



# LUNDS UNIVERSITET

## Public sector centralization and debt levels in the OECD

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## Abstract:

The connection between general government debt levels and centralization of general government expenditure is compared in 31 countries 1995-2019 and 35 countries 1972-2019, with four country groups in each of the datasets analyzed further. Connections between centralization and changes in debt levels are found to be mostly insignificant and results unstable to the inclusion of lagged changes in debt levels. Running regressions on the four country groups gives notably different results with higher explanatory power but centralization nonetheless tends to remain insignificant. The dependence of results on splitting the data indicates possible heterogenous effects and underlines the utility of performing further research on a country-specific basis instead of using pooled regressions. Regardless, centralization is found to have poor explanatory power for the overall changes in debt levels.

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# 1. Introduction

## 1.1 Debt & the public sector

Throughout history, debt and its implications has been an important topic of interest, and if it was ever in risk of being forgotten, the recent surge in government debt from responses to Covid-19 has once more brought the spotlight to the topic. Debt levels are, however, subject to more than just debate, and are often regulated. In Sweden, the level of debt is restricted by the debt anchor that stipulates that the public sector debt should be around 35 percent of GDP (plus minus 5 percentage points). Internationally, the 1992 Maastricht Treaty stipulates an upper limit of 60 percent of consolidated public sector debt to GDP for EU members.

However, any limitation or anchor faces both current and future challenges, as there are indications of an expanding public sector that risks being financed through increased debt levels. These indications are outlined in the following section.

### 1.1.2 Trajectory of public spending and future debt

The first pointer towards increased future government spending that could be financed through debt is the clear historic tendency throughout the 20<sup>th</sup> century towards larger public sectors as economies grow, in both developed and developing countries alike (Boix, 2001). As the public sector grows larger, there is increasingly more expenditure that can be paid for by debt, as opposed to politically difficult tax increases. For example, according to Greer & Denison (2016) the total debt at state and local level in the US has been increasing.

The second point that indicates expanding public sector levels (and the possibility of them being financed through loans) is whatever crisis lies in store in the future. Robert Higgs (2013), studied how American government has tended to grow during the 20<sup>th</sup> century, particularly in response to the various crises the economy has faced. Combined with Reinhart and Rogoff's (2011) observation that no country has been able to eternally prevent financial crises from occurring, one could expect the public sector to continue to expand in response to future crises.

Thirdly, an important part of financing government debt consists of future economic growth and the global economy now seems to be entering a low growth environment (Piketty, 2014). This could pose a severe problem for countries that have counted on their own future growth to fund the loans that they have taken on, leaving them with higher levels of debt than expected.

Finally, it can be noted that increased debt levels are already at the door, having first grown in advanced countries over the decades 1980-2010 (Cecchetti, S., Mohanty, M., & Zampolli, F. (2011). On top of that there has a considerable build-up of government debt in response to the economic downturn caused by Covid-19. This expansion of government debt could additionally be read as part of a decline in rules-based policy measures and an increased acceptance for government debt in several countries (in particular the US, France and Italy). Furthermore, according to Rogoff (2020), there is some consensus that in a low-interest environment counter-cyclical fiscal policy becomes both cheaper and more necessary to conduct. In fact, the heterodox Modern Monetary Theory would even point to a free lunch from increasing government debt when growth rates outpace interest (Kelton, 2019; Lewis, 2020), for example when printing new currency (Lewis, 2020). Thus, with no clear culture of restricted spending, it does not seem unreasonable to imagine a continued propensity to finance expansive fiscal policy with debt.

With government spending thus seeming to face an upward trajectory, a useful question to answer would therefore be whether the problems of high debt levels could be avoided or at least alleviated, without needing to move against strong trends or navigate the political minefield of adjusting total public spending levels. The right question might be found in a concurrent discussion, namely that of fiscal federalism and of the future role of the EU (see for example Bordo et al, 2013). In the EU, various initiatives are being discussed which significantly broadens the area of operations of the union, with potential increases of expenditure at the central level. At any rate, Brexit and tensions within the union have certainly heightened the relevance of which layer of government should be responsible for what piece of expenditure.

## 1.2 Research question

What this essay thus aims to do is to bring these two areas of research – debt and fiscal federalism - together, to find out whether the distribution of public spending between levels of government affects how much debt the public sector takes on. The research question this thesis endeavors to answer is therefore the following: *does the distribution of public spending between central and lower levels of government impact the total debt of the public sector?*

### 1.3 Relation to previous studies

This work adds to the existing literature in several ways. The main way is in using newer data and looking at longer time periods than previous work on debt such as Afonso and Hauptmeier (2009) and Foremny et al (2017) who used the time periods 1990-2005 and 1970-2009, respectively. In comparison, the longest data used for this essay instead stretches across five decades between the years 1972 and 2019.

Additionally, data from more countries is drawn upon than in several earlier studies. Schaltegger and Feld (2009), for example, looked at Swiss cantons, while Afonso and Hauptmeier (2009) at EU countries and Foremny et al (2017) at 17 OECD countries. Meanwhile, the most countries featured in the analysis of this thesis is 35 OECD countries.

## 2. Theory & previous research

This section will present the main logic and theoretic support of the two alternative hypotheses this essay presents. Hypothesis one is that having a larger share of public spending take place at a central level decreases the total amount of debt in relation to GDP that the public sector takes on. Hypothesis two, in contrast, is that having a larger share of public spending taking place at a *sub*-central level (i.e regional and local levels) will be associated with lower levels of public debt in relation to GDP.

### 2.1 Centralization

This section describes the support for hypothesis one, that centralized fiscal systems are less prone to financing themselves through debt. A note on the meaning of centralization in the context of this thesis: there are several ways in which a fiscal system could be centralized (for example restrictions of what areas local governments can spend on or how much control they have of their revenue streams). This thesis will for the sake of clarity limit the concept of centralization to a single area, namely the consolidation of public sector expenditure at the central level of government, as opposed to sub-central levels such as local or regional governments. The arguments in support for centralization's ability to reduce debt levels are outlined below.

### 2.1.1 Moral hazard

When looking at the theory surrounding fiscal federalism, one of the most prevalent arguments concerns the creation of a moral hazard situation as public spending is decentralized, making local and regional government more likely to take on debt compared to the central government. For the central government, there is no higher public authority from which funds can be granted from. This results in the agent, ie the government, bearing the costs of its actions, in this case, of financial irresponsibility in the form of disgruntled voters or creditors. Local or regional government can, by contrast, be bailed out or supported in other fiscal ways by the central government, which would allow them to spend freely and take on large amounts of debt, believing that the costs will be covered by a different institution and shifted to the federation (Gelpern, 2012)

Bordo, Jonung and Markiewicz (2013) note the importance of this mechanism playing a part in various historical example of excessive build-up of regional government debt in Canada, Germany, and the US. Gillette (2008), meanwhile, describes its potential effects on a municipal level. Gelpern (2012) also stresses the problem of moral hazard, while nuancing that the issue might be less stark in the case of local government, which can often face tougher fiscal controls and restrictions than do regions.

However, Gillette (2013) does note that municipal governments may default, declare bankruptcy and demand bailouts from central governments to avoid politically tough spending decisions. He notes examples from American municipalities refusing to either increase taxes or decrease spending in 2008 and 2009. Another American municipal example can be found in the work of Baldassere (1998). In support of this, Monkkonen's 1995 book on municipal finance found systematic avoidance of adjusting spending among local governments in 19<sup>th</sup> century Illinois state in the USA, which despite having financial maneuverability preferred defaults and bankruptcy.

Additionally, the moral hazard problem involves not only public organizations (local and regional governments), but also individuals themselves, who can reap the benefits of expansive fiscal policy in his or her hometown or regional province, and then relocate if the local or regional government faces tougher times or default and bankruptcy (Bruce, 1995). Regarding the importance of moral hazard on a higher level, Zahariadis (2013) notes the importance of ruling out country bailouts for fiscal federalism to be truly viable on an EU-wide level.

### 2.1.2 Economies of scale

Beyond the point of moral hazard, there is another theoretically supported reason for why central government could be less likely to be associated with higher levels of debt concerns financing costs and access to credit. Since the central government is a safer borrower, it can face lower interest rates (Greer and Denison, 2016) and thus be less likely to be overwhelmed by too expensive debts that spiral out of control. Similarly, Bordo et al. (2013) considers central government debt to be more favorable than its local or regional counterparts.

### 2.1.3 Questioning assumptions

Next, the theory that supports the debt benefits of decentralization (which will be presented in the next section) requires that certain assumptions are fulfilled. Free mobility, lack of externalities or connections between policy decisions between regions, as well as low transfers are required for benefits of decentralization to take place (Bordo et al, 2013). Chari and Kehoe (2004) stress that if there is a lack of a centrally predetermined monetary policy, sub-central governments will accrue excessive debt levels. Additionally, Bordo et al. (2013) note that in the absence of strong fiscal checks, debts in the sub-components (local and regional governments) will grow.

Another point is made by Rodden (2006) who writes that the benefits of decentralization depends on limiting central authority. However, limiting central authority could hamper efforts to effectively provide collective goods for the whole country or union, which would lead to inefficiencies (Bordo et al. 2013). Furthermore, decentralization arguments often lean on market discipline being more prevalent at lower levels of government, but this force could be compromised by bailout beliefs. For example Hanniman (2018) says that markets believe highly indebted Canadian provinces will be bailed out by the national government, which would then prevent fiscal discipline from being imposed by market forces in the form of higher interest rates to compensate for the risk of over-indebtedness.

## 2.2 Decentralization

With the theoretic support for the connection between centralization and lower debt levels now introduced, this section will instead present the prevailing arguments for the counterhypothesis, namely the connection between *decentralization* and lower debt levels. For the purposes of this thesis, decentralization is seen as the share of general government spending taking place at any level other than central government and thus includes both local and regional levels of government.

### 2.2.1. Market discipline & local preferences

A common argument in the fiscal federalism literature for why debt could potentially be more limited when spending takes place at a sub-central level concerns the costs of borrowing. Moreover, Oates (1999) points out that since sub-central governments lack control of monetary policy, they tend to be more reliant on borrowing from the private capital markets, which react better to fiscal indiscipline than publicly funded debt instruments, punishing excessive buildup of debt. This line of argument is also found in the work of McKinnon (1997). Meanwhile, Greer and Denison (2016) theorize that borrowing is more expensive at a local level, so spending at a lower level of government may introduce soft caps to the amount of debt that can be taken on. These higher costs should act as a non-formal limit to the amount of debt lower levels of government can take on.

On top of higher borrowing costs limiting debt accumulation at lower levels of government better than at central levels, Shah (2008) describes a broad agreement in the literature that at in theory, decentralization is able to improve allocative efficiency through better matching public expenditure to local voter preferences. Likewise, Teresa Ter-Minassian (1997) says there is broad support for decentralization efficiency. The more accurate reflection of local preferences to expenditure levels would thus be a way of avoiding the problem

As for the problem of moral hazard, Ter-Minassian (1997) points out that countries use a variety of methods to reduce the presence of it and reduce its consequences in their fiscal systems. In particular, she describes four main types used in different combinations. These include the previously mentioned market discipline as well as the following three methods to address moral hazard in a fiscal federalism context (parentheses indicating a country with large reliance on the mentioned control method):

1. “Cooperation between government levels in establishing debt control” (Australia, Scandinavia, and Germany).
2. Rules-based control methods (Switzerland, the US, and Spain).
3. Administrative control methods (non-federal states such as the UK, Korea, and France).

To conclude, the theoretical argument for why decentralized public spending could be less likely to take on debts compared to centralized spending involves two primary points. First, increased exposure to market-issued debt, leading to higher lending costs and debt priced

appropriately to risk. Second, more detailed matching of public expenditure to local voter preferences which increases efficiency, potentially limiting debt accumulation.

### 2.2.2 Questioning assumptions

Beyond the just-mentioned theoretic support for the decentralized spending, there are also objections to the assumptions of the centralization arguments. Findings of Bruce (1995) note the importance of tax base mobility as a cause of excessive debt, stemming from the moral hazard problem on the part of the individual, who can move from bankrupt localities to avoid bearing the costs. Should labor mobility be significantly lower than in his example (Canada) or changes across time the results can be affected.

Another assumption that can undermine the centralization debt efficiency argument is presented in Besley and Coate (2003), where they theorized that there are situations in which larger central government spending can create inefficiently large public deficits and debt accumulation, provided representatives in the central legislature act in a cooperative way with one another to increase spending.

## 2.3 Previous studies

In the next few sections, several earlier studies and their results will be outlined, giving a brief overview of the current empirical support for the two opposing hypotheses of centralized spending being either more or less prone to lead to higher debt levels.

### 2.3.1 Centralization

Afonso and Hauptmeier (2009) looked at EU countries for the period 1990-2005 and found that increasing decentralization of the public spending by one percent leads to a decrease in public sector primary balance by 0.1 percent the next period. In their study, decentralization therefor leads to larger public sector debt (if the primary budget balance was already negative). On top of this, the effect became more pronounced when government debt was already above 80 percent of GDP.

Another study is Foremny et al (2017), who found that more decentralization reduced fiscal consolidation in 17 OECD countries between 1974 and 2009. I.e., attempts by the public sector to close its primary budget deficits tended to be less successful in more decentralized countries and time periods. Additionally, Horváthová et al (2012) find a positive impact on the public debt from increased revenue decentralization.

### 2.3.2 Decentralization:

There are also several studies showing improved debt levels as a result of decentralization. Huther and Anwar (1996) in Oates (1999) found improved debt to GNP ratios as decentralization increased. Schaltegger and Feld (2009) studied Swiss cantons and found centralization reduced the chances of successful fiscal consolidation. Likewise, Darby et al (2005) studied fiscal consolidation in OECD countries and concluded the involvement of sub-central levels of government to be important.

Regarding support for the role of private lenders influencing debt levels, Delgado-Téllez & Pérez (2020) found a main effect on regional debt to be market discipline (financing costs) to an important factor in regional debt accumulation in Spain between 1995 and 2017. This partially validates the influence of market discipline affecting local or regional debt levels, which was a main argument for the efficiency of decentralized fiscal spending.

However, there are also examples of a lack of evidence for an effect on debt levels at all. For example, while Shah (2008) finds significant decreases in spending as a result of decentralization the effects on public debt and deficits are insignificant.

Evidently, there is a wide range of results from previous studies looking at the connection between centralization and government debt, indicating that the question is far from settled. This makes it interesting to further study the effect of public expenditure structure on debt, and this thesis will add to the discussion in two ways. First, by drawing on a longer dataset, spanning five decades (1972-2019) compared to previously mentioned periods of 1990-2005 (Afonso and Hauptmeier, 2009) and 1970-2009 (Foremny et al, 2017). Second, by including more countries, up to 35 OECD members compared to earlier studies looking at EU member countries (Afonso and Hauptmeier, 2009), another of 17 OECD countries (Foremny et al, 2017) or a one-country analysis of Swiss cantons (Schaltegger and Feld, 2009).

## 3. Method

In this section, the methodological approach of this thesis will be outlined and explained. The scope of this essay is a 35-country, 47-year analysis, drawing on 1'460 separate observations and takes a deeper look at 4 groups of included countries. The 35 countries are all OECD members for which sufficient data for the chosen regression variables are available. As for

the method, available data on debt, which will be the dependent variable in this thesis' statistical analysis, is first assessed for stationarity and steps are taken until stationarity can be confirmed. This is done for two datasets (information about the two datasets and their differences will be explained in section 4). Following the confirmation of stationarity, the chosen regression will then be described in detail.

### 3.2 Stationarity

With a dependent variable (debt) expressed as an absolute number and GDP growing over time, non-stationary data is practically guaranteed from the outset. This is confirmed with a quick test for stationarity in the form of a Fisher test for a unit root in the first regression set, which unequivocally indicates that the null hypothesis of all panels containing a unit root cannot be rejected. The choice of Fisher's unit root test over others is founded on the structure of the collected panel data, which has countries with different number of observations (Colombia with very few observations compared to France with many). The non-stationarity is made visually evident in the figure below where the debt has been divided by GDP to make the non-stationarity in all countries evident, instead of being dwarfed into a flat line by the nominal size of the US debt levels.

The nominal debt level is thus not a favorable way of expressing the independent variable on account of its non-stationarity, which will have to be addressed. The solution of choice is to transform the values by taking logged differences along the following method:

$$Y^* = \ln\left(\frac{Y_t}{Y_{t-1}}\right)$$

Following the transformation, a new Fisher test for a unit root is performed, the results of which validate the intervention – the null hypothesis of a unit root in all panels is now strongly rejected (p-value of 0.0000, only zeros visible).

As for the second regression set, where data on the general government debt of GDP is unavailable, the cumulative general government deficit since the start of the time period is used instead. Similarly to the first regression set, the Fisher test for a unit root strongly indicates the presence of non-stationarity. The process of taking log differences is then applied to those data which, after being found to be similarly stationary through a visual check confirmed by another Fisher test for a unit root, are used as the independent variable

### 3.2 Regression specification

Having achieved stationarity in the independent variable, a linear panel data regression is now allowed and chosen, and the regression's equation is set up. In order to avoid problems associated with simultaneous effects, all the right-hand variables have been lagged by at least one time period. Additionally, all variables apart from dummy variables are expressed as logged differences, along the previously described transformation:

$$Y^* = \ln\left(\frac{Y_t}{Y_{t-1}}\right),$$

Then, as an added precaution to capture autoregressive tendencies in the development of the debt level, a lag of the dependent variable is also included, bringing the equation to the following:

$$\begin{aligned} \% \Delta Debt = & \beta_1 + \beta_2 \% \Delta Centralization L. 1 + \beta_3 \% \Delta Public sector size L. 1 \\ & + \beta_4 \% \Delta real GDP L. 1 + \beta_5 \% \Delta real GDP L. 2 + \beta_6 \% \Delta real GDP L. 3 \\ & + \beta_{7-10} Country group interaction variables + \beta_{11} \% \Delta Debt L. 1 \\ & + \beta_{12} \% \Delta Debt L. 2 + \beta_{13} \% \Delta Debt L. 3 + Time dummy variables \end{aligned}$$

Or, desiring a more aesthetically pleasing version, when viewing every variable as *predefined as a log difference with one lag* unless otherwise stated:

$$\begin{aligned} Debt = & \beta_1 + \beta_2 Centralization + \beta_3 Public sector size + \beta_4 Growth \\ & + \beta_5 Growth lag 2 + \beta_6 Growth lag 3 \\ & + \beta_{7-10} Country interaction variables + \beta_{11} Debt + \beta_{12} Debt lag 2 \\ & + \beta_{13} Debt lag 3 + Time dummy variables \end{aligned}$$

## 4. Data

In this section the choice of included variables will be motivated and the data described, before moving on to determining the model specification. This thesis uses two datasets, one mainly based on the period 1995-2019 (primarily based on OECD data) and an extended set for 1972-2019 (mainly based on IMF data). Since the data doesn't entirely overlap, the two periods will be treated as two separate regression sets.

### 4.1 Debt

The dependent variable of this thesis consists of the country's public sector debt levels and has for the first regression set (1995-2019) been obtained from OECD (2021) data on

member countries' general government debt shares of GDP. The general government is defined as all layers of government (central, regional, etc.) and is as such a suitable measure. These data have then been multiplied by nominal GDP figures (in US dollars) for each respective country and year, in order to construct the nominal debt level of the public sector. The nominal GDP data was in turn collected from the World Bank database (2021).

The rationale for converting the debt from a measure relative to GDP into an absolute value is laid out by Bohn (2015), who underlines that the ratio can be excessively volatile as a consequence of shocks to economic output. Using an absolute value instead allows us isolate the effect of the explanatory variables on the actual level of debt, instead of the denominator (GDP). Failing to isolate the debt levels would instead require the inclusion of extra variables that are suspected of being correlated with economic output but not necessarily debt. In any case, using a ratio as the left-hand variable unreasonably complicates the interpretation of the later regression results when there is such a direct way of addressing the issue with easily available GDP figures.

For the second regression set (1972-2019), data on the general government debt was not found, either in nominal or relative terms. Instead, general government expenditure and revenue data were used to calculate each year's general government deficit. This was then multiplied by nominal GDP figures and summed as time progressed, to create a nominal value for each country's debt accumulated since the start of the time period.

## 4.2 Centralization

Next, centralization, the primary explanatory variable of interest. For this essay, it is defined as the share of public spending taking place at central government level and is constructed by dividing central government expenditure (including social securities, i.e., the largest measure of spending by the central government) by general (total) government expenditure, where both types of expenditures are expressed as a share of GDP.

Figures for general government expenditure were taken from the OECD (2021) in the first regression set while the second regression set uses IMF (2021) data. Central government expenditure collected from the IMF government finance statistics (2021) is used for both regression sets and was collected for each country individually and then combined into a unitary panel.

### 4.3 Public sector

Beyond the centralization structure of the public sector, this thesis will also include the size of the public sector itself. Two quick examples illustrate why the size of the public sector could potentially affect debt levels. On one hand, general government spending that consistently hovers around 10 percent of GDP will have a significantly smaller potential shortfall of revenue that needs to be covered by loans than a country with a public sector making up 50 percent of GDP. On the other hand, a larger public sector by definition has more resources and might therefore be more able to finance itself on its own, and therefore be less likely to finance itself through borrowing. As such, there are at least two theoretical arguments for why public sector size could influence debt levels.

Should there then turn out to be a connection between the degree of centralization and the public sector size, omitted variable bias will have been introduced unless the public sector size is included in the regression. Making sure to including the public sector as a control variable accounts for any potential connection between the degree of centralization, public sector size and general government debt. General government spending will be used to measure the public sector size.

### 4.4 Economic growth rate

Another important variable to be included is the overall growth rate of economies, which allows countries to diminish their debt-to-GDP ratios even when not servicing more than their interest payments, as growth increases the denominator (GDP), shrinking the ratio. Similarly, in the case of an interest in absolute debt levels, economic growth allows countries to reduce their levels of debt without changing the proportion of their expenditure that is devoted to debt servicing.

As a result, economic growth is frequently included as a variable in several studies and found to be important. For example, Delgado-Téllez & Pérez (2020) performed an analysis on regional debt growth in the regional governments in Spain and found growth to be an important factor in regional debt accumulation.

Having decided to include growth, one is then faced with the question of using either nominal or real growth rates. Considering the argument centers around faster growth allowing a country to outgrow its debts, it is desirable to have a measurement that accurately reflects this relationship. On one hand, large nominal growth rates that are a result of high inflation might

allow a country to outgrow domestic debts if creditors in the country have not included protectionary clauses against inflation. However, the inflationary pressures on the currency will in theory also put pressure on the exchange rate, nullifying (or at the very least reducing) any effects on external debts (debt owed to creditors abroad), provided the loans were made in foreign currency.

As a result, there is reason to believe that large nominal growth rates that are the results of high inflation instead of growth will be less likely to affect debt levels. Consequently, it is real growth rates that will be used when including economic growth in the regression. The figures used have been calculated from World Bank (2021) data on GDP at constant 2010 US dollars.

#### 4.5 Time variables

Additionally, a series of time variables will also be included to capture time-specific effects and will take the form of dummy variables for each of the years. This inclusion was made in order to capture broad or developments associated with certain years, such as the low-inflation, low-interest environment of the secular stagnation following the 1990's, which could be suspected of having an effect on debt levels as the costs of maintaining higher debt levels as interest rates have fallen. Likewise, the highly volatile, high-inflation and high-interest environment of the 1970's might also be suspected of affecting debt levels through the costs of borrowing and attitudes to the sustainability of large debt levels.

#### 4.6 Country group variables

Finally, a series of country group variables will be deployed to determine whether there are country- or region-specific effects at play. Since the group of observations spans 31 and 35 OECD countries in the first and second dataset respectively, there are plenty of opportunities to divide up the set. This combined with the OECD being a broader and more diverse group of countries than (for example) the Euro-zone, there is good reason to attempt to capture differences between groups of countries that appear broadly similar or share common economic or institutional characteristics.

The four country group variables that will be included are interaction variables for Nordic countries (on account of similarly extensive public sectors), Southern European (on account of their large debt levels), and Anglo-Saxon countries (on account of their shared institutional background), defined as current Commonwealth members plus the USA.

The last country group variable to be included is one for federal countries. Since this thesis focuses on the degree of economic centralization, it is also of some interest to see whether there are effects associated with decentralized institutions in a broader (in this case legislative) sense. For example, does increased decentralization in the legislative sense have a similar effect on debt accumulation as expenditure decentralization? The federalism variable can thus be thought of as capturing political decentralization or a broader, institutional culture in a sense that might ameliorate or aggravate the debt accumulation effects of public sector centralization. The categorization of federal countries used was from the Forum of Federations (2021).

## 5. Results & discussion

The next four sections will deal with the analysis of the two regression sets. In the first two sections (5.1 and 5.2), the sets will be analyzed one by one in their entirety, while in section 5.3 and 5.4 they will be broken down into the previously described country groups. Once more, it is stressed that the dependent variable is somewhat different in dataset number one compared to set two. The first dataset uses the change in total general government debt level, while set two uses change in accumulated general government deficits (i.e debt) taken on since the start of the time period. The choice of this second measure was made in order to accommodate the paucity of data on general government debt levels in the extended time period (pre-1995 for most OECD countries).

### 5.1 First regression set: 1995-2019

Running the previously described regression on the first dataset yields the regression results seen in figures 1-3 on pages 21-23. The final column of the regression, where the inclusion of the yearly dummy variables take place, are for the sake of space relegated to the appendix and the interested reader is directed to section 7.2 on page 34.

As can be seen below, the effect of the centralization variable appears both quite small and insignificant, with a value fluctuating between roughly -0.2 and -0.5. Initially (Figure 1 and Figure 2, regressions 1-6), the coefficient follows this pattern, never attaining significance. These initial results thus go against both the arguments for and against centralization affecting debt levels. However, from regressions 7-9 in Figure 2 and Figure 3, the variable is found to be significant with a coefficient around -0.9, indicating that a one percent increase in centralization would be associated with a 0.9 percent decrease in general government debt,

supporting the theory of centralized spending being associated with a lower propensity of the public sector to finance itself through taking on loans.

That interpretation remains viable when country-group specific effects, which are significant only once (for Nordic countries in regression 10), are brought into the regression. In contrast, the significance of the centralization variable is severely challenged by the inclusion of lags of the change in debt, which are consistently found to be significant. Not only is the significance of centralization removed by the included lagged y-variables, but even the direction of the centralization coefficient changes from the inclusion of the second lag in regression 11 and onward, severely undermining the support for centralization's hypothetical connections to lower debt levels in the observed sample. Finally, the yearly dummies are added in Figure 12 (page 34), which removes significance from all variables (apart from two lags of the dependent variable).

Furthermore, the R-squared value takes on very low values across the board (between 0 and 0.013) and only rises noticeably once the second and third lags of the dependent variables are included, to 0.156 in regression 12 in Figure 3. Including the dummy time variables removes the significance of the third lagged y-variable and increases the R-squared value further to its maximum of 0.207, as well as removing the significance of the constant.

Interestingly, in no regression was real growth found to be associated with changes in debt levels, which was somewhat unexpected, although less so than if the dependent variable would have been expressed as a share of GDP. Likewise, with two exceptions (regression 8 and 9 in Figures 2 and 3 respectively), the size of general government spending was found to have no significant impact on debt levels. Normally uninteresting, the persistent significance of the constant may in this case actually be a sign of a bias in countries' willingness to take on more debt, but the final removal of the constant's significance may indicate that it was merely capturing the importance of fluctuations in variables that were highly active during the years attaining significance.

At any rate, the very low R-squared value certainly indicates that centralization of general government expenditure is not a particularly powerful explanation for overall changes in debt levels, at least not in the 1995-2019 period. Looking at the first regression set, there can thus be said to be inconclusive support for the impact of centralization on debt, with tentative pointers toward a negative relationship.

**FIGURE 1 - REGRESSION OF LOG DIFFERENCE IN GENERAL GOVERNMENT DEBT, OECD DATA  
(1)**

VARIABLES	(1)	(2)	(3)	(4)
Centralization L.1	-0.209 (0.251)	-0.388 (0.380)	-0.389 (0.380)	-0.507 (0.367)
General government expenditure L.1		-0.270 (0.429)	-0.299 (0.450)	-0.546 (0.438)
Real Growth L1			-0.119 (0.558)	-0.562 (0.590)
Real Growth L2				0.658 (0.529)
Constant	0.105*** (0.015)	0.105*** (0.015)	0.108*** (0.021)	0.103*** (0.021)
Observations	643	643	643	641
R-squared	0.001	0.002	0.002	0.006
Number of Countries	31	31	31	31

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**FIGURE 2 - REGRESSION OF LOG DIFFERENCE IN GENERAL GOVERNMENT DEBT, OECD DATA (2)**

VARIABLES	(5)	(6)	(7)	(8)
Centralization L.1	-0.448 (0.377)	-0.503 (0.382)	-0.849* (0.446)	-0.977** (0.484)
General government expenditure L.1	-0.601 (0.465)	-0.605 (0.465)	-0.770 (0.478)	-0.846* (0.490)
Real Growth L1	-0.533 (0.605)	-0.545 (0.606)	-0.586 (0.606)	-0.612 (0.607)
Real Growth L2	0.420 (0.576)	0.413 (0.576)	0.407 (0.576)	0.411 (0.576)
Real Growth L3	0.552 (0.534)	0.553 (0.534)	0.535 (0.534)	0.520 (0.534)
Interaction Fed& Centralization L.1		0.973 (1.075)	1.220 (1.086)	1.166 (1.089)
Interaction Nor& Centralization L.1			0.867 (0.579)	0.964 (0.596)
o.Interaction Commonwea_1				-
Interaction Com& Centralization L.1				0.608 (0.878)
Constant	0.093*** (0.023)	0.094*** (0.023)	0.095*** (0.023)	0.096*** (0.024)
Observations	639	639	639	639
R-squared	0.007	0.009	0.012	0.013
Number of Countries	31	31	31	31

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**FIGURE 3 - REGRESSION OF LOG DIFFERENCE IN GENERAL GOVERNMENT DEBT, OECD DATA (3)**

VARIABLES	(9)	(10)	(11)	(12)
Centralization L.1	-1.004** (0.500)	-0.554 (0.442)	0.077 (0.362)	0.243 (0.361)
General government expenditure L.1	-0.846* (0.491)	-0.323 (0.444)	0.126 (0.375)	0.226 (0.367)
Real Growth L1	-0.603 (0.609)	-0.116 (0.545)	-0.093 (0.448)	0.118 (0.451)
Real Growth L2	0.411 (0.576)	0.117 (0.502)	0.124 (0.404)	0.125 (0.389)
Real Growth L3	0.518 (0.535)	0.220 (0.467)	0.007 (0.381)	0.214 (0.370)
Interaction Fed& Centralization L.1	1.186 (1.094)	1.415 (0.945)	-0.515 (0.785)	0.202 (0.775)
Interaction Nor& Centralization L.1	0.989 (0.608)	0.986* (0.535)	0.689 (0.458)	0.632 (0.455)
Interaction Com& Centralization L.1	0.630 (0.885)	0.524 (0.764)	-0.710 (0.611)	-0.549 (0.590)
Interaction Sou& Centralization L.1	0.206 (0.978)	0.117 (0.842)	-0.186 (0.675)	-0.218 (0.679)
Debt change L.1		0.152*** (0.038)	0.283*** (0.039)	0.455*** (0.052)
Debt change L.2			-0.001 (0.032)	-0.192*** (0.040)
Debt change L.3				0.085*** (0.030)
Constant	0.095*** (0.024)	0.055*** (0.021)	0.034* (0.017)	0.018 (0.018)
Observations	639	624	584	549
R-squared	0.013	0.036	0.101	0.156
Number of Countries	31	31	31	31

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 5.2 Second regression set: 1972-2019

Despite having a slightly more obtuse unit of measurement for the dependent variable, the extended time period of the second regression set (1972-2019 compared to 1995-2019) adds a large number of observations. Compared to the previous set, approximately 58 percent more observations are available (870 vs. the previous 549 in the final regression). The results are discussed below.

Similarly to the previous set of regressions based on OECD data, the centralization coefficient is initially shown to be negative. In contrast, it shows less variability in the significance than previously found and also remains negative throughout the whole table. Most importantly, centralization is now significant from the start and remains so up until regression 6, when a country-group specific effect for centralization is added, namely federal countries. This federal multiplier of centralization remains significant and negative up (taking on values between -1.2 and -1.8) until regression 10, when lags of the dependent variable start being included.

Adding the autoregressive component in regression number 10, all other significances vanish, and remain gone until the yearly dummy variables are added in the final regression (when the Nordic interaction variable is significant and negative). Like before, including lags of the dependent variable are associated with a lack of significance of the centralization variable, and the full-form regression (i.e., the one including the yearly dummy variables) still shows an insignificant effect of centralization on debt level changes. The full-form regression with all the yearly dummy variables can be found on page 34, side by side to the previous set's full-form results.

In contrast to the previous regression set however, the centralization effect was not robust to the inclusion of country-group specific variables. Additionally, the coefficient of the centralization variable stays negative in this dataset (though still insignificant in the final analysis).

Just as before, the R-squared value is incredibly low, moving from explaining around 1.5 to 3.4 percent of the changes in debt levels before lags of the dependent variable are added. Once the lags are added, the variation accounted for rises to 6.8 percent and finally to 13.8 once the annual dummy variables are included. This is a clear indication that even with a consistently negative and occasionally significant coefficient, any real impact is small and the

largest component of the explanatory power of the equation arises from the apparently autoregressive nature of debt accumulation and yearly dummy variables. Additionally, the growth rates remain perpetually insignificant.

Furthermore, like the first regression set, the constant term that starts out highly significant is eventually found to be insignificant, from the inclusion of the country-group specific effects. The positive constant is as previously mentioned usually uninteresting but may in this case be reflective of a constant bias toward debt accumulation.

For regression set 2, centralization can therefore be said to have slightly more indications of an effect on debt accumulation in a negative direction than regression set 1, albeit inconsistently so and at best explaining only an incredibly small part of the observed variation in debt levels.

**FIGURE 4 - REGRESSION OF ACCUMULATED GENERAL GOVERNMENT DEFICIT, IMF DATA (1)**

VARIABLES	(1)	(2)	(3)	(4)
Centralization L.1	-0.898*** (0.237)	-0.618* (0.330)	-0.576* (0.331)	-0.619* (0.326)
General government expenditure L.1		0.434 (0.356)	0.436 (0.367)	0.381 (0.365)
Real Growth L1			-0.171 (0.569)	-0.084 (0.611)
Real Growth L2				-0.348 (0.553)
Constant	0.099*** (0.014)	0.099*** (0.014)	0.102*** (0.021)	0.109*** (0.022)
Observations	973	973	972	969
R-squared	0.015	0.017	0.017	0.017
Number of Countries	35	35	35	35

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**FIGURE 5 - REGRESSION OF ACCUMULATED GENERAL GOVERNMENT DEFICIT, IMF DATA (2)**

VARIABLES	(5)	(6)	7)	(8)
Centralization L.1	-0.615* (0.330)	-0.391 (0.341)	-0.617 (0.406)	-0.422 (0.420)
General government expenditure L.1	0.402 (0.378)	0.431 (0.377)	0.365 (0.382)	0.430 (0.383)
Real Growth L1	-0.004 (0.621)	0.036 (0.620)	0.030 (0.620)	0.026 (0.619)
Real Growth L2	-0.344 (0.600)	-0.294 (0.599)	-0.269 (0.599)	-0.230 (0.599)
Real Growth L3	-0.121 (0.560)	-0.164 (0.559)	-0.192 (0.559)	-0.188 (0.559)
Interaction Fed& Centralization L.1		-1.850** (0.734)	-1.667** (0.755)	-1.299* (0.782)
Interaction Nor& Centralization L.1			0.556 (0.542)	0.393 (0.549)
Interaction Com& Centralization L.1				-1.516* (0.843)
Constant	0.110*** (0.024)	0.108*** (0.024)	0.109*** (0.024)	0.107*** (0.024)
Observations	965	965	965	965
R-squared	0.016	0.023	0.024	0.028
Number of Countries	35	35	35	35

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

FIGURE 6 - REGRESSION OF ACCUMULATED GENERAL GOVERNMENT DEFICIT, IMF DATA (3)

VARIABLES	(9)	(10)	(11)	(12)
Centralization L.1	-0.478 (0.431)	-0.557 (0.378)	-0.535 (0.382)	-0.637 (0.395)
General government expenditure L.1	0.429 (0.384)	0.015 (0.337)	0.128 (0.337)	0.091 (0.344)
Real Growth L1	0.042 (0.620)	-0.209 (0.535)	0.022 (0.539)	0.143 (0.553)
Real Growth L2	-0.230 (0.599)	-0.194 (0.516)	-0.284 (0.536)	-0.206 (0.557)
Real Growth L3	-0.190 (0.559)	-0.187 (0.481)	0.038 (0.482)	0.176 (0.509)
Interaction Fed& Centralization L.1	-1.303* (0.782)	0.095 (0.734)	0.195 (0.740)	0.083 (0.760)
Interaction Nor& Centralization L.1	0.447 (0.557)	0.826 (0.513)	0.625 (0.517)	0.679 (0.532)
Interaction Com& Centralization L.1	-1.461* (0.849)	-0.858 (0.784)	-0.572 (0.785)	-0.455 (0.795)
Interaction Sou& Centralization L.1	0.603 (1.054)	0.302 (0.901)	0.348 (0.898)	0.278 (0.957)
Ylag1		0.155*** (0.034)	0.147*** (0.036)	0.130*** (0.039)
Debt change L.2			-0.220 (0.214)	-0.245 (0.223)
Debt change L.3				-0.371* (0.217)
Constant	0.107*** (0.024)	0.066*** (0.022)	0.049** (0.022)	0.042* (0.023)
Observations	965	942	906	870
R-squared	0.028	0.038	0.035	0.034
Number of Countries	35	35	35	35

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### 5.3 Country group regressions - OECD

Running the regression on the country groups separately gives markedly different results compared to a unitary regression. Like before, the full regressions with all time dummy variables have been put in the appendix and the interested reader is directed to page 36 for a full overview.

Autoregressive components remain important, but the R-squared value tends to be much higher than before, approaching 0.35 and 0.7 in the Nordic and Anglo-Saxon cases respectively. Public sector size is frequently significant in the Nordic and Southern European cases but shows different signs on the coefficients, with a large, negative relationship in the Nordic countries (around -4 or -5) while smaller in the Southern European countries (around 0.7). However, inclusion of lagged y-variables erase many of these significance levels.

In stark contrast to all previous regressions, growth achieves its first significance, in the Southern European context, with a positive coefficient of around 0.5-1.0 for the three-period lag of the real growth rate, indicating that a one-percent increase would be associated with a one percent increase in the size of general government debt three years later. This effect is robust to the inclusion of the lagged independent variables.

As for centralization in the final regressions with the yearly dummy variables, it is insignificant in all four groups (and was only ever significant in one regression for Southern European countries – regression 9 in figure 20). Beyond not attaining significance, the coefficient alternates between being positive and negative when looking at the different groups in the final regression (Figure 21, page 41). The observed fluctuation is opposed to the coefficient being negative in most cases when the yearly dummies were not included apart from the Southern European regressions. The massive influence of the dummy variables are taken as an indication that there are important other variables that should be included in the baseline regression.

### 5.4 Country group regressions - IMF

Splitting the IMF dataset along the lines of the country groups also results in quite different results compared to the full dataset. For starters, final R-squared values are much higher (mainly on account of the yearly dummy variables), reaching approximately 0.5, 0.7 in the Nordic and Federal cases respectively and 0.9 in both the Anglo-Saxon and Southern European countries.

Centralization is significant in two out of the four groups, the first of which is one case in Federal countries (regression 1 in Figure 22, page 42) with a strong negative coefficient close to -2.5. The second is three occasions in Anglo-Saxon countries (regression 1, 5 and 9 in Figures 24 and 25 respectively, pages 43-44), for which coefficients between -2.7 and 0.5 are observed.

Perhaps most interesting of all changes compared to the pooled regression is the strong support for a positive relationship between general government expenditure and debt accumulation in three out of four groups (only Nordic countries lack the relationship). The relationship is consistently positive, with confirmed coefficients ranging between 0.7 and 3.1, with a large number around 2.0. These coefficients seem large (a one percent increase in general government expenditure being associated with a two percent increase in the accumulated debt in the 2.0 case) but this could be the result of using the slightly unwieldy debt measurement. In any case, the significance falls away when the yearly dummy variables are added.

The Federal interaction variables also takes on significance, in a negative direction with values between -1.2 and -2.9 for federal Anglo-Saxon countries (Figure 23, page 43) and briefly for federal Southern European countries (regression 6, Figure 29, page 46).

Another change is that growth is frequently significant but takes on varying signs depending on country group and lag number, most visible in Figures 23 and 25 on pages 43 and 44 respectively. Overall, it is difficult to discern any consistent size or direction of the lagged growth rates on debt accumulation. Without time variables, the effect is not evident in Southern European or Nordic countries, but once these are added (see figure 30, page 47) every country group has at least one significant effect growth effect on accumulated debt, with a very strong negative relationship in the Nordic countries (coefficients between -5 and -6, positive in federal countries (coefficient -1.3) and a slight negative relationship in Southern European and Anglo-Saxon countries (coefficients around 1.6).

The division of the pooled sample into country groups thus results in a variety of different results compared to before. This may be evidence for heterogenous effects dependent on the particularities of these countries, especially since the included yearly dummy variables only succeeds in removing the significance of centralization and public spending, but not country-group interaction terms or growth.

## 5.5 Areas for future studies

### 5.5.1 Refining current approach

Other factors that are occasionally included in regressions and found to be significant are political or ideological acceptability of debt (Greener and Denison, 2016). Another variable is for elections taking place, which Afonso and Hauptmeier (2009) find increases public spending. Both these variables should be possible to integrate as simple dummy variables without major issues.

A third variable is an institutional one, mentioned in Delgado-Téllez & Pérez' (2020) paper, where they concluded that decentralization design, whether regions were in control of their own revenues, was among a list of important factors in regional debt accumulation in Spain between 1995 and 2017. This variable is however shorter in supply and may not be entirely straightforward to find good data on for the extended time period.

### 5.5.2 Next step

Vitaly, it would be interesting to study the country group members individually, to try to parse out what the seemingly heterogenous effects from the regressions split along country group lines depend on, and whether this affects the currently uncertain relationship between centralization and debt. Should this clarify the relationship, yet another step (beyond differences in methodology for this question) is whether debt increases or decreases arising from centralization spending are the result of one sector being more efficient with the funding or whether one level of government adapts to revenue streams while another tends to operate at a certain level of expenditure regardless of revenue. That is to say, is debt accumulation/decumulation associated with centralization found in this thesis the result of one level of government being more prone to systematic deficits than the other?

## 6. Conclusion

This thesis has looked at whether centralization of public sector expenditure is associated with changes in the level of public sector debt. Two datasets have been used, one from OECD for the time period 1995-2019 which gives a clear-cut measure of the general government debt to GDP ratio, which can easily be multiplied by nominal GDP to find the level of debt.

In addition, longer data for 1972-2019 was collected from IMF, which did not include a measure of general government debt to GDP ratios. However, general government revenues

and expenditures were available and a measure of accumulated general government deficits (i.e. debt) could therefore be constructed.

Centralization was found to be insignificant in the 1995-2019 OECD dataset unless autoregressive terms and time dummy variables were left out. A Nordic interaction term with centralization was significant in those same circumstances. In the cases when significance was observed, the coefficient tended to take on values around -0.9, indicating a one percent decrease in debt for a one percent increase in centralization.

In the 1972-2019 IMF dataset, the centralization coefficient consistently took negative values, starting with significance around the coefficient value -1 but faded into insignificance with the inclusion of country-group interaction variables, autoregressive terms and time dummy variables.

In both datasets, centralization was a very poor tool to explain the total variation in debt level changes. Instead, the autoregressive component exerts a major influence in the explanatory power of the regression for the short dataset but not the longer, while the yearly dummy variables had a large impact on the R-squared value of both datasets.

Breaking down the datasets into the country groups, there is similarly low support for any effect of centralization on debt, though the R-squared value is much higher and many other variables attain significance. However, for centralization, OECD data produced a significant positive effect in only in one of the regressions for one of the country groups (Southern Europe), while the IMF data leads sees only the occasional significant effect in federal and Anglo-Saxon OECD members. All other cases saw insignificant effects of centralization of debt.

To conclude, when looking at OECD member countries between 1972 and 2019, there is little to no support for any consistent effect or direction of centralization of public sector expenditure on debt levels. The few observed significant results are highly dependent on viewing the data in subsamples instead of as an aggregated group. This could be evidence either of heterogenous effects that depend on the particularities of certain time periods and countries, indicating the utility of further, country-specific research. However, until further research clarifies the reason of these exceptions, the link between centralization and debt remains unverified.

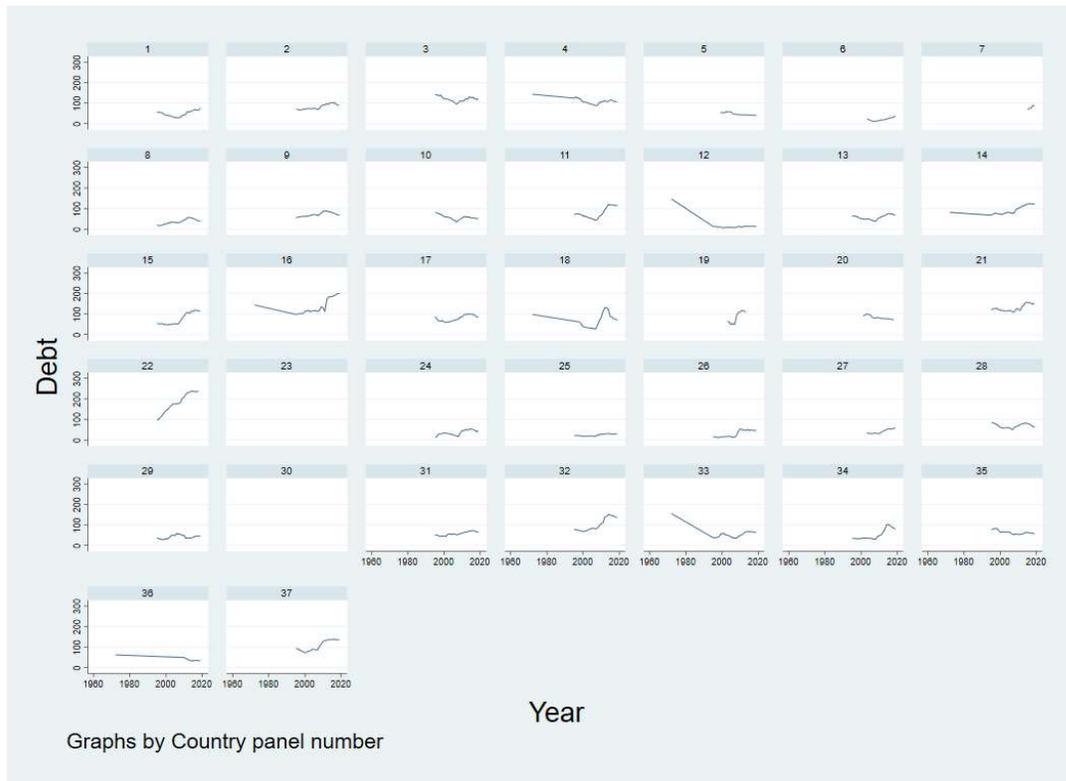
## 7. Appendix

### 7.1 Stationarity graphs

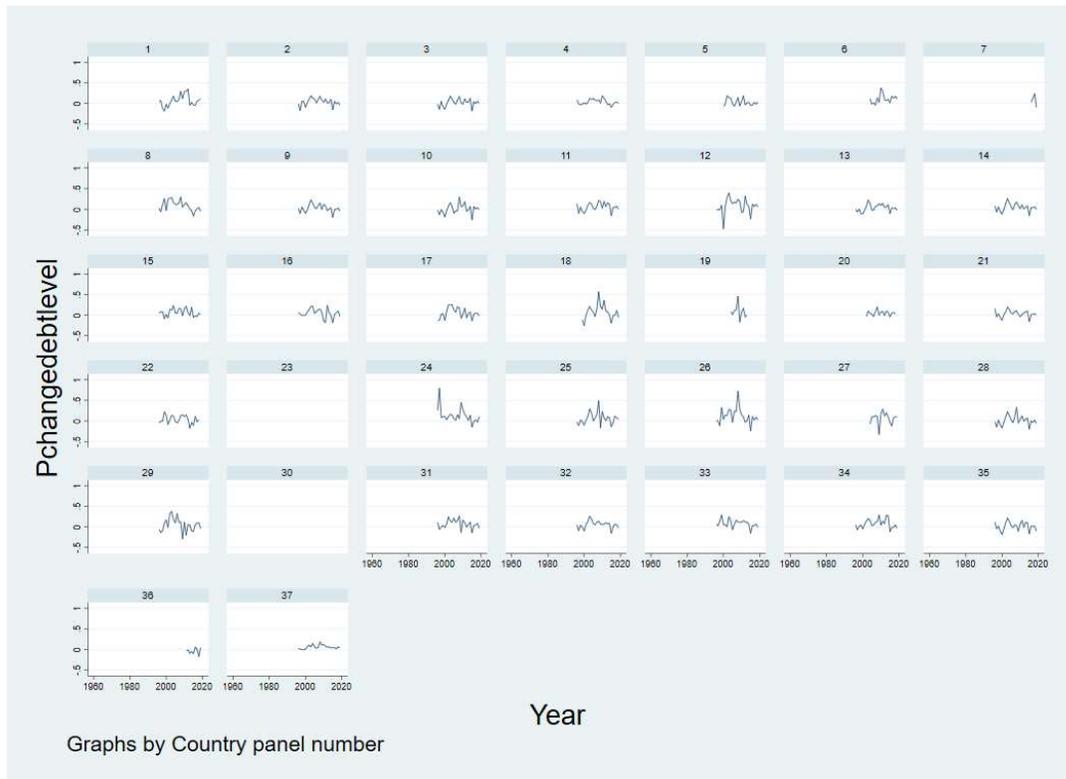
FIGURE 7 - COUNTRY CODE LEGEND

Code	Country	Code	Country	Code	Country
1	Australia	14	France	27	Mexico
2	Austria	15	United Kingdom	28	Netherlands
3	Belgium	16	Greece	29	Norway
4	Canada	17	Hungary	30	New Zealand
5	Switzerland	18	Ireland	31	Poland
6	Chile	19	Iceland	32	Portugal
7	Colombia	20	Israel	33	Slovakia
8	Czech Republic	21	Italy	34	Slovenia
9	Germany	22	Japan	35	Sweden
10	Denmark	23	Korea	36	United States
11	Spain	24	Lithuania	37	Turkey
12	Estonia	25	Luxembourg		
13	Finland	26	Latvia		

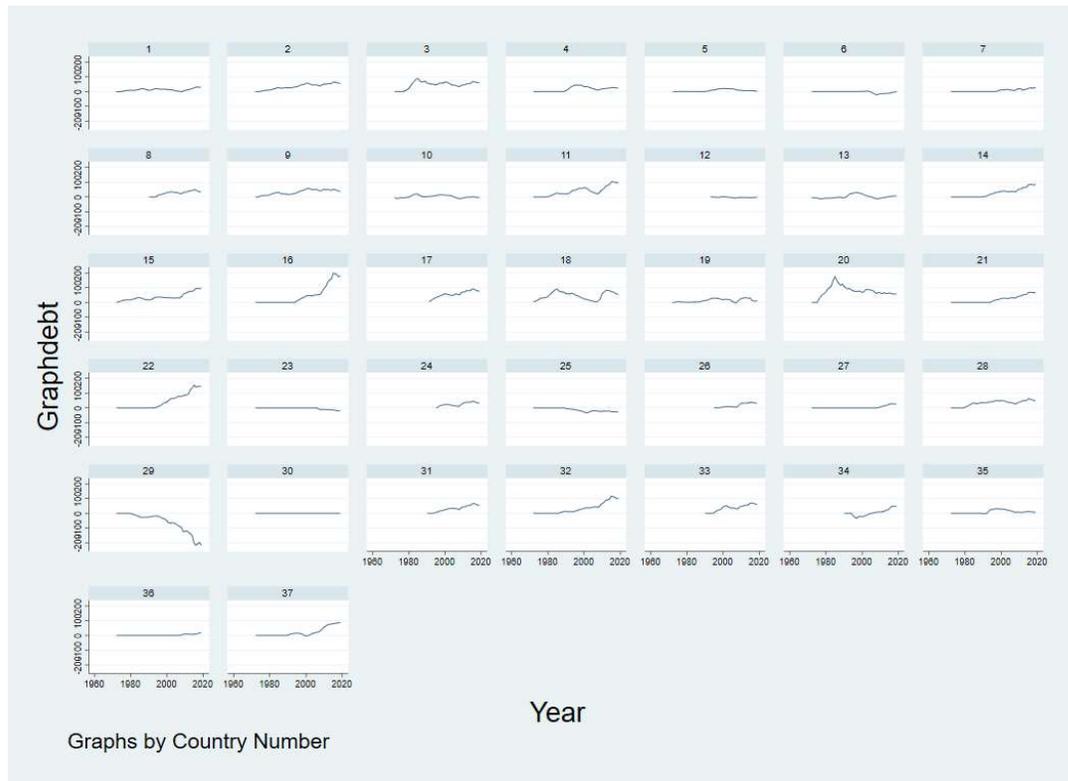
**FIGURE 8 - GENERAL GOVERNMENT DEBT AS SHARE OF GDP**



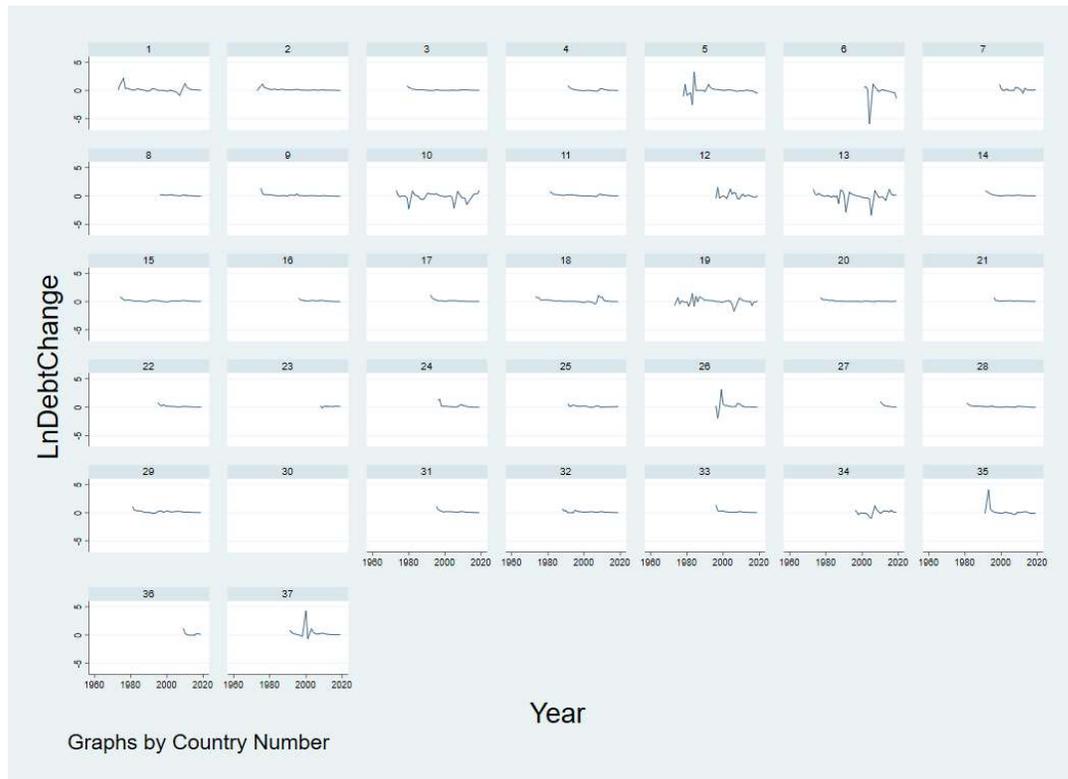
**FIGURE 9 - LOG DIFFERENCES IN ABSOLUTE GENERAL GOVERNMENT DEBT**



**FIGURE 10 - ACCUMULATED GENERAL GOVERNMENT DEFICIT AS SHARE OF GDP**



**FIGURE 11 - LOG DIFFERENCES IN ACCUMULATED GENERAL GOVERNMENT DEFICIT**



## 7.2 Regressions with all time variables

FIGURE 12 - OECD & IMF REGRESSIONS FROM 6.1 & 6.2, ALL TIME VARIABLES

VARIABLES	(OECD)	(IMF)
Centralization L.1	0.356 (0.373)	-0.585 (0.380)
General government expenditure L.1	0.090 (0.373)	-0.054 (0.328)
Real Growth L1	0.250 (0.565)	-0.139 (0.634)
Real Growth L2	0.296 (0.527)	-0.188 (0.641)
Real Growth L3	-0.487 (0.488)	0.038 (0.586)
o.Interaction Federal_1	-	-
o.Centralization L.1	-	-
Interaction Fed& Centralization L.1	0.266 (0.790)	-0.003 (0.692)
o.Interaction Nordic_1	-	-
Interaction Nor& Centralization L.1	0.545 (0.460)	1.003** (0.490)
o.Interaction Commonwea_1	-	-
Interaction Com& Centralization L.1	-0.458 (0.595)	-0.275 (0.729)
o.Interaction SouthernE_1	-	-
Interaction Sou& Centralization L.1	0.111 (0.688)	0.219 (0.858)
Debt change L.1	0.416*** (0.054)	0.245*** (0.054)
Debt change L.2	-0.222*** (0.040)	-0.127** (0.052)
Debt change L.3	0.038 (0.033)	0.036 (0.042)
o.1973	-	-
o.1974	-	-
o.1975	-	-
1976	-	0.454** (0.209)
1977	-	0.296 (0.180)
1978	-	0.276* (0.151)
1979	-	0.204 (0.143)
1980	-	-0.019 (0.134)

1981	-	0.111 (0.133)
1982	-	0.169 (0.132)
1983	-	0.186 (0.140)
1984	-	0.179 (0.122)
1985	-	0.155 (0.112)
1986	-	0.123 (0.114)
1987	-	-0.016 (0.117)
1988	-	0.201* (0.117)
1989	-	0.170 (0.113)
1990	-	0.190* (0.113)
1991	-	-0.050 (0.111)
1992	-	0.168 (0.117)
1993	-	0.170 (0.118)
1994	-	0.157 (0.106)
1995	-	0.208** (0.102)
1996	-	0.140 (0.103)
1997	-	0.133 (0.097)
1998	0.080 (0.147)	0.094 (0.096)
1999	0.206*** (0.071)	0.188** (0.089)
2000	0.024 (0.069)	0.046 (0.090)
2001	0.076 (0.068)	0.092 (0.090)
2002	0.121* (0.067)	0.083 (0.088)
2003	0.118* (0.068)	0.066 (0.088)
2004	0.048 (0.066)	-0.164* (0.085)
2005	0.050 (0.067)	-0.189** (0.086)
2006	0.013 (0.066)	-0.054 (0.088)
2007	0.063 (0.067)	0.020 (0.089)
2008	0.047 (0.066)	0.119 (0.090)
2009	0.127* (0.068)	0.132 (0.091)
2010	0.154* (0.079)	0.077 (0.099)

2011	0.090 (0.075)	0.103 (0.095)
2012	-0.031 (0.073)	0.046 (0.091)
2013	0.024 (0.065)	0.092 (0.082)
2014	0.063 (0.066)	0.075 (0.083)
2015	-0.025 (0.065)	0.038 (0.082)
2016	-0.055 (0.065)	0.037 (0.082)
2017	-0.043 (0.066)	0.024 (0.082)
2018	-0.006 (0.066)	0.038 (0.082)
o.2019	-	-
Constant	-0.007 (0.051)	-0.030 (0.061)
Observations	549	851
R-squared	0.207	0.138
Number of Countries	31	35

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 7.3 Country-group regressions OECD

### 7.3.1 Federal

**FIGURE 13 - FEDERAL COUNTRY GROUP REGRESSION (1), OECD DATA**

VARIABLES	(1)	(2)	(3)	(4)
Centralization L.1	0.724 (1.183)	1.825 (1.765)	1.740 (1.771)	1.605 (1.816)
General government expenditure L.1		1.699 (2.019)	2.461 (2.225)	2.329 (2.263)
Real Growth L1			2.734 (3.325)	2.634 (3.350)
Real Growth L2				0.996 (2.722)
Constant	0.116*** (0.039)	0.117*** (0.039)	0.066 (0.074)	0.048 (0.089)
Observations	112	112	112	112
R-squared	0.004	0.010	0.017	0.018
Number of Countries	6	6	6	6

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**FIGURE 14 - FEDERAL COUNTRY GROUP REGRESSION (2), OECD DATA**

VARIABLES	(5)	(6)	(7)	(8)	(9)
Centralization L.1	1.638 (1.824)	-0.228 (2.213)	1.232 (2.059)	0.335 (1.075)	0.355 (1.091)
General government expenditure L.1	2.234 (2.279)	1.080 (2.398)	3.130 (2.251)	0.789 (1.221)	-0.312 (1.352)
Real Growth L1	2.872 (3.395)	3.158 (3.381)	3.146 (3.108)	-0.837 (1.725)	-1.510 (1.800)
Real Growth L2	0.818 (2.754)	1.126 (2.746)	0.813 (2.524)	-0.117 (1.303)	0.385 (1.327)
Real Growth L3	1.418 (2.801)	1.260 (2.787)	1.130 (2.561)	-0.660 (1.330)	0.097 (1.405)
o._Federal_1		-	-	-	-
o.Centralization L.1		-	-	-	-
Interaction Anglo-Saxon & centralization		4.554 (3.096)	0.722 (3.017)	-3.123** (1.569)	-1.885 (1.856)
Ylag1			-0.281*** (0.082)	0.175*** (0.055)	0.468*** (0.169)
Ylag2				0.038 (0.043)	-0.084 (0.067)
Ylag3					-0.043 (0.046)
Constant	0.018 (0.107)	0.011 (0.106)	0.046 (0.098)	0.076 (0.053)	0.058 (0.055)
Observations	112	112	111	106	101
R-squared	0.021	0.041	0.148	0.186	0.199
Number of Countries	6	6	6	6	6

Standard errors in parentheses

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

### 7.3.2 Anglo-Saxon

**FIGURE 15 – ANGLO-SAXON COUNTRY GROUP REGRESSION (1), OECD DATA**

VARIABLES	(1)	(2)	(3)	(4)
Centralization L.1	0.000 (1.057)	0.631 (1.572)	-0.062 (1.651)	-0.076 (1.668)
General government expenditure L.1		1.754 (3.224)	2.580 (3.268)	2.499 (3.353)
Real Growth L1			6.923 (5.303)	6.589 (5.935)
Real Growth L2				0.626 (4.820)
Constant	0.188*** (0.059)	0.185*** (0.060)	0.012 (0.146)	0.005 (0.158)
Observations	67	67	67	67
R-squared	0.000	0.005	0.032	0.032
Number of Countries	3	3	3	3

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**FIGURE 16 – ANGLO-SAXON COUNTRY GROUP REGRESSION (2), OECD DATA**

VARIABLES	(5)	(6)	(7)	(8)	(9)
Centralization L.1	-0.105 (1.710)	-1.269 (1.814)	-0.544 (1.679)	-0.301 (0.720)	-0.594 (0.714)
General government expenditure L.1	2.540 (3.411)	1.998 (3.371)	4.028 (3.150)	1.564 (1.415)	-0.305 (1.670)
Real Growth L1	6.699 (6.101)	8.432 (6.088)	7.534 (5.594)	1.650 (2.482)	0.911 (2.545)
Real Growth L2	0.818 (5.289)	0.514 (5.207)	1.467 (4.788)	-0.751 (2.036)	-1.188 (2.022)
Real Growth L3	-0.466 (5.035)	-0.985 (4.964)	-1.113 (4.556)	-1.286 (1.995)	0.052 (2.132)
o._IFederal_1		-	-	-	-
o.Centralization L.1		-	-	-	-
_Interaction Federal & Centralization		5.529* (3.225)	1.761 (3.157)	-2.435* (1.363)	-1.697 (1.827)
Ylag1			-0.345*** (0.100)	0.134** (0.058)	0.390* (0.201)
Ylag2				0.013 (0.044)	-0.096 (0.070)
Ylag3					-0.081* (0.048)
Constant	0.009 (0.166)	-0.014 (0.164)	0.040 (0.151)	0.111 (0.067)	0.112 (0.072)
Observations	67	67	67	65	63
R-squared	0.032	0.079	0.237	0.274	0.311
Number of Countries	3	3	3	3	3

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### 7.3.3 Nordic countries

**FIGURE 17 - NORDIC COUNTRY GROUP REGRESSION (1), OECD DATA**

VARIABLES	(1)	(2)	(3)	(4)
Centralization L.1	0.292 (0.853)	-0.842 (1.033)	-0.458 (1.070)	-0.480 (1.072)
General government expenditure L.1		-3.217* (1.698)	-3.411** (1.698)	-3.509** (1.704)
Real Growth L1			-3.414 (2.602)	-4.277 (2.793)
Real Growth L2				2.258 (2.632)

Constant	0.024 (0.063)	0.013 (0.062)	0.081 (0.081)	0.048 (0.090)
Observations	102	102	102	102
R-squared	0.001	0.038	0.055	0.062
Number of Countries	5	5	5	5

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**FIGURE 18 - NORDIC COUNTRY GROUP REGRESSION (2), OECD DATA**

VARIABLES	(5)	(6)	(7)	(8)	(9)
Centralization L.1	-0.469 (1.118)	-1.095 (3.607)	-0.766 (2.440)	-0.658 (2.815)	-1.331 (3.130)
General government expenditure L.1	-3.496** (1.750)	-3.517** (1.763)	0.252 (1.508)	0.603 (1.903)	2.422 (2.172)
Real Growth L1	-4.265 (2.828)	-4.173 (2.887)	-1.669 (2.338)	-0.949 (2.672)	2.160 (3.013)
Real Growth L2	2.217 (2.890)	2.194 (2.908)	-0.891 (2.013)	-1.603 (2.143)	-0.186 (2.291)
Real Growth L3	0.094 (2.634)	0.068 (2.652)	-1.067 (1.809)	-1.783 (1.972)	-1.472 (2.128)
o.Centralization L.1		-	-	-	-
o._INordic_1		-	-	-	-
_INorXLagCe_1		0.647 (3.544)	2.229 (2.391)	2.154 (2.692)	3.345 (2.972)
Ylag1			0.601*** (0.091)	0.546*** (0.204)	0.683*** (0.233)
Ylag2				0.192 (0.182)	-0.038 (0.331)
Ylag3					0.352* (0.207)
Constant	0.047 (0.100)	0.046 (0.101)	-0.110 (0.070)	-0.097 (0.077)	-0.200** (0.088)
Observations	102	102	92	79	69
R-squared	0.062	0.063	0.387	0.327	0.348
Number of Countries	5	5	5	5	5

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### 7.3.4 Southern Europe

**FIGURE 19 - SOUTHERN EUROPE COUNTRY GROUP REGRESSION (1), OECD**

VARIABLES	(1)	(2)	(3)	(4)
Centralization L.1	-0.278 (0.189)	0.040 (0.317)	0.315 (0.310)	0.321 (0.303)
General government expenditure L.1		0.436	0.855**	0.774**

Real Growth L1		(0.349)	(0.354)	(0.348)
Real Growth L2			0.970***	0.347
Constant	0.113***	0.111***	0.100***	0.098***
	(0.009)	(0.009)	(0.009)	(0.009)
Observations	70	70	70	70
R-squared	0.032	0.055	0.180	0.233
Number of Countries	4	4	4	4

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**FIGURE 20 - SOUTHERN EUROPE COUNTRY GROUP REGRESSION (2), OECD**

VARIABLES	(5)	(6)	(7)	(8)	(9)
Centralization L.1	0.345	0.345	0.096	0.217	0.487*
	(0.289)	(0.289)	(0.205)	(0.229)	(0.272)
General government expenditure L.1	0.703**	0.703**	0.261	0.129	0.179
	(0.332)	(0.332)	(0.240)	(0.214)	(0.217)
Real Growth L1	0.341	0.341	0.131	0.026	0.056
	(0.410)	(0.410)	(0.290)	(0.257)	(0.254)
Real Growth L2	0.115	0.115	-0.124	-0.035	-0.028
	(0.466)	(0.466)	(0.329)	(0.289)	(0.286)
Real Growth L3	1.026***	1.026***	0.831***	0.558**	0.576**
	(0.380)	(0.380)	(0.268)	(0.245)	(0.244)
o_IFederal_1		-	-	-	-
o.Centralization L.1		-	-	-	-
o_Interaction Federal & Centralization		-	-	-	-
Ylag1			0.358***	0.761***	1.120***
			(0.045)	(0.158)	(0.230)
Ylag2				-0.057	-0.394*
				(0.083)	(0.213)
Ylag3					-0.024
					(0.057)
Constant	0.095***	0.095***	0.053***	0.018	0.021*
	(0.009)	(0.009)	(0.008)	(0.011)	(0.011)
Observations	70	70	70	67	64
R-squared	0.315	0.315	0.667	0.706	0.685
Number of Countries	4	4	4	4	4

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### 7.3.5 All groups, all years

FIGURE 21 - ALL COUNTRY GROUPS, ALL TIME VARIABLES, OECD

VARIABLES	(1) Federal	(2) Nordic	(3) Anglo-Saxon	(4) Southern Europe
Centralization L.1	-0.697 (1.191)	1.367 (1.651)	-0.337 (0.932)	0.395 (0.263)
General government expenditure L.1	-0.703 (1.478)	-0.363 (3.247)	-0.636 (2.488)	0.155 (0.204)
Real Growth L1	-4.219* (2.381)	1.322 (5.024)	3.525 (4.395)	0.490 (0.370)
Real Growth L2	-4.747** (2.260)	2.429 (4.976)	-0.128 (3.738)	-0.411 (0.375)
Real Growth L3	-6.081** (2.584)	-5.935 (4.318)	-0.790 (3.984)	0.331 (0.294)
Interaction Anglo-Saxon & Centralization	-3.968* (2.047)	-	-	-
Interaction Federal & Centralization	-	-	-1.304 (2.648)	-
Ylag1	0.109 (0.189)	0.595* (0.316)	0.273 (0.257)	0.766** (0.288)
Ylag2	-0.042 (0.072)	0.470 (0.472)	-0.103 (0.093)	-0.363 (0.269)
Ylag3	-0.093* (0.051)	0.153 (0.324)	-0.083 (0.058)	0.068 (0.184)
o.Year 1996	-	-	-	-
o.Year 1997	-	-0.226 (0.595)	-	-
o.Year 1998	-	-0.182 (0.622)	-	-
Year 1999	0.224 (0.137)	-0.226 (0.440)	-0.047 (0.211)	0.022 (0.118)
Year 2000	0.195 (0.137)	-0.130 (0.424)	-0.112 (0.222)	0.058 (0.052)
Year 2001	0.229 (0.139)	-0.213 (0.434)	-0.005 (0.225)	0.080* (0.046)
Year 2002	0.224 (0.139)	0.066 (0.422)	0.197 (0.199)	0.053 (0.036)
Year 2003	0.173 (0.142)	0.259 (0.454)	0.193 (0.185)	0.125*** (0.032)
Year 2004	0.012 (0.130)	-0.441 (0.420)	0.096 (0.163)	0.094** (0.041)
Year 2005	-0.022 (0.132)	-0.347 (0.466)	-0.021 (0.167)	0.063 (0.041)
Year 2006	-0.049 (0.127)	-0.554 (0.467)	-0.007 (0.177)	0.062 (0.041)
Year 2007	0.106 (0.132)	-0.172 (0.502)	0.107 (0.168)	0.021 (0.043)
Year 2008	0.348** (0.132)	-0.210 (0.469)	0.517*** (0.163)	0.092** (0.035)
Year 2009	0.281** (0.138)	-0.433 (0.433)	0.225 (0.249)	0.137*** (0.033)
Year 2010	-0.044 (0.172)	0.219 (0.609)	0.297 (0.298)	0.078* (0.042)
Year 2011	-0.195	0.007	0.152	0.041

	(0.171)	(0.557)	(0.243)	(0.044)
Year 2012	-0.161	-0.641	0.100	0.050
	(0.166)	(0.510)	(0.236)	(0.043)
Year 2013	0.202	-0.254	0.101	0.052
	(0.127)	(0.400)	(0.166)	(0.033)
Year 2014	0.043	0.247	0.092	0.023
	(0.127)	(0.435)	(0.174)	(0.034)
Year 2015	-0.138	-0.078	0.029	0.022
	(0.129)	(0.452)	(0.159)	(0.031)
Year 2016	-0.090	-0.461	0.018	0.013
	(0.129)	(0.455)	(0.161)	(0.026)
Year 2017	-0.251*	0.191	0.028	0.003
	(0.129)	(0.469)	(0.158)	(0.025)
Year 2018	-0.071	-0.171	0.030	0.001
	(0.130)	(0.448)	(0.166)	(0.023)
o.Year 2019	-	-	-	-
Year 1996	-	-	0.083	-
			(0.238)	
Constant	0.320**	-0.008	-0.036	-0.007
	(0.134)	(0.382)	(0.211)	(0.017)
Observations	101	69	63	64
R-squared	0.474	0.518	0.611	0.905
Number of Countries	6	5	3	4

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 7.4 Country-group regressions IMF

### 7.4.1 Federal countries

**FIGURE 22 - FEDERAL COUNTRY GROUP REGRESSION (1), ACCUMULATED GENERAL GOVERNMENT DEFICIT, IMF DATA**

VARIABLES	(1)	(2)	(3)	(4)
Centralization L.1	-2.493*** (0.570)	-0.953 (0.769)	-0.959 (0.781)	-0.806 (0.789)
General government expenditure L.1		2.554*** (0.874)	2.565*** (0.910)	2.746*** (0.920)
Real Growth L1			0.070 (1.514)	0.333 (1.525)
Real Growth L2				-1.709 (1.321)
Constant	0.113*** (0.024)	0.102*** (0.024)	0.101** (0.040)	0.131*** (0.047)
Observations	237	237	237	237
R-squared	0.078	0.111	0.111	0.117
Number of Countries	8	8	8	8

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**FIGURE 23 - FEDERAL COUNTRY GROUP REGRESSION (2), ACCUMULATED GENERAL GOVERNMENT DEFICIT, IMF DATA**

VARIABLES	(5)	(6)	(7)	(8)	(9)
Centralization L.1	-0.989 (0.791)	-0.084 (0.892)	0.598 (0.915)	0.935 (0.707)	0.028 (0.251)
General government expenditure L.1	2.839*** (0.916)	2.612*** (0.912)	1.708* (0.944)	2.189*** (0.756)	0.469* (0.278)
Real Growth L1	0.142 (1.521)	-0.282 (1.515)	0.402 (1.457)	-0.348 (1.144)	-0.652 (0.408)
Real Growth L2	-1.252 (1.338)	-1.022 (1.328)	-2.417* (1.255)	-1.944* (1.009)	0.781** (0.388)
Real Growth L3	-2.459* (1.335)	-2.474* (1.323)	-2.256* (1.231)	-1.553 (0.970)	0.626* (0.360)
o.Centralization L.1		-	-	-	-
o.Interaction Commonwea_1		-	-	-	-
Interaction Com & Centralization		-2.923** (1.194)	-2.707** (1.244)	-1.729* (0.973)	-1.200*** (0.348)
o.Interaction SouthernE_1		-	-	-	-
Interaction Sou & Centralization		0.536 (2.334)	-1.085 (2.169)	-0.482 (1.641)	-0.093 (0.651)
Ylag1			-0.145** (0.058)	-0.296*** (0.054)	0.413*** (0.036)
Ylag2				0.136** (0.054)	0.487*** (0.048)
Ylag3					-0.081** (0.036)
Constant	0.178*** (0.053)	0.181*** (0.053)	0.193*** (0.051)	0.167*** (0.041)	-0.027* (0.016)
Observations	237	237	231	219	209
R-squared	0.131	0.155	0.089	0.231	0.612
Number of Countries	8	8	8	8	8

Standard errors in parentheses

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

#### 7.4.2 Anglo-Saxon

**FIGURE 24 – ANGLO-SAXON COUNTRY GROUP REGRESSION (1), ACCUMULATED GENERAL GOVERNMENT DEFICIT, IMF DATA**

VARIABLES	(1)	(2)	(3)	(4)
Centralization L.1	-2.702*** (0.745)	-1.431 (0.951)	-1.488 (0.953)	-1.561 (0.976)
General government expenditure L.1		2.555** (1.211)	3.157** (1.359)	3.067** (1.385)
Real Growth L1			2.414 (2.465)	2.184 (2.549)

Real Growth L2				0.774 (2.076)
Constant	0.157*** (0.037)	0.152*** (0.037)	0.093 (0.071)	0.080 (0.079)
Observations	137	137	137	137
R-squared	0.091	0.121	0.127	0.128
Number of Countries	4	4	4	4

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**FIGURE 25 – ANGLO-SAXON COUNTRY GROUP REGRESSION (2), ACCUMULATED GENERAL GOVERNMENT DEFICIT, IMF DATA**

VARIABLES	(5)	(6)	(7)	(8)	(9)
Centralization L.1	-1.669* (1.002)	-0.847 (1.103)	-0.773 (0.491)	0.147 (0.236)	0.491** (0.216)
General government expenditure L.1	2.992** (1.440)	2.289 (1.487)	-0.349 (0.713)	0.725** (0.358)	0.368 (0.320)
Real Growth L1	2.219 (2.600)	1.567 (2.608)	-2.778** (1.110)	-0.512 (0.529)	-0.174 (0.469)
Real Growth L2	0.910 (2.248)	1.124 (2.234)	-0.654 (0.940)	1.606*** (0.455)	1.483*** (0.422)
Real Growth L3	-0.952 (2.114)	-1.176 (2.102)	-1.886** (0.890)	-0.224 (0.418)	-0.536 (0.409)
o.Interaction Federal_1		-	-	-	-
o.Centralization L.1		-	-	-	-
Interaction Fed & Centralization		-2.685* (1.564)	-1.614** (0.705)	-0.220 (0.359)	0.316 (0.328)
Ylag1			0.017 (0.037)	0.988*** (0.093)	1.674*** (0.140)
Ylag2				-0.074 (0.048)	-0.705*** (0.147)
Ylag3					0.002 (0.038)
Constant	0.098 (0.089)	0.111 (0.089)	0.221*** (0.038)	-0.036 (0.022)	-0.023 (0.020)
Observations	136	136	132	125	119
R-squared	0.123	0.143	0.265	0.761	0.807
Number of Countries	4	4	4	4	4

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### 7.4.3 Nordic countries

**FIGURE 26 - NORDIC COUNTRY GROUP REGRESSION (1), ACCUMULATED GENERAL GOVERNMENT DEFICIT, IMF DATA**

VARIABLES	(1)	(2)	(3)	(4)
Centralization L.1	-0.214 (0.578)	-0.449 (0.758)	-0.399 (0.766)	-0.444 (0.767)
General government expenditure L.1		-0.504 (1.051)	-0.599 (1.069)	-0.431 (1.080)
Real Growth L1			-0.945 (1.830)	-0.035 (2.026)
Real Growth L2				-1.878 (1.796)
Constant	0.012 (0.044)	0.014 (0.045)	0.037 (0.063)	0.059 (0.067)
Observations	173	173	173	173
R-squared	0.001	0.002	0.004	0.010
Number of Countries	5	5	5	5

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**FIGURE 27 - NORDIC COUNTRY GROUP REGRESSION (2), ACCUMULATED GENERAL GOVERNMENT DEFICIT, IMF DATA**

VARIABLES	(5)	(6)	(7)	(8)
Centralization L.1	-0.430 (0.772)	0.089 (0.699)	0.033 (0.735)	0.059 (0.780)
General government expenditure L.1	-0.414 (1.087)	-0.519 (1.006)	-0.585 (1.103)	-0.449 (1.211)
Real Growth L1	0.038 (2.065)	0.455 (1.871)	0.430 (2.196)	-0.014 (2.330)
Real Growth L2	-2.046 (1.987)	-2.997 (1.829)	-2.717 (1.921)	-3.146 (2.149)
Real Growth L3	0.359 (1.797)	0.881 (1.613)	0.898 (1.753)	1.054 (1.903)
o. Centralization L.1	-	-	-	-
Ylag1		0.589*** (0.108)	0.592*** (0.149)	0.631*** (0.161)
Ylag2			0.079 (0.126)	0.098 (0.166)
Ylag3				-0.077 (0.139)
Constant	0.053 (0.074)	-0.062 (0.070)	-0.075 (0.078)	-0.042 (0.091)
Observations	173	163	151	140
R-squared	0.011	0.174	0.138	0.133
Number of Countries	5	5	5	5

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

#### 7.4.4 Southern Europe

**FIGURE 28 - SOUTHERN EUROPE COUNTRY GROUP REGRESSION (1), ACCUMULATED GENERAL GOVERNMENT DEFICIT, IMF DATA**

VARIABLES	(1)	(2)	(3)	(4)
Centralization L.1	-0.322 (0.204)	0.168 (0.312)	0.238 (0.305)	0.250 (0.302)
General government expenditure L.1		0.698** (0.342)	0.872** (0.341)	0.804** (0.340)
Real Growth L1			0.771** (0.333)	0.179 (0.486)
Real Growth L2				0.771 (0.465)
Constant	0.130*** (0.010)	0.124*** (0.010)	0.112*** (0.011)	0.109*** (0.011)
Observations	87	87	87	87
R-squared	0.030	0.077	0.135	0.164
Number of Countries	4	4	4	4

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**FIGURE 29 - SOUTHERN EUROPE COUNTRY GROUP REGRESSION (2), ACCUMULATED GENERAL GOVERNMENT DEFICIT, IMF DATA**

VARIABLES	(5)	(6)	(7)	(8)	(9)
Centralization L.1	0.264 (0.302)	0.474 (0.304)	0.198 (0.224)	0.023 (0.249)	-0.104 (0.267)
General government expenditure L.1	0.771** (0.341)	0.823** (0.331)	0.318 (0.249)	0.333 (0.232)	0.134 (0.247)
Real Growth L1	0.177 (0.486)	0.287 (0.472)	0.014 (0.345)	0.099 (0.308)	0.055 (0.306)
Real Growth L2	0.429 (0.572)	0.443 (0.553)	0.142 (0.404)	0.005 (0.349)	-0.102 (0.341)
Real Growth L3	0.483 (0.470)	0.447 (0.455)	0.362 (0.331)	0.552* (0.289)	0.521* (0.284)
o.Interaction Federal_1		-	-	-	-
o.Centralization L.1		-	-	-	-
Interaction Federal & Centralization		-1.387** (0.554)	-0.403 (0.420)	-0.116 (0.367)	-0.277 (0.397)
Ylag1			0.414*** (0.050)	0.178 (0.156)	0.293 (0.195)
Ylag2				0.170* (0.091)	0.195 (0.144)
Ylag3					-0.075 (0.052)
Constant	0.108***	0.103***	0.051***	0.054***	0.051***

	(0.011)	(0.011)	(0.010)	(0.012)	(0.013)
Observations	87	87	87	83	79
R-squared	0.175	0.237	0.601	0.556	0.466
Number of Countries	4	4	4	4	4

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

#### 7.4.5 All groups, all years

**FIGURE 30 - ALL COUNTRY GROUPS, ACCUMULATED GENERAL GOVERNMENT DEFICIT, IMF DATA**

VARIABLES	Federal	Nordic	Anglo-Saxon	Southern Europe
Centralization L.1	0.071 (0.266)	0.399 (0.867)	0.348 (0.227)	0.460* (0.245)
General government expenditure L.1	0.392 (0.316)	-0.700 (1.518)	-0.346 (0.327)	0.165 (0.179)
Real Growth L1	-1.323** (0.552)	3.463 (3.176)	0.157 (0.487)	0.568* (0.312)
Real Growth L2	-0.024 (0.555)	-6.297** (3.045)	1.657*** (0.472)	-0.425 (0.344)
Real Growth L3	0.511 (0.553)	-5.157* (2.881)	0.456 (0.507)	0.326 (0.264)
Interaction Federal & Centralization	-	-	0.535* (0.304)	-4.274*** (0.923)
o.Centralization L.1	-	-	-	-
o._ICommonwea_1	-	-	-	-
Interactions Anglo-Saxon & Centralization	-1.019*** (0.363)	-	-	-
o._ISouthernE_1	-	-	-	-
_Interaction S.Europe & Centralization	0.180 (0.717)	-	-	-
Ylag1	0.432*** (0.045)	0.584*** (0.184)	1.831*** (0.155)	0.905*** (0.313)
Ylag2	0.519*** (0.059)	0.112 (0.172)	-0.732*** (0.191)	-0.480* (0.276)
Ylag3	-0.114** (0.048)	-0.258 (0.161)	0.037 (0.045)	0.115 (0.096)
o.Year 1973	-	-	-	-
o.Year 1974	-	-	-	-
o.Year 1975	-	-	-	-
o.Year 1976	-	0.797 (0.496)	-	-
o.Year 1977	-	-0.162 (0.460)	0.028 (0.077)	-
Year 1978	0.147 (0.104)	-0.009 (0.402)	0.146** (0.067)	-

Year 1979	0.065 (0.076)	-0.120 (0.451)	-0.152** (0.064)	-
Year 1980	0.018 (0.065)	-1.088** (0.463)	-0.104* (0.053)	-
Year 1981	0.007 (0.060)	-0.180 (0.446)	-0.045 (0.051)	-
Year 1982	0.023 (0.060)	0.468 (0.449)	-0.023 (0.049)	-
Year 1983	0.099* (0.057)	-0.078 (0.583)	0.179*** (0.048)	-
Year 1984	-0.008 (0.054)	0.058 (0.456)	-0.002 (0.048)	0.087 (0.108)
Year 1985	0.003 (0.053)	0.130 (0.377)	-0.065 (0.048)	-0.041 (0.090)
Year 1986	0.068 (0.052)	-0.068 (0.374)	-0.000 (0.049)	-0.044 (0.070)
Year 1987	0.061 (0.053)	-0.410 (0.397)	-0.067 (0.047)	0.251*** (0.060)
Year 1988	0.021 (0.052)	0.750* (0.412)	-0.120** (0.050)	0.080* (0.046)
Year 1989	0.015 (0.054)	0.315 (0.378)	-0.070 (0.052)	0.003 (0.043)
Year 1990	0.083 (0.053)	-0.076 (0.377)	0.055 (0.049)	0.079* (0.041)
Year 1991	0.171*** (0.056)	-0.735** (0.369)	0.066 (0.049)	-0.265*** (0.090)
Year 1992	0.107* (0.055)	-0.215 (0.403)	0.164*** (0.048)	-0.104 (0.068)
Year 1993	0.035 (0.056)	-0.020 (0.399)	-0.043 (0.053)	0.023 (0.057)
Year 1994	-0.026 (0.052)	-0.094 (0.399)	-0.012 (0.047)	-0.354*** (0.112)
Year 1995	0.066 (0.048)	-0.153 (0.404)	-0.063 (0.042)	0.014 (0.054)
Year 1996	-0.012 (0.055)	0.037 (0.375)	-0.104** (0.042)	-
Year 1997	-0.039 (0.051)	0.009 (0.367)	-0.091** (0.044)	0.123 (0.081)
Year 1998	0.030 (0.049)	-0.069 (0.370)	-0.072* (0.043)	0.093 (0.056)
Year 1999	0.035 (0.047)	0.136 (0.366)	0.008 (0.048)	-0.001 (0.054)
Year 2000	0.025 (0.047)	0.125 (0.362)	-0.038 (0.046)	0.043 (0.033)
Year 2001	0.088* (0.046)	-0.044 (0.365)	0.056 (0.043)	0.063** (0.029)
Year 2002	0.069 (0.046)	0.143 (0.362)	0.007 (0.042)	0.044 (0.028)
Year 2003	0.019 (0.046)	0.101 (0.369)	-0.041 (0.041)	0.110*** (0.028)
Year 2004	0.019 (0.044)	-0.358 (0.347)	-0.026 (0.040)	0.079** (0.035)
Year 2005	0.021 (0.045)	-1.480*** (0.352)	-0.044 (0.041)	0.050 (0.037)
Year 2006	-0.044 (0.044)	-0.795* (0.452)	-0.078* (0.040)	0.055 (0.033)
Year 2007	-0.074 (0.046)	-0.107 (0.568)	-0.041 (0.041)	0.011 (0.032)
Year 2008	0.073 (0.049)	-0.106 (0.570)	0.067 (0.041)	0.084*** (0.026)

Year 2009	0.139*** (0.049)	-0.178 (0.570)	0.095** (0.044)	0.125*** (0.030)
Year 2010	-0.035 (0.058)	0.322 (0.447)	-0.032 (0.056)	0.073* (0.040)
Year 2011	-0.015 (0.056)	-0.559 (0.442)	0.028 (0.052)	0.036 (0.040)
Year 2012	0.059 (0.054)	-0.847** (0.422)	-0.017 (0.049)	0.044 (0.034)
Year 2013	0.007 (0.046)	-0.332 (0.378)	-0.074* (0.040)	0.051* (0.029)
Year 2014	0.021 (0.044)	-0.319 (0.398)	-0.017 (0.041)	0.020 (0.029)
Year 2015	0.009 (0.043)	-0.337 (0.402)	-0.011 (0.037)	0.019 (0.028)
Year 2016	0.028 (0.043)	-0.395 (0.390)	-0.006 (0.037)	0.012 (0.022)
Year 2017	0.005 (0.042)	-0.064 (0.435)	0.000 (0.037)	-0.001 (0.023)
Year 2018	0.004 (0.042)	-0.079 (0.372)	-0.002 (0.037)	-0.000 (0.021)
o.Year 2019	-	-	-	-
Constant	-0.019 (0.034)	0.278 (0.288)	-0.060* (0.032)	0.006 (0.014)
Observations	209	140	119	79
Number of Countries	8	5	4	4
R-squared	0.722	0.525	0.939	0.931

Standard errors in parentheses

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

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