to environmental demands to create value and fulfill its distinct mission” (Christensen, Im et al. 2022).

GC is grounded on three key concepts that are interlinked with one another: capacity, context, and performance. Figure 1 illustrates the link between these three concepts that are built to avoid the pitfalls of focusing solely on KPIs that, rather than being made to improve the purpose for which they are built, only intend to improve their measurement scores. Christensen, Im et al. (2022) argue that by considering the internal and external factors that drive a particular key performance indicator (KPI) through the concept of context and measuring performance based on the given situation of each government through the concept of capacity, performance can be better understood.

Figure 1: Government competitiveness: integrating performance with context and capacity



Source: (Christensen, Im et al. 2022)

It is hard to overestimate the importance of governments in economic development. Solid financial planning and coordination with the private sector, investment of large sums of capital to build the necessary infrastructure, and the provision of guidance through the implementation of appropriate regulation have been (and are) some of the critical roles of governments across the globe. The concept of government capacity states the “potential of public administration/government to obtain desired results and policy outcomes and thereby can be seen as the basis or enabling factor for performance” (Thijs, Hammerschmid et al. 2017). In other words, government capacity represents the “set of skills, competencies, resources (human, financial, informational), structures and processes expected of public bureaucracies, so that

they can facilitate and contribute to problem-solving and effective policy making (Thijs, Hammerschmid et al. 2017). Although government capacity encompasses several dimensions that quantify the ability of governments to address state problems, the focus will be placed on policymaking, coordination, and regulatory extent.

The concept of government context lacks a formal definition in the economics and public administration literature. It has been used with several different applications in the literature, which hinders the ability to establish a standard definition. For instance, Van der Wal and Mussagulova (2020) conceptualizes government context as a geographic factor, Brown (2005) as the degree of government digitalization, i.e., e-government, and Christensen and Lægreid (2020) measure government context through numerous variables including public healthcare sector infrastructure, professional bureaucracy, the competence of politicians, economic performance and government trust. The concept of government context used in this paper can be defined as the conditional drivers that determine situational differences between governments and leverage government performance. This definition follows the triangular relationship defined by Christensen & Im (2022), shown in Figure 1, and adjusts well to the purposes of the present study.

Government performance embraces numerous concepts that, in essence, serve as an indication of a government's improvement in all dimensions. In most research, this concept is approached empirically rather than theoretically, and due to its extensive use in different subjects of study, it is a concept that is hard to define without

narrowing down its scope. The Government Competitiveness Center (2020) – GC Center – states that the “absence of political violence, as well as the consensus making for sustainable economic growth and low inequality,” is an indication of solid government performance. This concept adjusts well to the purposes of the present study and will be used to measure GC.

The concept of GC emerged as a criticism of the “disproportionate focus on business-related factors.” It emphasized the importance of social factors and welfare in quantifying governments’ performance. As a result, GC broadens the scope of the role of the government and includes elements other than economic indicators. It ultimately indicates a government’s capacity to foresee and deliver the needs of its citizens. At its core, GC is based upon three theoretical groundings: Easton’s systems theory, Maslow’s hierarchical needs theory, and Fukuyama’s state function.

Easton’s systems theory conceptualizes the idea of a dynamic interaction between the environment and the political system. Changes in the environment are transformed into demands to the political system – inputs, and the political system responds to these demands and delivers outputs. Under the Systems theory, there is a feedback loop upon which outcomes have the potential to generate new inputs.

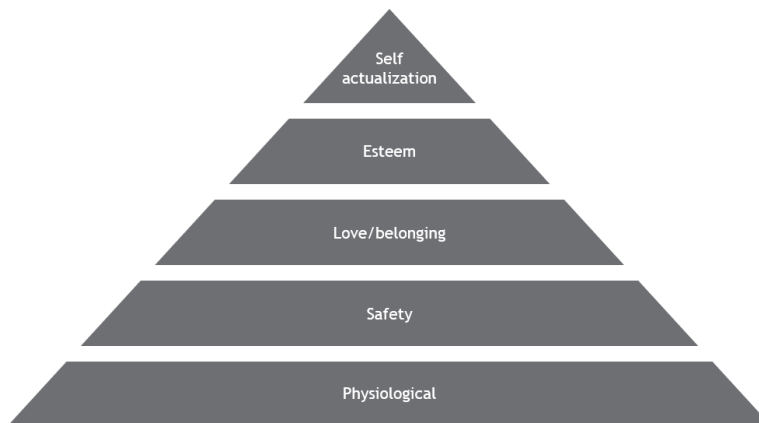
GC adds one additional stage to this interaction process whereby the public management capacity is emphasized, namely throughput. The relevance of this new sequence in establishing the relationship between economic growth and GC lies in the emphasis it places on the ability of the government to transform citizen needs

into actual outcomes. In other words, economic growth can be expected to be higher in those countries with robust government systems that allow them to turn “needs” into actual outcomes.

Maslow’s hierarchy of needs denotes five different ascending levels of needs. Starting from basic needs at the bottom of the pyramid to self-fulfillment needs at the top (Figure 2). Applying this theory of the psychology field to the study of public administration and economics implies that physiological needs, for example, access to food or infrastructure development, must be fulfilled first to climb to the next step of the hierarchy (Government Competitiveness Center 2022). The importance of Maslow’s hierarchy of needs lies in the policymaking prioritization governments ought to follow. Although there is a degree of overlap, until physiological conditions are covered, other needs above the physiological step will not be as urgent as the former.

Fukuyama states that there are three categories of functions that a state can cover. First, minimal; second, intermediate; and third, activist functions. (Government Competitiveness Center 2022). His theory is elaborated as a criticism of the excessive focus that international financial institutions (IFIs) place on reducing the scope of state functions to achieve economic development. Fukuyama states that by focusing solely on the scope of a state, IFIs have overlooked the importance of the strength of states. The author stresses the importance of combining the strength and

Figure 2: Maslow's hierarchical needs



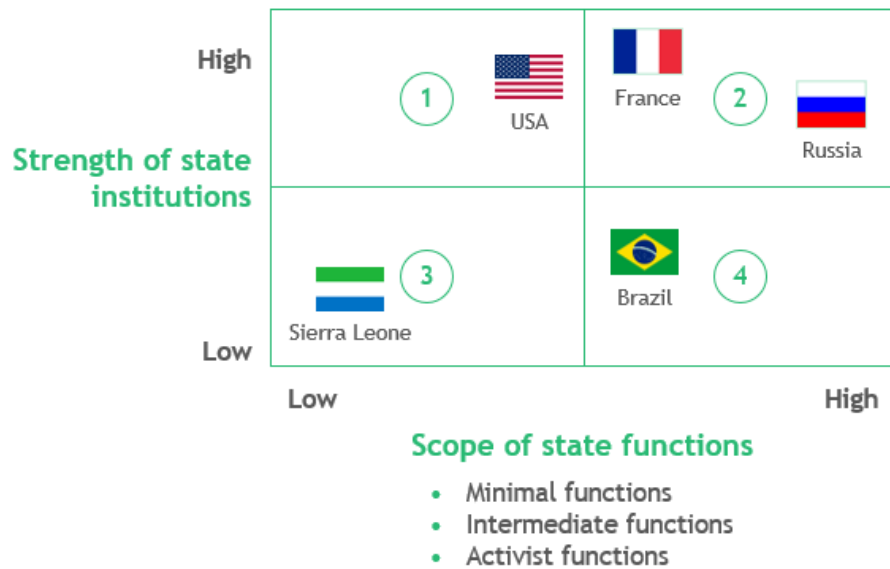
Source: Government Competitiveness Center (<https://www.gccenter.net/gc/framework.jsp>)

scope of state functions to determine the level of potential economic development of that state. Fukuyama develops the so-called stateness and strength matrix by plotting strength and scope in a matrix. The matrix can be separated into four quadrants that categorize states and their relative strength and scope of functions against other countries. Figure 3 shows an example provided by the author, in which a sample of countries is located based on these metrics.

In addition, Fukuyama stresses the importance of acknowledging the existence of different growth models. There are numerous pathways for growth, and the exclusive focus that IFIs placed on prescribing growth models that worked for Western countries harmed the economic development of those countries – “Democracy, federalism, decentralization, participation, social capital, culture, gender, ethnicity, and ethnic conflict have all been added to the development pot as ingredients bearing on the final taste of the stew”. Fukuyama’s theory helps explain the heterogenous effects of debt across countries. In other words, it describes why the same amounts

of debt have different effects on the economic growth levels of different countries (Fukuyama 2017).

Figure 3: Stateness and strength matrix of Francis Fukuyama



Source: Fukuyama, F. (2017). State Building: Governance and World Order in the 21st Century, Profile.

4. Methodology

The analysis covers a sample of 24 OCED countries with advanced and well-established democracies (Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States) with data from 1997 to 2021, thus inevitably including projections. With the exception of Poland's incorporation into the EU in 2004 and the UK's Brexit signed in 2020, all the rest of the countries have not undergone any drastic political change. The data has been collected from various sources, including the International Monetary Fund (IMF), Annual Macro-Economic database of the European Union (AMECO), Organization for Economic Co-operation and Development (OECD), and World Bank's World Development Indicators, Global Financial Development and World Governance Indicators (Annex 2).

In order to assess the long-run impact of debt, the dependent variable selected for this study is the five-year forward cumulative overlapping GDP per capita growth, which is a common approach in the literature (Kumar and Woo 2010, Cecchetti, Mohanty et al. 2011, Checherita-Westphal and Rother 2012, Panizza and Presbitero 2014).

Although considering the one-year forward GDP per capita growth as the dependent variable brings clear benefits in terms of the increased number of observations (Checherita-Westphal and Rother 2012), the focus of this study is placed on the long-

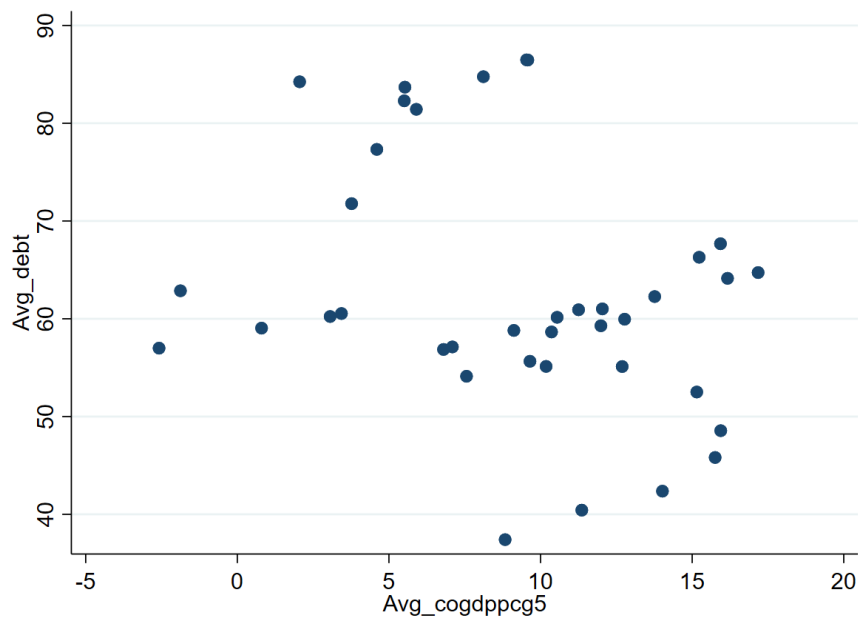
run effects of debt on growth. Replacing the dependent variable with yearly GDP per capita growth would assess immediate shocks of debt in growth.

A dependent variable with longer cumulative growth has also been considered. However, the reduction of the time series drastically reduced the significance of all variables.

Using a non-overlapping dependent variable has also been considered following Kumar & Woo's (2010) approach. However, similar to having a longer cumulative overlapping dependent variable, such a dramatic reduction of datapoints led to inconclusive results.

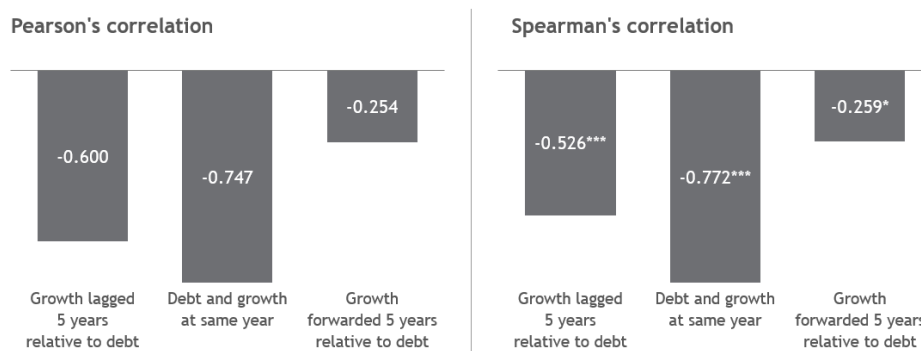
The rationale behind using forwarded periods on the dependent variable lies in the possibility of having reversed causality issues. Graph 9 shows an initial scatterplot on the relationship between government debt and the dependent variable five-year cumulative overlapping GDP per capita growth. The relationship between debt and growth is not entirely clear from the graph, and there are indications of a non-monotonic relationship between the two variables. To estimate the type of relationship that debt and growth have, different correlation tests can be used. Graph 10 shows the correlation of growth and debt using Pearson's and Spearman's correlation tests at different lags of economic growth.

Graph 9: Government debt and cumulative overlapping GDP per capita growth
scatterplot



Source: own work

Graph 10: Pearson's and Spearman's correlation of public debt and economic growth at different time lags



Source: Own work

Pearson's correlation measures the strength of the linear relationship between two variables. The values of this correlation lie between -1 and +1; -1 indicates a total negative correlation, and +1 indicates an absolute positive correlation. Pearson's correlation is strong as values are closer to these two values. Oppositely, the correlation is weaker as values are closer to 0, also being a possible indication of a nonlinear relationship.

On the left-hand side of Graph 10, it can be seen that the correlation becomes stronger as growth is lagged relative to debt. In other words, the probability that high indebtedness levels are explained by economic fluctuations is higher than the probability that public debt stock stagnates growth if reverse causality is not taken into account in the analysis. In addition, low correlation levels (-0.254) can indicate a non-linear relationship between debt and growth. Thus, Spearman's correlation test was also performed.

Spearman's correlation test assumes a non-linear relationship between the variables in question. Similar to Pearson's correlation results, the right-hand side of Graph 10 shows how the statistical significance of the correlation between debt and growth decreases when public debt explains growth, i.e. when growth is forwarded five years relative to debt. Independently of the lag applied, debt and growth are statistically significant, showing evidence of a possible non-linear relationship between debt and growth and stressing the need to control for potential reversed causality issues. One of the implications of this finding is the introduction of debt and its squared to measure nonlinearities with the shape of Graph 8.

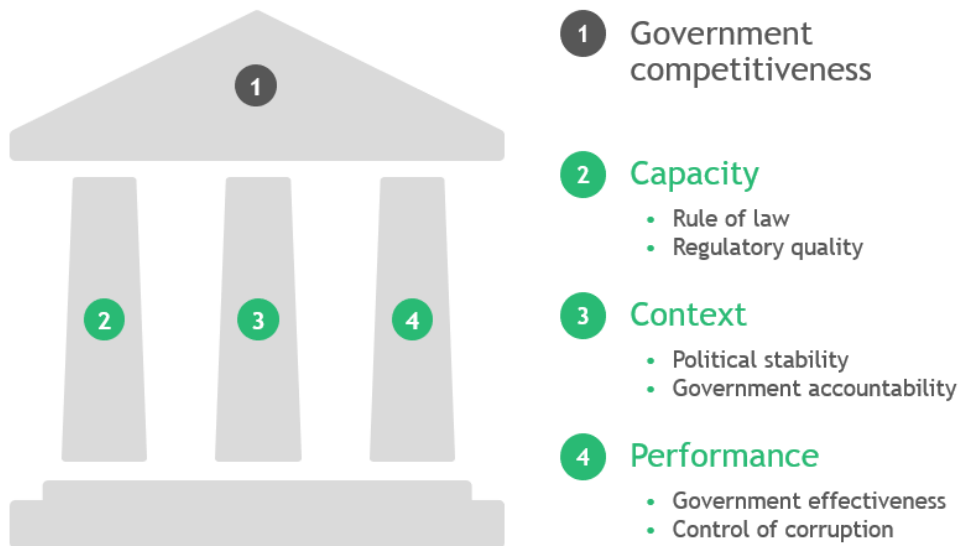
Other control variables introduced are similar to those used in the literature with slight changes: natural log of the GDP per capita, general government gross debt, and its squared term to address any nonlinearities, gross national savings, population growth, interest rates, banking crisis dummy variable, openness to trade and inflation (refer to Table 3 to see the statistical description of all variables, and Appendix 2 for additional data specifications). Missing data have been replaced by IMF estimates, and in the case of the banking crisis dummies, it has been estimated using numerous official sources (Appendix 3).

To test for the robustness of the results, government R&D spending and education (measured as the percent of the population who have completed tertiary education) have been included as additional regressors.

Finally, to control for other internal factors that might have an effect on growth and to account for heterogeneous effects of debt in growth, we add the variable GC. Figure 1 portrays the concept of government competitiveness and the variables contained in each pillar to measure this concept (Appendix 2).

- Capacity, measured by rule of law and regulatory quality.
- Context, measured by political stability and government accountability.
- Performance, measured by government effectiveness and control of corruption.

Figure 3: Government competitiveness: Integrating performance with context and capacity



Source: Christensen, R. K., et al. (2022). "Softening Performance's Pitfalls by Integrating Context and Capacity: A Government Competitiveness Framework." *Public Administration Review* 82(5): 887-892.

To measure government competitiveness, each variable building this concept has been normalized value from 0 to 1 relative to other OECD countries studied in the sample. For every year and variable, the value 0 was allocated to the country with the lowest score from the OECD sample studied. On the other hand, the value 1 was assigned to the country with the highest score. The rest of the datapoints are normalized according to these maximum and minimum values. The normalized average of these six variables represents the government competitiveness variable of the present study (Equation 5).

Equation 5: Government competitiveness variable construction methodology

$$GC = \frac{x - x_{min}}{x_{max} - x_{min}} ; \quad x = \frac{\sum_i^6 \left(\frac{v_i - v_{i_{min}}}{v_{i_{max}} - v_{i_{min}}} \right)}{6}$$

Missing values have been replaced according to the following criteria. First, in the case of empty values located between years with non-missing values, the average of the next and previous values, $t-1$ and $t+1$, have been used as an estimation method. Second, empty values at the beginning of the time series (in this case, $t=1997$) have been subtracted one standard deviation of the average of the series of the corresponding country.

Accordingly, the econometric model is specified as follows:

$$\begin{aligned} &COgdppcG_{i,(t+1,t+k)} \\ &= \alpha LNgdppc_{i,t} + \beta_1 debt_{i,t} + \beta_2 debt_sq_{i,t} + \beta_3 sav_{i,t} + \beta_4 CPI_{i,t} \\ &+ \beta_5 ADR_{i,t} + \beta_6 open_{i,t} + \beta_7 int_{i,t} + \beta_8 crisis_{i,t} + \beta_9 RnD_{i,t} \\ &+ \beta_{10} edu_{i,t} + \beta_{11} GC_{i,t} + \mu_i + \gamma_t + \varepsilon_{i,(t+1,t+k)} \end{aligned}$$

Where

- $COgdppcG_{i,(t+1,t+k)}$, is the cumulative overlapping GDP per capita growth from $t + 1$ to $t + k, k = 5$
- $LNgdppc_{i,t}$, is the natural logarithm of the GDP per capita time t
- $debt_{i,t}$, general gross government debt (as percent of GDP)
- $debt_sq_{i,t}$, general gross government debt squared (as percent of GDP)
- $sav_{i,t}$, gross national savings (as a percent of GDP)

- $CPI_{i,t}$, inflation measured by the consumer price index
- $ADR_{i,t}$, age dependency ratio
- $open_{i,t}$, openness to trade
- $int_{i,t}$, interest rate
- $crisis_{i,t}$, banking crisis dummy variable (being the presence of banking crisis 1)
- $RnD_{i,t}$, research and development (as a percent of GDP)
- $edu_{i,t}$, average years of education of the population
- $GC_{i,t}$, government competitiveness
- μ_i , country-fixed effects
- γ_t , time-fixed effects
- $\varepsilon_{i,(t+1t+k)}$ error term

Table 3: Descriptive statistics of independent variables

| Variable | Obs. | Mean | Std. Dev. | Min. | Max. |
|----------------------|-------------|-------------|------------------|-------------|-------------|
| Ln_GDPpc | 600 | 10.719 | 0.324 | 9.561 | 11.713 |
| Debt | 596 | 0.721 | 0.436 | 0.074 | 2.631 |
| Debt_squared | 596 | 71.000 | 96.383 | 0.553 | 692.432 |
| Savings | 600 | 0.238 | 0.069 | 0.039 | 0.416 |
| Inflation | 600 | 1.913 | 1.658 | -1.684 | 14.900 |
| Age dependency ratio | 600 | 0.665 | 0.022 | 0.594 | 0.734 |
| Openness | 597 | 0.898 | 0.586 | 0.181 | 3.888 |
| Crisis | 600 | 0.198 | 0.399 | 0.000 | 1.000 |
| Interests | 551 | 2.225 | 3.050 | -12.532 | 22.838 |
| Education | 600 | 10.692 | 1.305 | 6.692 | 13.183 |
| RnD | 597 | 2.050 | 0.867 | 0.429 | 4.815 |
| Population growth | 600 | 0.610 | 0.598 | -1.045 | 2.959 |
| Gov. competitiveness | 600 | 0.652 | 0.288 | 0.000 | 1.000 |

Table 4 and Table 5 portray the matrix of correlations and variance inflation factor (VIF) measure, respectively, estimated to avoid possible multicollinearity issues between the regressors. All the variables are accepted and free of multicollinearity problems under the conventional $VIF < 10$ thresholds (Salmerón, García et al. 2020).

Table 4: Correlation matrix

| | Ln_GDPpc | Debt | Debt_sq | Savings | Inflation | Age dep. Ratio | Openness | Crisis | Interests | Education | RnD | Population growth | Economic resilience |
|------------------------------|-----------------|-------------|----------------|----------------|------------------|---------------------------|-----------------|---------------|------------------|------------------|------------|------------------------------|--------------------------------|
| Ln_GDPpc | 1.00 | | | | | | | | | | | | |
| Debt | -0.29 | 1.00 | | | | | | | | | | | |
| Debt_sq | -0.26 | 0.95 | 1.00 | | | | | | | | | | |
| Savings | 0.38 | -0.37 | -0.29 | 1.00 | | | | | | | | | |
| Inflation | -0.07 | -0.21 | -0.22 | -0.20 | 1.00 | | | | | | | | |
| Age dep. Ratio | -0.11 | -0.43 | -0.41 | 0.13 | 0.24 | 1.00 | | | | | | | |
| Openness | 0.68 | -0.34 | -0.27 | 0.24 | 0.00 | 0.17 | 1.00 | | | | | | |
| Crisis | 0.12 | 0.10 | 0.07 | -0.12 | 0.13 | -0.05 | 0.10 | 1.00 | | | | | |
| Interests | -0.35 | 0.15 | 0.15 | -0.31 | 0.10 | 0.20 | -0.28 | -0.03 | 1.00 | | | | |
| Education | 0.31 | -0.16 | -0.10 | 0.34 | -0.11 | 0.08 | 0.07 | 0.00 | -0.06 | 1.00 | | | |
| RnD | 0.24 | -0.04 | -0.01 | 0.56 | -0.15 | -0.11 | -0.13 | 0.03 | -0.13 | 0.37 | 1.00 | | |
| Population growth | 0.56 | -0.48 | -0.42 | 0.15 | 0.22 | 0.21 | 0.43 | -0.02 | -0.09 | 0.24 | -0.07 | 1.00 | |
| Gov. comp-ness | 0.62 | -0.41 | -0.37 | 0.33 | -0.08 | -0.27 | 0.32 | -0.08 | -0.18 | 0.27 | 0.40 | 0.40 | 1.00 |

Table 5: VIF

| Variable | VIF | 1/VIF |
|----------------------|-------------|--------------|
| Gov~competitiveness | 2.53 | 0.396012 |
| R&D | 2.33 | 0.429926 |
| Debt | 2.21 | 0.453206 |
| Savings | 2.2 | 0.455552 |
| Age dependency ratio | 1.95 | 0.511961 |
| Population growth | 1.75 | 0.570446 |
| Openness | 1.66 | 0.60329 |
| Education | 1.33 | 0.754029 |
| Interests | 1.29 | 0.776954 |
| Inflation | 1.28 | 0.782637 |
| Crisis | 1.11 | 0.898513 |
| Mean VIF | 1.78 | |

The problem of endogeneity is addressed by following the System-GMM estimation method for dynamic panel regressions developed by Arellano and Bover (1995), and by lagging all the independent variables one period. Through Monte Carlo estimations, Blundell and Bond (1998) conclude that Difference-GMM (DGMM) estimations are largely biased and inaccurate and propose including an additional initial condition restriction that provides efficiency gains through the inclusion of

extra moment conditions, namely System-GMM¹⁰ (SGMM). Although as time series increases, DGMM and SGMM's results tend to converge, the latter still presents small efficiency gains (Arellano and Bond 1991, Blundell and Bond 1998). Additionally, SGMM is more precise when N is large, and T is small, $N \geq T$. In this study, we stick to this specification and analyze 24 countries in a time period of 24 years. In sum, the appropriateness of this methodology in regards to the endogeneity problem, data limitations, and the reduced estimation bias in comparison to DGMM, SGMM has been considered to have the necessary attributes to study nonlinearities of debt on growth.

Although studying the relationship between public debt and the economic growth of a single country allows deep-diving into the particularities of that specific country, significant research on this topic focuses on multiple countries to avoid any potential bias that might emerge from studying isolated cases. The most widely spread data structure built to study debt and economic growth is panel. The essential advantage of using panel data is that it accounts for individual heterogeneity, i.e., quality differences across the cross-section. In addition, having time series in the dataset allows studying the effects of public debt on growth can be estimated with more

¹⁰ For more detailed information refer to: Blundell, R. & Bond S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of econometrics*, 87, 115-143.

precision. In essence, the cross-section and the time series complement the flaws of one another (Salmon 2021).

The results of SGMM require looking into detail two particular aspects. First, testing for the overidentification of restrictions through the Hansen test, and second, testing for autocorrelation through the Arellano-Bond test for serial correlation (Arellano and Bond 1991). Regarding the former, it is conventionally recommended to have a greater number of groups than instruments since instruments reduce the efficiency of the estimation. As for the latter, tests for autocorrelation up to order five, namely AR(5), is required, given the overlapped nature of the dependent variable.

5. Results

The results of the estimations are displayed in Table 6. The model was extended by introducing additional variables commonly used in the literature and tested for multicollinearity (refer to Table 4 and Table 5). Under all of the models, the endogenous variables (namely, debt and its squared) are instrumented by their lag from period 1 to 5 due to the overlapped nature of the dependent variable, and the regressors known as being strictly exogenous to the dependent variable have been used as instruments.

Under the basic regression model, Model (1), the log of GDP per capita and the squared debt term are statistically significant at the 1% level; public debt and savings are at the 5% level, and interest rates are at the 10% level. As debt and debt squared are statistically significant, we derive that debt threshold effects exist at 103% of the debt-to-GDP ratio.

The model was extended to gradually include variables commonly used in the literature after testing them for multicollinearity (refer to Table 4 and Table 5).

Model (2) shows the extended model when government budget allocations on research and development are included, which works as a proxy for technological progress. After adding this variable, the significance level of public debt and interest rates increased. The inflation rate and openness to trade also turned out to be statistically significant at the 5% and 1% levels, respectively. The debt threshold increases slightly to 109% of the debt-to-GDP ratio.

Model (3) further extends the model to include the average years of education of the population as an independent variable as an additional proxy for human capital – results change slightly to those of Model (1) and (2). In the case of the log of GDP per capita and savings, their statistical significance decreases. For public debt and interest rates, it increases, and inflation, openness to trade, and population growth become statistically significant at the 10% and 1% levels, respectively. In this case, debt threshold levels increase by 38%, reaching 141% of the debt-to-GDP ratio.

Model (4) includes GC as an explanatory variable in addition to the variables included in Model (3). Across all models, Model (4) has the greatest number of variables with statistical significance above 10%. The log of GDP per capita, public debt and its squared term, inflation, openness to trade, and government competitiveness are significant at the 1% level, and population growth, interest rates, and education are at the 5% level. Although debt threshold levels increase compared to Model (1), they fall below that of Model (3) to a 128% debt-to-GDP ratio.

In terms of the validity of the results, the Sargan-Hansen test rejects the null hypothesis of overidentifying restrictions in all five models (H_0 : the instruments as a group are exogenous) and the results have been corrected for autocorrelation up to order 5.

Finally, there is evidence of non-linearities of debt on growth in the long run for the selected sample of OECD countries. This implies that as debt stock increases, debt's initial positive impact on growth is undermined by fiscal unsustainability.

Table 6: Estimations using SGMM

| <i>Dependent variable: COGDPpcG¹¹</i> | | | | |
|--|------------------------|------------------------|------------------------|------------------------|
| | (1) ¹² | (2) ¹³ | (3) ¹⁴ | (4) |
| Ln_GDPpc | -0.5638*** (0.1068) | -0.4839*** (0.085) | -0.3930** (0.1873) | -0.6338*** (0.1373) |
| Debt | 0.3529** (0.1327) | 0.3044*** (0.089) | 0.3948*** (0.1091) | 0.2564*** (0.0826) |
| Debt squared | -0.0017*** (0.0004) | -0.0014*** (0.0003) | -0.0014*** (0.0004) | -0.0010*** (0.0003) |
| Savings | 0.7955** (0.3158) | 0.5214*** (0.1634) | 0.7864* (0.3856) | -0.1308 (0.2063) |
| Inflation | -0.0038 (0.0071) | -0.0085*** (0.0019) | -0.0090** (0.0017) | -0.0080*** (0.0017) |
| Openness | 0.0996 (0.1063) | 0.1680** (0.0675) | 0.1545* (0.0789) | 0.2357*** (0.0673) |
| Pop. growth | -0.0131 (0.0507) | -0.0073 (0.0165) | 0.0488*** (0.0266) | 0.0452** (0.0179) |
| Interests | -0.0099* (0.0053) | -0.0051** (0.0024) | -0.0031*** (0.0013) | -0.0025** (0.001) |
| Crisis | 0.0260 (0.0195) | 0.0098 (0.0163) | 0.0130 (0.0253) | -0.0064 (0.0203) |
| R&D | | 0.0118 (0.0212) | -0.0468 (0.0849) | 0.0832 (0.052) |
| Education | | | 0.0175 (0.0127) | 0.0317** (0.0146) |
| Gov. comp~ness | | | | 0.1986*** (0.0605) |
| Hansen J Test | 0.408 | 0.426 | 0.315 | 0.172 |
| Observations | 546 | 543 | 543 | 543 |
| Debt threshold | 103% | 109% | 141% | 128% |

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

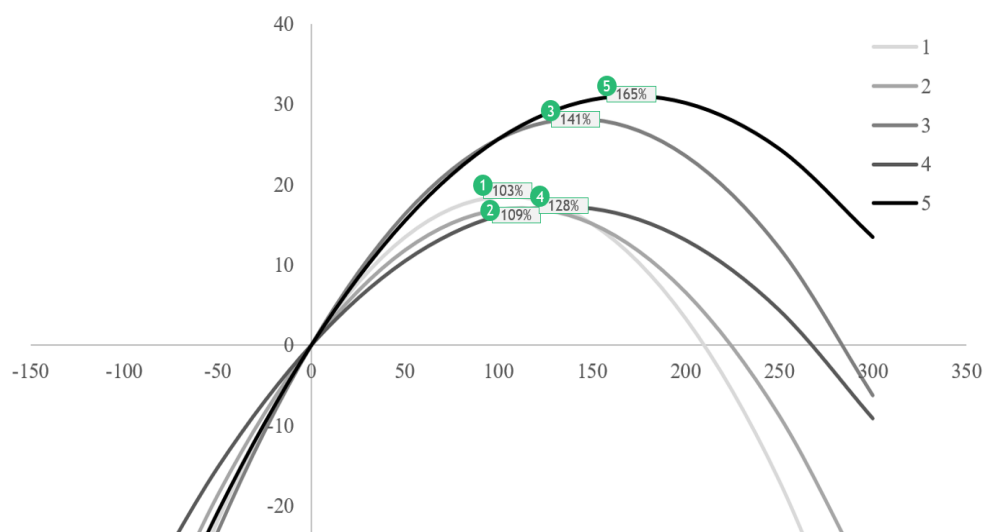
¹¹ COGDPpcG stands for cumulative overlapping GDP per capita growth

¹² Initial model

¹³ Extended model 1

¹⁴ Extended model 2

Graph 11: Government debt thresholds by model



Source: own work

Various studies in the literature use the SGMM estimators developed by Blundell & Bond (1998) to address nonlinearities and endogeneity problems (Blundell and Bond 1998).

Swamy (2020) states that the threshold is located in the 91-150 debt-to-GDP cohort; both Checherita-Westphal & Rother (2012) and Kumar & Woo (2010) that it lies around 90% of debt-to-GDP, for Euro countries using overlapping and non-overlapping variables in the case of the former, and emerging and advanced economies using non-overlapping growth and threshold dummies in the latter. Kumar and Woo obtained similar results in a subsequent study Woo and Kumar (2015). The results of the analysis using this method are similar to the previous literature in the sense that both support the idea of the existence of a non-linear

relationship between debt and growth. However, the results support the resilience of the economy to absorb high indebtedness. With thresholds ranging between 103% to 141% of GDP, we argue that there is great tolerance to debt in OECD countries with high government competitiveness.

The results are consistent with the expectations. First, debt thresholds increase when government competitiveness is taken into account. In comparison to several studies that follow the same methodology as in this study, debt thresholds show around 30% higher debt-to-GDP ratio thresholds to become negative for growth (Swamy, 2020; Checherita-Westphal & Rother, 2012; Kumar & Woo, 2010). Although Model (4) shows moderating effects compared to Model (3), 128% is still higher than most of the previous studies. Second, the study shows that higher government competitiveness accelerates the convergence rate of countries. Countries with higher GC will experience greater growth, since government efforts are more likely to be efficient, powerful and better aligned with their policy directions. Third, GC diminishes the effects of debt on the economy. Countries with higher government competitiveness (i.e., robust governments) are less affected by debt fluctuations.

6. Implications for the OECD countries studied

Public debt levels have steadily increased over the past two decades. Political, economic, and social conflicts between and within OECD countries have had consequences on public debt levels that reduce the fiscal flexibility of highly indebted countries.

Although looking at decade-long trends of economic growth of the OECD countries sample studied it can be observed that growth has remained fairly stable for most countries future growth can be undermined if rapid action is not taken against fiscal prudence. Although the urgency towards action is clearer in some countries than in others, debt trends are concerningly upward trending for most developed countries.

As shown in Graph 13, four countries (Greece, Italy, Japan and the USA) surpass threshold levels as per Model (4) in 2021. Additionally, five countries are on the verge of surpassing debt threshold levels, namely, Belgium, Canada, France, Portugal and Spain. As mentioned in previous sections, threshold levels are an indicator of maximum sustainable debt rather than a justification for debt increases. Thus, debt levels below the threshold are not a safety zone against fiscal prudence, rather, an indicator of the flexibility and room for fiscal action that governments have to mitigate the economic damage during periods of unforeseeable crisis.

Government competitiveness allows to control internal factors aside from the typically used economic indicators, and also allows to account for heterogeneous effects of debt in growth. Government competitiveness trends are more diverse than

economic growth trends (Graph 14), and South Korea represents the country with the greatest competitiveness growth rate among the OECD countries studied, in the past two decades. In relative terms, South Korea has gone through being the country with the lowest score in all indicators to occupying ~0.5 points from the normalized GC score (Graph 14). Although in terms of GC ranks the Korean government has increased only 5 steps, passing from 24th in 1997, to being 19th in 2021 (Graph 15). As shown in Graph 16, excluding political stability, all government competitiveness indicators of South Korea have experienced growth levels.

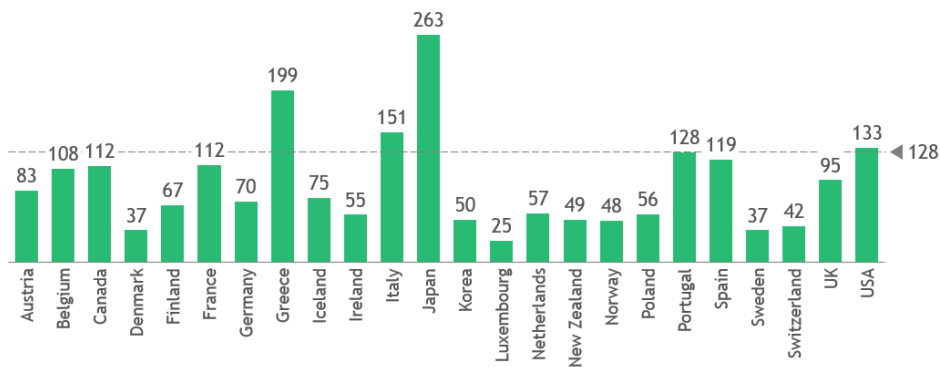
Finally, going back to the topic of debt, Graph 17 shows the evolution of government debt levels of South Korea. Public debt has increased at a 7% CAGR over the past ~20 years. As mentioned in previous sections, threshold levels are an indicator of maximum sustainable debt rather than a justification for debt increases. The Korean government must hold fiscal prudence, since assuming constant historic public debt growth rates (6.9%), 15 years are enough to surpass recommended threshold levels (Graph 17).

Graph 12: Economic growth by country



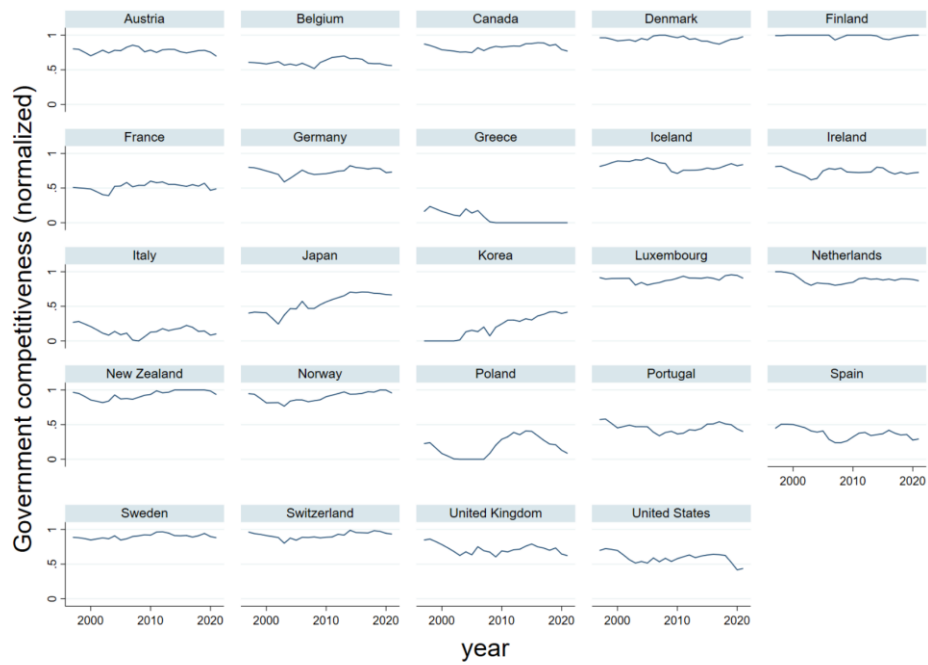
Source: Own work

Graph 13: Government debt in 2021 by country



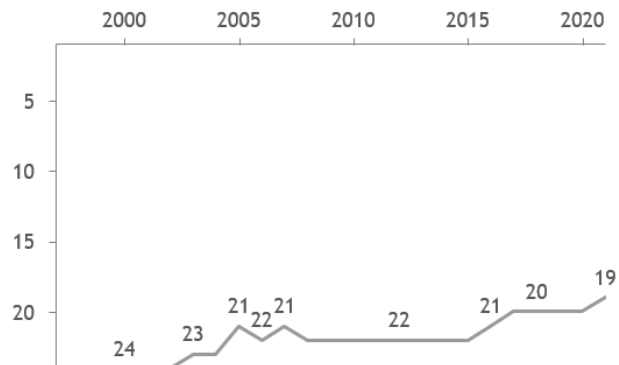
Source: Own work

Graph 14: Government competitiveness by country



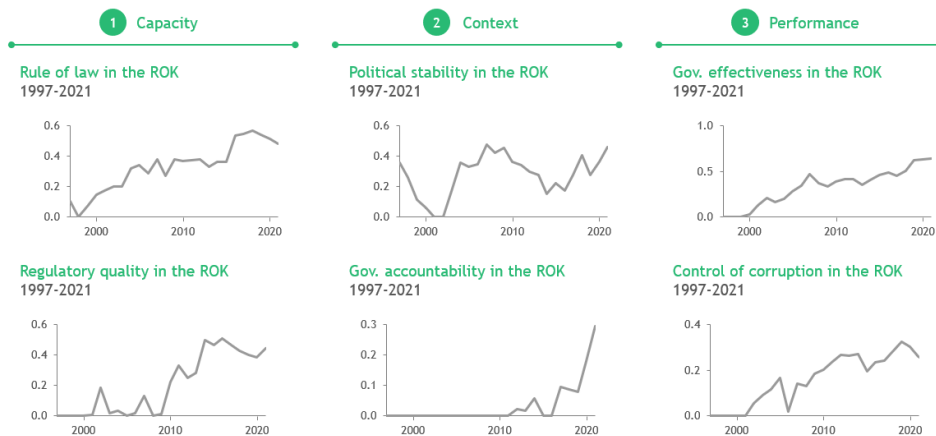
Source: Own work

Graph 15: Historical evolution of the GC score of the ROK



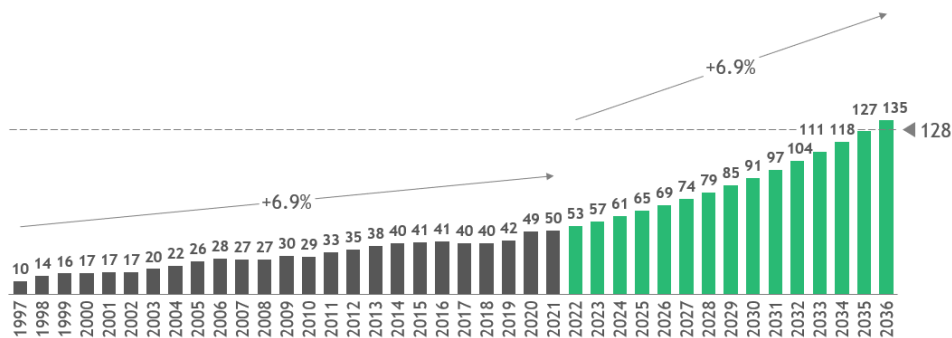
Source: Own work

Graph 16: Evolution of Government competitiveness indicators of South Korea



Source: Own work

Graph 17: Expected public debt levels of South Korea



Source: Own work

7. Conclusion

In the midst of the ongoing theoretical debate on the effects of public debt on economic growth after the GFC and the recent global pandemic, debt ratios of developed countries have unceasingly increased. Policy prescriptions widely vary depending on the theoretical inclination. Thus, it is of crucial importance to provide empirical evidence that supports any claim.

The literature on debt and growth emphasizes two aspects that need to be controlled to assess the debt dynamics correctly. First, the endogeneity issue, and second, possible nonlinearities of debt. Correct econometric specification and estimation procedures are required to estimate the debt dynamics accurately. The literature usually takes two different approaches to analyzing debt thresholds. First, the introduction of the squared term of debt alongside debt (Checherita-Westphal and Rother 2012), and second, threshold dummy variables (Caner, Grennes et al. 2010, Kumar and Woo 2010, Cecchetti, Mohanty et al. 2011, Woo and Kumar 2015). Given the characteristics of the data and nature of debt (unbalanced panel, relatively small number of developed countries, and potential endogeneity), the former has been considered the adequate methodological process to derive debt thresholds.

Given the robustness and convergence of the results with other similar studies, we conclude that public debt has a nonlinear behavior with growth, i.e., in the long run, the causality from debt to growth is negative for high debt levels.

The economic consistency and resilience developed countries have shown over the past ten years during the GFC and the recent global pandemic could explain the

higher tipping point from the results compared to other studies. Having more robust economic pillars than expected possibly raised the debt tolerance of OECD countries. Moreover, the competitiveness of the governments of these countries is a factor that enhances investors' trust, thus reducing the possible investment crowding-out effects during economic downturns.

This study contributes to the existing literature by providing empirical evidence supporting the fiscal unsustainability of high public debt in the long run. Datapoints where public debt ratios surpass the 90 percent threshold are especially concentrated in the post-GFC period and COVID pandemic. As a result, we cover the potential shortcomings of having a lack of empirical evidence above the threshold¹⁵ and gather data from all OECD countries with political and democratic stability in contrast to previous studies that only focus on specific groups of countries (Checherita-Westphal and Rother 2012, Asteriou, Pilbeam et al. 2020). Including additional independent variables not used previously provides more consistency to the previous literature. Further, by overlapping the data, we can control for business cycles and better analyze the long-run impacts of debt (Kumar and Woo 2010).

Finally, as Eberhardt (2017) indicates, disseminating the different components of public debt permits obtaining more robust conclusions. However, the limitations of the data do not allow approaching the topic this way. Under the present

¹⁵ From the period 1997 to 2008 there are only 49 datapoints of debt>90%; from 2009 to 2020 there are 97 datapoints.

circumstances, it is concluded that this is the most appropriate approach in dealing with the endogeneity problem of the real relationship between public debt and economic growth.

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9. Appendix

Appendix 1: Countries classification by income level

| Income level | Countries included |
|--------------|---|
| High-income | Andorra, Antigua and Barbuda, Aruba, Australia, Austria, Bahrain, Barbados, Belgium, Brunei Darussalam, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong SAR, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Kuwait, Latvia, Lithuania, Luxembourg, Macao SAR, Malta, Nauru, Netherlands, New Zealand, Norway, Oman, Palau, Poland, Portugal, Puerto Rico, Qatar, San Marino, Saudi Arabia, Seychelles, Singapore, Slovak Republic, Slovenia, Spain, St. Kitts and Nevis, Sweden, Switzerland, Taiwan Province of China, The Bahamas, Trinidad and Tobago, United Arab Emirates, United Kingdom, United States, Uruguay |
| Upper-middle | Albania, Argentina, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, China, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, Equatorial Guinea, Fiji, Gabon, Georgia, Grenada, Guatemala, Guyana, Iraq, Jamaica, Jordan, Kazakhstan, Lebanon, Libya, Malaysia, Maldives, Marshall Islands, Mauritius, Mexico, Moldova, Montenegro, Namibia, North Macedonia, Panama, Paraguay, Peru, Romania, Russia, Serbia, South Africa, St. Lucia, St. Vincent and the Grenadines, Suriname, Thailand, Tonga, Turkey, Turkmenistan, Tuvalu, Venezuela |
| Lower-middle | Algeria, Angola, Bangladesh, Belize, Benin, Bhutan, Bolivia, Cabo Verde, Cambodia, Cameroon, Comoros, Côte d'Ivoire, Djibouti, Egypt, El Salvador, Eswatini, Ghana, Haiti, Honduras, India, Indonesia, Islamic |

| | |
|------------|---|
| | <p>Republic of Iran, Kenya, Kiribati, Kyrgyz Republic, Lao P.D.R., Lesotho, Mauritania, Micronesia, Mongolia, Morocco, Myanmar, Nepal, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Philippines, Republic of Congo, Samoa, Senegal, Solomon Islands, Sri Lanka, São Tomé and Príncipe, Tajikistan, Tanzania, Timor-Leste, Tunisia, Ukraine, Uzbekistan, Vanuatu, Vietnam, Zambia, Zimbabwe</p> |
| Low-income | <p>Afghanistan, Burkina Faso, Burundi, Central African Republic, Chad, Democratic Republic of the Congo, Eritrea, Ethiopia, Guinea, Guinea-Bissau, Liberia, Madagascar, Malawi, Mali, Mozambique, Niger, Rwanda, Sierra Leone, Somalia, South Sudan, Sudan, Syria, The Gambia, Togo, Uganda, Yemen</p> |

Appendix 2: Data specification

| Variable | Details | Source |
|-------------------------------|--|---|
| GDP per capita | GDP is expressed in constant international dollars per person. Data are derived by dividing constant price purchasing-power-parity (PPP) GDP by the total population. | International Monetary Fund World Economic Outlook October 2020 |
| General government gross debt | Gross debt consists of all liabilities that require payment or payments of interest and/or principal by the debtor to the creditor at a date or dates in the future. This includes debt liabilities in the form of SDRs, currency and deposits, debt securities, loans, insurance, pensions and standardized guarantee schemes, and other accounts payable. Thus, all liabilities in the GFSM 2001 system are debt, except for equity and investment fund shares and financial derivatives and employee stock options. Debt can be valued at current market, nominal, or face values (GFSM 2001, paragraph 7.110). | International Monetary Fund World Economic Outlook October 2020 & AMECO (for US data from 1997 to 2000) |
| Gross national savings | Expressed as a ratio of gross national savings in current local currency and GDP in current local currency. Gross national saving is gross disposable income less final consumption expenditure after taking account of an adjustment for pension funds. [SNA 1993] For many countries, the estimates of national saving are built up from national accounts data on gross domestic | IMF World Economic Outlook October 2020 |

| | | |
|----------------------|--|--|
| | investment and from balance of payments-based data on net foreign investment. | |
| Inflation (CPI) | Expressed in averages for the year, not end-of-period data. A consumer price index (CPI) measures changes in the prices of goods and services that households consume. Such changes affect the real purchasing power of consumers' incomes and their welfare. As the prices of different goods and services do not all change at the same rate, a price index can only reflect their average movement. A price index is typically assigned a value of unity, or 100, in some reference period and the values of the index for other periods of time are intended to indicate the average proportionate, or percentage, change in prices from this price reference period. Price indices can also be used to measure differences in price levels between different cities, regions or countries at the same point in time. [CPI Manual 2004, Introduction] For euro countries, consumer prices are calculated based on harmonized prices. For more information see http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-BE-04-001/EN/KS-BE-04-001-EN.PDF .] | International Monetary Fund World Economic Outlook October 2020 |
| Age dependency ratio | Ratio of people younger than 20 and older than 64 to the working-age population | OCED Statistics |
| Openness to trade | Measured by the sum of exports and imports as a percent of GDP. | World Bank World |

| | | Development Indicators |
|--------------------------|---|---|
| Banking crisis | <p>A banking crisis is defined as systemic if two conditions are met: a. Significant signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system, and/or bank liquidations), b. Significant banking policy intervention measures in response to significant losses in the banking system. The first year that both criteria are met is considered as the year when the crisis start becoming systemic. The end of a crisis is defined the year before both real GDP growth and real credit growth are positive for at least two consecutive years.</p> | World Bank Global Financial Development |
| Research and development | <p>“[...] data on Government budget allocations for RD (GBARD) by socio-economic objective (SEO), using the NABS 2007 classification i.e.: Exploration and exploitation of the Earth, Environment, Exploration and exploitation of space, Transport, telecommunication and other infrastructures, Energy, Industrial production and technology, Health, Agriculture, Education, Culture, recreation, religion and mass media, Political and social systems, structures and processes, General advancement of knowledge: RD financed from General University Funds (GUF), General advancement of knowledge: RD financed from sources other than GUF, Defence. Please</p> | OCED Statistics |

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| | <p>note that in this new NABS 2007 classification, the three socio-economic objectives -- Education, Culture, recreation, religion and mass media, and Political and social systems, structures and processes -- were previously grouped under a single objective: Social structures and relationships. At the time of this publication there is no breakdown of historical data into the three new SEOs. Another issue relating to the transition from NABS 1993 to NABS 2007 is that what was formerly Other civil research is now to be distributed among the other chapters. This distribution has not yet been done in this database. Therefore, until the countries are in a position to provide breakdown according to the NABS 2007 classification, in some cases GBAORD by SEO is greater than the sum of its chapters.”</p> | |
| Education | <p>Measured as the percent of the population that have completed tertiary education</p> | <p>Barro & Lee Educational Attainment for Total Population, 1870-2010 & Population 2015- 2040 projections</p> |
| Population growth | <p>For census purposes, the total population of the country consists of all persons falling within the scope of the census. In the broadest sense, the total may comprise either all usual residents of the country or all persons</p> | <p>IMF World Economic Outlook October 2020</p> |

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| | present in the country at the time of the census. [Principles and Recommendations for Population and Housing Censuses, Revision 1, paragraph 2.42] | |
| Rule of law | Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence | World Bank Governance Indicators |
| Regulatory quality | Regulatory quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development | World Bank Governance Indicators |
| Political stability | Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism | World Bank Governance Indicators |
| Government accountability | Voice and accountability captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media | World Bank Governance Indicators |
| Government effectiveness | Government effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree | World Bank Governance Indicators |

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| | of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies | |
| Control of corruption | Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests | World Bank Governance Indicators |

Appendix 3: Banking crisis estimation source

| n | Country | Intervention | Source |
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| 1 | Austria | Yes | “The Oesterreichische Nationalbank (OeNB) has declared readiness to supply sufficient cash to banks, ATM operators, and the economy in response to increased withdrawals” (IMF 2020). |
| 2 | Belgium | Yes | “release of the countercyclical capital buffer provides the banks with extra (preventive) capacity to deal with possible loan losses should the worldwide slowdown in growth persist or gain momentum and, in this situation, therefore also ensures continuity of financial service provision and lending to the real economy. Through this release of the countercyclical buffer, the NBB is making approximately €1 billion worth of capital buffers available to Belgian banks to cover potential risks” (National Bank of Belgium 2020). |
| 3 | Canada | Yes | “The following programs are in active operation: a) Government of Canada Bond Purchase Program, b) Provincial Bond Purchase Program, c) Corporate Bond Purchase Program, d) Commercial Paper Purchase Program” (Bank of Canada 2020). |
| 4 | Denmark | Yes | “The Danish authorities decided on March 12, 2020 to preemptively release the countercyclical capital buffer and cancel the planned increases meant to take effect later. The |

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| | | | Danish Financial Stability Authority (DFSA) also announced a case by case relaxation of regulation on the LCR requirement . Banks and insurance companies are urged by the DFSA not to pay out dividends or buy back shares.” (IMF 2020). |
| 5 | Finland | Yes | “Key measures within Finland include: (i) Bank of Finland to support liquidity through investing in short-term Finnish corporate commercial paper [...]” (IMF 2020). |
| 6 | France | Yes | “Other measures include: (i) reducing the counter-cyclical bank capital buffer to 0 percent (an increase from 0.25 percent to 0.5 percent was to become effective by April); (ii) a temporary ban on short-selling stocks was in place until May 18; and (iii) credit mediation to support renegotiation of SMEs’ bank loans” (IMF 2020). |
| 7 | Germany | Yes | “release of the countercyclical capital buffer for banks from 0.25 percent to zero [...]” (Federal Financial Supervisory Authority 2020). |
| 8 | Greece | Yes | “Bond market developments have been positive, as shown by the recent upgrade of Greece’s credit rating by Moody’s and a decline in Greek government and corporate bond yields. A decisive factor behind this development was the inclusion of Greek government bonds in the ECB’s Pandemic Emergency Purchase Programme (PEPP) and their eligibility as collateral in Eurosystem refinancing operations [...] Bank credit to non-financial corporations, especially large firms, |

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| | | | increased in 2020, reflecting the measures taken by the Greek government to expand loan guarantee and co-financing schemes, as well as the favourable monetary policy measures of the ECB and the supervisory flexibility provided by the Single Supervisory Mechanism (SSM).” (Bank of Greece 2020). |
| 9 | Iceland | Yes | “Central Bank measures have significantly eased their access to liquidity, and funding spreads in international markets have narrowed. As a result, the banks have access to liquidity in both krónur and foreign currencies. They are therefore well positioned to address the repercussions of the pandemic.” (The Central Bank of Iceland 2020). |
| 10 | Ireland | Yes | “Given the severity of impact of the COVID-19 pandemic the full release of the CCyB was judged to be appropriate by the Central Bank.” (Nora, O'Brien et al. 2020). |
| 11 | Italy | Yes | “The Bank of Italy have announced a series of measures to help banks and non-bank intermediaries under its supervision, in line with the initiatives undertaken by the ECB and the EBA. These include the possibility to temporary operate below selected capital and liquidity requirements; extension of some reporting obligations; and rescheduling of on-site inspections” (IMF 2020). |
| 12 | Japan | Yes | Measures taken by the Bank of Japan are the following: “(1) an increase in purchases of CP and corporate bonds, (2) strengthening of the Special Funds-Supplying Operations to |

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| | | | Facilitate Financing in Response to the Novel Coronavirus (COVID-19), and (3) further active purchases of Japanese government bonds (JGBs) and treasury discount bills (T-Bills)” (Bank of Japan 2020). |
| 13 | Korea | Yes | <p>“On March 24, President Moon announced a financial stabilization plan of KRW 100 trillion (5.3 percent of GDP). The main elements are: 1) expanded lending of both state-owned and commercial banks to SMEs, small merchants, mid-sized firms, and large companies (the latter on a case-by-case basis) including emergency lending, partial and full guarantees, and collateralization of loan obligations; 2) a bond market stabilization fund to purchase corporate bonds, commercial paper, and financial bonds; 3) financing by public financial institutions for corporate bond issuance through collateralized bond obligations and direct bond purchases; 4) short-term money market financing through stock finance loans, BOK repo purchases, and refinancing support by public financial institutions; and 5) an equity market stabilization fund financed by financial holding companies, leading financial companies, and other relevant institutions.” (IMF 2020).</p> |
| 14 | Luxembourg | Yes | <p>“Luxembourg banks committed to offer a 6-month moratorium on loan repayment for SMEs, self-employed and liberal professionals.” (IMF 2020).</p> |
| 15 | Netherlands | Yes | <p>“The systemic buffers will be lowered, from its current 3% of global risk-weighted exposures to 2.5% for ING, 2% for</p> |

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| | | | Rabobank and 1.5% for ABN Amro. The introduction of a floor for mortgage loan risk weighting will be postponed.” (De Nederlandsche Bank 2020). |
| 16 | New Zealand | Yes | “The Reserve Bank announced an emergency policy rate cut by 75 basis points, to 0.25%. The Reserve Bank has committed to the OCR remaining at 0.25% until 2021 while asking financial institutions to be ready for a negative OCR by 1 December 2020. This has raised expectations that a negative OCR will occur in 202; The Reserve Bank announced further measures to support commercial banks to strengthen liquidity; buying up to \$100bn of bonds in the secondary market by June 2022. The Large Scale Asset Purchase (LSAP) Programme includes NZ Government Bonds, Local Government Funding Agency Bonds and NZ Government Inflation-Indexed Bonds” (KPMG 2020). |
| 17 | Norway | Yes | “Norges Bank reduces the policy rate by 0.75 percentage point to 0.25 percent” (Norges Bank 2020). Further, it has provided extraordinary F-lonas to banks in numerous occasions (Norges Bank 2020) |
| 18 | Poland | Yes | “The Monetary Policy Council (MPC), [...] has cut rates three times this year by a cumulative 140 basis points to 0.1% to tackle the economic slowdown” (Gocłowski and Koper 2020). |
| 19 | Portugal | Yes | “The Board of Directors of the Banco de Portugal has decided to postpone the phase-in period by 1 year, defined in |

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| | | | 2017 and revised in 2019, of the capital buffer for “other systemically important institutions” (O-SII).” (Banco de Portugal 2020). |
| 20 | Spain | Yes | “The Banco de España will apply the flexibility available in the regulations on minimum requirements for own funds and eligible liabilities (MREL), in view of the impact of COVID-19” (Banco de España 2020) |
| 21 | Sweden | Yes | “During an extraordinary meeting today, Monday, 16 March, FI’s Board of Directors decided to adopt a countercyclical buffer rate of 0 per cent in accordance with the proposal presented on Friday, 13 March 2020.” (Finansinspektionen 2020) |
| 22 | Switzerland | Yes | “Swiss National Bank sets up SNB COVID-19 refinancing facility and requests deactivation of countercyclical capital buffer” (Swiss National Bank 2020) |
| 23 | United Kingdom | Yes | “At its special meeting ending on 10 March 2020, the Monetary Policy Committee (MPC) voted unanimously to reduce Bank Rate by 50 basis points to 0.25%. The MPC voted unanimously for the Bank of England to introduce a new Term Funding scheme with additional incentives for Small and Medium-sized Enterprises (TFSME), financed by the issuance of central bank reserves. The MPC voted unanimously to maintain the stock of sterling non-financial investment-grade corporate bond purchases, financed by the issuance of central bank reserves, at £10 billion. The |

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| | | | <p>Committee also voted unanimously to maintain the stock of UK government bond purchases, financed by the issuance of central bank reserves, at £435 billion. The reduction in Bank Rate will help to support business and consumer confidence at a difficult time, to bolster the cash flows of businesses and households, and to reduce the cost, and to improve the availability, of finance.” (Bank of England 2020)</p> |
| 24 | United States | Yes | <p>“Federal funds rate were lowered by 150bp in March to 0-0.25bp [...],Federal Reserve also introduced facilities to support the flow of credit [...] Federal banking supervisors encouraged depository institutions to use their capital and liquidity buffers to lend, [...] Lower the community bank leverage ratio to 8 percent [...]” (IMF 2020)</p> |

국문초록

정부부채가 경제성장에 미치는 영향 - OECD 국가의 비선형 문헌 재검토 -

서울대학교 행정대학원

행정학 전공

김중열

2008 세계 금융위기와 현재 전 세계가 겪고 있는 코로나-19 팬데믹은 OECD 국가 경제에 가장 피해를 많이 입은 사건으로 꼽을 수 있다. 경제 저성장과 정부부채에 미친 타격은 과대평가 하기 어려울 정도로 많은 정부의 재정상태나 사람들의 삶에 큰 영향을 미쳤다. 정부부채에 대한 염려가 커지면서 이 주제에 학술적인 관심이 증가하며 부채가 경제에 미치는 영향의 연구가 부족함이 들어났다. 본문은 정부부채가 경제성장에 미치는 영향을 OECD 24 국 샘플로 주청한다. 1997 부터 2021 년 데이터를 사용하여, SGMM 방법론을 통해 정부부채와 경제성장 간의 내생성과 역인과성을 통제한다. 높은 정부부채는 경제성장에 부정적인 효과를 미치고 정부부채와 경제성장은 비선형 관계를 지니고 있다고 결론을 내린다.

주제어: 정부부채, 경제성장, 재정정책, 부채 문턱

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