Interaction of Fiscal Space, Fiscal Rules and Fiscal Spending During the Covid-19 Pandemic

Bachelor thesis

submitted to

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Abstract

In early 2020, the world was hit by the Covid-19 pandemic. Suddenly, governments implemented curfews and closed borders that *inter alias* disrupted a disruption of supply chains and income losses. To ensure that businesses and individuals weathered this crisis well, public sectors around the world launched stimulus packages. As these varied in size, the research paper aims to find macroeconomic fundamentals that influenced the amount of government spending. The concept that defines public spending constraints is called *fiscal space.* Since there is no single definition or metric for this concept, a literature review of different approaches to depicting and interpreting fiscal space is first provided. Furthermore, the four forms of fiscal rules are presented, namely expenditure rules, revenue rules, budget balance rules and finally debt rules. Based on the CEPR Covid Economics article *"Did fiscal space influence Covid-19's fiscal response?"* (Apeti, Combes, Debrun, & Minea, 2021), OLS regressions are estimated in the following part to empirically assess the relationship between spending, fiscal space parameters, the presence of fiscal rules and further control variables. Given that the results obtained differ in some respects from those of Apeti et al. (2021), the following section analyses the outcomes and discrepancies and looks for possible ways to account for some insignificant effects. For instance, one can assume that the Covid-19 crisis is different in structure from other economic crunches. The goal of the public sector was not to increase economic activity in the short term but rather bring it above the stillstand and allow a restart in the long run. Another potential cause for the insignificant results is that public debt ratios are only constrained in the long term, allowing governments to spend almost without constraints in the very short run. In other words, one can assume that the intertemporal budget constraint leaves room for borrowing during the crisis and can, even though it may lead to debt problems at a later stage.

1. Introduction

In early 2020, the whole world was catapulted into a state of extreme emergency caused by the Covid-19 pandemic. Not only did it evoke an international health alert (WHO, 2020), but the worldwide economy was also severely affected across all sectors. To reduce negative repercussions, stimulus packages were put in place to compensate e.g., for lost income and to counter-cyclically ensure that the economy would overcome the crisis.

The size of the stimulus packages varies across countries. This thesis will identify possible macroeconomic reasons for that. It is based on and inspired by the *CEPR Covid Economics* article "*Did fiscal space influence Covid-19's fiscal response?"* (Apeti, Combes, Debrun, & Minea, 2021). It revisits the articles empirical research with the help of recent data and adjusted variables. In addition, it provides a more detailed theoretical framework and literature review on fiscal space and fiscal rules.

This paper will not address the impact of high debt on economic growth, nor the need for higher public spending to maintain the state of the infrastructure, or for better social provision. These are also the subject of current discussion and are important issues in debt and fiscal sustainability analysis (Ostry, Ghosh, & Espinoza, 2015). Also, question of fiscal consolidation, the effectiveness of the stimulus package, and an examination of the direction of spending, are not in the focus. Mainly, the government's *ability* to spend and its influencing factors are considered. This results in the following research question: Was fiscal spending constrained during the Covid-19 crisis? And if so, by what factors?

In chapter 2., existing concepts, definitions, and measures of fiscal space are presented and evaluated for use in the subsequent empirical analysis. Further, it deals with fiscal rules and how they affect fiscal spending. The following section 3. is the empirical analysis for the effect of both fiscal space and rules on spending during the Covid-19 pandemic. This part includes an interpretation of the obtained results. A conclusion of the work follows at the end.

2. Theoretical analysis of fiscal spending

In the section 2.1., concepts for fiscal space are listed and analyzed. The interaction between different measurements of fiscal space and fiscal expenditure is explained. The section 2.2. describes the mechanism and types of fiscal rules and their effects on fiscal policy.

2.1. Relationship between fiscal space and fiscal spending

Prior to the Global Financial Crisis (GFC), the concept of fiscal space was especially used regarding the sustainability of public expenditure in low-income countries as described in Heller (2005). Sustainability reflects in this context that states have no risk of insolvency. Afterwards, the concept began to be applied frequently to assess the fiscal situation of developed and high-income countries (Marcel, 2014). With the GFC, the debate related to fiscal space changed, not

only geographically, but also in terms of the accompanying connotation. Instead of seeing fiscal space as the possibility of what policymakers can still spend, it was increasingly seen as the necessary buffer to have before being forced to pursue consolidation (Ghosh, Kim, Mendoza, Ostry, & Qureshi, 2013).

The necessity to create more fiscal space was one of the main justifications for the austerity programs after the GFC. Countries highly affected by the ensuing debt crisis and under pressure from the financial markets and international organizations, such as Greece, Iceland, Ireland and Portugal, were forced into fiscal consolidation. In the European Union (EU), laws have been strengthened to prevent future fiscal instability and have balanced public finances. The *Treaty on Stability, Coordination, and Governance in the Economic and Monetary Union (TSCG)*, a strengthening of the *EU Stability and Growth Pact* which also allows for sanction mechanisms, states that the government budget must balances or in surplus (European Comission, 2012). However, not all developed countries undertook the same form of consolidation after the GFC. Conversely, Japan and the United States did not reduce their debt ratios[1]. Although after the financial crisis it was assumed, they would also need to stabilize it (Marcel, 2014), the high deficits have continued, especially with the Covid-19 pandemic (see Figure 1). These different handling of high debt ratios raises the question as to how debt is problematic in the first place.

Financing expenditures through debt requires that the underlying budget situation allows borrowing. Sovereigns only receive money on favorable terms if the probability of repayment is high, i.e., fiscal policy is sustainable in the long term. Mathematically expressed, a state is solvent if the future (discounted) value of all revenues is sufficient to pay debt and future (discounted) expenditures. This is described with the intertemporal budget constraint (Wyplosz, 2020; Perotti, 2007):

$$B_t = \prod_{q=0}^{t-1}(1 + r_q - g_q)B_0 + \sum_{q=1}^{t-1}\prod_{u=q+1}^{t-1}(1 + r_u - g_u)D_q$$

(with B_t the debt position as to GDP ratio in period t, r_t the real interest rate in period t, g_t the GDP growth rate in period t and D_t the primary budget deficit as to GDP ratio in period t).

The intertemporal budget constraint is the most obvious constraint for fiscal policy (besides credit market imperfections and political constraint). Nevertheless, the current debate on fiscal space often leaves budget constraint out of the argumentation (Perotti, 2007).

In general, there are various definitions and measures of fiscal space, yet sometimes the term is applied even without stating what exactly is meant or measured (Gros, 2020). Heller (2005) defines it as "*room in a government's budget that allows it to provide resources for a desired*

[1] Unless otherwise specified, the debt ratio is used synonymously with gross government debt per GDP.

purpose without jeopardizing the sustainability of its financial position or the stability of the economy". This definition is often referred to in the literature.

The IMF (2017) states that fiscal space is a multidimensional indicator, what makes it difficult to say whether a country has sufficient fiscal space or not. Thus, the IMF (2017) underlines the necessity of using several tools to assess fiscal space and applies the following four principal measures: (1) the debt burden (2) the debt profile, (3) the financing conditions, and (4) the adjustment needed to stabilize debt in a context of rising aging costs. Additionally, it notes that fiscal space is a concept that depends on future policy implications, it is a *"forward-looking and dynamic assessment"* (IMF, 2017). This concept depends on several assumptions about developments within the economy and foreign countries, as international spillover may impact the fiscal situation. Overall, the IMF (2017) urges caution in the use of the fiscal space. Moreover, it conducts a medium- to long-term horizon in its own analysis with a projection in different scenarios to address uncertainties. In contrast, the European Commission (EC), which, as already mentioned, has a major influence on fiscal rules in the Euro Area, takes a more short-term view when considering fiscal space. The compliance with the Stability and Growth Pact has just a three-year horizon. The focus on such a short period shows that the argument is not based on a budget constraint, i.e., not directly on the question of whether a fiscal expenditure poses a long-term threat to solvency (Wyplosz, 2020).

The simplest measure of debt sustainability, for which data is widely available across countries, is the debt to GDP ratio, usually based on gross debt[2] (World Bank Group, 2015; Marcel, 2014). Romer and Romer (2019) define fiscal space as *"the room a country has to use fiscal policy to stimulate the economy or to undertake a bailout and recapitalization of its financial sector"*. As an indicator they use the gross government debt ratio and find a strong negative correlation between this ratio prior to a crisis and more expansionary fiscal policy in situations of distress between 1980 and 2017. Accordingly, lower debt ratios imply that countries suffer less after crises. However, there are two possible reasons for this correlation. The direct link implies that higher indebtedness leads to constraints in accessing the sovereign credit market, i.e., there are less investors willing to grant money or they demand much higher risk premiums for higher debt to GDP ratios. In this sense, there is a causality from higher debt to worse market access. The indirect link justifies the causality with political decisions alone. Austerity has been imposed on countries with high debt ratios due to ideologies of governments or international organizations. Even if there is no market pressure leading to a correlation between debt and fiscal space, highly

[2] Gross debt is defined as "*all liabilities that are debt instruments"*, which are special drawing rights (SDRs), currency and deposits, debt securities, loans, insurance, pension, and standardized guarantee schemes and other accounts payable (but liabilities in form of form of equity and investment fund shares and financial derivatives and employee stock options are excluded) (IMF, 2013).

indebted countries are forced to consolidate. The difficulty in assessing which of the two justifications applies is that there is no perfect direct measure of market access. Romer and Romer (2019) use interest rates as control variables and find reasons for the presence of the direct link, yet with a co-existence of the indirect link that strengthens the correlation simultaneously. Thus, they state that debt has an impact on budget spending through several channels, but that policy decisions are one of them. They also show evidence of a non-linear relationship between the debt ratio and fiscal space. Very low debt ratios may be the result of an intense austerity periods in which a country spends and invests insufficiently. This may inhibit growth and hence be undesirable in long-term for fiscal space. Thus, a bell-shaped relationship could be conceivable, implying that very low as well as very high debt could be problematic (Ostry, Ghosh, & Espinoza, 2015). This is analyzed in chapter 3., the empirical section.

Not only because of the uncertainty of the causality of debt and market access, but also because the debt ratio does not take micro- and macroeconomic country-specific characteristics into account, e.g., about a country's ability to repay, its use as an isolated indicator of fiscal space is viewed critically (Kose, Ohnsorge, & Sugawara, 2018; IMF, 2017; Wyplosz, 2020). While for multiple countries there are fixed policy determined debt ratio limits, as with the Maastricht criterion, no cross-country and across time fixed debt ratio can be derived beyond which debt is problematic. For instance, Krugman (2020) argues that, due to low interest rate rates, when government would invest 2% of GDP yearly and debt ratios rises to 200%, debt would still be sustainable and the possibility of default low. Another example is Japan, which has a very high debt ratio that is not associated with a high probability of default according to most ratings (Kose, Kurlat, Ohnsorge, & Sugawara, 2017). At the same time, other countries already have a warning of insolvency at much lower debt ratios, especially in low-income countries. For example, the Central African Republic is one of the so-called heavily indebted poor countries. In in 2019 it had a debt ratio of just 47.18%. Yet, such a debt ratio for a Euro country would even be in line with the Maastricht criteria.

Nevertheless, the debt level per se does not seem to be completely irrelevant. There is an empirical evidence that high debt levels can inhibit growth and therefore be problematic (Reinhart & Rogoff, 2010). Furthermore, they can undermine confidence in solvency (Hutchison, 2020). The simple debt to GDP ratio continues to be used as a simplification, but more complex assessments of fiscal space also refer to debt levels and use them as part of the analysis. Some of them are considered in the following.

The first attempt to examine fiscal space is often attributed to Bohn (1998), even though he does not explicitly declare its measurement as *fiscal space* but as a *sustainability test*. While the earlier study of fiscal policy with the intertemporal budget constraint requires assumptions such as the interest rate, Bohn's (1998) does not. His idea is to take historical data and test whether the debt

to GDP ratio is significantly stationary. Prior univariate regressions do not find significant evidence of rejecting unit root using a standard Dickey-Fuller and Phillips-Perron test. Unlike those, he adds variables for temporary government spending and cyclical variations in output and obtains strong evidence of mean reversion in the debt to GDP ratio in the U.S. between 1916 and 1984. Since there is a significant positive correlation between the debt ratio and the lagged primary surplus, U.S. fiscal policy responded to high debt levels. He declares this to be a sufficient condition for the intertemporal budget constraint to hold and fiscal policy to be sustainable. The difficulty with this measure of fiscal space is that it only states whether there is "infinite" or no fiscal space at all, but not "how much space", which makes it difficult to use for the empirical work later in the paper (Nerlich & Reuter, 2015; Bohn, 1998).

To refer to the debt ratio, while making clear that there is no single target for the debt ratio, fiscal space can be defined as *"difference between the current debt level and [the] debt limits"* (Ghosh, Kim, Mendoza, Ostry, & Qureshi, 2013), with the limit differing across countries. The fiscal limit is the point at which the amount of debt is no longer sustainable and therefore fiscal solvency is not insured anymore. Beyond this point, even positive primary balance cannot offset the interest burden and debt settlement. The debt dynamics become explosive, and government loses market access. It is not able to pay the desired interest, which results in a default. So, the debt limit is the maximum amount of debt where the current level of debt can be renewed, and the primary deficit can be financed with the market-given interest rate. Ghosh, et al. (2013) calculate the debt limit for advanced countries, using a *primary balance reaction function*. For 2015, They conclude that the median of the projected debt limit is at 183,4 % debt per GDP. The idea behind using the fiscal reaction function is that the primary balance in the current period depends fundamentally on lagged debt ratios, not only with linear terms but also with quadratic and cubic terms. The exact approach is reused in Nerlich and Reuter (2015) who examine the interaction of fiscal rules and fiscal space and in Moody's Analytics fiscal space database (Zandi, Cheng, & Packard, 2011). As the Moody's database is not freely available and the calculation of the endogenously determined debt limit involves variables that are not generally available for all countries, the concept is not applied in the empirical chapter 3.

As a critique of existing, mostly static definitions and applications, Wyplosz (2020) likewise defines fiscal space as the difference between the current deficit and a threshold. As a further approach, he calculates this limit as the deficit at which the sustainability condition of the intertemporal budget constraint is (strictly) fulfilled:

$$\lim_{t\to\infty} \frac{B_t}{\prod_{q=0}^{t-1}(1+r_q-g_q)} \leq 0$$

The difficulty with this definition of fiscal space is its dependency on the future path of interest rate and growth rate. Since it is complex to forecast up to an infinite horizon, Wyplosz (2020)

simplifies it by considering a medium-term horizon of 30 years. At the end, considering the EU countries, he also obtains a strong negative correlation between fiscal space and the debt ratio. Since Wyplosz (2020) even concludes that his result does not one single reliable number and that it has a strong relationship with more easily ascertainable debt ratios used as an empirical indicator, this concept is not applied in the empirical estimation of this thesis.

Another approach is to measure fiscal space with the tax revenues. Aizeman and Jinjarak (2010) propose a concept, called *de facto fiscal space*, which is the number of years it would take to repay the total public debt with tax revenues. They show the statistical significance of de facto fiscal space regarding the stimulus following the GFC. Using a cross-country dataset out of 75 low-, lower middle-, upper middle- and high-income countries, they discover that higher fiscal space indeed resulted in higher fiscal stimuli during crises.

To calculate the change in fiscal space due to the increasing population age in advanced economies, Park (2012) defines fiscal space as *"distance between the current tax revenue level and the peak of the Laffer curve (maximum revenue)"*. He explains that the tax revenues are the main possibility for governments to stabilize the debt stock. Park's (2012) idea is to look also at the income side to determine how much revenue capacity the public sector could still create. Due to insufficient data and high uncertainty, e.g., in the calculation of the peak of the Laffer curve, this concept is not applied in the empirical section.

A very close approach is taken by Hütgen (2020). He describes the fiscal space as the difference between a limit and the debt ratio and he defines the limit as *"maximum level of debt that is sustainable, i.e. the present discounted value of all future fiscal surpluses when raising taxes at the peak of the Laffer curve"*. However, this definition of fiscal limit is very sensitive toward changes in interest rates. When in crises the risk premium suddenly increases, then the fiscal limit also changes (Hürtgen, 2020). Due to the complex assumptions involved in calculating the peak of the Laffer curve and lack of data, this approach is not further considered.

The World Bank (2915) suggest for fiscal space, besides the debt to GDP ratio, two additional concepts. Another measure is the balance to GDP ratio (either as primary balance or as structural balance), which is a flow measure and looks at future debt sustainability and rollover risk. Further, it suggests using the primary balance sustainability gap *(pbsg)*, being the difference between the actual primary balance and the debt-stabilizing primary balance (World Bank Group, 2015):

$$pbsg = p - \left(\frac{r-g}{1+g}\right) d^* = p - \left(\frac{i-\gamma}{1+\gamma}\right) d^*$$

(with p the primary balance in % of GDP, r the real interest rate, g the real GDP growth, d^* the target debt to GDP ratio, γ the nominal output growth and i the nominal interest rate).

The overall fiscal balance sustainability gap *(ofbsg)* is based on a similar idea. A positive gap indicates that, under given overall fiscal balance, the government debt would diminish over time (Kose, Kurlat, Ohnsorge, & Sugawara, 2017):

$$ofbsg = b - \left(\frac{-\gamma}{1+\gamma}\right) d^*$$

(with b the overall fiscal balance in % of GDP). The right-hand-side indicates the fiscal balance, that stabilizes the debt stock at the targeted level. However, both measures depend on a target debt to GDP ratio, which is difficult to determine and depends heavily on the political context and ideology. For simplicity, the target is defined as equal to the historical median in an "economy's peer group". Yet, both indicators show that the assessment of debt sustainability must look on and growth rates. They consider that the debt burden can change over time. High debt levels can be unproblematic in the long run, or even moderate debt levels can have an exploding snowball effect, when interest rates are high, and growth is low.

An increasing literature argues that one should look at the entire balance sheet for sovereigns, as is done for firms, because (financial) assets are important for adequate risk assessment and stronger balance sheets provide more room for spending during recessions. Other components of the public sector balance sheet that can be used to assess fiscal sustainability whether debt are domestical or external owned to, the currency structure and the maturity profile (Henao-Arbelaez & Sobrinho, 2017; Yousefi, 2019; Kose, Kurlat, Ohnsorge, & Sugawara, 2017).

However, a major problem in assessing detailed public sector balance sheets is finding common definitions for the components. To address this problem, the BIS, Commonwealth Secretariat, ECB, Eurostat, IMF, OECD, Paris Club Secretariat, UNCTAD and the Word Bank have agreed on a jointly published approach (Eurostat, 2014; IMF, 2013). They define net debt as gross debt minus financial assets corresponding to debt instruments, net worth as the total value of assets minus liabilities and net financial worth as the total value of its financial assets minus the total value of its outstanding liabilities.

Since assets can serve as collateral and improve market access, they can function a "buffer" in times of crisis. This leads to lower liquidity and solvency risk for countries with higher assets ratios, reducing the probability of debt default (Alves, et al., 2020; Henao-Arbelaez & Sobrinho, 2017). Henao-Arbelaez and Sobrinho (2017) describes that net debt can better explain market perceptions about the government's solvency than gross debt. Yet, how well assets offset debt risk also depends on the type of asset. Liquid assets having a higher effect. Further, the risk-reducing impact of assets is higher in emerging markets than in advanced countries. The advantage of taking financial assets (equally for net financial worth), instead of total assets (or net worth), is that they are more marketable and thus easier to value (Yousefi, 2019).

By using the IMF's database Public Sector Balance Sheet, Yousefi (2019) recognizes that, besides liabilities, assets also play a key role in the assessment of fiscal resilience, measured by the long-term government bond yield. Especially for advanced countries, net (financial) worth strengthens the balance sheet. Yousefi (2019) argues that a stronger balance sheet equates to more fiscal space and thus leads to an increased ability for counter-cyclical spending during crises. However, the data availability for financial and especially for non-financial assets is limited. This makes it difficult to generalize the results (Yousefi, 2019; Alves, et al., 2020).

Additionally, especially for emerging and developing countries, it seems useful to distinguish between external and domestic debt and the currency in which debt is issued (Panizza, 2008). A higher share of debt held by non-residents may increase liquidity and currency risk, while a higher share of foreign currency debt raises the exchange rate risk. Foreign funds are more volatile and exhibit more procyclicality. Vulnerability can further increase when currency mismatches, as sudden depreciation may arise. Also, the private sector has implications for fiscal stability. High debt ratios in the private sector can lead to stress, which may trigger a build-up of contingent liabilities on the sovereign level due to implicit bailout guarantees (Kose, Ohnsorge, & Sugawara, 2018; World Bank Group, 2015).

Lastly, market perceptions entail more information about the state of an economy, not only macroeconomic components (as mostly presented so far as indicator for fiscal space). They combine economic, institutional, and political factors to judge fiscal solvency. Such variables are e.g., the credit default swaps (CDS) spread and debt ratings (Kose, Kurlat, Ohnsorge, & Sugawara, 2017). The level of the CDS spreads is a risk indicator, as a CDS contract allows to transfer the default risk, i.e., to be fully compensated in case of default. CDSs and bond spreads contain similar information about risk and default expectations. Both are positively correlated with the risk premium, but CDSs exhibit faster responses (Fontana & Scheicher, 2016).

2.2. Relationship between fiscal rules and fiscal spending

The following part discusses the issue of fiscal rules and how different types of rules affect fiscal spending. The first subsection 2.2.1. explains the need to reduce pro-cyclical fiscal spending and gives solutions to increase the credibility of fiscal policy. Then, subsection 2.2.2. describes the four types of fiscal rules. Finally, subsection 2.2.3. discusses the limits to fiscal rules.

2.2.1. The necessity to increase fiscal credibility

A situation in which countries persistently accumulate debt regardless of the economic situation (both during expansions and recessions), thus bringing debt to unsustainable levels, is called *deficit bias*. Reasons for this are the common pool problem, short time horizon or time inconsistency. For example, governments can use fiscal operations to address communities of interest, increase the possibility of being re-elected (Hutchison, 2020; Debrun, Moulin, Turrini,

Ayuso-i-Casals, & Kumar, 2008). To counteract the deficit bias, measures can be introduced to increase the accountability of policy makers. One possibility is to delegate budgetary decisions to external institutions that have a longer time horizon and are not dependent on re-election. A "sustainability council" could collectively assess the debt sustainability, the impact of fiscal spending, and the cyclical position of the government (Debrun, Moulin, Turrini, Ayuso-i-Casals, & Kumar, 2008; Perotti, 2007). Fiscal rules are another possibility of solving the problem.

The idea of fiscal rules is that states commit themselves to limit public debt, which leads to more fiscal flexibility to intervene and spend countercyclically in economic crises but also to more credibility in the financial market (Hutchison, 2020). It is interesting to note that such rules are often implemented in election years, either to limit the action of the following government or because the new government wants to fix its own ideas in the economic structure in the long-term (Debrun, Moulin, Turrini, Ayuso-i-Casals, & Kumar, 2008).

Schaechter et al. (2012) define fiscal rules as a numerical limit, constraint or target for a fiscal aggregate. They say that fiscal rules are permanent, so that the framework cannot be changed in the short term. Some fiscal rules additionally provide more detailed operational guidance. Yet, the mere presence of fiscal rules does not necessarily lead to tighter disciplined behavior; they must also be well designed. They should include institutional coverage, independence of the monitoring and enforcement body, a legal basis, flexibility to respond to shocks, and corrective mechanisms and sanctions (Bandaogo, 2020).

Generally, there is a positive correlation between fiscal spending and fiscal space, leading to pro-cyclical expenditure, as countries with higher fiscal space can afford to spend more discretionary money[3]. Yet, this pro-cyclical effect can be mitigated by efficient fiscal rules. If such rules exist, policy is restricted in its spending and cannot freely dispose of all possible resources. Discretionary spending tends to become smaller (Nerlich & Reuter, 2015). Looking at the interaction between fiscal rules and fiscal space for the EU countries since 1985, Nerlich and Reuter (2015) find a positive correlation between fiscal space and fiscal rules, implying fiscal rules tend to increase the room for fiscal interaction. Debrun, et al. (2008) come to a similar result, finding with a panel regression that fiscal rules have a statistically positive effect on the budget balance. However, the effectiveness depends on the type. These are presented in the following subsection (Debrun, Moulin, Turrini, Ayuso-i-Casals, & Kumar, 2008). Overall, well-constructed fiscal rules also ensure greater trust in repayment on the part of investors. As a result of higher credibility, they demand a lower risk premium.

[3] Discretionary spending refers to spending that is not automatically spent because of existing laws are implemented, but which can be freely disposed of for a short period of time.

However, it should be recognized that the causality between fiscal space and rules may be subject to reverse causality or endogeneity. It is possible that countries had (did not have) introduced fiscal rules because their fiscal space being (not being) in good condition and because (not) having a high preference for fiscal discipline (Debrun, Moulin, Turrini, Ayuso-i-Casals, & Kumar, 2008). Conversely, the desired causality would be that countries with high fiscal space have it because of their fiscal rules. As there is often a lag of time between the implementation of fiscal rules and a higher fiscal space, Nerlich and Reuter (2015) conclude that the causality goes indeed from the stricter rules to higher fiscal space. Contrary, Bandaogo (2020) discovers, after correcting for endogeneity and reverse causality, that the dummy variable for fiscal rules is no longer significant. Only a variable distinguishing across different strengths of fiscal rules shows a significant positive relationship between these rules and fiscal discipline.

2.2.2. Types of fiscal rules

There are four types of fiscal rules, for which a differentiation is made in the later regression: expenditure rules, revenue rules, budget balance rules and debt rules.

Expenditure rules are used to limit the total primary or current spending in absolute values, growth rates or percentages of GDP. As those rules do not constrain the revenue side, they are not directly linked to debt ratios or debt sustainability. Their advantage is that they set a clear communicable guideline, easy to monitor and thus tend to be credible (Nerlich & Reuter, 2015).

Revenue rules, the rarest form of rules, are intended to set requirements (ceilings or floors) on receipts or decide the use of windfall tax revenues (Nerlich & Reuter, 2015; IMF, 2009).

Budget balance rules set targets for the overall balance, the structural balance, or the cyclical adjusted balance. They can specify maximum levels of deficit, as for example the Maastricht criterion 3% of GDP, or can give targets for the surplus, as in case of Sweden with 1% average surplus. As the balance is the most important influence on government debt, they are very effective in providing debt sustainability. However, they do not necessarily allow for public stabilization during recessions. To address this disadvantage, there is a special form, called structural or cyclically adjusted budget balance rules, which allow exceptions during recessions. To prevent abuse of such exceptions, however, it is important that the criteria for when these rules may be exceeded are clearly defined from the outset (Nerlich & Reuter, 2015).

Debt rules give explicit limits or targets for ratios, the debt in nominal values or the debt related to repayment capacity. On the one hand, they are easy to communicate, on the other hand, they generally do not provide any short-term orientation and have no cyclical stabilizing properties. Their weakness is that they can only be influenced indirectly via the balance changes or in the denominator of the ratio, as debts are taken over from previous governments (Nerlich & Reuter, 2015; Debrun, Moulin, Turrini, Ayuso-i-Casals, & Kumar, 2008).

Empirically, budget balance and debt rules are associated with increased procyclicality, whereas expenditure rules can prevent it (Debrun, Moulin, Turrini, Ayuso-i-Casals, & Kumar, 2008). Due to the described advantages and disadvantages, multiple fiscal rules can be used simultaneously. Debt rules can be linked to expenditure rules or cyclically adjusted balance rules (IMF, 2009; Debrun, Moulin, Turrini, Ayuso-i-Casals, & Kumar, 2008; Schaechter, Kinda, Budina, Weber, & Guerguil, 2012). According to the IMF Fiscal Rules Dataset in 2015, 43 countries had expenditure rules, 12 countries had revenue rules, 72 had budget balance rules and 69 had debt rules, when both national and supranational rules are considered (see Figure 2).

2.2.3. Limits of fiscal rules

Fiscal rules are not the solution to all problems mentioned above. Depending on their type and design, they may also entail disadvantages. The decision to implement budget balance rules that do not have exceptions for crisis periods poses a trade-off between adhering to the budget discipline set out in the rules and the fulfilment of cyclical countermeasures. Moreover, fiscal rules can result in a trade-off between low deficits or debt and sufficient government investment. This problem can be reduced by excluding some types of expenditure from the base of the rule (e.g., through fixed quotas set for investment, which do not count in the calculations for the fiscal rules). Last, especially in non-developed countries with low transparency, there is the risk of *"creative accounting"* (IMF, 2009). Particularly, when there are ways to exclude some types of expenses, monitoring becomes more complicated. For example, investments could be exempted from the rule, but a uniform definition of what is attributable to them does not exist (Debrun, Moulin, Turrini, Ayuso-i-Casals, & Kumar, 2008). Beside the combination of multiple rules, escape clauses are a solution. They allow to break their fiscal rules in shock periods, i.e., eliminate the rule's set limit for spending. Such an escape clause was granted by the EU during the Covid-19 pandemic, allowing states to not only spend counter-cyclical, but also to stop austerity plans (Bandaogo, 2020). Good escape rules clearly define cases in which exceptions apply, i.e., when an economic situation allows for far-reaching fiscal measures, and specify the duration and the path back to compliance with the rule (Schaechter, Kinda, Budina, Weber, & Guerguil, 2012). In recent years, not only has the number of fiscal rules increased, but also their stringency, the existence of escape rules (see Figure 3) and correction mechanisms for cyclical fluctuations were increasingly established (Bandaogo, 2020).

3. Fiscal policy during the Covid-19 pandemic

The following paragraph will empirically address the relationship between fiscal space, fiscal rules and fiscal spending, taking into account the data from the Covid-19 pandemic. Before carrying out and analyzing the regression in section 3.2., section 3.1 provides an overview of the pre-crisis economic and fiscal situation.

3.1. Economic situation before and within the crisis

After the latest major economic shock, the GFC, and the subsequent debt crisis, high fiscal stimuli were applied, and monetary policy programs implemented. Retrospectively, both are also usually evaluated as adequate for this period (Hutchison, 2020). Yet, expansionary policies extended well beyond the crisis phase. Even as unemployment declined and production was high, few efforts were made to reduce debt (Hutchison, 2020). Early in 2020, with interest rates near or below the zero-lower-bound across Japan, the United States and Europe, countries were able to borrow cheap and pursue expansionary fiscal policy long after the shock. Therefore, fiscal deficits were mostly high at the onset of the Covid-19 pandemic, and thus fiscal space was considered predominantly low (Hutchison, 2020).

With the Covid-19 crisis, worldwide economy was hit simultaneously by multiple shocks. Uncertainty and the impossibility to consume some goods due to the confinement as well as income-losses resulted in an aggregate demand shock. Border and business closure and the disruption of supply chains translated into an aggregate supply shock (Makin & Layton, 2020). During a crisis, the public sector can step in as a *"spender from last resort"* (Mazzucato, 2020), when the private spending alone fails, bringing the economy back to a growth path. This was also the case during the Covid-19 crisis. Yet, a major difference between fiscal spending during the Covid-19 depression and other economic crises is that the governments interest was not to increase economic activity but to restrain firms from their normal activity across sectors (Martin, 2020). Governments tried to bring the corporate revenues and jobs through the crisis, e.g., with the help of loans and direct subsidies, to guarantee a later restart of the economy. Welfare payments for individuals such as income transfers, tax cuts and wage subsidies, health expenditure and tax cuts were also part of the fiscal programs. A fiscal stimulus can be funded in a variety of ways. It is widely accepted that debt financing spreads the burden over time and is preferable to a short-term increase of taxes during a crisis (Martin, 2020).

3.2. Empirical examination of fiscal spending during Covid-19

Coming back to the research question, in the following part, the effect of fiscal rules and fiscal space toward the government spending will be examined empirically. To begin, subsection 3.2.1. briefly summarizes the main reference paper Apeti, et al. (2021). After a description of the data and the general procedure in subsection 3.2.2. the estimated results are presented in 3.2.3. and interpretations and explanations are provided in the subsections 3.2.4. and 3.2.5.

3.2.1. Abstract and implications of Apeti, et al. (2021)

As described, the concept of fiscal space suggests that there is one or a set of indicators that limit the possibility of spending or net borrowing. While the link has been confirmed for the GFC e.g., by Aizenman and Jinjarak (2010), it does not imply by generalization that it also exists for

the Covid-19 crisis. Apeti, et al. (2021) use data from the pandemic and find that the fiscal stimulus (in % of GDP) is not significantly affected by the debt to GDP ratio. However, they estimate a significant negative relationship with debt to taxes and a significant positive one with sovereign the debt rating. For all fiscal space variables, pre-crisis values are taken. To validate the analysis and determine stability, homogeneity, and robustness, different sets of control variables are added, outliers are excluded, the sample is modified, the stimulus is separated into its components and non-linearities are checked. Even though certain instabilities and insignificances are identifiable when outliers are removed or when a distinction is made between developing and developed countries, Apeti, et al. (2021) conclude that debt per tax revenues and especially debt ratings are significant predictors for the size of the fiscal stimulus.

The interest of the following subsections is not only to assess the results of Apeti, et al. (2021) with updated data for the fiscal stimulus, but also to vary different variables. For fiscal space further variables will be considered and as measurement of the stimulus package not only as *"additional spending or foregone revenues"* but also as *"accelerated spending and deferred revenue"* and *"liquidity support"* are added. In addition, the effect of fiscal rules is considered, and a systematic distinction between OECD and non-OECD countries is made. The consistent distinction between different country groups is supported across literature (Ghosh, Kim, Mendoza, Ostry, & Qureshi, 2013; Perotti, 2007; Rummelhoff, 2018).

3.2.2. The methodology and data

As variable for the fiscal stimulus, likewise to Apeti, et al. (2021) the IMF Database is used in the estimation. As for all data, the detailed sources can be found in Table 1. To increase comparability between the countries, the values are measured in % of GDP. The IMF distinguishes between *"above-the-line"* (*additional spending, forgone revenue and accelerated spending*), *"below-the-line"* measures (equity injections, asset purchases, loans, debt assumptions, including through extra-budgetary funds)[4] and contingent liabilities, which usually are summed up in the following regressions. By default, the control variables are GDP per capita, population density, share of population over 65 years, the inflation rate, exports, imports (both in % of GDP), unemployment rates and the strictness of governments during the pandemic (including school closures, workplace closures, and travel bans). Except the latter, the control parameters and the indicators for fiscal space are taken at the pre-crisis levels in 2019. As the pandemic was not predicted by governments across the world, i.e., it was an exogenous shock, one can assume that there is no reverse causality. Including exports and imports to the regression

[4] Definition of the Fiscal Monitor 2020 (IMF, 2020): *"Above-the-line" measures: Involve revenue raising and government expenditure, which affects the overall fiscal balance and government debt.*
"Below-the-line" measures: Generally involve the creation of assets or liabilities without affecting fiscal revenues and spending today. Examples include government provision of loans or equity injection in firms.

seems reasonable, as higher trade openness was associated with significant lower fiscal spending in the stimulus after the financial crisis (Aizenman & Jinjarak, 2010). The country's wealth is often measured in GDP per capita. This is a common control variable as it may be associated with higher spending (Hürtgen, 2020). Population density, the ratio of old population and the government strictness are inserted because of the specifics of the Covid-19 crisis, in which closer contact led to more infections, older people were particularly likely to be affected by severe outbreaks, and tighter restrictions may have led to more government compensations.

Obviously, there exists other effects on the size of the stimulus packages that are not considered here. Yet, given the relatively small sample size as the regression is cross-sectional, including much more variables would lead to multicollinearity especially when only sub-groups of countries are considered to control the robustness of the results. Such an omitted variable can be the political ideology, which is sometimes included as a control variable in the regression in the examination fiscal policy (Debrun, Moulin, Turrini, Ayuso-i-Casals, & Kumar, 2008; Nerlich & Reuter, 2015). Debrun, et al. (2008) use it as one of many controls' parameters *political ideology*, taking an orientation of the main government party along a right-to-left axis. Although this parameter is significant in some of their regressions, it is not included in the following empirical work. First, it is difficult to interpret such a parameter. Second, it is hardly possible to claim that a right- or left-wing government generally spends more or less. Third, databases for such a variable are often incomplete or themselves with political judgement. Besides, one could also add the political stability or the situation of the administration. For both variables, the data availability is not very good. Besides, one can assume that they correlate positively with the GDP per capita, richer countries usually have a better state apparat. Similar reasoning applies to the Human Development Index (HDI) which has a correlation of 0.7247 with GDP per capita, which is by higher than among the other control variables. In many regressions related to fiscal spending, the election year is considered, since governments may spend more in election years to get higher votes. However, as the Covid-19 pandemic was an exogenous shock lasting for more than one year, it is reasonable to omit this variable.

3.2.3. Regression results

The following cross-sectional regression is estimated with an Ordinary Least Squares (OLS) including different combinations, i.e., with different control variables, country groups, indicators for fiscal space and the stimulus

$$Stimulus_i = \beta_0 + \beta_1 Fiscal\_Space_i + \beta_j \boldsymbol{X}_i^j + \varepsilon_i$$

(with the $stimulus$ and $fiscal\ space$ in country i, $\boldsymbol{X}_i^j$ the vector of j control variables, ε_i the error term). Unless otherwise specified, the significance level used is 10% and the measure of the stimulus is total spending (in % of GDP), which differs from Apeti, et al. (2021), who by

default take *additional spending or foregone revenues*. Yet, they do not provide any justification for the exclusion of *liquidity support* and *accelerated spending and deferred revenue*.

First, considering only the effect of the control variable, without any fiscal space parameter, one obtains for all countries combined that GDP per capita (p-value: 0.013) and the fraction of old population (p-value: 0.000) are significant (see Figure 4). Both variables are positively correlated ($\rho_{GDP,oldpopul} = 0.5657$), as generally richer countries commonly have an older population. Then, a distinction is made between the country subgroups. For the OECD countries, additionally the strictness with which the governments have acted during the pandemic has a significant effect (p-value: 0.005) (see Figure 5). For the non-OECD countries, the only individual significant coefficient is old population (p-value: 0.077), which loses its significancy, when only low- and middle-income countries are considered, i.e., when high income non-OECD countries are excluded. In this last case, the overall regression (indicated by the F-value) is even insignificant (see Figures 6 and 7).

Turning now to the first measure of fiscal space, gross debt to GDP, one can graphically see a large difference between OECD and non-OECD countries. While the relationship is positive for the OECD countries, it is graphically not clear for the non-OECD countries (see Figures 8 and 9). An OLS estimation for all countries shows that the relationship from gross debt to GDP is positive and significant, which is contrary to the economic intuition. Yet, it loses its significancy when the sub-groups are considered individually. This applies to the OECD and non-OECD countries, even if the outlier Mauritius (MUS) is excluded or only low- or middle-income countries are taken into account (see Figures 10, 11 and 12). Comparing the models with and without the linear variable for gross debt to GDP with the Akaike's information criterion (AIC) and the Bayesian information criterion (BIC), only when all countries are analyzed together, adding the debt ratio improves the model. When, as in Apeti, et al. (2021), the logarithm, instead of the linear parameter of gross debt to GDP, is considered, the calculated significances do not change a lot. All p-values and information criteria remain approximately constant (see Figures 13, 14 and 15). When second- and third-degree powers are added to the linear term, no coefficient for gross debt to GDP is significant, irrespective of the country sample. Also, both information criteria are in any case higher than in the model with only the linear terms, indicating that adding higher powers does not improve the model (see Figures 16, 17 and 18). Turing to the linear parameter for net debt to GDP, one obtains roughly the same results: for all countries together, there is a significant positive relationship, while the relationship in both sub-groups is insignificant (see Figures 19, 20 and 21). To judge which model (with gross or with net debt ratios) should be used, the previously mentioned two information criteria are consulted. Yet, comparing the AIC and BIC becomes complicated, as data for net debt is only available for half of the countries compared to gross debt (84 instead of 167). To make those comparable, the AIC

and BIC are re-calculated for the gross debt ratio, but only including the variables for which also net debt ratios are available (see Figure 22). The determined differences are relatively small (with a maximum in absolute values of 1.2). The AIC and BIC are a bit smaller for all countries together and the OECD countries and a bit bigger for the non-OECD countries, so it is not clear which of the debt ratios is better in explaining what constraints the fiscal spending within a crisis. Like Apeti, et al. (2021), in the next step, the gross debt to tax ratio is considered. Graphically, due to some outliers and lots of countries with similar gross debt to tax ratios, no clear relationship is evident, but one can see big differences between OECD and non-OECD countries (see Figure 23). The OLS estimation returns a relationship that is positive for OECD countries and negative for non-OECD countries, but not significant in both cases (see Figures 24 and 25). To make the results comparable with Apeti, et al. (2021), who find a significant negative effect, the logarithm of the debt to tax ratio is studied. As regressand both total spending and *additional spending or foregone revenues* are used. Looking at the effect from logarithm of the debt to tax ratios on total spending, the OLS states that neither for OECD countries nor for non-OECD countries the positive effect is significant (see Figure 26 and 27). The non-significancy also holds when, as by Apeti, et al. (2021), *additional spending or foregone revenues* is taken as dependent variable (with a p-value of 0.217 for OECD and 0.464 for non-OECD countries) (see Figure 28 and 29). It is noteworthy that a univariate regression with the logarithm of the debt to tax ratio on *additional spending or foregone revenues* has indeed a significant negative relationship (p-value: 0.022), but when GDP per capita is added, it loses the significance (p-value: 0.514). Further, there is no significancy in a univariate regression for total spending (p-value: 0.109) (see Figure 30). This result is inconsistent with Apeti, et al. (2021).

In the next step, gross debt is divided by both tax revenues and GDP. Especially, when its logarithm is used, a good negative relationship appears (see Figure 31). This is, as shown by the OLS regression, also significant for all countries together and both subgroups when the outlies Tuvalu (TUV) and Mauritius (MUS) are removed (see Figures 32, 33 and 34). Both outliers are small island states for which there could also be measurement inaccuracies, so exclusion is economically justifiable. Comparing the information criteria for the models with and without debt per GDP per tax revenues, for any sub-group both the AIC and the BIC are smaller. This suggests that the model with debt per GDP and per tax revenues is better than a model with only the control variables (see Figure 35). Since there is also a large divergence between the non-OECD countries, a further distinction is made between income classes. Although the variances appear larger for low- and middle-income countries, the graph shows a negative correlation. An OLS estimation confirms this correlation. It is highly significant for middle-income countries (p-value: 0.001), and, despite the small sample, even reliable for low-income countries (p-value: 0.092) (see Figure 36, 37 and 38).

As described in the second part, there is evidence that not only debt, but several components and characteristic of the balance sheet determine fiscal strength. Therefore, the next part considers the effects of the stock positions for financial assets, liabilities, and net (financial) worth on total spending. Using the OLS, the coefficients financial assets, liabilities and net financial worth were found to be significant at a 5% level (see Figure 39). However, they lose significance when the control variables or net financial worth are removed. The results should be treated with caution, as data is only available for 19 countries, i.e., the regression entails only five degrees of freedom and a more detailed examination in subgroups is not possible. Moreover, it is noticeable that the effect of net financial worth is negative, which contradicts economic intuition. The direction of effect of assets and liabilities are as expected.

Another characteristic of balance sheet is the currency in which the debt is incurred. A negative relationship can be seen graphically between the total fiscal spending and the share of general government debt in foreign currency (see Figure 40). This is confirmed with an OLS estimation (see Figure 41). If one distinguishes between OECD and non-OECD countries, the significant effect disappears for OECD countries, but remains for non-OECD countries (see Figures 42 and 43). However, even here the sample sizes are small, and results must be handled with caution.

Similar results are obtained when the residency of creditors is included in the regression. Graphically, a negative correlation is visible. Moreover, it is notable that this exhibits heteroskedasticity: lower shares of foreign debt have a higher variance in spending. The external debt has a significant effect on the size of the stimulus package, but only for all countries together or just the non-OECD countries. For the OECD countries, the effect is not significant (see Figures 44, 45, 46 and 47).

Adding the average maturity of debt to a model with the gross debt to GDP ratio, no significancy of the coefficient of average maturity is found, regardless of which subgroup is considered (see Figures 48, 49 and 50). It is worth noting, that the mean of average debt maturity is close in OECD countries (9.1208) to non-OECD countries (9.6223) (see Figure 51).

As explained in section 2.1., economically, one could hypothesize that lower tax revenues and higher debt levels together (thus more years needed to repay the debt) reduce the ability to spend in times of crisis. When the years needed to repay the total gross debt with tax revenues are taken as variable for fiscal space, as suggested by Aizenman and Jinjarak (2010), no clear relationship can be derived graphically, even if outliers are removed (see Figures 52 and 53). Also, an inverse relationship cannot be verified with the OLS estimation. There appears no significance regardless of the group of countries considered (see Figures 54, 55 and 56).

In the next step, the sustainability gaps are considered, which are calculated as described in section 2.1. (Kose, Kurlat, Ohnsorge, & Sugawara, 2017). The targeted debt ratio is equal to its country group average, which is in line with the World Bank Group (2015), yet a strong

assumption. The primary balance sustainability gap is computed with interest rates for which comparable and reliable data is only available for the OECD countries. Looking at the graph showing total expenditure as a function of the primary balance sustainability gap, one sees that there are only narrow differences among most countries in the sustainability gap, with Mexico (MEX) and Turkey (TUK) being outliers (see Figure 57). The OLS estimation states that no significant link exists, even if both outliers are excluded (see Figure 58). As the overall fiscal balance is independent of the interest rates, it is calculated for all countries. Yet, this sustainability gap is, beside some outliers, graphically close across countries (see Figure 59) and insignificant, neither for OECD nor for non-OECD countries (see Figures 60 and 61).

Next, the analysis of market expectations reflected in both debt ratings and the CSD-spread are considered. As measure the average of foreign currency long-term sovereign debt ratings by Moody's, Standard & Poor's, and Fitch Ratings is taken (Kose, Kurlat, Ohnsorge, & Sugawara, 2017). Graphically, one sees that in general countries with higher ratings spend more than countries with lower ratings. Moreover, the dispersion of spending also increases with the rating value (there is heteroskedasticity). As expected, OECD countries have on average a much higher rating than non-OECD countries (see Figure 62). For all countries together, the effect of ratings is significant (p-value: 0.012). The same holds for non-OECD countries (p-value: 0.002). However, considering a sample of only the OECD countries, the coefficient loses significance (p-value: 0.512) (see Figures 63, 64 and 65).

Graphically, a modest negative relationship between the stimulus package and CDS spread can be identified when the outliers Ukraine (UKR), Iraq (IRQ), and Argentina (ARG) are excluded (see Figure 66). Given the OLS estimation, the relationship is never significant, neither with all countries together nor in a sub-sample of countries (see Figures 67, 68 and 69).

In the next step, the effect of fiscal rules is considered. As simplification, only existence (as a dummy variable) rather than stringency is used as regressor. Since most macroeconomic variables are insignificant, the effect of fiscal rules is modelled first with only the control variables and second with also the logarithm debt per GDP and per tax revenue (which is the only robust significant regressor for fiscal space). In the first model (only control variables), with all countries combined, balanced budget rules have a significant negative effect and debt rules a significant positive effect on the fiscal stimulus. When only OECD countries are considered, the significant effect of balanced budget rules disappears, while for only non-OECD countries, the significance of debt rules vanishes (see Figures 70, 71 and 72). In all the three samples, the AIC and BIC are smaller for models including the dummy variables for fiscal rules and would therefore suggest adding those to the model (see Figure 73).

For the case in which fiscal rules are added to the model, with the logarithm of gross debt per GDP and per tax revenue, debt rules have a significant positive effect for all countries together,

but all three other rules are insignificant. In a model with only the OECD countries, the same holds, while in a model with just the non-OECD countries, none of the four fiscal rules coefficients are significant at a 10% level (see Figures 74, 75 and 76). Whilst comparing the information criterions for the models with fiscal rules with those that do not include these dummy variables, no conclusive result is found. For all countries together as well as for the non-OECD countries, AIC prefers the model with fiscal rules and BIC without. For only OECD countries, both AIC and BIC suggest using the model with fiscal rules contained (see Figure 77).

3.2.4. Interpretation of the results

To begin with, it is worth noting the similarities and differences with Apeti, et al. (2021). They also find no significance for the gross debt ratio but have a relatively robust significance for the debt to tax ratio and debt rating, even with control variables. When only *additional spending or foregone revenues* rather than total spending is taken, to reconstruct a model as close as possible to the Apeti, et al. (2021), no significant relationship can be found as soon as GDP per capita is added as a control variable. Although the data used in this work has been updated and thus slightly changed, this finding is surprising. A comparison of the summary between Apeti, et al. (2021) and the here used data shows that both the stimulus and debt to tax revenue ratios have similar characteristics in terms of standard deviation and mean. An explanation for the different results does not emerge. For the debt rating in all countries together, the estimation in this thesis comes to a similar result as Apeti, et al. (2021), saying that the coefficient for the rating is significant. However, there are differences when distinguishing between country groups. When removing outliers, Apeti, et al. (2021) find a significant positive correlation between ratings and the stimulus even for developed countries, which is not the case here.

In the part of the analysis that goes beyond that of Apeti, et al. (2021), no clear result could be determined as to whether net or gross debt would be a better measure. Looking at further indicators, it is conspicuous that multiple coefficients are significant only for non-OECD countries. For those, the debt held by non-residences and debt in foreign currencies have significant effects, which is in line with Perotti (2007). Yet, it is important to note that data, especially recent data, in those countries is not always reliable. Nevertheless, there seems to be evidence that for low- and middle-income countries, it is generally more important who holds the debt and in which currency it was incurred.

The effect of assets, liabilities and net worth can only be determined for all countries together, because the accounting here has so far only been done by few countries, even among the developed countries. Excluding a subgroup would make the data perfectly multicollinear and the estimation impossible. Overall, there are significant effects of financial assets, liabilities and net financial worth, with the latter going in a different direction than expected.

Also, an empirical analysis for both sustainability gaps, which were suggested e.g., by the World Bank Group (2015) shows no significant correlation.

The only fiscal space indicator, which is significant for every sub-sample, when two major outliers are excluded, is gross debt scales with both GDP and tax revenues. The interpretation for this fiscal space indicator is rather complex, as the dependent variable, the stimulus, is at the same time only scaled with GDP. One can conclude that the size of the economy has a very strong effect on fiscal space, which results in the effect of double scaling.

Generally, it is useful to scale debt not necessarily with GDP but also with exports or revenues. The scaling with exports reflects whether the country can generate enough foreign income to service external debt. Scaling with revenues represents how much money a country can mobilize and therefore its repayment capacity is considered (IMF, 2013). The share of public revenues per GDP differs greatly across countries. While Denmark and Norway collect 40% and 47% of GDP as government revenue, respectively, in the case of the U.S. and Switzerland it is more of a "lean government" with revenues about 11% of GDP in 2019 (IMF, 2021). However, scaling fiscal space with variables other than GDP while keeping the stimulus as a share of GDP is not in line with the economic intuition. Hence, further work could also scale spending with other variables, such as tax revenues, exports, or calculate it per capita.

At most two of the four forms of fiscal rules are significant: debt rules and fiscal balance rules, with the former showing a positive and the latter a negative effect on government spending. The risk of procyclicality, which is mainly attributed to balanced budget rules and debt rules (Debrun, Moulin, Turrini, Ayuso-i-Casals, & Kumar, 2008), thus seems to have actually materialized for fiscal balance rules. Despite the attribution, it cannot be significantly confirmed that expenditure rules reduce procyclicality. Yet, as the analysis concentrates only on dummy variables. In the empirical analysis of Bandaogo (2020) it was shown that the dummy variables lose their significance after correcting for endogeneity. Only the variable differentiating the strictness of rules remained significant. Thus, an open question stays how escape rules and different degrees of strictness affected the size of the stimulus packages during the Covid-19 pandemic.

Since of the control variables, government stickiness and the share of the elderly population are significant (especially among OECD countries), this points to need-based spending. Therefore, the question arises whether states were not fiscally constrained at all during the crisis but could spend as much as needed and only GDP per capita shows relevance beyond that. As described in subsection 3.2.2., stricter government action caused more workplace closures and was thus accompanied by a greater need for public support. Elderly people were more affected by the illness as a vulnerable group and so it could be assumed that more medical devices were needed, i.e., more government spending was conducted. Furthermore, among OECD countries, GDP per

capita is also significant positive (although only at a level of 10%). Thus, it can be said that richer countries were able to spend more. This is in line with econometric intuition.

Overall, the lack of significancy for the most parameters for fiscal space contrasts with the work about the GFC (Romer & Romer, 2019; Aizenman & Jinjarak, 2010). For the Covid-19 crisis, there seems to be no consensus in on the effect of fiscal space. Hutchison (2020) states that countries with more fiscal space were able to fiscally react stronger during the crisis, even in the short term. This contrasts with Beemelech and Tzur-Ilan (2020) who find no significant effect for most indicators for fiscal space to the fiscal spending. Consequently, the result of this thesis falls mostly in line with the second finding of Beemelech and Tzur-Ilan (2020).

3.2.5. Potential explanations for the absence of significance

The following section provides an analysis regarding the lack of significance for most fiscal space variables on fiscal expenditure. First, it is worth asking whether the fiscal spending is the true coefficient which is constrained by fiscal space. It is also conceivable that new borrowing (measured by fiscal balance) is limited by high debt. This theory can be easily assessed by looking whether the relationship between fiscal balance and the debt ratio is positive, i.e., whether highly indebted countries are associated with lower borrowing during the crisis. The OLS regression shows that there is a significant negative correlation for OECD countries, which is economically counterintuitive (the relationship of non-OECD countries is insignificant) (see Figures 78 and 79). Thus, the lack of significance is not necessarily because spending is the false restricted (dependent) variable and fiscal space has in short terms an influence on net borrowing.

The absence of significance can be due to several reasons, both statistical and economic. The first reason is a statistical one. Since a cross-sectional analysis was conducted, only few data points are available. As the economic structure across countries differs strongly, the sample was divided into subgroups, reducing again the number of datapoints being available to estimate the coefficients. The small number of degrees of freedom reduces the possibility of increasing the amount of control variables and fiscal space coefficients. Therefore, it is hardly possible to look at the interaction of multiple measurements for fiscal space. To increase observation points, further research could look not only at spending at the time of the crisis, but beyond it or include other economic crises.

The second statistical problem could be that the fiscal spending parameter or various regressors were not properly measured, e.g., that there is a systematic error in the data. Since the source of the data base for the stimulus is the IMF, which can be considered trustworthy, this probability is rather low. Also, the databases for fiscal space or control variables are from reliable sources. However, the data collection might not be done by the international organizations directly. They may refer to information published by the states. One reason why the data may be subject to

errors is that indicators are very differently defined. For, e.g., the fiscal stimulus, not all funds made available by the government must be drawn down and it is difficult to reliably quantify components of the stimuli such as tax reductions, as they were implemented.

A third statistical reason is that there are other parameters and indicators, omitted here, that determine the fiscal space of countries and their options for fiscal policy. These can include components of the public sector balance sheet, or the share of government bonds hold by central banks. Both can be the basis for the further research. To reduce the omitted variable bias, the current state of the economic literature was analyzed prior to the empirical analysis. Yet, the analysis of debt sustainability is still ongoing. The lack of data concerning e.g., government non-financial asset and the difficulty to measure those in a consistent way explains why not every possible influence of fiscal sustainability could have been examined.

As a fourth possibility, one could argue that there is simply no variable constraining government spending at all. This is supported by the fact that the age structure and the stringency with which states have responded are among the few robustly significant variables indicating need-based spending. This explanation would be along the lines of the Modern Monetary Theory (MMT) discussion, which argues that central banks can take on government debt on their own balance sheets. Simplistically summarized, MMT says that governments, as monetary monopolies, can issue fiat money without collecting it through taxes or private debt. As a result, fiscal space increases effectively to infinity (Palley, 2014). The main criticism of MMT is that it ignores the inflation caused by massive money creation. Moreover, the theory overlooks the mechanisms of an open economy and neglects the fact that low-risk government bonds are essential for financial stability (Palley, 2014). Given the absence of supporting evidence for this theory, it will not be considered further here.

A fifth explanation is that the findings here are correct for this crisis but cannot be generalized. For instance, that the Covid-19 pandemic can be considered as a “special” crisis from a fiscal point of view. The goal of the stimulus packages for many sectors was not to directly jump start the economy, but to enable the lockdown and guarantee a later restart (Martin, 2020). Also, the low interest rate environment can be used as an argument for this theory. This could be the reason why the parameters of fiscal space have lost relevance. It would be interesting to analyze in future studies how, e.g., interest rates interact with other fiscal space parameters.

As a sixth possibility, why insignificance is that high debt only leads to problems in the aftermath of the crisis. This phenomenon could be seen to a similar extent during the GFC, where some European countries especially experienced a sovereign debt crisis after the crisis, because they were no longer able to bear prior accumulated debt. Certainly, the debt situations during the crises are only comparable to a limited extent. However, the case of Greece shows that high debt ratios only became problematic in 2012, when high interest charges burdened the fiscus and a

default was threatening. For a closer look, a graphical representation shows the debt development and CDS spread for the four countries Greece, Japan and Portugal and Venezuela (see Figure 80). The CDS spread is a simplified measure of the probability of default and thus of fiscal distress and sustainability. There appears no fully consistent movement. For the three Western countries, the CDS spread is slightly lagged compared to the debt ratio, while in Venezuela the CDS spread rose prior to the debt ratio. A panel regression of debt levels on CDS yields a significant positive correlation, both for advanced and emerging countries (see Figures 81 and 82)[5]. However, looking at a regression that includes the debt ratio not only for the current period, but also with several lags, one can see that the debt level within the period is even negatively associated with the CDS, while that of the previous period has an absolute value higher and significant positive impact. The phenomenon is robust for both advanced and emerging countries (see Figures 83, 84 and 85). The regression supports the hypothesis that debt levels are problematic in the medium and longer run and that borrowing and high fiscal spending, even debt-financed, are possible at the time of the crisis despite high debt levels.

That debt is mostly a long-term indicator for fiscal space goes also in line with literature (Kose, Ohnsorge, & Sugawara, 2018; IMF, 2017; Romer & Romer, 2019) and is also suggested in the in the main reference paper by Apeti, et al. (2021). They say that "*the governments' intertemporal constraint will - sooner or later - kick in and […] reduce the possibility of fiscal maneuver"*. Thus, it is still valid to be concerned about high debt levels in the following years, despite the lack of significance in the regression (Bandaogo, 2020).

The last and seventh point mentioned here, although there would certainly be other explanations, argues that fiscal space is an important construct, although it was insignificant within the crisis. The idea is that it is not the sum of the spending but its effect that is influenced by the fiscal space. Thus, fiscal space can affect the fiscal multiplier: First, through the so-called Ricardian channel, suggesting that small fiscal space reduces the fiscal multiplier because households and firms already anticipate upcoming tax increases and thus do not increase consumption and investment (Perotti, 2007). Second, through the interest rate channel, saying that investors increase interest premia in the case of higher debt and, consequently, borrowing costs increase in the real economy and private investment decreases (World Bank Group, 2015; Kose, Ohnsorge, & Sugawara, 2018).

4. Conclusion

The research question of whether fiscal spending is constrained in times of crisis is difficult to answer with data from the Covid-19 period. Not only does the ongoing literature differ on this

[5] Due to data availability, the regression takes data since 2005 into account.

matter, but the empirical investigation of this thesis also revealed several difficulties. Most parameters for fiscal space are not significant. Moreover, it is worth mentioning that the pandemic was a "special" crisis for the fiscal sector. Governments did not want to pursue fiscal policy to stimulate the economy in the short term, but to help it recover in the medium term, after the immediate health emergency and lockdowns were over (Martin, 2020).

Yet, given that *"with every disaster, there is also the opportunity to learn from the […] situation and contain the seeds that could nourish future disasters"* (Hürtgen, 2020), it is valuable to analyze the fiscal implications from the Covid-19 pandemic. Generally, the estimation conducted here supports the usefulness of distinguishing between different groups of countries, which is already done in many debt analyses (IMF, 2013). Regarding the measurement of fiscal space, this paper underlines the IMF's warning about the use of the concept (IMF, 2017). There is no simple measure, as the debt to GDP ratio, or one specific debt limit, for all countries or even a country group indicating that debt is unsustainable.

As implicated by the empirical work, one can conclude that fiscal spending is not strongly constrained by fiscal space variables in the short run, especially in a low interest rate environment. The Covid-19 pandemic has shown that it is possible for sovereigns to intervene in a stabilizing and stimulative manner even when debt ratios were high. In the medium run, however, it may still be the case that ordinary fiscal space parameters, e.g., the debt ratio, have an effect, in the sense that less indebted countries suffer less after a crisis (Romer & Romer, 2019) or that the multiplier for fiscal spending decreases with less fiscal space (Perotti, 2007).

Moreover, there are good arguments for changing existing fiscal rules, such as the Maastricht criteria, which focus on debt and borrowing ratios in a rather simplistic and short-term way. Instead, an increasing literature, suggests that several dimensions of the balance sheet and private debt should also be included (Henao-Arbelaez & Sobrinho, 2017; Yousefi, 2019; Kose, Kurlat, Ohnsorge, & Sugawara, 2017). This paper cannot disagree with this assertion, but data is lacking for a sufficiently robust analysis. Thus, it is important to collect more standardized data for later studies.

In continued research, it is certainly recommended to focus on dynamic frameworks. Historical data has shown that debt can cause problems at a late stage. Therefore, the evolution of debt should be closely monitored to prevent subsequent debt crises (Ozili, 2021). Especially, if interest rates and thus interest rate burdens raise, high debt stocks could be jeopardizing for fiscal sustainability (Gros, 2020). Overall, it appears that the issue of fiscal space is less about how much the public sector can intervene and expend within a crisis and more about how much spending and borrowing before and within crises can lead to later problems.

Appendix

Table 1: Source and detailed description of the data

Fiscal Policies in Response to the COVID-19 Pandemic, last updated April 2021.

Source: *IMF Database*, *https://www.imf.org/en/Topics/imf-and-covid19/Fiscal-Policies-Database-in-Response-to-COVID-19 , retrieved 02.05.2021*

General fiscal space data (General government gross debt % of GDP, Primary balance, % of GDP, Cyclically adjusted balance, % of potential GDP, Fiscal balance, % of GDP, General government gross debt, % of average tax revenues, Fiscal balance, % of average tax revenues, General government debt in foreign currency, % of total, 5-year sovereign CDS spreads, basis points, Foreign currency long-term sovereign debt ratings, index from 1-21, General government debt held by nonresidents, % of total,-Sovereign debt average maturity),

Source*: Kose, M. Ayhan, Sergio Kurlat, Franziska Ohnsorge, and Naotaka Sugawara (2017). "A Cross-Country Database of Fiscal Space." World Bank Policy Research conn Working Paper 8157, World Bank, Washington, DC (last updated spring 2021), https://www.worldbank.org/en/research/brief/fiscal-space, retrieved 02.05.2021*

Net government debt in % of GDP,

Source: IMF. *World Economic Outlook Database 2021 (last update April 2021): https://www.imf.org/en/Publications/WEO/weo-database/2021/April/download-entire-database, retrieved 07.06.2021*

Gross GDP growth,

Source: IMF. *World Economic Outlook Database 2021 (last update April 2021): https://www.imf.org/en/Publications/WEO/weo-database/2021/April/download-entire-database, retrieved 07.06.2021*

GDP per capita (current US$) in 2019,

Source: *The World bank Database https://data.worldbank.org/indicator/NY.GDP.PCAP.CD, retrieved 04.05.2021*

Population density (people per sq. km of land area) 2018,

Source: *The World bank Database, https://data.worldbank.org/indicator/EN.POP.DNST, retrieved 04.05.2021*

Population over 65 years,

Source: *Our-World-in-Data, https://ourworldindata.org/age-structure, retrieved 05.05.2021*

Balance Sheet Composition ((financial) assets, liabilities and net (financial) worth),

Source: *IMF, Public Sector Balance Sheet (PSBC) database, https://data.imf.org/?sk=82A91796-0326-4629-9E1D-C7F8422B8BE6, retrieved 07.06.2021*

Government Stringency Index, the average for the total year 2020,

Source: *Our-World-in-Data, https://ourworldindata.org/policy-responses-covid, retrieved 06.05.2021*

Inflation, consumer prices (annual %) in 2019,

Source: *The World bank Database https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG, retrieved 04.05.2021*

Exports of goods and services (% of GDP) in 2019,

Source: *The World Bank Database https://data.worldbank.org/indicator/NE.EXP.GNFS.ZS, retrieved 06.05.2021*

Imports of goods and services (% of GDP) in 2019,

Source: *The World Bank Database https://data.worldbank.org/indicator/NE.IMP.GNFS.ZS, retrieved 06.05.2021*

Unemployment, total (% of total labour force) (modelled ILO estimate) 2019,

Source: *The World Bank Database, https://data.worldbank.org/indicator/SL.UEM.TOTL.ZS, retrieved 06.05.2021*

Workplace closures during the COVID-19 pandemic, last updated May 10, 2021 (Number of Days in 2020 for which "Required for all but key workers"),

Source: *Our-World-in-Data, https://ourworldindata.org/grapher/workplace-closures-covid, retrieved 11.05.2021*

Country-Code and Categories (OECD, Heavily indebted poor countries (HIPC), High Income, Lower Income, Lower Middle Income, Upper Middle Income, Middle Income),

Source: *The World Bank Database https://databank.worldbank.org/data/download/site-content/CLASS.xls, retrieved 13.05.2021;*

Note: The database for the country group was not updated in 2021, which implies that Costa Rica is not yet declared as an OECD country. Since the regression mainly concerns the period before 2021, this does not seem to be a major problem.

Fiscal Rules, last updated 2015,

Source: *Schaechter, A., Kinda, T., Budina, M. N., Weber, A., & Guerguil, M. (2012). Fiscal Rules in Response to the Crises. Toward the "Next-Generation" Rules: A New Dataset. IMF;https://www.imf.org/external/datamapper/FiscalRules/map/map.htm, retrieved 14.05.2021*

Long-term interest rates forecast, last update 2021,

Source: *OECD Data, https://data.oecd.org/interest/long-term-interest-rates-forecast.htm#indicator-chart, retrieved 13.06.2021*

Human Development Index (HDI) in 2020

Source: *Our-World-in-Data, https://ourworldindata.org/human-development-index, retrieved 22.06.2021*

List of Tables and Figures

List of Abbreviations

AIC ..... Akaike's information criterion
ARG..... Argentina
BIC ..... Bayesian information criterion
BIS..... Bank for International Settlements
CDS .....credit default swaps
e.g. ..... exempli gratia
EC.....European Commission
ECB .....European Central Bank
EU.....European Union
GFC ..... Global Financial Crisis
HDI.....Human Development Index
i.e. .....id est
IMF..... International Monetary Fund
IRQ.....Iraq
MEX ..... Mexico
MMT .....Modern Monetary Theory
MUS .....Mauritius
OLS .....Ordinary Least Squares
TSCG..... Treaty on Stability, Coordination & Governance in the Economic & Monetary Union
TUK.....Turkey
TUV..... Tuvalu
U.S.....United States
UKR.....Ukraine
UNCTAD ..... United Nations Conference on Trade and Development

Figures

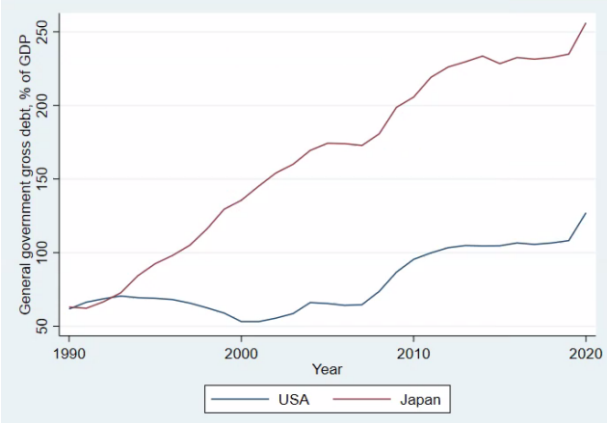

Figure 1. Japan and USA government gross debt in % of GDP since 1990

Data source*: Kose, M. Ayhan, Sergio Kurlat, Franziska Ohnsorge, and Naotaka Sugawara (2017). "A Cross-Country Database of Fiscal Space." World Bank Policy Research conn Working Paper 8157, World Bank, Washington, DC (last updated spring 2021), https://www.worldbank.org/en/research/brief/fiscal-space, retrieved 02.05.2021*

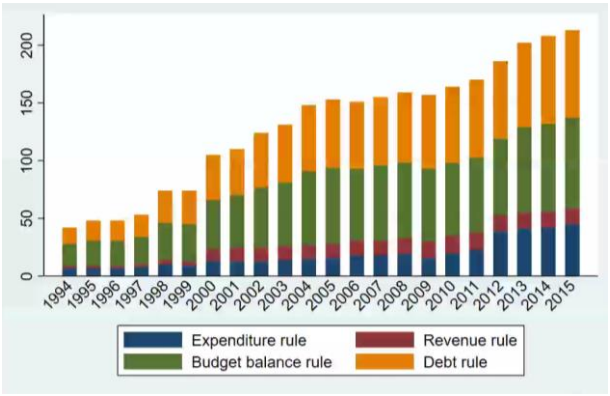

Figure 2: Number of fiscal rules between 1994 and 2015

Data source: *Fiscal Rules, last updated 2015, Source: Schaechter, A., Kinda, T., Budina, M. N., Weber, A., & Guerguil, M. (2012). Fiscal Rules in Response to the Crises. Toward the "Next-Generation" Rules: A New Dataset. IMF; https://www.imf.org/external/datamapper/FiscalRules/map/map.htm, retrieved 14.05.2021*

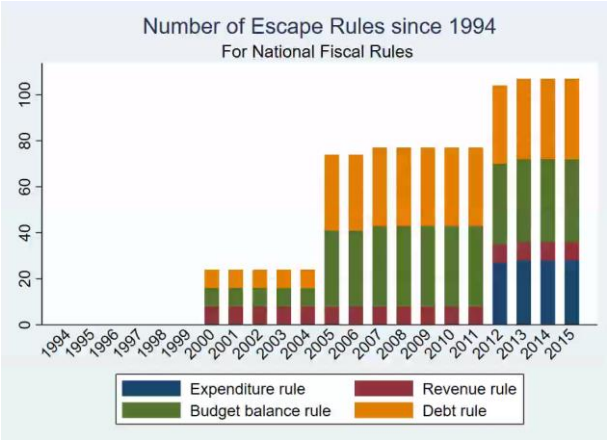

Figure 3: Number of escape rules for national fiscal rules between 1994 and 2015

Data source: *Fiscal Rules, last updated 2015, Source: Schaechter, A., Kinda, T., Budina, M. N., Weber, A., & Guerguil, M. (2012). Fiscal Rules in Response to the Crises. Toward the "Next-Generation" Rules: A New Dataset. IMF; https://www.imf.org/external/datamapper/FiscalRules/map/map.htm, retrieved 14.05.2021*

Source	SS	df	MS	Number of obs	=	116
				F(9, 106)	=	9.78
Model	3871.07105	9	430.119005	Prob > F	=	0.0000
Residual	4661.19355	106	43.9735241	R-squared	=	0.4537
				Adj R-squared	=	0.4073
Total	8532.2646	115	74.1936052	Root MSE	=	6.6313

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
GDP_capita_2019	.0000934	.0000368	2.54	0.013	.0000204	.0001664
popdensity	.0013786	.0009946	1.39	0.169	-.0005934	.0033505
oldpopul	.4452049	.0848017	5.25	0.000	.2770773	.6133324
gvtstrictyness2020	.023716	.057677	0.41	0.682	-.0906343	.1380662
covidcases	6.23e-06	.0000351	0.18	0.860	-.0000634	.0000759
Infl2019	-.2378053	.1736742	-1.37	0.174	-.5821312	.1065206
EXP2019	-.0360052	.0326965	-1.10	0.273	-.1008292	.0288188
IMP2019	-.0124827	.0298523	-0.42	0.677	-.0716677	.0467024
Akaike's information criterion and Bayesian information criterion					.1624537	.3354157
					'.163221	7.723245

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	116	-413.882	-378.8162	10	777.6324	805.1683

Figure 4: OLS estimation of total fiscal stimulus; only control variables

Data source: *As for all following figures, individual data sources are given in Table 1.*

Source	SS	df	MS	Number of obs	=	35
				F(9, 25)	=	4.01
Model	1624.06237	9	180.451374	Prob > F	=	0.0028
Residual	1124.35309	25	44.9741235	R-squared	=	0.5909
				Adj R-squared	=	0.4436
Total	2748.41546	34	80.8357488	Root MSE	=	6.7063

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
GDP_capita_2019	.0001223	.0000607	2.02	0.055	-2.68e-06	.0002474
popdensity	.0091552	.0113632	0.81	0.428	-.0142477	.0325581
oldpopul	1.006601	.2553089	3.94	0.001	.4807827	1.53242
gvtstrictyness2020	.6071718	.1974406	3.08	0.005	.2005353	1.013808
covidcases	.0000389	.0000498	0.78	0.441	-.0000636	.0001414
Infl2019	.9401693	.6498631	1.45	0.160	-.3982489	2.278587
EXP2019	-.0633678	.0562554	-1.13	0.271	-.1792281	.0524925
IMP2019	-.0342103	.0502085	-0.68	0.502	-.1376167	.0691961
Unempl2019	-.2111283	.4347361	-0.49	0.631	-1.106484	.6842274
_cons	-45.38365	15.56372	-2.92	0.007	-77.43773	-13.32957

Akaike's information criterion and Bayesian information criterion

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	35	-126.0229	-110.3811	10	240.7622	256.3157

Figure 5: OLS estimation for OECD countries; only control variables

Source	SS	df	MS	Number of obs	=	81
				F(9, 71)	=	1.86
Model	514.847348	9	57.2052609	Prob > F	=	0.0727
Residual	2186.33975	71	30.7935176	R-squared	=	0.1906
				Adj R-squared	=	0.0880
Total	2701.1871	80	33.7648387	Root MSE	=	5.5492

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
GDP_capita_2019	-.0000468	.000083	-0.56	0.575	-.0002122	.0001187
popdensity	.0011091	.0010144	1.09	0.278	-.0009135	.0031317
oldpopul	.194776	.1086582	1.79	0.077	-.0218823	.4114343
gvtstrictyness2020	-.0235291	.05318	-0.44	0.660	-.129567	.0825088
covidcases	-6.60e-06	.0000506	-0.13	0.897	-.0001075	.0000943
Infl2019	-.2317196	.1619717	-1.43	0.157	-.554682	.0912428
EXP2019	.0174701	.0419117	0.42	0.678	-.0660994	.1010396
IMP2019	.0225324	.0352649	0.64	0.525	-.0477839	.0928487
Unempl2019	.0386807	.1156032	0.33	0.739	-.1918255	.269187
_cons	3.50205	3.508439	1.00	0.322	-3.493579	10.49768

Akaike's information criterion and Bayesian information criterion

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	81	-256.9674	-248.4032	10	516.8064	540.7509

Figure 6: OLS estimation for non-OECD countries; only control variables

Source	SS	df	MS	Number of obs	=	71
				F(9, 61)	=	1.31
Model	164.010463	9	18.2233847	Prob > F	=	0.2497
Residual	847.477023	61	13.8930659	R-squared	=	0.1621
				Adj R-squared	=	0.0385
Total	1011.48749	70	14.4498212	Root MSE	=	3.7273

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
GDP_capita_2019	.0001169	.000212	0.55	0.583	-.000307	.0005407
popdensity	-.0019641	.0027864	-0.70	0.484	-.0075359	.0036077
oldpopul	.0591212	.1105861	0.53	0.595	-.1620095	.2802518
gvtstrictyness2020	.0284364	.0406563	0.70	0.487	-.0528609	.1097337
covidcases	.0000313	.0000376	0.83	0.409	-.0000439	.0001064
Infl2019	-.0465016	.1088482	-0.43	0.671	-.264157	.1711538
EXP2019	.0285758	.0353121	0.81	0.422	-.0420351	.0991867
IMP2019	-.0024537	.0292213	-0.08	0.933	-.0608853	.055978
Unempl2019	.0143329	.0857004	0.17	0.868	-.1570357	.1857015
_cons	1.139341	2.563718	0.44	0.658	-3.98713	6.265812

Akaike's information criterion and Bayesian information criterion

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	71	-195.0503	-188.7699	10	397.5397	420.1665

Figure 7: OLS estimation for low- and middle-income countries; only control variables

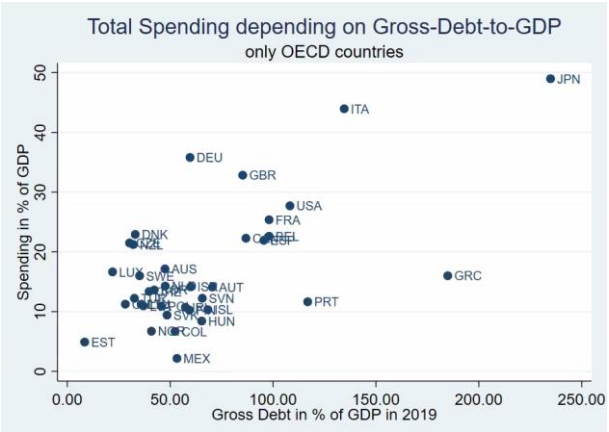

Figure 8: Total Spending depending on the gross debt ratio; OECD countries

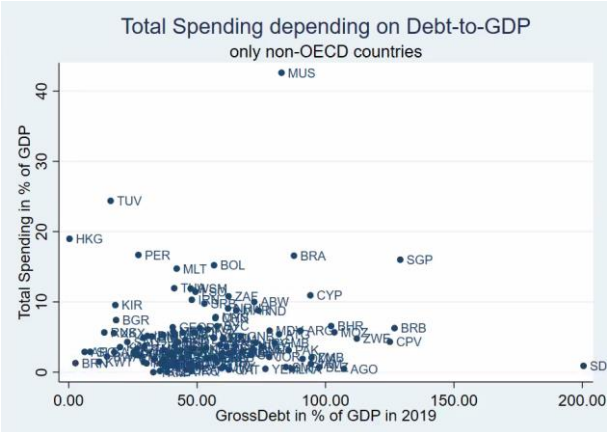

Figure 9: Total spending depending on the gross debt ratio; non-OECD countries

Source	SS	df	MS	Number of obs	=	116
				F(10, 105)	=	10.13
Model	4189.93955	10	418.993955	Prob > F	=	0.0000
Residual	4342.32505	105	41.3554767	R-squared	=	0.4911
				Adj R-squared	=	0.4426
Total	8532.2646	115	74.1936052	Root MSE	=	6.4308

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	.0628859	.0226472	2.78	0.007	.0179807	.1077911
GDP_capita_2019	.0000959	.0000357	2.68	0.008	.000025	.0001667
popdensity	.0005674	.0010078	0.56	0.575	-.0014309	.0025658
oldpopul	.3807265	.0854539	4.46	0.000	.2112872	.5501659
gvtstrictyness2020	.01122	.0561144	0.20	0.842	-.1000445	.1224846
covidcases	.0000154	.0000342	0.45	0.654	-.0000525	.0000832
Infl2019	-.220592	.1685389	-1.31	0.193	-.5547734	.1135894
EXP2019	-.0207483	.0321808	-0.64	0.521	-.0845568	.0430603
IMP2019	-.0194085	.0290572	-0.67	0.506	-.0770237	.0382066
Unempl2019	.0083452	.1249739	0.07	0.947	-.239455	.2561454
_cons	-1.437712	3.692989	-0.39	0.698	-8.760228	5.884803

Akaike's information criterion and Bayesian information criterion

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	116	-413.882	-374.7062	11	771.4124	801.7019

Figure 10: OLS estimation with the gross debt to GDP ratio

Source	SS	df	MS	Number of obs	=	35
				F(10, 24)	=	3.54
Model	1637.14023	10	163.714023	Prob > F	=	0.0054
Residual	1111.27523	24	46.3031347	R-squared	=	0.5957
				Adj R-squared	=	0.4272
Total	2748.41546	34	80.8357488	Root MSE	=	6.8046

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	.0276527	.0520325	0.53	0.600	-.079737	.1350424
GDP_capita_2019	.000121	.0000616	1.96	0.061	-6.24e-06	.0002482
popdensity	.0086503	.0115689	0.75	0.462	-.0152269	.0325274
oldpopul	.9536323	.2775656	3.44	0.002	.3807649	1.5265
gvtstrictyness2020	.5520409	.2256015	2.45	0.022	.0864222	1.01766
covidcases	.0000424	.0000509	0.83	0.413	-.0000627	.0001475
Infl2019	1.037482	.6843465	1.52	0.143	-.3749401	2.449903
EXP2019	-.0641866	.0571014	-1.12	0.272	-.1820381	.0536648
IMP2019	-.0321413	.0510935	-0.63	0.535	-.1375931	.0733104
Unempl2019	-.329438	.4941037	-0.67	0.511	-1.349218	.6903419
_cons	-42.37702	16.77479	-2.53	0.019	-76.99848	-7.755562

Akaike's information criterion and Bayesian information criterion

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	35	-126.0229	-110.1764	11	242.3527	259.4616

Figure 11: OLS estimation with the gross debt to GDP ratio; OECD countries

Source	SS	df	MS	Number of obs	=	81
				F(10, 70)	=	1.86
Model	567.148667	10	56.7148667	Prob > F	=	0.0658
Residual	2134.03843	70	30.4862633	R-squared	=	0.2100
				Adj R-squared	=	0.0971
Total	2701.1871	80	33.7648387	Root MSE	=	5.5214

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	.0356781	.0272394	1.31	0.195	-.0186492	.0900054
GDP_capita_2019	-.0000533	.0000827	-0.64	0.521	-.0002183	.0001117
popdensity	.0007457	.0010467	0.71	0.479	-.001342	.0028334
oldpopul	.1920551	.1081347	1.78	0.080	-.0236128	.4077229
gvtstrictyness2020	-.0167495	.0531666	-0.32	0.754	-.1227869	.089288
covidcases	-8.64e-06	.0000504	-0.17	0.864	-.0001091	.0000918
Infl2019	-.2600222	.1626038	-1.60	0.114	-.5843251	.0642808
EXP2019	.0295166	.0427042	0.69	0.492	-.0556543	.1146875
IMP2019	.0095542	.0364607	0.26	0.794	-.0631644	.0822729
Unempl2019	.0177137	.1161336	0.15	0.879	-.2139074	.2493348
_cons	1.771497	3.732559	0.47	0.637	-5.672857	9.21585

Akaike's information criterion and Bayesian information criterion

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	81	-256.9674	-247.4226	11	516.8451	543.1841

Figure 12:OLS estimation with the gross debt to GDP ratio; non-OECD countries

Source	SS	df	MS	Number of obs	=	116
				F(10, 105)	=	10.11
Model	4185.7313	10	418.57313	Prob > F	=	0.0000
Residual	4346.5333	105	41.3955553	R-squared	=	0.4906
				Adj R-squared	=	0.4421
Total	8532.2646	115	74.1936052	Root MSE	=	6.4339

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debtGDP2019	3.075419	1.115476	2.76	0.007	.8636363	5.287202
GDP_capita_2019	.000099	.0000358	2.77	0.007	.0000281	.00017
popdensity	.0007873	.0009886	0.80	0.428	-.0011729	.0027475
oldpopul	.3878994	.0848631	4.57	0.000	.2196315	.5561673
gvtstrictyness2020	.0074016	.0562728	0.13	0.896	-.1041769	.1189801
covidcases	.0000167	.0000343	0.49	0.627	-.0000513	.0000847
Infl2019	-.2333716	.1685141	-1.38	0.169	-.5675039	.1007607
EXP2019	-.0176323	.032416	-0.54	0.588	-.0819072	.0466426
IMP2019	-.0264233	.0294021	-0.90	0.371	-.0847222	.0318756
Unempl2019	.0386548	.1230526	0.31	0.754	-.2053358	.2826454
_cons	-9.883342	5.182402	-1.91	0.059	-20.15909	.3924042

Figure 13: OLS estimation with the log gross debt to GDP ratio

Source	SS	df	MS	Number of obs	=	35
				F(10, 24)	=	3.50
Model	1630.10862	10	163.010862	Prob > F	=	0.0058
Residual	1118.30684	24	46.5961183	R-squared	=	0.5931
				Adj R-squared	=	0.4236
Total	2748.41546	34	80.8357488	Root MSE	=	6.8261

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debtGDP2019	1.05869	2.939007	0.36	0.722	-5.007123	7.124502
GDP_capita_2019	.0001199	.0000622	1.93	0.066	-8.38e-06	.0002482
popdensity	.0087073	.0116329	0.75	0.461	-.0153019	.0327164
oldpopul	.9768132	.2727119	3.58	0.002	.4139635	1.539663
gvtstrictyness2020	.563009	.2354132	2.39	0.025	.0771401	1.048878
covidcases	.0000429	.0000518	0.83	0.416	-.0000641	.0001498
Infl2019	.9840768	.6726147	1.46	0.156	-.4041317	2.372285
EXP2019	-.0645826	.0573601	-1.13	0.271	-.1829681	.0538028
IMP2019	-.0316541	.0515962	-0.61	0.545	-.1381434	.0748351
Unempl2019	-.2475369	.4539024	-0.55	0.591	-1.184345	.6892716
_cons	-46.40078	16.09156	-2.88	0.008	-79.61213	-13.18943

Figure 14: OLS estimation with the log gross debt to GDP ratio; OECD countries

Source	SS	df	MS	Number of obs	=	81
				F(10, 70)	=	1.86
Model	567.138129	10	56.7138129	Prob > F	=	0.0658
Residual	2134.04897	70	30.4864139	R-squared	=	0.2100
				Adj R-squared	=	0.0971
Total	2701.1871	80	33.7648387	Root MSE	=	5.5215

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debtGDP2019	1.597541	1.219811	1.31	0.195	-.8352958	4.030378
GDP_capita_2019	-.0000391	.0000828	-0.47	0.638	-.0002042	.000126
popdensity	.0008264	.0010321	0.80	0.426	-.0012321	.0028849
oldpopul	.1919986	.1081358	1.78	0.080	-.0236715	.4076687
gvtstrictyness2020	-.0205673	.0529625	-0.39	0.699	-.1261976	.0850631
covidcases	-9.36e-06	.0000504	-0.19	0.853	-.0001099	.0000911
Infl2019	-.2539466	.1620531	-1.57	0.122	-.5771514	.0692582
EXP2019	.0304859	.04287	0.71	0.479	-.0550157	.1159875
IMP2019	.004821	.0376045	0.13	0.898	-.0701788	.0798209
Unempl2019	.0277996	.115325	0.24	0.810	-.2022088	.257808
_cons	-2.320769	5.652761	-0.41	0.683	-13.59484	8.953307

Figure 15: OLS estimation with the log gross debt to GDP ratio; non-OECD countries

Source	SS	df	MS	Number of obs	=	116
				F(12, 103)	=	8.48
Model	4240.77784	12	353.398153	Prob > F	=	0.0000
Residual	4291.48677	103	41.6649201	R-squared	=	0.4970
				Adj R-squared	=	0.4384
Total	8532.2646	115	74.1936052	Root MSE	=	6.4548

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	-.0037649	.1590404	-0.02	0.981	-.3191839	.3116542
debtGDP2019_2	.0012693	.0020673	0.61	0.541	-.0028307	.0053694
debtGDP2019_3	-6.07e-06	7.70e-06	-0.79	0.432	-.0000213	9.20e-06
GDP_capita_2019	.0000928	.000036	2.58	0.011	.0000214	.0001643
popdensity	.0005384	.0010323	0.52	0.603	-.0015089	.0025856
oldpopul	.3940293	.0866504	4.55	0.000	.2221787	.5658798
gvtstrictyness2020	.0138927	.0563847	0.25	0.806	-.097933	.1257184
covidcases	.0000107	.0000349	0.31	0.759	-.0000584	.0000799
Infl2019	-.242913	.1703819	-1.43	0.157	-.5808253	.0949993
EXP2019	-.0214852	.0323244	-0.66	0.508	-.0855932	.0426227
IMP2019	-.0184723	.029503	-0.63	0.533	-.0769846	.0400399
Unempl2019	.0241749	.1265736	0.19	0.849	-.226854	.2752038
_cons	-.8922246	4.956354	-0.18	0.857	-10.72198	8.937534

Akaike's information criterion and Bayesian information criterion

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	116	-413.882	-374.0232	13	774.0463	809.843

Figure 16: OLS estimation with higher power gross debt to GDP ratios

Source	SS	df	MS	Number of obs	=	35
				F(12, 22)	=	2.86
Model	1673.8916	12	139.490967	Prob > F	=	0.0159
Residual	1074.52385	22	48.8419934	R-squared	=	0.6090
				Adj R-squared	=	0.3958
Total	2748.41546	34	80.8357488	Root MSE	=	6.9887

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	-.2687098	.3518383	-0.76	0.453	-.9983778	.4609582
debtGDP2019_2	.0037095	.0042775	0.87	0.395	-.0051616	.0125806
debtGDP2019_3	-.0000125	.0000148	-0.85	0.406	-.0000431	.0000181
GDP_capita_2019	.0001202	.0000639	1.88	0.073	-.0000123	.0002528
popdensity	.0105347	.0121099	0.87	0.394	-.0145797	.035649
oldpopul	.8589148	.3135664	2.74	0.012	.2086179	1.509212
gvtstrictyness2020	.5200814	.2598997	2.00	0.058	-.0189175	1.05908
covidcases	.0000305	.0000543	0.56	0.580	-.0000821	.0001431
Infl2019	.9403623	.7340746	1.28	0.214	-.5820152	2.46274
EXP2019	-.0518413	.0604378	-0.86	0.400	-.1771817	.073499
IMP2019	-.040951	.053454	-0.77	0.452	-.1518077	.0699058
Unempl2019	-.3219267	.6008313	-0.54	0.597	-1.567975	.9241212
_cons	-31.90806	21.28395	-1.50	0.148	-76.04827	12.23214

Akaike's information criterion and Bayesian information criterion

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	35	-126.0229	-109.5878	13	245.1757	265.3952

Figure 17: OLS estimation with higher power gross debt to GDP ratios; OECD countries

Source	SS	df	MS	Number of obs	=	81
				F(12, 68)	=	1.77
Model	641.730443	12	53.4775369	Prob > F	=	0.0720
Residual	2059.45666	68	30.2861273	R-squared	=	0.2376
				Adj R-squared	=	0.1030
Total	2701.1871	80	33.7648387	Root MSE	=	5.5033

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	-.2624956	.2745108	-0.96	0.342	-.8102734	.2852821
debtGDP2019_2	.0058874	.0046004	1.28	0.205	-.0032925	.0150674
debtGDP2019_3	-.0000323	.000023	-1.41	0.164	-.0000782	.0000135
GDP_capita_2019	-.0000557	.0000842	-0.66	0.510	-.0002237	.0001123
popdensity	.0015764	.0011718	1.35	0.183	-.000762	.0039147
oldpopul	.2028811	.1080032	1.88	0.065	-.0126358	.4183981
gvtstrictyness2020	-.0095488	.0532475	-0.18	0.858	-.1158025	.096705
covidcases	-.0000117	.0000503	-0.23	0.817	-.0001121	.0000887
Infl2019	-.2872601	.163951	-1.75	0.084	-.6144192	.0398991
EXP2019	.0132499	.0440892	0.30	0.765	-.0747286	.1012285
IMP2019	.025073	.0390672	0.64	0.523	-.0528844	.1030303
Unempl2019	.0141986	.1159049	0.12	0.903	-.217086	.2454832
_cons	5.247808	5.763263	0.91	0.366	-6.252603	16.74822

Akaike's information criterion and Bayesian information criterion

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	81	-256.9674	-245.9818	13	517.9637	549.0915

Figure 18: OLS estimation with higher power gross debt to GDP ratios; non-OECD countries

Source	SS	df	MS	Number of obs	=	70
				F(10, 59)	=	8.04
Model	3204.59786	10	320.459786	Prob > F	=	0.0000
Residual	2352.32618	59	39.8699352	R-squared	=	0.5767
				Adj R-squared	=	0.5049
Total	5556.92404	69	80.535131	Root MSE	=	6.3143

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Netdebt	.0406232	.0229742	1.77	0.082	-.0053481	.0865945
GDP_capita_2019	.00014	.0000433	3.23	0.002	.0000533	.0002267
popdensity	.003135	.0045541	0.69	0.494	-.0059777	.0122478
oldpopul	.4036592	.1088486	3.71	0.000	.1858536	.6214649
gvtstrictyness2020	.209174	.0902899	2.32	0.024	.0285043	.3898436
covidcases	.0000367	.0000385	0.95	0.344	-.0000403	.0001138
Infl2019	-.1000079	.2546102	-0.39	0.696	-.6094817	.409466
EXP2019	-.019494	.0397445	-0.49	0.626	-.0990226	.0600347
IMP2019	-.0427241	.0368527	-1.16	0.251	-.1164661	.0310178
Unempl2019	.1355693	.155881	0.87	0.388	-.1763478	.4474864
_cons	-12.56125	5.771127	-2.18	0.034	-24.10925	-1.013251

Figure 19: OLS estimation with the net debt to GDP ratio

Source	SS	df	MS	Number of obs	=	34
				F(10, 23)	=	3.93
Model	1703.6403	10	170.36403	Prob > F	=	0.0032
Residual	996.253931	23	43.3153883	R-squared	=	0.6310
				Adj R-squared	=	0.4706
Total	2699.89423	33	81.8149768	Root MSE	=	6.5814

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Netdebt	.0397154	.0392791	1.01	0.322	-.0415396	.1209705
GDP_capita_2019	.0001634	.0000642	2.55	0.018	.0000306	.0002962
popdensity	.0047314	.0116017	0.41	0.687	-.0192685	.0287313
oldpopul	1.014381	.2648698	3.83	0.001	.4664559	1.562306
gvtstrictyness2020	.5682829	.2145825	2.65	0.014	.1243852	1.012181
covidcases	.0000616	.0000513	1.20	0.242	-.0000445	.0001677
Infl2019	1.249407	.6638199	1.88	0.073	-.1238087	2.622624
EXP2019	-.0799487	.056045	-1.43	0.167	-.1958866	.0359892
IMP2019	-.047681	.0507791	-0.94	0.357	-.1527256	.0573635
Unempl2019	-.3975503	.4555588	-0.87	0.392	-1.339945	.5448448
_cons	-45.46322	16.55928	-2.75	0.012	-79.71869	-11.20775

Figure 20: OLS estimation with the net debt to GDP ratio; OECD countries

Source	SS	df	MS	Number of obs	=	36
				F(10, 25)	=	1.39
Model	277.608483	10	27.7608483	Prob > F	=	0.2433
Residual	500.981811	25	20.0392724	R-squared	=	0.3566
				Adj R-squared	=	0.0992
Total	778.590294	35	22.245437	Root MSE	=	4.4765

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Netdebt	-.0055699	.0286958	-0.19	0.848	-.06467	.0535301
GDP_capita_2019	-.0000683	.0001568	-0.44	0.667	-.0003911	.0002546
popdensity	.0000383	.0049148	0.01	0.994	-.010084	.0101606
oldpopul	.0569077	.1394689	0.41	0.687	-.2303339	.3441493
gvtstrictyness2020	.0965907	.0861334	1.12	0.273	-.0808043	.2739857
covidcases	.0000838	.0000623	1.35	0.190	-.0000445	.0002122
Infl2019	.0416588	.2527551	0.16	0.870	-.4789001	.5622177
EXP2019	.0499506	.0537671	0.93	0.362	-.0607848	.160686
IMP2019	.0345665	.0479505	0.72	0.478	-.0641893	.1333223
Unempl2019	-.0037737	.1339283	-0.03	0.978	-.2796043	.2720569
_cons	-4.038411	5.522406	-0.73	0.471	-15.41202	7.335196

Figure 21: OLS estimation with the net debt to GDP ratio; non-OECD countries

```
. quietly regress SPENDING debtGDP2019 $CONTROL if Netdebt!=.
Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	70	-252.4264	-222.4268	11	466.8536	491.587

```
. quietly regress SPENDING Netdebt $CONTROL
Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	70	-252.4264	-222.339	11	466.6779	491.4114

```
. quietly regress SPENDING debtGDP2019 $CONTROL if OECD==1 & Netdebt!=.
Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	34	-122.6122	-106.2474	11	234.4948	251.2848

```
. quietly regress SPENDING Netdebt $CONTROL if OECD==1
Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	34	-122.6122	-105.6638	11	233.3276	250.1176

```
. quietly regress SPENDING debtGDP2019 $CONTROL if OECD==0 & Netdebt!=.
Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	36	-106.4132	-98.34967	11	218.6993	236.1181

```
. quietly regress SPENDING Netdebt $CONTROL if OECD==0
Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	36	-106.4132	-98.4767	11	218.9534	236.3721

Figure 22: AIC and BIC for gross vs. net debt ratios

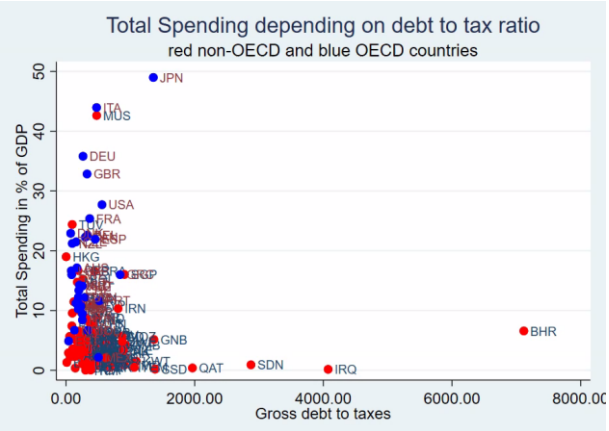

Figure 23: Total spending depending on debt to tax ratio

```
. regress  SPENDING debtTAX2019 $CONTROL if OECD==1
```

Source	SS	df	MS	Number of obs	=	35
				F(10, 24)	=	3.49
Model	1628.13058	10	162.813058	Prob > F	=	0.0059
Residual	1120.28487	24	46.6785364	R-squared	=	0.5924
				Adj R-squared	=	0.4226
Total	2748.41546	34	80.8357488	Root MSE	=	6.8322

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtTAX2019	.0031284	.0105969	0.30	0.770	-.0187425	.0249992
GDP_capita_2019	.0001263	.0000633	2.00	0.057	-4.32e-06	.000257
popdensity	.0089077	.0116068	0.77	0.450	-.0150476	.032863
oldpopul	1.00106	.2607782	3.84	0.001	.4628402	1.53928
gvtstrictyness2020	.5798917	.2213575	2.62	0.015	.1230324	1.036751
covidcases	.0000422	.0000519	0.81	0.424	-.0000649	.0001493
Infl2019	1.00745	.7001906	1.44	0.163	-.4376719	2.452573
EXP2019	-.062913	.0573322	-1.10	0.283	-.1812409	.0554149
IMP2019	-.0350937	.0512385	-0.68	0.500	-.1408448	.0706574
Unempl2019	-.266113	.4804658	-0.55	0.585	-1.257746	.7255196
_cons	-44.67058	16.03881	-2.79	0.010	-77.77306	-11.5681

Figure 24: OLS estimation with the gross debt to tax ratio; OECD countries

```
. regress  SPENDING debtTAX2019 $CONTROL if OECD==0
```

Source	SS	df	MS	Number of obs	=	81
				F(10, 70)	=	1.71
Model	530.848706	10	53.0848706	Prob > F	=	0.0950
Residual	2170.33839	70	31.0048342	R-squared	=	0.1965
				Adj R-squared	=	0.0817
Total	2701.1871	80	33.7648387	Root MSE	=	5.5682

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtTAX2019	-.0009827	.0013679	-0.72	0.475	-.003711	.0017455
GDP_capita_2019	-.0000386	.000084	-0.46	0.648	-.0002062	.0001291
popdensity	.0011545	.0010198	1.13	0.261	-.0008795	.0031885
oldpopul	.1740626	.1127784	1.54	0.127	-.0508668	.398992
gvtstrictyness2020	-.0216167	.0534285	-0.40	0.687	-.1281766	.0849431
covidcases	-3.72e-06	.0000509	-0.07	0.942	-.0001053	.0000979
Infl2019	-.2344848	.1625721	-1.44	0.154	-.5587246	.089755
EXP2019	.0154424	.0421499	0.37	0.715	-.0686229	.0995076
IMP2019	.0236886	.0354223	0.67	0.506	-.0469589	.0943362
Unempl2019	.0362561	.1160483	0.31	0.756	-.1951948	.2677071
_cons	3.989947	3.585367	1.11	0.270	-3.160842	11.14074

Figure 25: OLS estimation with the gross debt to tax ratio; non-OECD countries

```
. regress  SPENDING log_debtTAX2019 $CONTROL if OECD==1
```

Source	SS	df	MS	Number of obs	=	35
				F(10, 24)	=	3.48
Model	1626.44156	10	162.644156	Prob > F	=	0.0060
Residual	1121.9739	24	46.7489125	R-squared	=	0.5918
				Adj R-squared	=	0.4217
Total	2748.41546	34	80.8357488	Root MSE	=	6.8373

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debtTAX2019	.5980296	2.650904	0.23	0.823	-4.873168	6.069227
GDP_capita_2019	.0001251	.0000631	1.98	0.059	-5.12e-06	.0002553
popdensity	.0088626	.0116576	0.76	0.455	-.0151974	.0329227
oldpopul	1.000586	.26166	3.82	0.001	.460546	1.540625
gvtstrictyness2020	.5800701	.2344216	2.47	0.021	.0962476	1.063893
covidcases	.0000416	.0000521	0.80	0.432	-.000066	.0001492
Infl2019	.9687144	.6745358	1.44	0.164	-.423459	2.360888
EXP2019	-.0634108	.057355	-1.11	0.280	-.1817857	.0549641
IMP2019	-.0345585	.0512129	-0.67	0.506	-.1402566	.0711397
Unempl2019	-.2285434	.4499033	-0.51	0.616	-1.157098	.7000114
_cons	-47.13549	17.66609	-2.67	0.013	-83.59651	-10.67448

Figure 26: OLS estimation with the log gross debt to tax ratio; OECD countries

```
. regress  SPENDING log_debtTAX2019 $CONTROL if OECD==0
```

Source	SS	df	MS	Number of obs	=	81
				F(10, 70)	=	1.65
Model	514.978106	10	51.4978106	Prob > F	=	0.1108
Residual	2186.20899	70	31.2315571	R-squared	=	0.1906
				Adj R-squared	=	0.0750
Total	2701.1871	80	33.7648387	Root MSE	=	5.5885

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debtTAX2019	.0606988	.9380892	0.06	0.949	-1.810261	1.931659
GDP_capita_2019	-.0000468	.0000836	-0.56	0.577	-.0002134	.0001199
popdensity	.0010948	.0010451	1.05	0.298	-.0009896	.0031792
oldpopul	.19684	.113983	1.73	0.089	-.0304919	.4241719
gvtstrictyness2020	-.0234913	.0535601	-0.44	0.662	-.1303136	.0833309
covidcases	-6.98e-06	.0000513	-0.14	0.892	-.0001093	.0000953
Infl2019	-.2321165	.1632349	-1.42	0.159	-.5576783	.0934453
EXP2019	.0181078	.0433441	0.42	0.677	-.0683393	.1045549
IMP2019	.0219743	.0365472	0.60	0.550	-.0509168	.0948654
Unempl2019	.0402293	.118857	0.34	0.736	-.1968236	.2772821
_cons	3.124578	6.820338	0.46	0.648	-10.47816	16.72731

Figure 27: OLS estimation with the log gross debt to tax ratio; non-OECD countries

```
. regress  addspend log_debtTAX2019 $CONTROL if OECD==1
```

Source	SS	df	MS	Number of obs	=	35
				F(10, 24)	=	1.37
Model	339.737834	10	33.9737834	Prob > F	=	0.2543
Residual	597.200746	24	24.8833644	R-squared	=	0.3626
				Adj R-squared	=	0.0970
Total	936.93858	34	27.5570171	Root MSE	=	4.9883

addspend	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debtTAX2019	2.450467	1.934028	1.27	0.217	-1.541171	6.442106
GDP_capita_2019	.000077	.000046	1.67	0.107	-.000018	.000172
popdensity	-.0065324	.0085051	-0.77	0.450	-.024086	.0110211
oldpopul	.0541649	.1909001	0.28	0.779	-.3398335	.4481634
gvtstrictyness2020	.0910056	.1710277	0.53	0.600	-.2619783	.4439894
covidcases	-1.17e-06	.000038	-0.03	0.976	-.0000797	.0000773
Infl2019	-.2287816	.4921231	-0.46	0.646	-1.244474	.7869106
EXP2019	-.0217803	.0418447	-0.52	0.607	-.1081435	.0645828
IMP2019	-.0424852	.0373635	-1.14	0.267	-.1195997	.0346294
Unempl2019	-.3020215	.3282373	-0.92	0.367	-.97947	.3754271
_cons	-8.188492	12.8887	-0.64	0.531	-34.78947	18.41248

Figure 28: OLS estimation for additional spending with the log gross debt to tax ratio; OECD countries

```
. regress  addspend log_debtTAX2019 $CONTROL if OECD==0
```

Source	SS	df	MS	Number of obs	=	81
				F(10, 70)	=	5.66
Model	254.030451	10	25.4030451	Prob > F	=	0.0000
Residual	313.918535	70	4.4845505	R-squared	=	0.4473
				Adj R-squared	=	0.3683
Total	567.948986	80	7.09936233	Root MSE	=	2.1177

addspend	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debtTAX2019	-.2618069	.3554731	-0.74	0.464	-.9707758	.4471619
GDP_capita_2019	-.0000549	.0000317	-1.73	0.087	-.0001181	8.22e-06
popdensity	.0013612	.000396	3.44	0.001	.0005713	.002151
oldpopul	.0348511	.0431919	0.81	0.422	-.0512925	.1209947
gvtstrictyness2020	-.0093136	.0202957	-0.46	0.648	-.0497921	.0311649
covidcases	.0000125	.0000194	0.65	0.521	-.0000262	.0000513
Infl2019	-.086003	.0618551	-1.39	0.169	-.2093692	.0373632
EXP2019	.0201615	.0164245	1.23	0.224	-.0125961	.0529192
IMP2019	.0185288	.0138489	1.34	0.185	-.0090921	.0461496
Unempl2019	.0161237	.0450389	0.36	0.721	-.0737035	.1059509
_cons	3.650685	2.584452	1.41	0.162	-1.503843	8.805212

Figure 29: OLS estimation for additional spending with the log gross debt to tax ratio; non-OECD countries

```
. regress addspend log_debtTAX2019
```

Source	SS	df	MS	Number of obs	=	164
				F(1, 162)	=	5.34
Model	85.4965086	1	85.4965086	Prob > F	=	0.0221
Residual	2595.05797	162	16.0188764	R-squared	=	0.0319
				Adj R-squared	=	0.0259
Total	2680.55448	163	16.4451195	Root MSE	=	4.0024

addspend	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debtTAX2019	-.8043691	.3481747	-2.31	0.022	-1.491915	-.116823
_cons	9.114562	2.023898	4.50	0.000	5.117938	13.11119

```
. regress addspend log_debtTAX2019 GDP_capita_2019
```

Source	SS	df	MS	Number of obs	=	156
				F(2, 153)	=	29.69
Model	724.32916	2	362.16458	Prob > F	=	0.0000
Residual	1866.24112	153	12.1976544	R-squared	=	0.2796
				Adj R-squared	=	0.2702
Total	2590.57028	155	16.7133566	Root MSE	=	3.4925

addspend	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debtTAX2019	-.2086195	.3189751	-0.65	0.514	-.8387835	.4215445
GDP_capita_2019	.0001029	.000014	7.35	0.000	.0000752	.0001305
_cons	4.157869	1.909449	2.18	0.031	.3855798	7.930159

```
. regress SPENDING log_debtTAX2019
```

Source	SS	df	MS	Number of obs	=	164
				F(1, 162)	=	2.59
Model	185.223886	1	185.223886	Prob > F	=	0.1092
Residual	11569.6855	162	71.4178115	R-squared	=	0.0158
				Adj R-squared	=	0.0097
Total	11754.9093	163	72.1160083	Root MSE	=	8.4509

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debtTAX2019	-1.18394	.7351644	-1.61	0.109	-2.635681	.2678007
_cons	14.34009	4.273423	3.36	0.001	5.901289	22.77888

Figure 30: OLS estimation with the log gross debt to tax ratio with less control variables

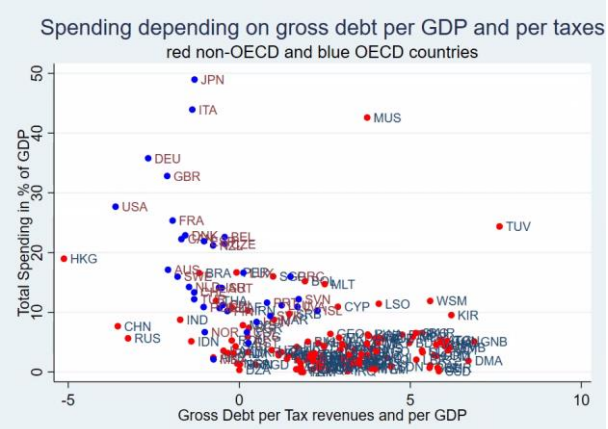

Figure 31: Total spending depending on debt to GDP times tax ratio

```
. regress SPENDING log_debt_TAXGDP $CONTROL if Code!="MUS" & Code!="TUV"
```

Source	SS	df	MS	Number of obs	=	115
				F(10, 104)	=	13.85
Model	4199.423	10	419.9423	Prob > F	=	0.0000
Residual	3153.9751	104	30.3266836	R-squared	=	0.5711
				Adj R-squared	=	0.5298
Total	7353.3981	114	64.5034921	Root MSE	=	5.507

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debt_TAXGDP	-1.071899	.3826963	-2.80	0.006	-1.8308	-.3129975
GDP_capita_2019	.0000604	.0000347	1.74	0.085	-8.47e-06	.0001293
popdensity	.0010978	.0008279	1.33	0.188	-.0005439	.0027395
oldpopul	.3494188	.0755726	4.62	0.000	.1995554	.4992822
gvtstrictyness2020	.0209022	.0533938	0.39	0.696	-.0849798	.1267842
covidcases	.0000195	.0000292	0.67	0.507	-.0000385	.0000774
Infl2019	-.1963995	.1455905	-1.35	0.180	-.485111	.0923121
EXP2019	-.037323	.0276239	-1.35	0.180	-.0921023	.0174563
IMP2019	.01403	.0278707	0.50	0.616	-.0412387	.0692987
Unempl2019	.1135846	.1048648	1.08	0.281	-.0943662	.3215355
_cons	1.900252	3.71979	0.51	0.611	-5.476231	9.276734

Figure 32: OLS estimation for with the debt to GDP times tax

```
. regress SPENDING log_debt_TAXGDP $CONTROL if OECD == 1
```

Source	SS	df	MS	Number of obs	=	35
				F(10, 24)	=	4.42
Model	1781.49945	10	178.149945	Prob > F	=	0.0014
Residual	966.916006	24	40.2881669	R-squared	=	0.6482
				Adj R-squared	=	0.5016
Total	2748.41546	34	80.8357488	Root MSE	=	6.3473

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debt_TAXGDP	-2.288868	1.15786	-1.98	0.060	-4.678574	.1008372
GDP_capita_2019	.0000575	.0000662	0.87	0.394	-.0000791	.000194
popdensity	.0080967	.0107682	0.75	0.459	-.0141279	.0303213
oldpopul	.8261089	.2583171	3.20	0.004	.2929686	1.359249
gvtstrictyness2020	.3663602	.2230713	1.64	0.114	-.0940363	.8267567
covidcases	.0000462	.0000472	0.98	0.338	-.0000513	.0001437
Infl2019	.4353546	.6659823	0.65	0.520	-.9391653	1.809875
EXP2019	-.0493691	.053713	-0.92	0.367	-.1602273	.0614891
IMP2019	-.01397	.0486114	-0.29	0.776	-.1142991	.0863591
Unempl2019	.0990721	.4403719	0.22	0.824	-.8098108	1.007955
_cons	-29.12866	16.87027	-1.73	0.097	-63.94719	5.68987

Figure 33: OLS estimation for with the debt to GDP times tax ratio; OECD countries

```
. regress SPENDING log_debt_TAXGDP $CONTROL if OECD == 0 & Code!="MUS" & Code!="TUV"
```

Source	SS	df	MS	Number of obs	=	80
				F(10, 69)	=	4.45
Model	498.642382	10	49.8642382	Prob > F	=	0.0001
Residual	773.019284	69	11.203178	R-squared	=	0.3921
				Adj R-squared	=	0.3040
Total	1271.66167	79	16.0969831	Root MSE	=	3.3471

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debt_TAXGDP	-.8292044	.2885188	-2.87	0.005	-1.404784	-.2536251
GDP_capita_2019	-.0001189	.0000515	-2.31	0.024	-.0002216	-.0000162
popdensity	.0009233	.0006126	1.51	0.136	-.0002988	.0021454
oldpopul	.022886	.0714611	0.32	0.750	-.119675	.1654469
gvtstrictyness2020	-.0060159	.036633	-0.16	0.870	-.0790968	.067065
covidcases	.0000509	.0000315	1.62	0.110	-.0000118	.0001137
Infl2019	-.1144069	.0982558	-1.16	0.248	-.3104219	.0816081
EXP2019	.0362656	.0259449	1.40	0.167	-.0154931	.0880242
IMP2019	.0470648	.0258561	1.82	0.073	-.0045167	.0986464
Unempl2019	.0239172	.069756	0.34	0.733	-.1152422	.1630767
_cons	3.536318	2.53556	1.39	0.168	-1.521985	8.594622

Figure 34: OLS estimation for with the debt to GDP times tax ratio; non-OECD countries

```
. quietly regress SPENDING log_debt_TAXGDP $CONTROL if Code!="MUS" & Code!="TUV"

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	115	-402.2621	-353.5884	11	729.1768	759.3711

Note: BIC uses N = number of observations. See [R] BIC note.

```
. quietly regress SPENDING $CONTROL if log_debt_TAXGDP!=. & Code!="MUS" & Code!="TUV"

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	115	-402.2621	-357.7701	10	735.5401	762.9894

Note: BIC uses N = number of observations. See [R] BIC note.

Akaike's information criterion and Bayesian information criterion

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	35	-126.0229	-107.7412	11	237.4824	254.5913

Note: BIC uses N = number of observations. See [R] BIC note.

```
. quietly regress SPENDING $CONTROL if OECD == 1 & log_debt_TAXGDP!=.

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	35	-126.0229	-110.3811	10	240.7622	256.3157

Note: BIC uses N = number of observations. See [R] BIC note.

```
. quietly regress SPENDING log_debt_TAXGDP $CONTROL if OECD == 0 & Code!="MUS" & Code!="TUV"

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	80	-224.1572	-204.2462	11	430.4924	456.6946

Note: BIC uses N = number of observations. See [R] BIC note.

```
. quietly regress SPENDING $CONTROL if OECD == 0 & Code!="MUS" & Code!="TUV" & log_debt_TAXGDP!=.

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	80	-224.1572	-208.7689	10	437.5378	461.3581

Note: BIC uses N = number of observations. See [R] BIC note.

Figure 35: AIC and BIC for gross debt to tax times GDP ratio vs. control variables

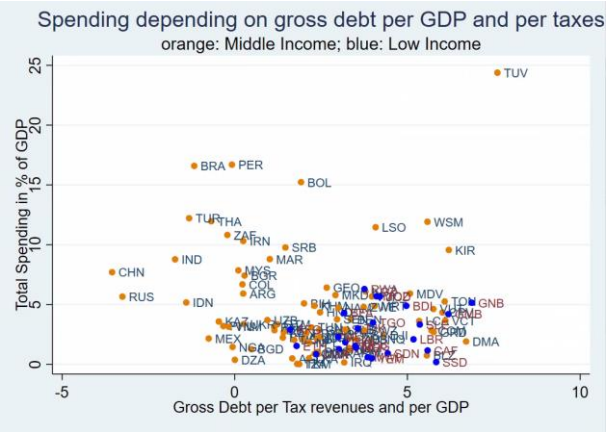

Figure 36: Total spending depending on debt to GDP times tax ratio; low- and middle-income countries

```
. regress SPENDING log_debt_TAXGDP $CONTROL if MiddleIncome==1 & Code!="MUS" & Code!="TUV"
```

Source	SS	df	MS	Number of obs	=	56
				F(10, 45)	=	2.20
Model	301.126788	10	30.1126788	Prob > F	=	0.0354
Residual	616.348091	45	13.6966242	R-squared	=	0.3282
				Adj R-squared	=	0.1789
Total	917.474879	55	16.6813614	Root MSE	=	3.7009

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debt_TAXGDP	-1.483897	.4319562	-3.44	0.001	-2.353901	-.6138922
GDP_capita_2019	-.0002919	.0002477	-1.18	0.245	-.0007908	.000207
popdensity	-.0042784	.0031887	-1.34	0.186	-.0107007	.002144
oldpopul	-.0158826	.1161011	-0.14	0.892	-.2497222	.2179569
gvtstrictyness2020	.0098143	.0564069	0.17	0.863	-.1037951	.1234237
covidcases	.000063	.0000392	1.61	0.115	-.000016	.000142
Infl2019	-.1125298	.1616044	-0.70	0.490	-.4380178	.2129582
EXP2019	.0375372	.039338	0.95	0.345	-.0416937	.1167681
IMP2019	.0464345	.0364141	1.28	0.209	-.0269072	.1197762
Unempl2019	.0877284	.0935138	0.94	0.353	-.1006181	.2760749
_cons	4.666978	4.087291	1.14	0.260	-3.565249	12.89921

Figure 37: OLS estimation with the debt to GDP times tax ratio; middle-income countries

```
. regress SPENDING log_debt_TAXGDP $CONTROL if LowerIncome == 1 & Code!="MUS" & Code!="TUV
```

Source	SS	df	MS	Number of obs	=	15
				F(10, 4)	=	2.34
Model	45.0952988	10	4.50952988	Prob > F	=	0.2142
Residual	7.71158033	4	1.92789508	R-squared	=	0.8540
				Adj R-squared	=	0.4889
Total	52.8068792	14	3.77191994	Root MSE	=	1.3885

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debt_TAXGDP	2.141742	.9704261	2.21	0.092	-.5525924	4.836077
GDP_capita_2019	.0045623	.00391	1.17	0.308	-.0062936	.0154182
popdensity	.0038601	.0027032	1.43	0.226	-.0036453	.0113655
oldpopul	.1002056	.8779233	0.11	0.915	-2.3373	2.537712
gvtstrictyness2020	.0118925	.0632868	0.19	0.860	-.1638198	.1876049
covidcases	.0031248	.0019596	1.59	0.186	-.002316	.0085656
Infl2019	-.1885671	.1346286	-1.40	0.234	-.5623559	.1852217
EXP2019	.0603674	.0504195	1.20	0.297	-.0796195	.2003543
IMP2019	-.0038042	.0486348	-0.08	0.941	-.1388361	.1312277
Unempl2019	-.2686116	.265304	-1.01	0.369	-1.005214	.4679903
_cons	-10.21047	6.83506	-1.49	0.210	-29.18764	8.766703

Figure 38: OLS estimation with the debt to GDP times tax ratio; low-income countries

```
. regress SPENDING StockFinancialAsset StockLiabilities NetFinancialWorth2019 NetWorth2019 $CONTROL
```

Source	SS	df	MS	Number of obs	=	19
				F(13, 5)	=	7.76
Model	1522.75736	13	117.135181	Prob > F	=	0.0169
Residual	75.4433264	5	15.0886653	R-squared	=	0.9528
				Adj R-squared	=	0.8301
Total	1598.20068	18	88.7889269	Root MSE	=	3.8844

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
StockFinancialAsset	8.868911	2.835755	3.13	0.026	1.579371	16.15845
StockLiabilities	-8.541016	2.83951	-3.01	0.030	-15.84021	-1.241824
NetFinancialWorth2019	-8.470817	2.767686	-3.06	0.028	-15.58538	-1.356253
NetWorth2019	.0543893	.0914004	0.60	0.578	-.1805629	.2893415
GDP_capita_2019	.0003398	.0000829	4.10	0.009	.0001268	.0005528
popdensity	.0597563	.0194015	3.08	0.027	.0098831	.1096295
oldpopul	1.211371	.3038721	3.99	0.010	.4302434	1.9925
gvtstrictyness2020	.6919136	.2924233	2.37	0.064	-.0597844	1.443612
covidcases	.0002795	.0001391	2.01	0.101	-.000078	.000637
Infl2019	.5680722	.5222563	1.09	0.326	-.7744304	1.910575
EXP2019	-.7136544	.1552055	-4.60	0.006	-1.112623	-.3146861
IMP2019	.0364262	.1119302	0.33	0.758	-.2512995	.3241519
Unempl2019	-.9672318	.7925434	-1.22	0.277	-3.004529	1.070066
_cons	-53.26611	21.68048	-2.46	0.057	-108.9976	2.465349

Figure 39: OLS estimation with financial assets, liabilities and net (financial) worth

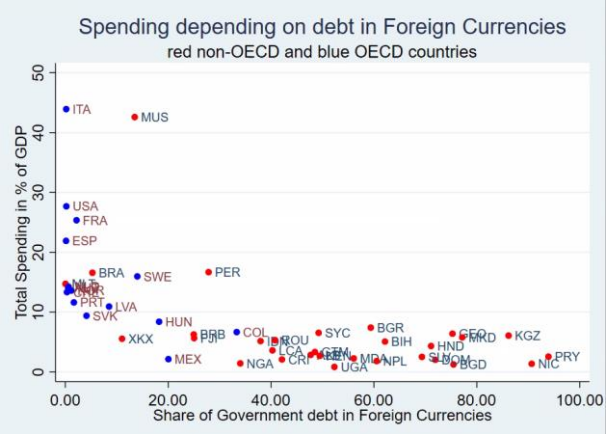

Figure 40: Total spending depending on debt in foreign currencies

```
. regress SPENDING debtGDP2019  debtForeignCurrency $CONTROL
```

Source	SS	df	MS	Number of obs	=	38
				F(11, 26)	=	4.84
Model	2751.49495	11	250.135904	Prob > F	=	0.0005
Residual	1343.23939	26	51.6630536	R-squared	=	0.6720
				Adj R-squared	=	0.5332
Total	4094.73434	37	110.668496	Root MSE	=	7.1877

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	.1462316	.0493829	2.96	0.006	.0447236	.2477397
debtForeignCurrency	-.0039085	.0012174	-3.21	0.004	-.0064108	-.0014062
GDP_capita_2019	6.07e-06	.0000941	0.06	0.949	-.0001874	.0001996
popdensity	.0047688	.0045096	1.06	0.300	-.0045007	.0140383
oldpopul	-.0988965	.2226667	-0.44	0.661	-.5565946	.3588015
gvtstrictyness2020	-.1709022	.1191816	-1.43	0.164	-.4158835	.0740791
covidcases	.0000231	.0000832	0.28	0.784	-.000148	.0001941
Infl2019	-1.480905	.6970003	-2.12	0.043	-2.913609	-.0481999
EXP2019	-.0812445	.0819806	-0.99	0.331	-.2497581	.0872691
IMP2019	.023026	.0800711	0.29	0.776	-.1415625	.1876146
Unempl2019	.0096094	.4508432	0.02	0.983	-.917112	.9363309
_cons	23.97124	10.50627	2.28	0.031	2.375296	45.56719

Figure 41: OLS estimation including debt in foreign currencies

```
. regress SPENDING gvt_debt_in_foreign_currency_TOT $CONTROL if OECD==1
```

Source	SS	df	MS	Number of obs	=	14
				F(10, 3)	=	1.30
Model	1201.29633	10	120.129633	Prob > F	=	0.4629
Residual	277.201925	3	92.4006416	R-squared	=	0.8125
				Adj R-squared	=	0.1875
Total	1478.49826	13	113.730635	Root MSE	=	9.6125

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gvt_debt_in_foreign_currency_TOT	-.5908812	.6182598	-0.96	0.410	-2.55846	1.376697
GDP_capita_2019	.000263	.0002355	1.12	0.346	-.0004866	.0010125
popdensity	-.0210575	.0540452	-0.39	0.723	-.1930535	.1509385
oldpopul	.9604212	.654328	1.47	0.238	-1.121943	3.042785
gvtstrictyness2020	1.15255	.8469596	1.36	0.267	-1.542854	3.847953
covidcases	8.16e-06	.0001771	0.05	0.966	-.0005555	.0005719
Infl2019	6.512325	6.916322	0.94	0.416	-15.4985	28.52315
EXP2019	.2101181	1.728075	0.12	0.911	-5.289386	5.709623
IMP2019	-.2176102	1.76487	-0.12	0.910	-5.834213	5.398993
Unempl2019	1.044399	1.299155	0.80	0.480	-3.090092	5.17889
_cons	-94.54119	66.40776	-1.42	0.250	-305.8803	116.7979

Figure 42: OLS estimation including debt in foreign currencies; OECD countries

```
. regress SPENDING gvt_debt_in_foreign_currency_TOT $CONTROL if OECD==0
```

Source	SS	df	MS	Number of obs	=	24
				F(10, 13)	=	1.76
Model	1055.14289	10	105.514289	Prob > F	=	0.1671
Residual	777.262805	13	59.7894466	R-squared	=	0.5758
				Adj R-squared	=	0.2495
Total	1832.4057	23	79.6698128	Root MSE	=	7.7324

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gvt_debt_in_foreign_currency_TOT	-.2603294	.1028733	-2.53	0.025	-.4825737	-.0380851
GDP_capita_2019	-.0006256	.0006989	-0.90	0.387	-.0021354	.0008842
popdensity	.002887	.006691	0.43	0.673	-.011568	.017342
oldpopul	.0153151	.4476577	0.03	0.973	-.9517906	.9824208
gvtstrictyness2020	-.2015649	.1693765	-1.19	0.255	-.5674806	.1643508
covidcases	-7.28e-06	.0001919	-0.04	0.970	-.0004219	.0004073
Infl2019	-1.518451	.7524619	-2.02	0.065	-3.144047	.1071436
EXP2019	.0118041	.1285026	0.09	0.928	-.265809	.2894172
IMP2019	.0324097	.09314	0.35	0.733	-.168807	.2336265
Unempl2019	-.005035	.7434028	-0.01	0.995	-1.611059	1.600989
_cons	38.78841	13.43867	2.89	0.013	9.755935	67.82088

Figure 43: OLS estimation including debt in foreign currencies; non-OECD countries

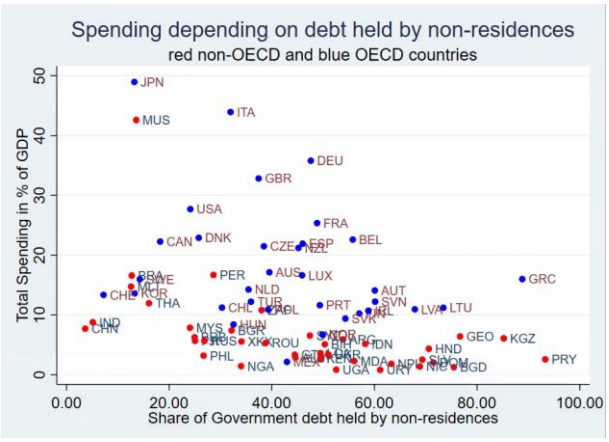

Figure 44: Total spending depending on external debt

```
. regress SPENDING debtGDP2019  debtForeignResid $CONTROL
```

Source	SS	df	MS	Number of obs	=	64
				F(11, 52)	=	5.81
Model	3360.62935	11	305.511759	Prob > F	=	0.0000
Residual	2736.22163	52	52.6196467	R-squared	=	0.5512
				Adj R-squared	=	0.4563
Total	6096.85098	63	96.7754123	Root MSE	=	7.2539

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	.1896119	.0486609	3.90	0.000	.0919666	.2872572
debtForeignResid	-.0018523	.0006508	-2.85	0.006	-.0031582	-.0005463
GDP_capita_2019	.0001025	.0000537	1.91	0.062	-5.30e-06	.0002103
popdensity	.0028814	.0040878	0.70	0.484	-.0053213	.0110841
oldpopul	.2092409	.1576516	1.33	0.190	-.1071101	.525592
gvtstrictyness2020	-.0595019	.1001346	-0.59	0.555	-.2604367	.1414329
covidcases	.0000587	.0000457	1.28	0.205	-.000033	.0001505
Infl2019	-.5079466	.4177697	-1.22	0.230	-1.346263	.3303697
EXP2019	-.0117974	.0453252	-0.26	0.796	-.102749	.0791542
IMP2019	-.0421148	.045129	-0.93	0.355	-.1326726	.0484431
Unempl2019	.0276053	.2487614	0.11	0.912	-.471571	.5267817
_cons	4.203819	7.561367	0.56	0.581	-10.96917	19.37681

Figure 45: OLS estimation including external debt

```
. regress SPENDING debtGDP2019  debtForeignResid $CONTROL if OECD==1
```

Source	SS	df	MS	Number of obs	=	32
				F(11, 20)	=	3.09
Model	1616.49281	11	146.953891	Prob > F	=	0.0137
Residual	950.401106	20	47.5200553	R-squared	=	0.6297
				Adj R-squared	=	0.4261
Total	2566.89391	31	82.8030294	Root MSE	=	6.8935

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	.1381112	.0969536	1.42	0.170	-.0641305	.3403529
debtForeignResid	-.0016263	.0011404	-1.43	0.169	-.004005	.0007525
GDP_capita_2019	.0000882	.0000712	1.24	0.230	-.0000603	.0002367
popdensity	.0165195	.0136196	1.21	0.239	-.0118905	.0449295
oldpopul	.6503313	.3459931	1.88	0.075	-.0713976	1.37206
gvtstrictyness2020	.263345	.304853	0.86	0.398	-.3725672	.8992572
covidcases	.000062	.0000537	1.16	0.262	-.00005	.000174
Infl2019	.4532653	.7728153	0.59	0.564	-1.158799	2.06533
EXP2019	-.0497758	.061543	-0.81	0.428	-.1781522	.0786006
IMP2019	-.0446973	.0593149	-0.75	0.460	-.1684261	.0790315
Unempl2019	.126693	.5916415	0.21	0.833	-1.107449	1.360835
_cons	-22.80551	21.02135	-1.08	0.291	-66.65528	21.04426

Figure 46: OLS estimation including including external debt; OECD countries

```
. regress SPENDING debtGDP2019  debtForeignResid $CONTROL if OECD==0
```

Source	SS	df	MS	Number of obs	=	32
				F(11, 20)	=	2.30
Model	1072.44744	11	97.4952218	Prob > F	=	0.0510
Residual	848.27965	20	42.4139825	R-squared	=	0.5584
				Adj R-squared	=	0.3155
Total	1920.72709	31	61.9589384	Root MSE	=	6.5126

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	.1313751	.0638933	2.06	0.053	-.0019041	.2646543
debtForeignResid	-.0036966	.0011777	-3.14	0.005	-.0061533	-.0012399
GDP_capita_2019	-.0000854	.0003695	-0.23	0.819	-.0008562	.0006853
popdensity	.0024294	.0046104	0.53	0.604	-.0071879	.0120466
oldpopul	-.091876	.268196	-0.34	0.735	-.6513231	.467571
gvtstrictyness2020	-.1711754	.1094278	-1.56	0.133	-.3994378	.0570869
covidcases	7.42e-06	.0000888	0.08	0.934	-.0001778	.0001926
Infl2019	-1.135725	.5196479	-2.19	0.041	-2.219692	-.0517586
EXP2019	-.031243	.0726067	-0.43	0.672	-.1826978	.1202119
IMP2019	.055057	.0657961	0.84	0.413	-.0821912	.1923051
Unempl2019	.1432934	.2795909	0.51	0.614	-.4399231	.7265098
_cons	21.1685	9.236697	2.29	0.033	1.90109	40.43592

Figure 47: OLS estimation including including external debt; non-OECD countries

```
. regress SPENDING debtGDP2019  debt_average_maturity $CONTROL
```

Source	SS	df	MS	Number of obs	=	69
				F(11, 57)	=	8.82
Model	3620.54097	11	329.140088	Prob > F	=	0.0000
Residual	2127.3454	57	37.3218491	R-squared	=	0.6299
				Adj R-squared	=	0.5585
Total	5747.88636	68	84.5277407	Root MSE	=	6.1092

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	.0859719	.0321387	2.68	0.010	.0216152	.1503286
debt_average_maturity	-.0347305	.1808027	-0.19	0.848	-.3967816	.3273207
GDP_capita_2019	.0001638	.0000561	2.92	0.005	.0000514	.0002761
popdensity	.0005217	.0073552	0.07	0.944	-.0142069	.0152503
oldpopul	.3987274	.1295442	3.08	0.003	.1393197	.6581351
gvtstrictyness2020	.198641	.0974026	2.04	0.046	.0035957	.3936863
covidcases	.0000267	.000048	0.56	0.580	-.0000695	.0001229
Infl2019	-.1610369	.2385376	-0.68	0.502	-.6387001	.3166264
EXP2019	.017496	.0548604	0.32	0.751	-.0923601	.1273522
IMP2019	-.0981396	.0519808	-1.89	0.064	-.2022293	.0059501
Unempl2019	.0793499	.1716283	0.46	0.646	-.2643298	.4230295
_cons	-13.98976	7.367251	-1.90	0.063	-28.74243	.7629059

Figure 48: OLS estimation including debt average maturity

```
. regress SPENDING debtGDP2019  debt_average_maturity $CONTROL if OECD==1
```

Source	SS	df	MS	Number of obs	=	26
				F(11, 14)	=	2.16
Model	1554.96514	11	141.360468	Prob > F	=	0.0882
Residual	916.231988	14	65.445142	R-squared	=	0.6292
				Adj R-squared	=	0.3379
Total	2471.19713	25	98.8478853	Root MSE	=	8.0898

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	.0676005	.0923435	0.73	0.476	-.1304567	.2656577
debt_average_maturity	-.0821297	.7286976	-0.11	0.912	-1.645031	1.480771
GDP_capita_2019	.0001074	.0000994	1.08	0.298	-.0001058	.0003205
popdensity	.0191575	.0194523	0.98	0.341	-.0225635	.0608784
oldpopul	.6708042	.489863	1.37	0.192	-.3798475	1.721456
gvtstrictyness2020	.357525	.3978202	0.90	0.384	-.4957144	1.210764
covidcases	-3.38e-06	.0001006	-0.03	0.974	-.0002191	.0002124
Infl2019	.4665879	.9549701	0.49	0.633	-1.581619	2.514795
EXP2019	-.0125748	.1402562	-0.09	0.930	-.3133945	.2882449
IMP2019	-.1156755	.1196448	-0.97	0.350	-.372288	.1409371
Unempl2019	.0589734	.7646545	0.08	0.940	-1.581047	1.698994
_cons	-25.13922	25.45276	-0.99	0.340	-79.72997	29.45152

Figure 49: OLS estimation including debt average maturity; OECD countries

```
. regress SPENDING debtGDP2019  debt_average_maturity $CONTROL if OECD==0
```

Source	SS	df	MS	Number of obs	=	43
				F(11, 31)	=	1.39
Model	232.856722	11	21.1687929	Prob > F	=	0.2252
Residual	471.08743	31	15.1963687	R-squared	=	0.3308
				Adj R-squared	=	0.0933
Total	703.944152	42	16.7605751	Root MSE	=	3.8983

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	.0484596	.0331367	1.46	0.154	-.0191231	.1160423
debt_average_maturity	.0119852	.1493198	0.08	0.937	-.2925546	.316525
GDP_capita_2019	-.0003946	.0002465	-1.60	0.120	-.0008973	.0001081
popdensity	-.0168489	.0071633	-2.35	0.025	-.0314585	-.0022393
oldpopul	.2372479	.1461212	1.62	0.115	-.0607682	.535264
gvtstrictyness2020	.1543252	.079595	1.94	0.062	-.0080098	.3166603
covidcases	.0000443	.0000445	1.00	0.327	-.0000464	.0001351
Infl2019	-.4053957	.2080237	-1.95	0.060	-.8296628	.0188714
EXP2019	.0136684	.0498786	0.27	0.786	-.0880596	.1153965
IMP2019	-.0870309	.0487239	-1.79	0.084	-.1864039	.0123421
Unempl2019	-.0377792	.1230492	-0.31	0.761	-.2887398	.2131813
_cons	-1.827405	6.31755	-0.29	0.774	-14.71213	11.05732

Figure 50: OLS estimation including debt average maturity; non-OECD countries

```
. sum debt_average_maturity

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
debt_avera~y |         75    9.441746    4.356844    2.082539   20.09435

. sum debt_average_maturity if OECD==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
debt_avera~y |         27    9.120821    3.731479    2.082539   16.59268

. sum debt_average_maturity if OECD==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
debt_avera~y |         48    9.622267    4.700175    2.179273   20.09435
```

Figure 51: Comparison of average debt maturity

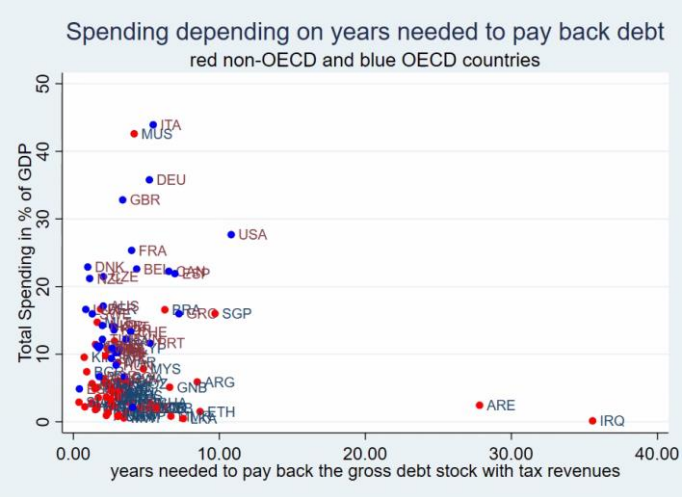

Figure 52: Total spending depending on years needed to pay back debt

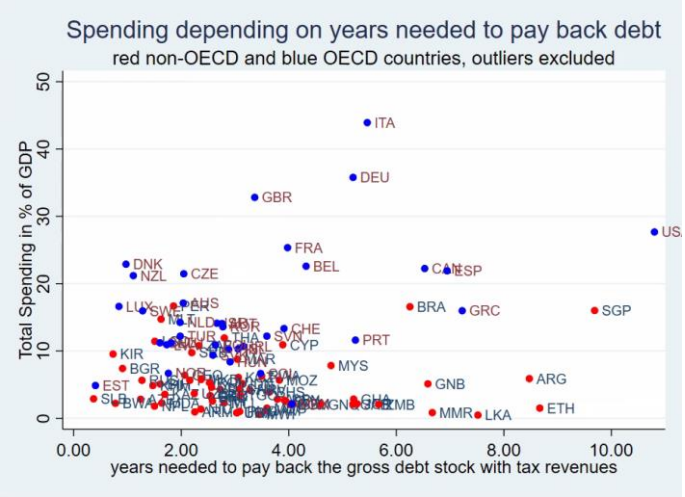

Figure 53: Total spending depending on years needed to pay back debt; outliers excluded

```
. regress SPENDING debtGDP2019 yearspaydebt2019 $CONTROL
```

Source	SS	df	MS	Number of obs	=	88
				F(11, 76)	=	6.30
Model	3549.00854	11	322.63714	Prob > F	=	0.0000
Residual	3890.84173	76	51.195286	R-squared	=	0.4770
				Adj R-squared	=	0.4013
Total	7439.85027	87	85.5155204	Root MSE	=	7.1551

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	.086382	.0304566	2.84	0.006	.0257225	.1470414
yearspaydebt2019	-.1216517	.1842212	-0.66	0.511	-.48856	.2452566
GDP_capita_2019	.0001203	.0000438	2.75	0.008	.000033	.0002075
popdensity	.0004549	.0011769	0.39	0.700	-.0018891	.0027989
oldpopul	.288384	.1173262	2.46	0.016	.0547087	.5220594
gvtstrictyness2020	.0028345	.0843212	0.03	0.973	-.1651057	.1707748
covidcases	.0000271	.00004	0.68	0.499	-.0000524	.0001067
Infl2019	-.2770047	.2781936	-1.00	0.323	-.8310753	.2770658
EXP2019	-.0106032	.0411729	-0.26	0.797	-.0926062	.0713998
IMP2019	-.0367034	.0362362	-1.01	0.314	-.1088741	.0354672
Unempl2019	.007105	.167534	0.04	0.966	-.3265678	.3407778
_cons	-.1818806	5.683625	-0.03	0.975	-11.5018	11.13804

Figure 54: OLS estimation including years needed to pay back debt

```
. regress SPENDING debtGDP2019 yearspaydebt2019 $CONTROL if OECD==1
```

Source	SS	df	MS	Number of obs	=	35
				F(11, 23)	=	3.29
Model	1681.22406	11	152.838551	Prob > F	=	0.0077
Residual	1067.1914	23	46.399626	R-squared	=	0.6117
				Adj R-squared	=	0.4260
Total	2748.41546	34	80.8357488	Root MSE	=	6.8117

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	-.0228554	.0734718	-0.31	0.759	-.1748433	.1291325
yearspaydebt2019	.9752757	1.000564	0.97	0.340	-1.094549	3.0451
GDP_capita_2019	.0001108	.0000626	1.77	0.090	-.0000186	.0002403
popdensity	.0113131	.0118989	0.95	0.352	-.0133015	.0359278
oldpopul	.9691056	.2783078	3.48	0.002	.393382	1.544829
gvtstrictyness2020	.4987473	.2323608	2.15	0.043	.0180725	.9794222
covidcases	.0000452	.0000511	0.89	0.385	-.0000604	.0001509
Infl2019	.9648612	.6890986	1.40	0.175	-.4606478	2.39037
EXP2019	-.0605576	.057282	-1.06	0.301	-.1790543	.0579392
IMP2019	-.0317333	.0511484	-0.62	0.541	-.1375419	.0740752
Unempl2019	-.192587	.5141588	-0.37	0.711	-1.256206	.8710315
_cons	-40.91113	16.85947	-2.43	0.023	-75.78759	-6.034663

Figure 55: OLS estimation including years needed to pay back debt; OECD countries

```
. regress SPENDING debtGDP2019 yearspaydebt2019 $CONTROL if OECD==0 & Code!="ARE" & Code!="IRQ" & Code!="MUS"
```

Source	SS	df	MS	Number of obs	=	50
				F(11, 38)	=	2.16
Model	362.965752	11	32.9968866	Prob > F	=	0.0387
Residual	579.708602	38	15.2554895	R-squared	=	0.3850
				Adj R-squared	=	0.2070
Total	942.674354	49	19.2382521	Root MSE	=	3.9058

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	.0168799	.0435033	0.39	0.700	-.0711879	.1049476
yearspaydebt2019	-.2459065	.6447227	-0.38	0.705	-1.551079	1.059266
GDP_capita_2019	.0000518	.000123	0.42	0.676	-.0001972	.0003008
popdensity	.0000218	.0011139	0.02	0.984	-.0022331	.0022767
oldpopul	.0110795	.1088522	0.10	0.919	-.2092803	.2314393
gvtstrictyness2020	.0524662	.0572409	0.92	0.365	-.0634119	.1683443
covidcases	.000025	.0000407	0.61	0.543	-.0000574	.0001073
Infl2019	-.1450418	.2041867	-0.71	0.482	-.558396	.2683125
EXP2019	.0670223	.0389649	1.72	0.094	-.0118581	.1459027
IMP2019	-.0080172	.0342066	-0.23	0.816	-.0772649	.0612304
Unempl2019	.0874876	.1087227	0.80	0.426	-.13261	.3075852
_cons	-1.038739	4.317633	-0.24	0.811	-9.77933	7.701851

Figure 56: OLS estimation including years needed to pay back debt; non-OECD countries

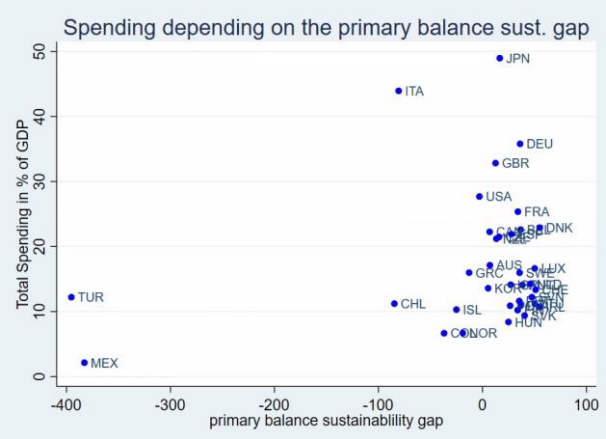

Figure 57: Total spending depending on the primary balance sustainability gap

```
. regress SPENDING pbsg $CONTROL if OECD==1 & Code!="TUR" & Code!="MEX"
```

Source	SS	df	MS		
Model	1357.14484	10	135.714484	Number of obs	= 32
Residual	1018.55811	21	48.5027669	F(10, 21)	= 2.80
				Prob > F	= 0.0225
Total	2375.70295	31	76.635579	R-squared	= 0.5713
				Adj R-squared	= 0.3671
				Root MSE	= 6.9644

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pbsg	-.0695808	.0505388	-1.38	0.183	-.1746819	.0355203
GDP_capita_2019	.0000845	.0000803	1.05	0.305	-.0000824	.0002514
popdensity	.0104695	.0123288	0.85	0.405	-.0151697	.0361086
oldpopul	.9865554	.3089308	3.19	0.004	.3440986	1.629012
gvtstrictyness2020	.4493846	.234781	1.91	0.069	-.0388693	.9376385
covidcases	.0000333	.0000543	0.61	0.547	-.0000797	.0001462
Infl2019	-.6171426	2.324997	-0.27	0.793	-5.452238	4.217953
EXP2019	-.0513488	.0607036	-0.85	0.407	-.1775888	.0748913
IMP2019	-.0066263	.056349	-0.12	0.908	-.1238105	.1105579
Unempl2019	-.5095286	.5762719	-0.88	0.387	-1.707952	.6888943
_cons	-30.93395	22.33884	-1.38	0.181	-77.39011	15.52222

Figure 58: OLS estimation with the primary balance sustainability gap

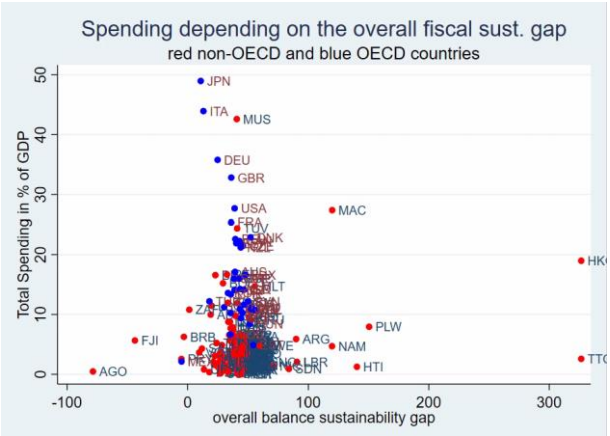

Figure 59: Total spending depending on the overall fiscal sustainability gap

```
. regress SPENDING ofbg $CONTROL if OECD==1
```

Source	SS	df	MS	Number of obs	=	35
				F(10, 24)	=	3.80
Model	1684.863	10	168.4863	Prob > F	=	0.0035
Residual	1063.55246	24	44.3146859	R-squared	=	0.6130
				Adj R-squared	=	0.4518
Total	2748.41546	34	80.8357488	Root MSE	=	6.6569

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ofbg	-.1398247	.1193723	-1.17	0.253	-.3861971	.1065477
GDP_capita_2019	.0001284	.0000605	2.12	0.044	3.57e-06	.0002532
popdensity	.007573	.0113602	0.67	0.511	-.0158732	.0310192
oldpopul	1.003164	.2534473	3.96	0.001	.4800743	1.526253
gvtstrictyness2020	.5316812	.2063124	2.58	0.017	.1058733	.9574891
covidcases	.0000515	.0000505	1.02	0.319	-.0000528	.0001558
Infl2019	.7425807	.6667721	1.11	0.276	-.6335692	2.118731
EXP2019	-.0382368	.0598213	-0.64	0.529	-.161702	.0852284
IMP2019	-.0389853	.0500055	-0.78	0.443	-.1421916	.064221
Unempl2019	-.1523705	.4344429	-0.35	0.729	-1.049017	.7442756
_cons	-37.09428	16.99293	-2.18	0.039	-72.16597	-2.022584

Figure 60: OLS estimation with the overall fiscal sustainability gap; OECD countries

```
. regress SPENDING ofbg $CONTROL if OECD==0
```

Source	SS	df	MS	Number of obs	=	81
				F(10, 70)	=	1.67
Model	520.167515	10	52.0167515	Prob > F	=	0.1055
Residual	2181.01958	70	31.1574226	R-squared	=	0.1926
				Adj R-squared	=	0.0772
Total	2701.1871	80	33.7648387	Root MSE	=	5.5819

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ofbg	-.0116201	.0281209	-0.41	0.681	-.0677056	.0444653
GDP_capita_2019	-.0000501	.0000839	-0.60	0.552	-.0002174	.0001171
popdensity	.0011112	.0010204	1.09	0.280	-.0009239	.0031462
oldpopul	.1911998	.1096405	1.74	0.086	-.0274712	.4098708
gvtstrictyness2020	-.0277289	.0544503	-0.51	0.612	-.1363265	.0808688
covidcases	-5.10e-06	.000051	-0.10	0.921	-.0001069	.0000967
Infl2019	-.2306842	.1629452	-1.42	0.161	-.5556682	.0942997
EXP2019	.0180461	.0421816	0.43	0.670	-.0660825	.1021748
IMP2019	.0243137	.0357337	0.68	0.498	-.0469549	.0955822
Unempl2019	.0339527	.1168458	0.29	0.772	-.199089	.2669943
_cons	4.152679	3.864423	1.07	0.286	-3.55467	11.86003

Figure 61: OLS estimation with the overall fiscal sustainability gap; non-OECD countries

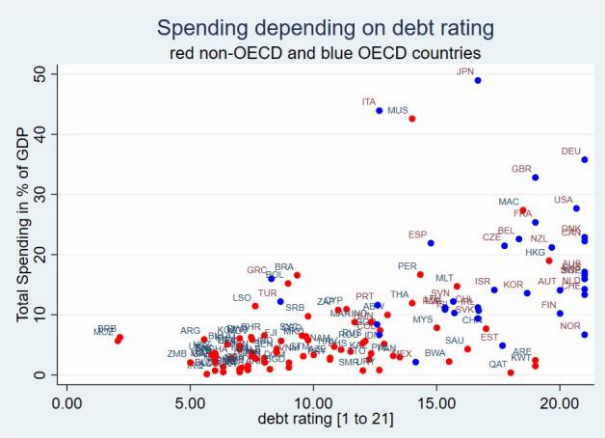

Figure 62: Total spending depending on the debt rating

```
. regress SPENDING debtrating2019 $CONTROL
```

Source	SS	df	MS	Number of obs	=	101
				F(10, 90)	=	7.74
Model	3647.7527	10	364.77527	Prob > F	=	0.0000
Residual	4240.72877	90	47.1192086	R-squared	=	0.4624
				Adj R-squared	=	0.4027
Total	7888.48147	100	78.8848147	Root MSE	=	6.8643

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtrating2019	.6562457	.254657	2.58	0.012	.1503252	1.162166
GDP_capita_2019	-2.68e-06	.0000551	-0.05	0.961	-.0001121	.0001067
popdensity	.0013535	.0010449	1.30	0.199	-.0007223	.0034294
oldpopul	.3934484	.0945624	4.16	0.000	.2055837	.5813131
gvtstrictyness2020	.0165957	.0734416	0.23	0.822	-.129309	.1625003
covidcases	-1.33e-06	.0000368	-0.04	0.971	-.0000744	.0000718
Infl2019	-.1888539	.2277976	-0.83	0.409	-.6414137	.2637059
EXP2019	-.056389	.0377916	-1.49	0.139	-.1314687	.0186907
IMP2019	.0112291	.0346249	0.32	0.746	-.0575593	.0800175
Unempl2019	.1789175	.1458215	1.23	0.223	-.1107823	.4686174
_cons	-5.462116	5.461436	-1.00	0.320	-16.31221	5.38798

Figure 63: OLS estimation with the debt rating

```
. regress SPENDING debtrating2019 $CONTROL if OECD==1
```

Source	SS	df	MS	Number of obs	=	35
				F(10, 24)	=	3.57
Model	1644.2975	10	164.42975	Prob > F	=	0.0051
Residual	1104.11795	24	46.0049148	R-squared	=	0.5983
				Adj R-squared	=	0.4309
Total	2748.41546	34	80.8357488	Root MSE	=	6.7827

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtrating2019	.3960865	.5972266	0.66	0.514	-.8365286	1.628702
GDP_capita_2019	.0000932	.0000755	1.23	0.229	-.0000626	.000249
popdensity	.0091802	.0114927	0.80	0.432	-.0145396	.0329
oldpopul	.9763655	.2622119	3.72	0.001	.4351867	1.517544
gvtstrictyness2020	.6092079	.199714	3.05	0.006	.1970185	1.021397
covidcases	.0000381	.0000503	0.76	0.457	-.0000658	.000142
Infl2019	.9813745	.6601982	1.49	0.150	-.3812077	2.343957
EXP2019	-.0545427	.0584318	-0.93	0.360	-.17514	.0660547
IMP2019	-.0323382	.050859	-0.64	0.531	-.1373061	.0726297
Unempl2019	-.0039343	.5393773	-0.01	0.994	-1.117154	1.109286
_cons	-52.15808	18.76485	-2.78	0.010	-90.88683	-13.42933

Figure 64: OLS estimation with the debt rating; OECD countries

```
. regress SPENDING debtrating2019 $CONTROL if OECD==0
```

Source	SS	df	MS	Number of obs	=	66
				F(10, 55)	=	2.51
Model	797.922436	10	79.7922436	Prob > F	=	0.0145
Residual	1746.80915	55	31.7601663	R-squared	=	0.3136
				Adj R-squared	=	0.1888
Total	2544.73158	65	39.1497167	Root MSE	=	5.6356

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtrating2019	.9243857	.2825704	3.27	0.002	.3581019	1.49067
GDP_capita_2019	-.0002159	.0001026	-2.10	0.040	-.0004216	-.0000102
popdensity	.0013677	.0010651	1.28	0.204	-.0007668	.0035021
oldpopul	.1332039	.117182	1.14	0.261	-.1016342	.3680419
gvtstrictyness2020	-.1134461	.0716647	-1.58	0.119	-.2570653	.0301731
covidcases	.0000121	.0000538	0.23	0.823	-.0000957	.0001199
Infl2019	-.1484504	.2231548	-0.67	0.509	-.5956626	.2987618
EXP2019	-.0412661	.049454	-0.83	0.408	-.1403742	.057842
IMP2019	.0735843	.0423257	1.74	0.088	-.0112383	.1584069
Unempl2019	.0471482	.1324495	0.36	0.723	-.2182865	.3125829
_cons	1.393006	5.157922	0.27	0.788	-8.9437	11.72971

Figure 65: OLS estimation with the debt rating; non-OECD countries

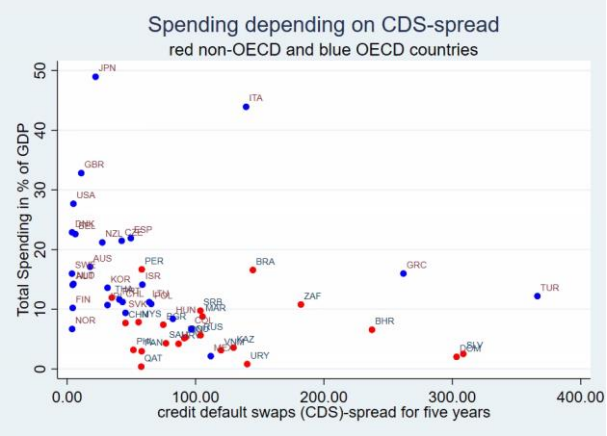

Figure 66: Total spending depending on CDS-spread

```
. regress SPENDING spread52019 $CONTROL if Code!="UKR" & Code!="ARG" &  Code!="IRQ"
```

Source	SS	df	MS		
				Number of obs	= 48
				F(10, 37)	= 4.10
Model	1880.53519	10	188.053519	Prob > F	= 0.0008
Residual	1697.04849	37	45.8661755	R-squared	= 0.5256
				Adj R-squared	= 0.3974
Total	3577.58368	47	76.1188018	Root MSE	= 6.7725

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
spread52019	-.0163715	.0176967	-0.93	0.361	-.0522285	.0194854
GDP_capita_2019	.000103	.000059	1.75	0.089	-.0000165	.0002225
popdensity	.0071109	.009511	0.75	0.459	-.0121601	.0263819
oldpopul	.5879927	.1490388	3.95	0.000	.2860113	.8899741
gvtstrictyness2020	.37333	.1617024	2.31	0.027	.0456898	.7009701
covidcases	.000036	.0000431	0.83	0.410	-.0000514	.0001234
Infl2019	.1743101	.4582284	0.38	0.706	-.7541489	1.102769
EXP2019	.0204155	.0632669	0.32	0.749	-.1077753	.1486064
IMP2019	-.0866463	.0609868	-1.42	0.164	-.2102173	.0369247
Unempl2019	.4967026	.2535076	1.96	0.058	-.0169526	1.010358
_cons	-25.52486	11.48812	-2.22	0.032	-48.802	-2.247713

Figure 67: OLS estimation with CDS-spread

```
.  regress SPENDING spread52019 $CONTROL if Code!="UKR" & Code!="ARG" &  Code!="IRQ" & OECD==1
```

Source	SS	df	MS		
				Number of obs	= 26
				F(10, 15)	= 1.81
Model	1110.46769	10	111.046769	Prob > F	= 0.1440
Residual	918.232509	15	61.2155006	R-squared	= 0.5474
				Adj R-squared	= 0.2456
Total	2028.7002	25	81.1480079	Root MSE	= 7.824

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
spread52019	.0157184	.0424103	0.37	0.716	-.074677	.1061138
GDP_capita_2019	.0000988	.000097	1.02	0.324	-.0001079	.0003055
popdensity	.0070848	.0144373	0.49	0.631	-.0236875	.0378571
oldpopul	.9441317	.3513876	2.69	0.017	.1951668	1.693097
gvtstrictyness2020	.4636538	.2806746	1.65	0.119	-.1345899	1.061897
covidcases	.0000425	.0000644	0.66	0.519	-.0000947	.0001797
Infl2019	.5518117	.9875723	0.56	0.585	-1.553149	2.656772
EXP2019	-.0243336	.1057545	-0.23	0.821	-.2497441	.2010769
IMP2019	-.0846874	.107824	-0.79	0.444	-.3145088	.1451341
Unempl2019	-.2681147	.7523577	-0.36	0.727	-1.871727	1.335498
_cons	-34.50408	21.12789	-1.63	0.123	-79.53712	10.52895

Figure 68: OLS estimation with CDS-spread; OECD countries

```
. regress SPENDING spread52019 $CONTROL if Code!="UKR" & Code!="ARG" &  Code!="IRQ" & OECD==0
```

Source	SS	df	MS	Number of obs	=	22
				F(10, 11)	=	1.25
Model	231.813667	10	23.1813667	Prob > F	=	0.3602
Residual	204.629054	11	18.6026413	R-squared	=	0.5311
				Adj R-squared	=	0.1049
Total	436.442721	21	20.7829867	Root MSE	=	4.3131

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
spread52019	-.0210627	.0164617	-1.28	0.227	-.0572947	.0151694
GDP_capita_2019	-.0002077	.0001073	-1.94	0.079	-.0004439	.0000284
popdensity	-.0122183	.011746	-1.04	0.321	-.0380711	.0136345
oldpopul	-.0646853	.220928	-0.29	0.775	-.5509446	.421574
gvtstrictyness2020	.0625965	.1829645	0.34	0.739	-.3401056	.4652986
covidcases	.0000723	.0000642	1.13	0.284	-.0000689	.0002136
Infl2019	-.289766	.6860908	-0.42	0.681	-1.799842	1.22031
EXP2019	.0124757	.0767331	0.16	0.874	-.1564128	.1813642
IMP2019	-.034034	.0709102	-0.48	0.641	-.1901063	.1220383
Unempl2019	.2132471	.2255193	0.95	0.365	-.2831175	.7096118
_cons	8.425327	14.58594	0.58	0.575	-23.67812	40.52877

Figure 69: OLS estimation with CDS-spread; non-OECD countries

```
. regress SPENDING $RULE $CONTROL
```

Source	SS	df	MS	Number of obs	=	71
				F(13, 57)	=	5.73
Model	3710.97626	13	285.459712	Prob > F	=	0.0000
Residual	2841.04937	57	49.8429714	R-squared	=	0.5664
				Adj R-squared	=	0.4675
Total	6552.02563	70	93.6003661	Root MSE	=	7.06

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ER	-.8860471	2.472749	-0.36	0.721	-5.837642	4.065548
RR	-.2573057	2.742351	-0.09	0.926	-5.748769	5.234158
BBR	-11.11104	2.962468	-3.75	0.000	-17.04328	-5.178799
DR	6.368428	2.628993	2.42	0.019	1.103961	11.6329
GDP_capita_2019	.0000938	.0000513	1.83	0.073	-8.98e-06	.0001966
popdensity	.0027725	.0012002	2.31	0.025	.0003692	.0051759
oldpopul	.4862688	.1382227	3.52	0.001	.2094826	.7630551
gvtstrictyness2020	.1930956	.0928972	2.08	0.042	.007072	.3791191
covidcases	.0000336	.0000432	0.78	0.440	-.0000529	.0001202
Infl2019	-.856396	.4232741	-2.02	0.048	-1.703988	-.0088042
EXP2019	-.0602606	.0457595	-1.32	0.193	-.1518923	.0313711
IMP2019	-.0255601	.044632	-0.57	0.569	-.1149342	.0638139
Unempl2019	-.1566545	.2248514	-0.70	0.489	-.6069116	.2936026
_cons	-.1142732	6.028652	-0.02	0.985	-12.18644	11.95789

Figure 70: OLS estimation with fiscal rules

```
. regress SPENDING $RULE $CONTROL if OECD==1
```

Source	SS	df	MS	Number of obs	=	34
				F(13, 20)	=	3.68
Model	1925.78927	13	148.137636	Prob > F	=	0.0045
Residual	805.682632	20	40.2841316	R-squared	=	0.7050
				Adj R-squared	=	0.5133
Total	2731.4719	33	82.7718758	Root MSE	=	6.347

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ER	-7.36511	4.348255	-1.69	0.106	-16.43541	1.705192
RR	-2.844793	3.635814	-0.78	0.443	-10.42897	4.739381
BBR	-8.94484	5.37084	-1.67	0.111	-20.14822	2.258535
DR	13.56441	5.288335	2.56	0.018	2.533133	24.59568
GDP_capita_2019	.0000932	.000081	1.15	0.264	-.0000758	.0002622
popdensity	.0181618	.0117945	1.54	0.139	-.0064411	.0427647
oldpopul	.5210471	.3446958	1.51	0.146	-.1979757	1.24007
gvtstrictyness2020	.6899606	.2092898	3.30	0.004	.2533897	1.126531
covidcases	.0000527	.0000482	1.09	0.287	-.0000478	.0001532
Infl2019	.1202363	2.187849	0.05	0.957	-4.443537	4.684009
EXP2019	-.0869652	.0552198	-1.57	0.131	-.2021516	.0282213
IMP2019	-.0481397	.0557537	-0.86	0.398	-.1644398	.0681605
Unempl2019	-.2978379	.504322	-0.59	0.561	-1.349835	.7541593
_cons	-28.88848	22.04264	-1.31	0.205	-74.86863	17.09167

Figure 71: OLS estimation with fiscal rules; OECD countries

```
. regress SPENDING $RULE $CONTROL if OECD==0
```

Source	SS	df	MS		
Model	1147.49957	13	88.2691974	Number of obs	= 37
Residual	929.70816	23	40.4220939	F(13, 23)	= 2.18
				Prob > F	= 0.0492
				R-squared	= 0.5524
				Adj R-squared	= 0.2994
Total	2077.20773	36	57.7002146	Root MSE	= 6.3578

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ER	-2.24331	3.357623	-0.67	0.511	-9.189083	4.702462
RR	-3.007967	3.935979	-0.76	0.453	-11.15016	5.134227
BBR	-14.02371	3.443838	-4.07	0.000	-21.14784	-6.899593
DR	5.191231	3.581356	1.45	0.161	-2.217368	12.59983
GDP_capita_2019	.0001444	.0002697	0.54	0.598	-.0004137	.0007024
popdensity	.0001803	.0020595	0.09	0.931	-.0040801	.0044408
oldpopul	.056651	.2250179	0.25	0.803	-.4088341	.5221361
gvtstrictyness2020	-.0419253	.1085723	-0.39	0.703	-.2665243	.1826736
covidcases	.0000246	.0000854	0.29	0.776	-.0001521	.0002012
Infl2019	-.1565241	.5272493	-0.30	0.769	-1.247222	.9341742
EXP2019	.0117911	.0809714	0.15	0.885	-.1557111	.1792932
IMP2019	.0450497	.0806819	0.56	0.582	-.1218536	.2119529
Unempl2019	-.2625642	.2579433	-1.02	0.319	-.7961606	.2710321
_cons	15.35934	7.556788	2.03	0.054	-.2730694	30.99174

Figure 72: OLS estimation with fiscal rules; non-OECD countries

```
. quietly regress SPENDING $RULE $CONTROL

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	71	-261.3768	-231.713	14	491.4259	523.1035

```
Note: BIC uses N = number of observations. See [R] BIC note.

. quietly regress SPENDING $CONTROL if DR!=.

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	71	-261.3768	-240.8339	10	501.6678	524.2946

```
Note: BIC uses N = number of observations. See [R] BIC note.

. quietly regress SPENDING $RULE $CONTROL if OECD==1

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	34	-122.8099	-102.0545	14	232.109	253.4781

```
Note: BIC uses N = number of observations. See [R] BIC note.

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	34	-122.8099	-102.0545	14	232.109	253.4781

```
Note: BIC uses N = number of observations. See [R] BIC note.

. quietly regress SPENDING $CONTROL if OECD==1 & DR!=.

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	34	-122.8099	-107.681	10	235.3619	250.6255

```
Note: BIC uses N = number of observations. See [R] BIC note.

. quietly regress SPENDING $CONTROL if OECD==0 & DR!=.

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	37	-127.0162	-123.4722	10	266.9444	283.0536

```
Note: BIC uses N = number of observations. See [R] BIC note.
```

Figure 73: AIC and BIC for OLS with fiscal rules vs. only control variables

```
. regress SPENDING log_debt_TAXGDP $RULE $CONTROL if Code!="MUS" & Code!="TUV"
```

Source	SS	df	MS	Number of obs	=	70
				F(14, 55)	=	8.56
Model	3805.06029	14	271.79002	Prob > F	=	0.0000
Residual	1747.30788	55	31.7692342	R-squared	=	0.6853
				Adj R-squared	=	0.6052
Total	5552.36817	69	80.4691039	Root MSE	=	5.6364

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debt_TAXGDP	-1.626209	.6084536	-2.67	0.010	-2.845578	-.4068412
ER	-1.087085	2.08195	-0.52	0.604	-5.259407	3.085236
RR	.2862914	2.227619	0.13	0.898	-4.177956	4.750539
BBR	-4.376272	2.629124	-1.66	0.102	-9.645155	.8926107
DR	5.605047	2.120352	2.64	0.011	1.355766	9.854327
GDP_capita_2019	.0000664	.0000469	1.42	0.163	-.0000276	.0001603
popdensity	.0024311	.0009606	2.53	0.014	.0005061	.0043561
oldpopul	.330233	.1161039	2.84	0.006	.0975557	.5629104
gvtstrictyness2020	.1748418	.0819068	2.13	0.037	.0106969	.3389868
covidcases	.0000413	.0000345	1.19	0.237	-.000028	.0001105
Infl2019	-.9020588	.3502033	-2.58	0.013	-1.603882	-.2002357
EXP2019	-.0464431	.0366089	-1.27	0.210	-.1198091	.0269229
IMP2019	-.0183365	.0379494	-0.48	0.631	-.0943888	.0577159
Unempl2019	-.0140771	.1886103	-0.07	0.941	-.3920605	.3639063
_cons	-1.940035	5.580752	-0.35	0.729	-13.12411	9.244042

Figure 74: OLS estimation with fiscal rules and log debt to tax times GDP ratio

```
. regress SPENDING log_debt_TAXGDP $RULE $CONTROL if OECD == 1
```

Source	SS	df	MS	Number of obs	=	34
				F(14, 19)	=	4.68
Model	2117.36161	14	151.240115	Prob > F	=	0.0011
Residual	614.110293	19	32.3215944	R-squared	=	0.7752
				Adj R-squared	=	0.6095
Total	2731.4719	33	82.7718758	Root MSE	=	5.6852

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debt_TAXGDP	-2.63182	1.081026	-2.43	0.025	-4.894434	-.3692064
ER	-7.603183	3.89611	-1.95	0.066	-15.75784	.5514703
RR	-3.912168	3.286103	-1.19	0.249	-10.79006	2.965724
BBR	-10.4642	4.851157	-2.16	0.044	-20.61779	-.3106072
DR	13.02587	4.742108	2.75	0.013	3.100524	22.95121
GDP_capita_2019	.0000158	.0000792	0.20	0.844	-.00015	.0001816
popdensity	.0193402	.0105758	1.83	0.083	-.0027953	.0414757
oldpopul	.3832688	.3138996	1.22	0.237	-.2737306	1.040268
gvtstrictyness2020	.4153658	.218783	1.90	0.073	-.0425522	.8732838
covidcases	.000057	.0000432	1.32	0.202	-.0000334	.0001475
Infl2019	.0492176	1.959949	0.03	0.980	-4.053004	4.151439
EXP2019	-.0681615	.0500617	-1.36	0.189	-.1729418	.0366188
IMP2019	-.0189022	.0513642	-0.37	0.717	-.1264087	.0886043
Unempl2019	.162816	.4897653	0.33	0.743	-.8622745	1.187906
_cons	-12.02702	20.92385	-0.57	0.572	-55.82115	31.76711

Figure 76: OLS estimation with fiscal rules and log debt to tax times GDP ratio; OECD countries

```
. regress SPENDING log_debt_TAXGDP $RULE $CONTROL if OECD == 0 & Code!="MUS" & Code!="TUV"
```

Source	SS	df	MS	Number of obs	=	36
				F(14, 21)	=	3.06
Model	492.983349	14	35.2130964	Prob > F	=	0.0102
Residual	241.547342	21	11.5022544	R-squared	=	0.6712
				Adj R-squared	=	0.4519
Total	734.530692	35	20.9865912	Root MSE	=	3.3915

SPENDING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log_debt_TAXGDP	-.8112738	.5743133	-1.41	0.172	-2.005624	.3830761
ER	1.415227	1.867581	0.76	0.457	-2.468621	5.299074
RR	-.1540617	2.159392	-0.07	0.944	-4.644762	4.336639
BBR	-3.611433	2.524264	-1.43	0.167	-8.860927	1.638062
DR	3.043987	1.932282	1.58	0.130	-.9744133	7.062388
GDP_capita_2019	.0000137	.0001497	0.09	0.928	-.0002976	.000325
popdensity	.0003826	.0010989	0.35	0.731	-.0019028	.002668
oldpopul	-.096742	.125984	-0.77	0.451	-.35874	.1652559
gvtstrictyness2020	.0238709	.0644759	0.37	0.715	-.110214	.1579559
covidcases	.0000525	.0000459	1.14	0.266	-.0000429	.0001479
Infl2019	-.0367247	.2895853	-0.13	0.900	-.6389504	.565501
EXP2019	.0224781	.0436585	0.51	0.612	-.0683148	.113271
IMP2019	.051695	.0502206	1.03	0.315	-.0527445	.1561345
Unempl2019	-.173057	.148975	-1.16	0.258	-.4828674	.1367535
_cons	4.555333	4.448421	1.02	0.317	-4.695666	13.80633

Figure 75: OLS estimation with fiscal rules and log debt to tax times GDP ratio; non-OECD countries

```
. quietly regress SPENDING log_debt_TAXGDP $RULE $CONTROL if Code!="MUS" & Code!="TUV"

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	70	-252.3977	-211.9325	15	453.8649	487.5924

Note: BIC uses N = number of observations. See [R] BIC note.

```
. quietly regress SPENDING log_debt_TAXGDP $CONTROL if Code!="MUS" & Code!="TUV" & DR!=.

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	70	-252.3977	-216.7937	11	455.5874	480.3208

Note: BIC uses N = number of observations. See [R] BIC note.

```
. quietly regress SPENDING log_debt_TAXGDP $RULE $CONTROL if OECD == 1

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	34	-122.8099	-97.43875	15	224.8775	247.7729

Note: BIC uses N = number of observations. See [R] BIC note.

```
. quietly regress SPENDING log_debt_TAXGDP $CONTROL if OECD == 1 & DR!=.

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	34	-122.8099	-105.1556	11	232.3112	249.1012

Note: BIC uses N = number of observations. See [R] BIC note.

```
. quietly regress SPENDING log_debt_TAXGDP $RULE $CONTROL if OECD == 0 & Code!="MUS" & Code!="TUV"

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	36	-105.3646	-85.34563	15	200.6913	224.444

Note: BIC uses N = number of observations. See [R] BIC note.

```
. quietly regress SPENDING log_debt_TAXGDP $CONTROL if OECD == 0 & Code!="MUS" & Code!="TUV" & DR!=.

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	36	-105.3646	-89.59916	11	201.1983	218.617

Note: BIC uses N = number of observations. See [R] BIC note.

Figure 77: AIC and BIC for fiscal rules and gross debt to tax times GDP ratio vs. gross debt to tax times GDP ratio

```
. regress fiscbalGDP2020 debtGDP2019 $CONTROL if OECD==1
```

Source	SS	df	MS	Number of obs	=	35
				F(10, 24)	=	2.22
Model	152.398115	10	15.2398115	Prob > F	=	0.0534
Residual	164.879921	24	6.86999673	R-squared	=	0.4803
				Adj R-squared	=	0.2638
Total	317.278036	34	9.33170695	Root MSE	=	2.6211

fiscbalGDP2020	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	-.0595828	.0200423	-2.97	0.007	-.1009481	-.0182176
GDP_capita_2019	2.00e-07	.0000237	0.01	0.993	-.0000488	.0000492
popdensity	.0013123	.0044562	0.29	0.771	-.0078849	.0105095
oldpopul	.0487498	.106915	0.46	0.653	-.1719119	.2694116
gvtstrictyness2020	-.0723278	.0868991	-0.83	0.413	-.2516786	.1070231
covidcases	-.0000149	.0000196	-0.76	0.455	-.0000554	.0000256
Infl2019	-.0886273	.2636022	-0.34	0.740	-.6326756	.455421
EXP2019	.0099221	.0219948	0.45	0.656	-.0354729	.055317
IMP2019	.0083879	.0196806	0.43	0.674	-.0322309	.0490067
Unempl2019	.2947413	.190323	1.55	0.135	-.098066	.6875486
_cons	-3.357799	6.461452	-0.52	0.608	-16.69358	9.977981

Figure 78: OLS estimation for the fiscal balance in 2020 with debt to GDP ratio; OECD countries

```
. regress fiscbalGDP2020 debtGDP2019 $CONTROL if OECD==0
```

Source	SS	df	MS	Number of obs	=	80
				F(10, 69)	=	1.10
Model	169.897203	10	16.9897203	Prob > F	=	0.3723
Residual	1062.51317	69	15.3987416	R-squared	=	0.1379
				Adj R-squared	=	0.0129
Total	1232.41037	79	15.6001313	Root MSE	=	3.9241

fiscbalGDP2020	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
debtGDP2019	-.0120618	.0198921	-0.61	0.546	-.0517454	.0276219
GDP_capita_2019	.0000485	.000059	0.82	0.414	-.0000691	.0001661
popdensity	-.00066	.0007556	-0.87	0.385	-.0021673	.0008472
oldpopul	.0265409	.0781041	0.34	0.735	-.1292724	.1823543
gvtstrictyness2020	.0048249	.0382345	0.13	0.900	-.0714509	.0811006
covidcases	-.0000188	.0000364	-0.52	0.607	-.0000914	.0000538
Infl2019	.1570437	.1159714	1.35	0.180	-.0743129	.3884003
EXP2019	-.0363457	.0325078	-1.12	0.267	-.1011969	.0285056
IMP2019	.0484807	.0264651	1.83	0.071	-.0043158	.1012772
Unempl2019	-.1879196	.0838996	-2.24	0.028	-.3552947	-.0205445
_cons	-6.963513	2.686172	-2.59	0.012	-12.32228	-1.604746

Figure 79: OLS estimation for the fiscal balance in 2020 with debt to GDP ratio; non-OECD countries

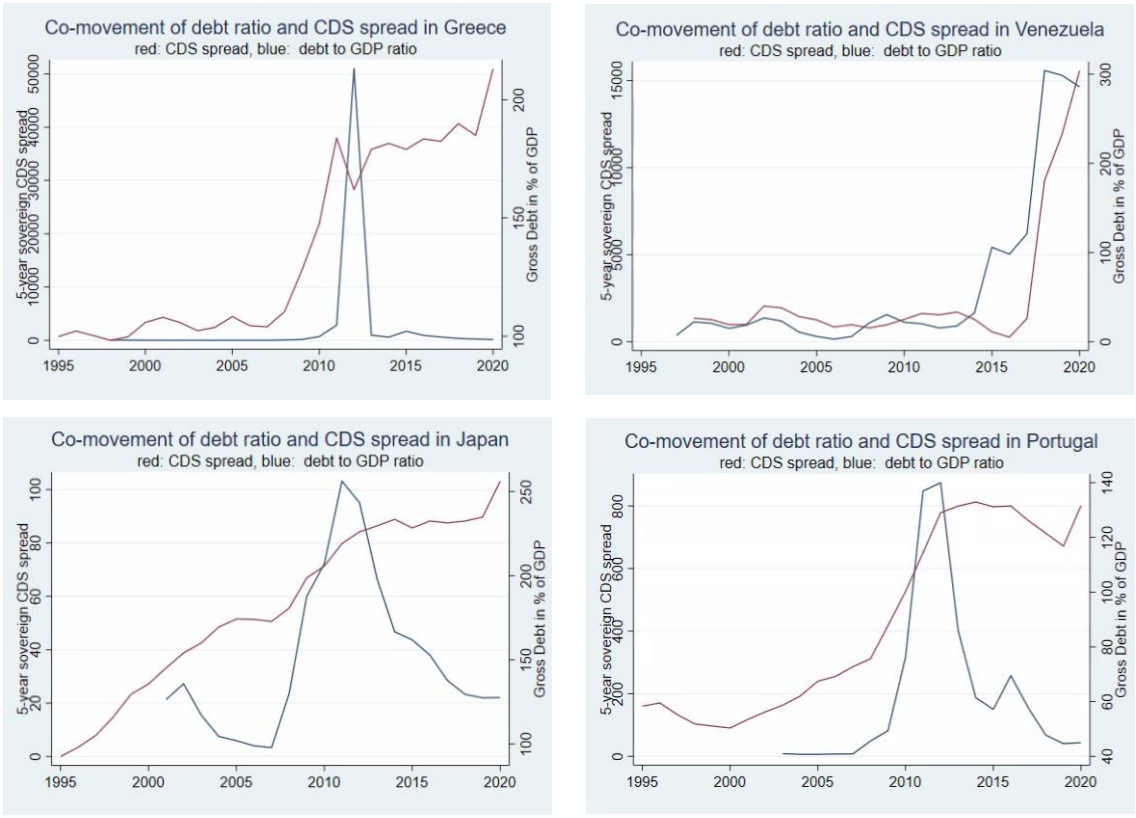

Figure 80: Debt ratio and CDS spread in Greece, Japan, Venezuela and Portugal

```
. xtreg cds5y ggdy if year>=2005  & group==1, re

Random-effects GLS regression                   Number of obs     =       398
Group variable: ifscode                         Number of groups  =        31

R-sq:                                           Obs per group:
     within  = 0.0012                                         min =         1
     between = 0.1447                                         avg =      12.8
     overall = 0.0142                                         max =        16

                                                Wald chi2(1)      =      5.71
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0169
```

cds5y	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ggdy	6.36847	2.665864	2.39	0.017	1.143474	11.59347
_cons	-214.6255	226.9884	-0.95	0.344	-659.5146	230.2636
sigma_u	0					
sigma_e	2554.0203					
rho	0	(fraction of variance due to u_i)				

Figure 81: Panel regression of debt levels on CDS yields; advanced countries

```
. xtreg cds5y ggdy if year>=2005  & group==2, re

Random-effects GLS regression                   Number of obs     =       565
Group variable: ifscode                         Number of groups  =        41

R-sq:                                           Obs per group:
     within  = 0.0125                                         min =         1
     between = 0.2273                                         avg =      13.8
     overall = 0.0386                                         max =        16

                                                Wald chi2(1)      =     22.63
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

cds5y	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ggdy	81.15354	17.05903	4.76	0.000	47.71846	114.5886
_cons	-2389.341	974.6132	-2.45	0.014	-4299.548	-479.1343
sigma_u	0					
sigma_e	12345.72					
rho	0	(fraction of variance due to u_i)				

Figure 82: Panel regression of debt levels on CDS yields; emerging countries

```
. xtreg cds5y ggdy L1.ggdy L2.ggdy L3.ggdy L4.ggdy, re

Random-effects GLS regression                   Number of obs     =     1,080
Group variable: ifscode                         Number of groups  =        72

R-sq:                                           Obs per group:
     within  = 0.0366                                         min =         1
     between = 0.0509                                         avg =      15.0
     overall = 0.0375                                         max =        23

                                                Wald chi2(5)      =     41.94
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

cds5y	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ggdy						
--.	-137.7971	37.8895	-3.64	0.000	-212.0591	-63.53502
L1.	337.673	65.55132	5.15	0.000	209.1948	466.1512
L2.	-134.3466	66.80747	-2.01	0.044	-265.2869	-3.406395
L3.	-54.67854	60.84011	-0.90	0.369	-173.923	64.56589
L4.	13.56804	34.90812	0.39	0.698	-54.85062	81.98669
_cons	-389.6378	526.2443	-0.74	0.459	-1421.058	641.7822
sigma_u	660.83053					
sigma_e	8974.6727					
rho	.00539256	(fraction of variance due to u_i)				

Figure 83: Panel regression of (lagged) debt levels on CDS yields

```
. xtreg cds5y ggdy L1.ggdy L2.ggdy L3.ggdy L4.ggdy if group==1, re

Random-effects GLS regression                   Number of obs     =       435
Group variable: ifscode                         Number of groups  =        31

R-sq:                                           Obs per group:
     within  = 0.2132                                         min =         1
     between = 0.0274                                         avg =      14.0
     overall = 0.2017                                         max =        21

                                                Wald chi2(5)      =    108.42
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

cds5y	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ggdy						
--.	-128.1552	18.3509	-6.98	0.000	-164.1223	-92.18812
L1.	312.7616	33.65218	9.29	0.000	246.8045	378.7187
L2.	-153.5718	36.83825	-4.17	0.000	-225.7734	-81.37012
L3.	-35.9642	37.01144	-0.97	0.331	-108.5053	36.5769
L4.	9.345675	21.83903	0.43	0.669	-33.45804	52.14939
_cons	-109.4203	189.2929	-0.58	0.563	-480.4275	261.5869
sigma_u	0					
sigma_e	2191.2289					
rho	0	(fraction of variance due to u_i)				

Figure 84: Panel regression of (lagged) debt levels on CDS yields; advanced countries

```
. xtreg cds5y ggdy L1.ggdy L2.ggdy L3.ggdy L4.ggdy if group==2, re

Random-effects GLS regression                   Number of obs     =       645
Group variable: ifscode                         Number of groups  =        41

R-sq:                                           Obs per group:
     within  = 0.0383                                         min =         1
     between = 0.2552                                         avg =      15.7
     overall = 0.0602                                         max =        23

                                                Wald chi2(5)      =     40.94
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

cds5y	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ggdy						
--.	-116.6762	55.53845	-2.10	0.036	-225.5295	-7.822797
L1.	344.3748	94.32023	3.65	0.000	159.5105	529.239
L2.	-112.4836	94.24577	-1.19	0.233	-297.2019	72.23475
L3.	-28.28112	84.39607	-0.34	0.738	-193.6944	137.1321
L4.	-3.591331	47.94787	-0.07	0.940	-97.56743	90.38477
_cons	-2423.548	934.2959	-2.59	0.009	-4254.735	-592.3619
sigma_u	0					
sigma_e	11443.069					
rho	0	(fraction of variance due to u_i)				

Figure 85: Panel regression of (lagged) debt levels on CDS yields; emerging countries

Bibliography

Aizenman, J., & Jinjarak, Y. (2010). *De facto fiscal space and fiscal stimulus: Definition and assessment. Working Paper (No. w16539).* National Bureau of Economic Research.

Alves, M. A., Clerck, S. D., Gamboa, J., Harris, J., Tieman, A. F., & Renteria, C. (2020). *Public Sector Balance Sheet Database: Overview and Guide for Compilers and Users* . IMF.

Anderson, B., & Minarik, J. J. (2006). *Design Choices for Fiscal Policy Rules.* OECD Journal on Budgeting. Volume 5 – No. 4.

Apeti, A. E., Combes, J.-L., Debrun, X., & Minea, A. (2021). *Did fiscal space influence Covid-19's fiscal response?* CEPR. Covid Economics Issue 74.

Bandaogo, M. S. (2020). *Fiscal Rules in Times of Crisis.* Research & Policy Briefs. No. 36. World Bank Group.

Benmelech, E., & Tzur-Ilan, N. (2020). *The Determinants of fiscal and monetary policies during the covid-19 crisis. Working Paper 27461*. Cambridge: NBER. Working Paper Series.

Bohn, H. (1998). *The behavior of U.S. public debt and deficits.* The Quarterly Journal of Economics, 113(3), 949–963.

Debrun, X., Moulin, L., Turrini, A., Ayuso-i-Casals, J., & Kumar, M. S. (2008). *Tied to the mast? National fiscal rules in the European Union.* CEPR. Economic Policy April 2008 pp. 297–362.

European Comission. (2012). *Treaty on Stability, Coordination and Governance in the Economic and Monetary Union".*

Eurostat. (2014). *Measuring net government debt: theory and practice. Statistical working papers.* European Union. Eurostat.

Fontana, A., & Scheicher, M. (2016). *An analysis of euro area sovereign CDS and their relation with government bonds.* Journal of Banking & Finance. Volume 62, January 2016, Pages 126-140.

Ghosh, A. R., Kim, J. I., Mendoza, E. G., Ostry, J. D., & Qureshi, M. S. (2013). *Fiscal fatigue, fiscal space and debt sustainability in advanced economies. NBER Working Paper Series.* The Economic Journal 123.566. F4-F30. Working Paper 16782.

Gros, D. (2020). *Lessons From the COVID-19 Crisis for Euro Area Fiscal Rules.* ZBW – Leibniz Information Centre for Economics.

Heller, P. (2005). *Understanding fiscal space. International Monetary Fund.* International Monetary Fund.

Henao-Arbelaez, C., & Sobrinho, N. (2017). *Government Financial Assets and Debt Sustainability. IMF Working Paper WP/17/173.* IMF.

Hürtgen, P. (2020). *Fiscal sustainability duringthe COVID-19 pandemic. Discussion paper No 35/2020.* Deutsche Bundesbank.

Hutchison, M. M. (2020). *The Global Pandemic, Policy Space and Fiscal Rules to Achieve Stronger Stabilization Policies.* Seoul Journal of Economics, Vol. 33, No. 3.

IMF. (2009). *Fiscal Rules - Anchoring Expectations for Sustainable Public Finances.* Prepared by the Fiscal Affairs Department (In consultation with other departments). Approved by Carlo Cottarelli.

IMF. (2013). *Public Sector Debt Statistics: Guide for Compilers and Users.* Washington, DC: IMF.

IMF. (2017). *IMF Fiscal Monitor: Achieving More with Less, April 2017.*

IMF. (2020). *Fiscal Monitor. Policies to Support People. Dunring the COVID-19 Pandemic. April 2020.* Washington, DC: IMF.

IMF. (2021). *Fiscal Monitor. A fair shot.* Washington, DC, April: IMF.

Kose, M. A., Kurlat, S., Ohnsorge, F., & Sugawara, N. (2017). *A Cross-Country Database of Fiscal Space.* World Bank Group. Policy Research Working Paper 8157.

Kose, M. A., Ohnsorge, F., & Sugawara, N. (2018). *Fiscal Space: Concept, Measurement, and Policy Implications. Research & Policy Briefs From the World Bank Malaysia Hub.* World Bank Group, No. 19.

Krugman, P. (2020). The case for permanent stimulus. *Mitigating the COVID economic crisis: Act fast and do whatever it takes*, *3*, 213-219.

Makin, A. J., & Layton, A. (2020). *The global fiscal response to COVID-19: Risks and repercussions.* Economic Society of Australia. Economic Analysis and Policy 69 (2021) 340–349.

Marcel, M. (2014). *Budgeting for fiscal space and government performance beyond the great recession.* OECD Journal on Budgeting, 13(2), 9-47.

Martin, F. (2020). *Economic Realities and Consequences of the COVID-19 Pandemic—PART II: The Economy and Fiscal Policy. ECONOMIC Synopses No 11.* Federal Reserve Bank of St. Louis.

Mazzucato, M. (2020). *Capitalims after the pandemic. Getting the recovery right.* Foreign Affairs, 99(6), 50-61.

Nerlich, C., & Reuter, W. H. (2015). *Fiscal rules, fiscal space and procyclical fiscal policy. Working Paper No 1872 / December 2015.* European Central Bank.

Ostry, J. D., Ghosh, A. R., & Espinoza, R. (2015). *When Should Public Debt Be Reduced? IMF Staff Discussion Note DSN/15/10.* IMF.

Ozili, P. K. (2021). *The COVID-19 global debt crisis: how to avoid it.* Available at SSRN 3819071.

Palley, T. I. (2014). *Money, Fiscal Policy, and Interest Rates: A Critique of Modern Monetary Theory.* Review of Political Economy, 27:1, 1-23.

Panizza, U. (2008). *Domestic and external public debt in developing countries.* United Nations Conference on trade and development. Discussion Papers No. 188.

Park, S. G. (2012). *Quantifying Impact of Aging Population on Fiscal Space.* IMF Working Paper WP/12/164.

Perotti, R. (2007). *Fiscal Policy in Developing Countries: A Framework and Some Questions. Policy Research Working Paper 4365.* The World Bank. Development Research Group.

Reinhart, C., & Rogoff, K. (2010). Debt and Growth Revisited. *MPRA Paper No. 24376*.

Romer, C. D., & Romer, D. H. (2019). *Fiscal space and the aftermath of financial crises: how it matters and why (No. w25768).* National Bureau of Economic Research.

Rummelhoff, V. (2018). *A Critical Examination of the Debt-to-GDP Ratio and Its Implications for Policy-Making in Selected OECD Eonomies.*

Schaechter, A., Kinda, T., Budina, M. N., Weber, A., & Guerguil, M. (2012). *Fiscal Rules in Response to the Crises. Toward the "Next-Generation" Rules: A New Dataset.* IMF.

Spilimbergo, A., Symansky, S., Blanchard, O., & Cottarelli, C. (2008). *Fiscal Policy for the Crisis. SPN/08/01*. IMF Staff Position Note.

WHO. (2020, 01 30). Retrieved from Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV): https://www.who.int/news/item/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov)

World Bank Group. (2015). *Global Economic Prospects. Having Fiscal Space and Using It.* Washington, DC: International Bank for Reconstruction and Development, The World Bank.

Wyplosz, C. (2020). *What's Wrong with Fiscal Space?* Graduate Institute of International and Development Studies and CEPR.

Yousefi, S. R. (2019). *Public Sector Balance Sheet Strength and the Macro Economy. IMF Working Paper WP/17/170.* IMF.

Zandi, M., Cheng, X., & Packard, T. (2011). *Fiscal Space. Special Report.* Moody's Analytics.