Public Debt Regulation in the European Union:

Poison or Panacea

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Abstract

This study will analyse to what extent the European debt regulation as outlined in the Stability and Growth Pact contributes towards sustainable economic growth. The primary focus of this paper is to see whether the deficit-debt ceilings as described in the SGP are in fact critical levels (they are not). The value of this thesis lies in the fact that it combines an extensive literature review of recent literature on the topic with an empirical study, both aimed for EU debt regulation analysis. For the empirical study, 19 OECD countries were taken in the period 1983 to 2010. The literature study yields the following results: first, debt affects economic growth only at high levels of approximately 75-80% or higher. Second, spending cuts are preferred to tax based corrections for their efficiency and their trait to have a smaller effect on output. Third, the timing of fiscal consolidation is of immeasurable importance: the state of the economy seriously influences both output and the structural deficit. Fourth, when considering spending reductions, the right mix of government expenditures targeted could in fact lead to stable debt, and a level that is allowed by EU fiscal regulation. The following can be concluded from the own empirical research: First, effects of debt on economic growth for different debt levels are not always significant but are never negative. Second, the effect of debt on the whole dataset is negligible, indicating a non-linear trend. Third, debt levels do not seem to matter much for debt levels lower than 30% of GDP. Fourth, debt levels produce a strong positive effect on economic growth starting somewhere between 30-50%, peak around 70%, and become weaker again after this. Fifth, and last, no significant effect of debt on growth exists above levels of 100%, but, if results were in fact significant, the sign of the effect is likely to be positive. All in all, there is no evidence that debt harms economic growth for levels below 70%, and debt rules do not contribute towards sustainable economic growth but tend to have a negative effect on growth instead.

Keywords: stability, growth, government, public, debt

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Table of Contents

Foreword and acknowledgements

"Economics is all about happiness", I recall my high school economics teacher say. I have always held onto that thought. It was pleasant, even comforting, to be occupying myself with a science that gave me room to ponder over and build fundamentals for this happiness. It sharpens the practice of economics with a clear direction, turns economists in some kind of doctors, who provide the tools, a suitable environment and equal chances to live a happy life. At least, that was my reading of that phrase for a long time.

Testing out this thought on fellow students and colleagues in the past years made it clear to me the 'happiness direction' was by far not shared by all. *What exactly is happiness?* was the most heard response and a very valid question indeed, for without its answer, economics could by *no means be* about a universal kind of happiness. I added the notion of utility to the discussion, a concept which I believe to be strong on the microeconomic level, but its weaknesses are soon revealed when more than one person is considered. I was disappointed by its limitations. Some praised the market for its ability to be a forum to 'obtain' happiness. Others claimed economics has nothing to say about it at all. When I felt I had figured out *my* purpose within the field of economics, I was again back to square one.

I then discovered economics is different to any kind of science. It is these kind of disagreements (on what economics is about), perception differences, and intellectual discourses which give shape to economics. It supplies the science with both its strength (a balanced result after thorough debate) and its weakness (time-consuming process and lack of efficacy). Innovation in economics is not about building new models, but finding better arguments.

So what has become of my happiness approach? For now, I have reduced it to what we know people *do not want*. To take some: people generally don't like unemployment, losing money, and giving up privileges. And this all is more likely to happen in an economy that experiences a drawback or suffers a recession (10.2 million Europeans lost their jobs since the start of the European sovereign debt crisis, a recent report by the International Labour Organisation shows[1]). Occasionally required and inevitable, a growth slowdown (and its consequences) is sometimes unnecessary and can very well be avoided. This thesis is just about that, and the synthesis of 3 years thought evolution forms its basis.

I would like to express my gratitude to Yvonne Adema for her guidance in writing this thesis. Her interesting and stimulating seminars led me to ask Yvonne to supervise me, which I am very glad she accepted. She was able to motivate me whenever necessary, and was a great guide in writing my first academic paper, of which the result lies in front of you. I owe the choice to continue in policy economics to her ability to make me enthusiastic about policy topics.

Furthermore, I would like to thank my colleague, teacher and friend Arjo Klamer, who has always supported me in my endeavours, and from whom I have learnt a great deal in the past years. He has taught me to think critically about economics as it is taught (which can be confusing at times!), and introduced me to the enriching view of cultural economics. It is because of the many conversations about our common topic of interest, the euro and the European Union, that I decided to study the Stability and Growth Pact in more depth.

I would like to thank my economics teacher Earl James at the International School Hilversum for making me enthusiastic about his subject and teaching me said phrase, which led me to continue my studies in economics, from which I get much enjoyment, just like he expected. I want to thank my friend Christiaan Wouterlood for our many discussions on economics and politics, which keeps me up pace with topical issues and always stretches my perspective. I would like to thank Remco Swart for his enjoyable company during late summer nights on a deserted cultural economics department.

[1] Refer to ILO World of Work report 2013 (http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/wcms_209607.pdf).

1. Introduction

The Stability and Growth Pact forms the very core of the agreements of the 28 EU Member States, and is aimed to guarantee the stability of the Economic and Monetary Union. Among the set rules, are the ceilings for maximum government deficit and debt: 3% and 60% of GDP respectively. If a Member State is to exceed these limits, the Excessive Deficit Procedure 'sets out criteria, schedules and deadlines for the Council to reach a decision on the existence of an excessive debt' (The Corrective Arm, 2013). In other words, the sovereign is required to bring back the deficit or debt to said levels within a certain time period, depending on the severity of the deficit/debt.

Already when the pact was conceived, it was criticized from many sides. Deadlines to bring back deficit or debt to the prescribed levels are set within a certain time frame. This means that leaders are forced to take actions to comply with these rules, regardless of the state of the economy. This is apparent in Europe of today: nearly all Member States of the European Union are subject to some kind of fiscal consolidation to bring back deficit and debt levels.[2] The problems associated with fiscal consolidation lead by a simple numeric rule are apparent: measures are not taken in response to changing economic indicators, but are designed to meet European fiscal demands.

Fiscal adjustments could take place in two ways. First, the government might decide to raise taxes, increasing tax revenue. Second, government spending might be cut. Effects on the economy, as will be shown in this paper, are drastically different.

The aim of this paper is to test the economic validity of the debt agreements as outlined in the Stability and Growth Pact. Do the disadvantages of fiscal consolidation for the sole means of reducing government debt outweigh the benefits of (temporarily) exceeding the limit? What exactly are the economic consequences of debt levels above 60% of GDP? What pains and gains are associated with excessive debt and fiscal consolidation? This paper tries to add to the existing literature in the following ways. First, the research methodology is comparable to a regression discontinuity design, by comparing observations above and below assigned thresholds

[2] As an example, the overall tax-to-GDP ratio has gone up from 38.4% to 38.8% in the EU27 area, between 2009 and 2011 (Allen and Corselli-Nordblad, 2013).

to determine causal effects (a debt-to-GDP ratio of 60%). The primary focus of this paper is hence not to determine a possible new cut-off level, but to see whether the deficit-debt ceilings as described in the SGP are in fact critical levels (they are not). Second, the value of this thesis lies in the fact that it combines an extensive literature review of recent literature on the topic with an empirical study, both aimed for EU debt regulation analysis. Third, the thesis will show how the SGP might have arisen from political motivations, rather than economic ones. Following from this, finally, the paper will incorporate a normative element, by arguing that strict SGP compliance might not be in the best interest of the economy on a national or supranational level. *How, if at all, does compliance with a maximum debt to GDP ratio 60% of GDP as outlined in the Stability and Growth Pact affect economic growth?* will be the central question of this thesis.

The paper has the following structure. After Section 1 (the introduction), Section 2 will provide an extensive literature review and consists of two main parts. In the first part the different channels through which debt can affect growth will be discussed. As a second step, past literature on fiscal consolidation outlining costs and gains of fiscal measures will be examined, as well as the fluctuation of fiscal multipliers during different states of the economy. Section 3 forms the empirics part of this paper. A policy recommendation for Europe is given in Section 4. Section 5 is the conclusion.

2. Literature review: The costs of high debts and deficits

The debt-deficit agreements following from the Stability and Growth Pact have received increased attention in light of the 2008-2012 financial crisis and the current European sovereign debt crisis (roughly starting in 2010). The SGP, in place since July 1998, gained a more prominent place on political agendas in the previous years. In fact, targeting deficits and debt has become one of the methods to prevent the current crisis from worsening. The academic literature has indicated several empirically supported risks associated with a disproportionate deficit or debt.

Nearly all studies find a negative effect of debt on GDP growth, but the debt level and size of the effect differs across the studies. Afonso and Jalles (2011) find

that countries with initial debt-to-GDP of 90% will find a decline of 0.2% in their economic growth rates for every additional 10 percentage points increase in the debt ratio. The same study suggests, on the other hand, that a 10 percentage points increase in the ratio for countries with initial debt of 30% will experience a positive effect on growth: 0.1 (with a threshold at 59%, beyond this, a higher debt level adversely affects growth).

Kumar and Woo (2010) find that, on average, a 10 percentage point increase in the debt-to-GDP ratio leads to a negative growth of 0.2% annually. The results show an inverse relationship between initial debt and subsequent growth. Debt levels of 90% or higher seem to have a significant negative effect on growth. This value lies close to the outcome of a study performed by Cecchetti et al. (2011), which found a turning point of 85%, and Checherita and Rother (2010), claiming a proven turning point of debt of 90-100% of GDP. Reinhart and Rogoff (2010) showed that, by taking many developed countries over a time period of about 200 years, average turning points lie around 90%.[3] Pattillo et al. (2004) find that, finally, on average, "at high levels of debt, there is a large negative impact: on average, the results imply that doubling debt from any initial debt level at or above the threshold[4] will reduce per capita growth by about 1 percentage point" (p. 16).

2.1 Channels

Discovering *how* debt affects growth requires going a bit deeper in the matter. What are the mechanism through which a high debt could influence economic growth? The following channels could be identified. Not surprisingly, as will be shown, the literature is not decisive on the direction of effects (if at all they occur) and the magnitude of the relationships. A comprehensive summary of study results can be found in Appendix A.

[3] We have to put a side note concerning the reliability of this result. As the reader might be aware, an April 2013 paper by Herndon, Ash and Pollin showed an error in the Reinhart and Rogoff dataset. Although Reinhart and Rogoff claimed the conclusion as stated in this paper remains the same, the Herndon study contradicts the claim that Reinhart and Rogoff identified a stylized fact (Herdon et al., 2013). We therefore have to be careful with interpreting the main conclusion of this paper.

[4] Debt on growth at around 65 percent of exports.

2.1.1. Interest rates (private and sovereign)

Higher debt is likely to be associated with higher sovereign risk premiums by investors (Baum et al., 2012). This effect might trickle down in the economy, increasing private real interest rates and leading to a decrease in private spending growth (Elmendorf and Mankiw, 1998). Indeed, sovereign yield spreads might be enlarged by high debt (Attinasi et al. 2009; Cogono et al. 2003) and eventually lead to higher sovereign long-term real interest rates (Ardagna et al. 2004, Laubach 2009). The effect magnitude of a higher public debt ratio on interest rates found in the studies, however, varies. An ECB study by Checherita and Rother (2010) suggests that one percentage point of acceleration in the change of public debt ratio account for a 7 basis point increase in sovereign long-term real interest rates (and 11 basis points for nominal rates). Engen and Hubbard (2005) estimate that for every percentage point increase in the debt to GDP ratio, real interest rates increase by 2.4 basis points. Both aforementioned papers do not, however, directly regress those higher interest rates on economic growth. For this, we look at a study on 20 industrialised economies between 1965 and 1994. D'Adda and Scorcu (1997) found that for every percentage point increase in the real interest rate, economic growth falls by 1/5 of a percentage point in the average growth rate (a more or less linear effect). However, we have to be cautious when interpreting these results. Although a longitudinal research method is used enabling us to say something about causation, it is always extremely difficult to isolate interest rate effects from other factors affecting economic growth. In addition, as Hubbard (2012) points out, several surveys on the economy of the US have evaluated the empirical literature on the relationship between government debt and interest rates, but not even for this country a universal consensus was reached.

2.1.2. Private saving and investment

Levels of saving and investment in an economy are affected by an excessive debt level. Most importantly, a budget deficit has to be financed somehow. When savings are used for this, the more efficient option -productive investment- is foregone. How this works is best illustrated using a simple economic model of an open economy.

More specifically, we can state that, in an open economy:

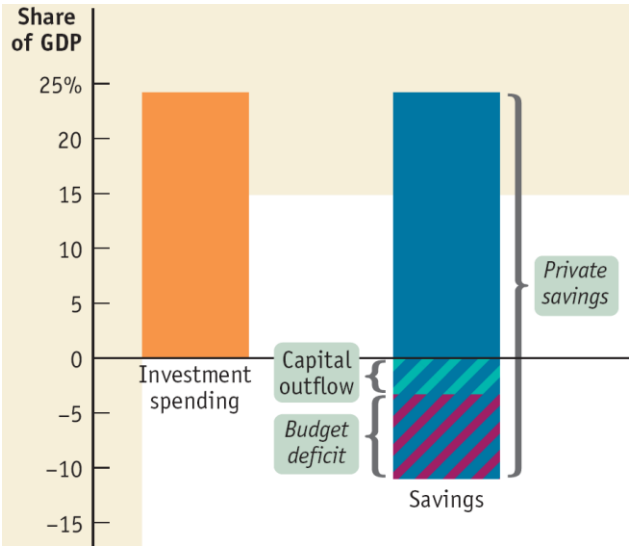
$$I = S + (T - G) + (M - X) \qquad (1)$$

where *I* represents investment, *S* savings, *T* government revenue through taxation, *G* government spending, *M* imports, and *X* exports. The equation can also be rewritten as:

$$I = S_{Private} + S_{Government} + (IM - X) = S_{national} + CI \qquad (2)$$

where *S* again represents savings and *CI* capital inflow.

Figure 1: Japan Investment Spending in 2003



Source: Krugman & Wells (2006)

Let us look at actual investment spending figures of Japan, 2003 (Figure 1). Investment spending equalled 24.2% of GDP. To finance the (high) budget deficit (7.9% of GDP), a part of total private savings (38.3% of GDP) is absorbed and off-set. A capital outflow (or negative capital inflow when following the identity) further absorbs private spending, which could alternatively have been used for investment.

This effect is present in the empirics. Checherita and Rother (2010) find a turning point between 82% and 91% of debt to GDP above which the private sector seems to start dissaving. The study suggests that households might anticipate inflation and/or financial market distress, as well that capital might flee the country. After all,

with a possibility of inflation ahead, the value of money is more certain today than it is tomorrow. Although the results of the Checherita and Rother (2010) study are robust, further evidence in the literature supporting this effect is hard to find. A 1989 study of Modigliani and others shows a small yet significant effect of higher government debt levels on lower private saving. Schclarek (2004), on the other hand, performed a study on 83 countries in the period 1970-2002, but found no relation between high debt and private savings.

Following economic theory, dissaving with these high debt levels seems to contradict Ricardian equivalence, which holds that consumers internalise the government budget constraint. In this situation, it would mean that with high government debt, private savings would increase, as private agents anticipate higher future taxes to finance the government deficit.

Although the savings rate can be useful in telling us something about economic growth, the effect of high government debt on *private investment* is even more interesting for the analysis. Channels through which private investment is affected, vary. Most importantly, a high deficit can be financed through borrowing on the (internal) bond market. The government then directly competes with private agents for domestic savings. With an increasing demand for these domestic savings, interest rates rise (see previous section). Opportunity costs of saving therefore decrease, delaying private investment. When domestic investors start to borrow on foreign capital markets, government borrowing has effectively crowded out private investment. This finding is empirically supported in Salotti and Trecroci (2012).

There is general consensus that government borrowing raises real interest rates. Barro (1974) describes that "shifts between debt and tax finance for a given amount of public expenditure would have no first-order effect on the real interest rate, volume of private investment, etc." (as cited in Barro, 1979, p. 940). Following from this, it proves useful to look at an overview of past research on Ricardian equivalence and private investment. After all, when the equivalence holds, no private investments effects are found. Wheeler (1999) analysed US data from 1980 and 1995 and found ample evidence in support of the equivalence, while influential work by Elmendorf and Mankiw (1998) found inconclusive results. An empirical study by Gochoco (1990), on the other hand, does provide evidence of a private investment crowding out effect, but limits the analysis to less developed countries. A 1998 meta-analysis of 27 studies testing the Ricardian equivalence found strong evidence of the proposition's

falsity (Stanley, 1998). Adding more recent studies to the sample renders results similar to those in the Stanley meta-analysis (Wroblowsky, 2007). The effects of higher government debt on private saving and investment are therefore not always too decisive, but we might say that the 'interest rate effect' as described above can be regarded a stylised fact. However, studies that show a causal effect, results suggest government debt and private saving/investment are inversely related.

2.1.3. Total Factor Productivity and physical capital accumulation

The effect of high government debt on total factor productivity (TFP) and capital accumulation is not as apparent as it is for the previously described channels. For this, we have to look into the effectiveness of government policy. Pattillo et al. (2004) describe how governments might be less willing to undertake policy reforms, if there is a possibility that benefits of a higher output would flow to foreign creditors. An uncertain policy direction might hurt efficiency of investment, and with that, productivity growth. This process is also described in Agénor and Montiel (1995). It is important to stress that a negative effect of debt on the *growth* of TFP has been found, not on absolute values of TFP itself.

Pattillo et al. (2004) analysed 61 developing countries in the period 1969-98. Doubling debt, the study shows, will lead to a decline in total factor productivity (TFP) of about 1 percentage point. Checherita and Rother (2010) identify a turning point of 100% debt-to-GDP, above which debt affects TFP negatively. Salotti and Trecroci (2012), finally, find that a 30% difference in the debt/GDP ratio can cause a productivity growth deceleration of 0.26%.[5]

Capital accumulation is a driver of growth as well. Being a measure for 'the creation of wealth' capital accumulation directly follows from production, and is hence affected by total factor productivity. Pattillo et al. (2004) estimate that, in analysing growth, TFP accounts for two third as a driver for growth, with the remaining driver being capital accumulation. Doubling debt (when initial debt is 65% with respect to GDP or higher), the study shows, will decelerate physical accumulation growth with 1 percentage point. On the other hand, Schclarek (2004) finds only limited evidence on the relationship between external debt and total factor

[5] The average growth rate in the sample is 2.23%.

productivity growth, and no relation between high debt and capital accumulation.

The results of the literature review analysing the different channels, are summarised in Table A1, Appendix A.

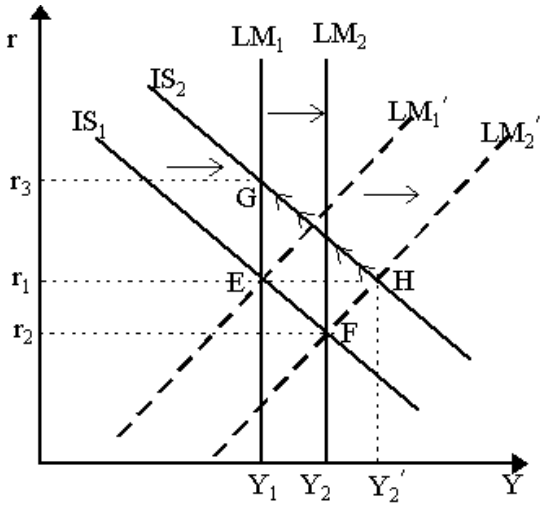
2.2. Fiscal consolidation: costs and gains

How, if at all, would fiscal consolidation affect output? This question clearly points towards an everlasting debate on economic theory, with Keynesians and monetarists as its main players. These two schools of thought have been highly influential in government policy, and in order to understand today's policy decisions, it is important to provide a background on underlying policy motivations.

2.2.1. Generally accepted theories in economics

The monetarist view of a fiscal stimulus/contraction is best shown in the IS-LM model. Figure 2 shows the Monetarist Transmission Mechanism at work.

Figure 2: Monetarist Transmission Mechanism



Source: HETwebsite

The *IS* curve is derived from the Keynesian output model and can be written as:

$$Y = C\left(Y - T(Y)\right) + I(r) + G + NX(Y) \qquad (3)$$

where *Y* represents income, *C*(*Y*-*T*(*Y*)) represents consumer spending (as an increasing function of disposable income), *I*(*r*) represents investment (as a decreasing function of the real interest rate *r*), *G* is government spending, and *NX*(*Y*) represents exports minus imports, as a decreasing function of income Y, (Hicks, 1937).

In addition, the LM curve is defined as:

$$\frac{M}{P} = L(i, Y) \tag{4}$$

where money supply is represented by *M*/*P*, with price level *P*, and *L* representing money demand, defined as a function of interest rate *i*, and real income *Y*.

The elasticity (or, rather, inelasticity) of the *LM* curve is what essentially divides the debate on the effectiveness of fiscal policy. The *LM* curve by monetarists, and later neo-Keynesians known for the neo-classical synthesis[6], is often defined as a vertical, inelastic curve[7]. We find this in the work of neo-Keynesians Modigliani (1977) and Tobin (1970), who characterise monetarist Friedman's *LM* interpretation to be inelastic.[8][9] *LM* inelasticity is a view often held by monetarists today. Suppose, now, the government increases spending (*G*). As can be seen from equation 3, this will shift the *IS* curve to the right. Output, however, won't be changed and remains Y_1, as the equilibrium will move from point *E* to point *G*. The sole effect of increased government spending would therefore be a higher interest rate. In effect, for fiscal policy to be effective, a shift of the money supply is required. Equation 4 shows how the real money supply (*M*/*P*) is reflected in the *LM* curve.

LM_1' represents the 'regular' *LM*, being positively sloped. Now, when the government increases spending and the *IS* curve is shifted to the right, output moves from Y_1 to Y_2, and interest rate *r* rises somewhat, but not as much as under in the monetarist vertical LM assumption.

Showing the Keynesian and monetarist economic theory serves two purposes. First, and most importantly, it shows the possible underlying motivations of certain

[6] Neo-Keynesians started with works of Keynes and synthesised it with neo-classical models.
[7] Neo-Keynesians perceive the *LM* curve to be inelastic in the long run only.
[8] Interestingly, 'founder' of monetarism Milton Friedman did allow for LM elasticity in his early work (Friedman, 1956), but this view was not shared by many later monetarists.
[9] Elasticity of the LM curve is determined by demand responsiveness to the interest rate: the larger the effect of interest rate differences on demand, the more elastic the LM curve.

policy measures. Taking a monetarist or Keynesian stance in the matter of fiscal policy could therefore be of great importance in determining certain policy moves. Second, studying the two discordant theories we learn it is impossible to devise one clear stylised fact of how higher/lower government expenditure affects output. For that, it is better to turn to empirics.

This paper is not the forum to discuss the monetarist or Keynesian argument validity. Likewise, it is not the place to identify past European policy-making and to fit it in either one of the schools of thought. Based solely on the just explained economic theory (which are both accepted theories in economic thinking), it would therefore not be in order to make any normative statements on what is considered 'right or wrong' economic policy. The intention of the following section on the empirics of fiscal consolidation is therefore, again, not to support any of the two theories, but to make predictions of future fiscal consolidation based on past experiences.

2.2.2. Past empirics on fiscal consolidation

Alesina et al. (2012) performed an extensive study on the effects of fiscal consolidation on output, using a sample of 15 OECD countries, and associated episodes identified in Devries et al. (2011). The data, which runs from the year 1978 to 2009, provides a solid foundation to evaluate the effects of either spending cuts and/or tax-based adjustments. The research shows that tax-based corrections produce "deep and long lasting recessions" (p. 26) while spending cuts are only associated with very mild and short-lived recessions, and sometimes with no recession whatsoever. Some standard neoclassical reasons explaining this difference could be provided, amongst which the distortionary supply-side effects of taxation or (on the other hand) wealth effects of expectations of lower taxes when spending is cut (Alesina et al., 2012). Spending-based consolidations could in fact be favourable, as long as they go together with supply-side reforms, market liberalization, and/or wage modernization (Alesina and Ardagna, 1998; Perotti, 2012).

Where Alesina et al. (2012) do not present an absolute effect of fiscal consolidation (spending or tax based) on output, Coenen et al. (2008), when analysing a permanent reduction in debt-to-GDP from 70% to 60% using a transfer-based

consolidation[10], find a long-run negative effect on output.[11] The main reason behind this phenomenon, is that lower interest payments on debt allow for higher fiscal transfer to households, and through an income effect decreases the labour supply. A falling marginal product of capital will lead to lower investment, consequently decreasing output in the long run (Coenen et al., 2008). However, this analysis is performed using a two-country open-economy model[12], rather than using empirics. The empirical analysis of Romer and Romer (2010) shows for the United States, that for every 1 percent GDP exogenous tax increase, output declines by almost 3 percent.

This strong output effect of tax increases could potentially be more harmful. De Grauwe and Ji (2013) found that government bond markets in the eurozone are "more susceptible to self-fulfilling liquidity crises than stand-alone countries" (pp. 20-21). The study suggests the existence of multiple equilibria: as countries are hit by liquidity crises, they are forced [by fiscal rules] to comply with strong austerity, moving the economy into a recession, greatly reducing the effectiveness of bringing down debt.

It is hard to find more studies that indicate a relationship in numerical terms, i.e., giving a precise effect of an exogenous tax increase on GDP. The output effect is determined by 1) the size of the tax correction (most likely non-linear), 2) the kind of tax considered, and 3) the economic climate at the time of the tax correction. Kim (1998) shows, for example, how differences in tax systems account for some 30% of the discrepancies in growth rates. As an exogenous factor, inflation could be a factor influencing the size of the output effect.

When determining the efficacy of fiscal consolidation in improving the structural deficit, there are two main factors at play: timing and the instrument mix. As will be explained in the next section, a high fiscal multiplier could lead to (substantial) output losses. Fiscal multipliers are usually higher in economic downturns, delaying consolidation could reduce negative effects on output. Rawdanowicz (2012) therefore stresses to select reasonable fiscal targets consistent with market conditions. This will hopefully avoid "hysteresis and adverse market reactions" (p. 13). A recent OECD report by Cournède et al. (2013) shows the

[10] A mix of reducing transfers, government spending, raising consumption tax and labour income taxes.
[11] Coenen et al. (2008) estimate a possible increase of 0.3% in fiscal transfer to households, thanks to lower interest payments with a lower debt.
[12] The New Area-Wide Model (NAWM), developed at the European Central Bank.

importance of choosing the right fiscal instruments, as to minimise adverse output effects. Specifically, the report ranks government expenditures from those favourable to least beneficial in terms of being consistent with "growth, equity and global-rebalancing objectives". In addition, it projects that twenty OECD countries would be able to manage "to keep debt durably stable at 60% [of GDP] by relying only on well-ranked instruments" (p. 7).[13] In conclusion, the literature suggests that by timing well and using an efficient policy mix, output losses could be decreased, while at the same time complying with (EU) fiscal targets.

2.2.3. Fiscal multiplier effects

Exogenous spending multipliers look at the effect on national income caused by an autonomous change in spending, such as private investment spending, government and consumer spending, or foreign spending on exports. Whether fiscal consolidation is actually effective in improving the debt to GDP ratio, depends heavily on the fiscal multiplier. An extensive study by Guichard et al. (2007) on the effectiveness of fiscal consolidation in improving the structural balance, shows a modest debt-to-GDP gain with most fiscal consolidation (improving the structural balance by an average of 2.8%). It is hard from these results, though, to predict output effects for specific countries as multipliers differ greatly across economies, especially as the timing of a fiscal shock is an important determinant of effects on national income. Auerbach and Gorodnichenko (2010) estimate that fiscal multipliers in recessions and expansions differ greatly, with multipliers being much larger recessions (this finding is confirmed by Baum et al. (2012) and Callegari et al. (2012)). Specifically, historical experience in the US economy points to a government spending multiplier of between 0 and 0.5 in expansions, and between 1 and 1.5 in recessions (Auerbach and Gorodnichenko, 2010, p. 19). In a later paper, this was again confirmed for a larger sample of OECD countries (Auerbach and Gorodnichenko, 2011). The OECD (2010) estimated that typical short run multipliers lie between 0.5 and 1. Next to the recession-expansion multiplier difference, output effects of fiscal shocks were estimated to be smaller for higher levels of debt: "when the level of debt is equal to zero… a one percent increase in government spending

[13] A possible drawback of this study is that it does not involve social externalities

raises output by 0.73 percent over the course of three years. If the level of debt is 100 percent of GDP… then output response is just 0.09 percent" (p. 18).[14]

It is a mistake to think that fiscal consolidation always improves the debt ratio. Eyraud and Weber (2013) of the IMF have produced a paper, in which they analyse European debt ratio targets and evaluated them on their effectiveness in reducing debt to GDP quotes. They find that 1) fiscal multipliers are often underestimated, and as fiscal consolidation often takes place in a depressed economic environment, fiscal tightening might initially raise the debt ratio, 2) setting the debt ratio as a fiscal target is risky, as governments might be incentivised to focus on short-term behaviour of the debt ratio, 3) consolidation packages could be modified to minimise negative output effects or a rising debt ratio (carefully selecting sectors for spending cuts as to reduce output effects, holding off cuts till the economy has regained strength). The findings of the IMF paper originate from 'debt dynamic formulas' rather than statistics. However, as stated earlier, the conclusions are in line with empirics based papers (amongst which Auerbach and Gorodnichenk, 2011; Baum et al., 2012).

A fiscal multiplier of greater than 1 could, in times of fiscal consolidation, be unfavourable for different reasons. First, if GDP levels fall and debt remains constant, the debt ratio will in fact rise. Second, to illustrate, with a multiplier greater than 1, fiscal consolidation of, say, 5 monetary units, will cause a more than equivalent fall in GDP. Third, in case output decreases, the cyclical (temporary) deficit will rise. In turn, this will cause government revenues from taxation to drop and expenditures on social benefits to rise. This might move the economy in a recession, raising the structural deficit. Or, to use the words of De Grauwe and Ji (2013): "the story of the eurozone is a story of self-fulfilling debt crises…" (p. 21).

2.2.4. Discussion of the literature

What conclusions could we draw from the literature research? For a clear overview, it is best to review the individual channels through which debt can influence economic growth, and compare these results to the costs and gains of fiscal consolidation.

[14] These conclusions have been reached by using a smooth transition autoregressive model, in addition allowing for differential contemporaneous responses to structural shocks (STVAR model).

It is clear that studies seem to support the finding that the effect of debt on GDP is non-linear and, more specifically, is only significant for high levels of debt. High levels are often defined to be 90% of GDP of higher (Afonso and Jalles, 2010; Cechetti et al., 2011; Checherita and Rother, 2010; Kumar and Woo, 2010; Reinhart and Rogoff, 2010). Not many studies included absolute effects of debt on growth. Afonso and Jalles (2010), though, did this quite extensively: above a ratio of 90%, every 10 percent point increase will lead to output decline of 0.2%. Studies that did suggest a negative relationship between debt and growth for *low* debt levels (i.e. lower than 50), were for emerging country samples only (Pattillo et al., 2011; Reinhart and Rogoff, 2010). There was not one study that did not confirm a relationship between debt and growth. The lowest threshold (for advanced economies) found in the literature was 70-80%[15] (Checherita and Rother, 2010), the highest 90% (Kumar and Woo, 2010; Reinhart and Rogoff, 2010). We could safely say that debt is unlikely to influence growth negatively below 70% of GDP, and most likely not below an even higher threshold. For low levels of debt, the short-run impact could be positive as well, as studies of Afonso and Jalles (2010) and Baum et al. (2012) show us. However, the long run costs are not taken into account in this study, and they are very likely to be negative (as other studies suggest).

There were not many studies evaluating the different channels separately. However, the literature always (if not indecisive) points to negative relationships between high debt and the interest rate, private saving and investment, and total factor productivity. For interest rates, Checherita and Rother (2010) was the only study consulted that yielded a significant negative result (one percentage point of acceleration in the change of public debt ratio account for a 7 basis point increase in sovereign long-term real interest rate). Two studies found a negative effect of the debt ratio on private saving and/or investment (Checherita and Rother, 2010; Modigliani et al., 1989), while one report did not find a relationship (Schclarek, 2004). For total factor productivity, Checherita and Rother (2010) found a turning point in debt/GDP of around 100%. It is hard to compare the different studies, as the authors apply different definitions (and some studies find turning points, while others investigate absolute effects). Clear is that high public debt is likely to affect growth negatively

[15] This result was obtained using a certain confidence interval specification; this explains the differing debt level which is stated in Appendix A1.

(Pattillo et al., 2004; Salotti and Trecroci, 2012). Out of the four studies considered, only Schclarek (2004) found limited evidence of public debt on TFP.

So, a high public debt affects growth, almost certainly above a debt level of 90% of GDP. However, EU fiscal regulations prescribe a debt level of no more than 60% of GDP. What could we say about policy implications for EU countries? And what are associated costs? Let us first look at the results of the literature research on tax changes. Different results support a strong negative effect of tax increases on output. Alesina et al. (2012) showed that tax-based corrections could lead to "deep and long lasting recessions". While these terms contain a degree of subjectivity, literature also provides some more concrete numerical relationships. Romer and Romer (2010) show (for the US) for every 1 percent GDP exogenous tax increase, output declines by almost 3 percent. Coenen et al. (2008) argue how a decrease in the debt ratio from 70% to 60% will lead to a long-run negative effect on output. This is quite an important result: it shows that decreasing the debt ratio with 10 percentage points will generate a harmful output effect. No study, on the other hand, proved a negative effect of having debt to GDP of 70% compared to 60% (only, naturally, the buffer to a 'critical threshold' has become smaller[16]).

Where the literature is quite clear on the negative output effect of tax increases, spending cuts *are not exclusively* harmful to economic growth. Alesina et al. (2012) identify mild and short-lived recessions at the most after spending cuts. That a decrease in government expenditure reduces output (assuming no crowding-in effects) follows from the basic Keynesian expenditure equation. Again, the size of the effect is determined by factors such as the size of the spending cut, the kind of spending cut (on what sector in the economy) and the state of the economy. Therefore it is hard to make direct predictions of output effects of budget cuts. Yet, based on the literature, we could draw several conclusions. First, the effect of spending corrections on output is likely to be smaller compared to tax changes. Reasons for this could be that crowding in effects of the private sector might occur when government spending is cut. As tax increases directly decrease disposable income, there is a general welfare loss. Higher government revenues are used to finance the deficit, so there will be no redistribution through the economy. Second, compared to tax corrections, spending cuts will not lead to deadweight losses, as is unavoidably the case with ad valorem

[16] We have to always keep in mind that in certain cases this might alarm financial markets, giving rise to risk premiums.

taxation. Third, tax corrections are less desirable in countries that do not have a very efficient taxation system. Although this might not be the case for many Western Europe, tax systems in some Eastern European countries might not be as efficient, and spending cuts could be the preferred option. Fourth, and last, budget reductions could create a precedent and provide manoeuvring space for healthy economic reform[17], such as necessary labour market reforms.

Although budget cuts might be preferred to tax corrections in improving structural deficits, the results of the studied literature show us output outcomes could still be unpredictable. The research on fiscal multipliers explains why. Timing of fiscal consolidation (whether tax corrections or government cuts) shows to be of much importance. Fiscal multipliers have proven to be significantly higher in times of economic downturns (Auerbach and Gorodnichenko, 2010; Baum et al., 2012; Callegari et al., 2012). As Eyraud and Weber (2013) point out, fiscal multipliers of larger than 1 could initially raise the debt ratio. This would mean that, next to an output decline, the consolidation procedure failed in the short run. Especially this short run is what matters, as the EU evaluates government finances with a one or two-year outlook.

Based on the investigated literature, we could draw four conclusions. The conclusions are preliminary as, after all, the empirical section of this paper will see if these findings are supported by own analysis. First, debt affects economic growth only at high levels of approximately 75-80% or higher. Second, spending cuts are preferred to tax based corrections for their efficiency and their trait to have a smaller effect on output. Third, the timing of fiscal consolidation is of immeasurable importance: the state of the economy seriously influences both output and the structural deficit. Fourth, when considering spending reductions, the study of Cournède et al. (2013) shows that the right mix of government expenditures targeted could in fact lead to stable debt, and a level that is allowed by EU fiscal regulation. As Ramey (2011) shows, timing and targeting is everything.

[17] Often serving a political goal (and not necessarily an economic one)

3. Empirical research

3.1. Data

For this study, 19 OECD member countries were taken, in the time period 1983 through 2010.[18] The preferred approach was initially to take European Union Member States for the analysis only, but data availability, especially for public debt levels, were too limited. This would have yielded too little data points to conduct thorough and reliable research. The time period was chosen to include both periods before and after conception of the original Stability and Growth Pact entering into force on 1 July 1998. In addition, economies change: going much further back would have made it necessary to control for many more factors, such as economic structure, HDI and policy environment. After all, the aim of the research is to tell something about the situation today, and to empirically support/advise against certain policy moves from an economic point of view.

OECD countries also outside the European Union were also included in the analysis. This choice could be justified in the following ways: first, Europe's main economies are represented in the OECD. This enables us to use one data source for public debts (except for France and the United Kingdom) for nearly all countries. Second, most countries in the OECD, like in the European Union, have about equally high levels of national income per capita and a high Human Development Index. Lastly, debt/deficit criteria rules for the European Union are not specific for these economies. In other words, they have not be designed to fit the EU economies explicitly, so high public debt is expected to have roughly the same effect in every country. In the model, there will be a correction for country-specific effects as to ensure an equally comparable analysis.

A variety of databases have been consulted. GDP growth levels and public debt for all countries except for France and the UK have been retrieved from the OECD World Economic Outlook, updated June 2013. For France and the United Kingdom, public debt levels were not available for the required years. For this, the database of the International Monetary Fund, the World Economic Outlook Database

[18] See Appendix B, section B2 for a list of countries included in the study

April 2013 was consulted. This was the latest edition available at the time of writing the paper.

The data for the first four control variables, investment spending, gross national savings, inflation, exports respectively, were all retrieved from the IMF database, for the reasons that not all of these control variables were (in such depth) available from the OECD website. Although GDP term definition of OECD and IMF slightly differ, GDP growth numbers were nearly equal in both datasets, allowing the use of IMF data for control variables.

Finally, not the IMF nor the OECD economic outlooks were able to provide statistics on consumption expenditure. Deemed an important determinant of economic growth, this is an essential control variable. The World Bank dataset (June 2013) was consulted to provide the necessary statistics.

3.2. Methodology

The basic estimation equation is as follows:

$$Y_{it} = \alpha + \beta D_{it} + \gamma_1 I_{it} + \gamma_2 S_{it} + \gamma_3 \pi_{it} + \gamma_4 E_{it} + \gamma_5 C_{it} + \mu_i + \nu_t + \varepsilon_{it} \qquad (5)$$

Where:

Y_{it}: Economic growth in percentages as measured in GDP, where *t* takes annual values

α: A constant term

βD_{it}: Debt level as a percentage of GDP, with constant β to be computed

I_{it}: Total investment as a percentage of GDP

S_{it}: Total gross national savings, as a percentage of GDP

π_{it}: Inflation in percentage change compared to previous year *t*, as measured in average consumer prices

E_{it}: Volume of exports of goods and services, percentage change

C_{it}: Final consumption expenditure, annual percentage growth

μ_i: Country fixed effects

ν_t: Time fixed effects

ε_{it}: The error term

For the control variables, γ_k are the parameters which will be estimated. A fixed effects Ordinary Least Square regression will be used.

By including the 5 control variables, the most important determinants of economic growth have been taken in the analysis. Where possible, percentages of GDP have been taken to enable easy comparison.

Year dummies (ν_t) are included in the analysis to control for shocks applicable to all countries, such as common economic downturns, the introduction of the euro, the shared interest rate regime after the introduction for these countries, and monetary expansions or contractions. Dummies for country fixed effects (μ_i) capture economic and social features specific for each country, which remain stable over time.

3.3. Results

Before the results are discussed, it is necessary to state the econometrics, after running initial regressions, have slightly changed. As can be seen from the previous section, the basic estimation equation showed the inclusion of S_{it}, or total gross national savings (as percentage of GDP). After running the first round of regressions, the savings variable turned out to be systematically insignificant, also when dummies were excluded. Therefore it was decided to use a bivariate correlation matrix to see to what extent included variables correlate with each other. The output can be found in Appendix C. The correlation between variables investment and savings turned out to be high (0.587) and also highly significant (at the 1% level). Running two regressions, one including investment and excluding savings and vice versa, showed that by excluding savings from the analysis, all independent variables became significant. This was still not the case when savings was included but investment was not.

The approach of the regression analysis is as follows. First, the direct effect with control variables were tested. By adding dummy variables for countries and time dummies separately, we can analyse the impact of country specific and time fixed effects (and see how it makes the included variables more or less significant). As a last test, the data will be filtered on the severity of debt: the effect of different debt levels, below and above the debt ratio of 60% (as is the EU requirement). Results of

the regression of debt on GDP will be discussed first, later the effects of the control variables will also be analysed.

Let us first take a look at the full set of data, where we separate between results of regressions with no dummies, time fixed dummies separately, country specific effects separately, and both dummies combined. The results are presented in Table 1.

Table 1: Effect of debt on growth. Full set, with controls, separate dummies

Unstandardized Coefficient β	No dummies	Time fixed	Country specific	Both dummies included
Debt	-0.003	-0.004**	0.002	0.006*
	(0.002)	(0.002)	(0.004)	(0.071)
Inflation	-0.022***	-0.027***	-0.016***	-0.030***
	(0.005)	(0.005)	(0.006)	(0.006)
Exports	0.118***	0.073***	0.116***	0.063***
	(0.008)	(0.009)	(0.008)	(0.009)
Consumer exp.	0.811***	0.745***	0.797**	0.714***
	(0.028)	(0.027)	(0.029)	(0.027)
Investment	0.037**	0.040***	0.069***	0.043*
	(0.015)	(0.013)	(0.025)	(0.024)
# Observations	560	560	560	560

* : Significant P ≤ 0.1 (2-tailed)

** : Significant P ≤ 0.05 (2-tailed)

*** : Significant P ≤ 0.01 (2-tailed)

Standard errors are shown in parentheses

When no dummies are included, the effect of growth is negative, but the effect is almost negligible. In addition, the relationship is not significant. So, without adding dummies, for the full dataset, there is no proven effect of debt on GDP growth. Adding time fixed effects to the regression changes this conclusion. We observe a comparable negative effect on growth but the result, however, is now significant. The analysis includes shocks applicable to all countries so similarities in exogenous shocks are, by including the time dummy, not specific for one country, but related to time. When looking at country specific effects only, the effect of debt on growth becomes highly insignificant. In other words, characteristics differ greatly across

countries. The discussion section will provide economic reasoning for this observation.

When both dummies are included, we arrive at a small positive (0.006) and significant result (at the 10% significance level). The fact that the result is now significant, indicates that including both dummies has been successful in obtaining a positive result for the effect of debt on growth. So, when looking at the full dataset, with control and dummy variables included, we can reject the null hypothesis of no effect on growth. Still, the effect is very small. On average, for every 10 percentage point of increase in the debt ratio, economic growth is enhanced by 6/10 basis point (0.06 percentage point).

In the full dataset, all control variables turn out to be significant, at the 5% level (and almost always at the 1% significance level). The inclusion of these particular control variables has hence been successful. Inflation has a stable negative effect on growth and does not seem to differ much with or without the inclusion of the dummy variables. Exports clearly fluctuate to an extent that we cannot find signs of linearity in the results. The effect is also quite strong: for every 10 percent increase in exports, growth is increased by 1.18 percentage point. Using economic reasoning, however, it is unlikely that exports on itself have such a strong effect on economic growth, but the relationship is more likely to take place in the opposite direction. The effect of consumer expenditure on economic growth is quite large and stable regardless of the inclusion of dummies. Total gross investment in an economy does seem to have an effect on the rate of economic growth, though the effect is quite small, yet stable in the different datasets.

Table 2 shows the effect of debt on growth for low levels of debt. For debt levels lower than 30% no significant effect was proven. This is different when higher levels are also included: when debt levels between 30-50% are taken in the analysis, the result becomes significant (at the 1% level). This is also the case for the results of the inclusion of debt levels up to 80% of GDP.

Table 2: Upper bound low debt levels

Unstandardized Coefficient β	Less than 30	Less than 50	Less than 60	Less than 70	Less than 80
Debt†	0.048	0.031***	0.024***	0.022***	0.020***
	(0.030)	(0.012)	(0.008)	(0.007)	(0.006)
Inflation	-0.099***	-0.042**	-0.045***	-0.033***	-0.033***
	(0.019)	(0.008)	(0.007)	(0.006)	(0.006)
Exports	0.088***	0.084***	0.065***	0.055***	0.055***
	(0.024)	(0.014)	(0.012)	(0.010)	(0.010)
Consumer exp.	0.727***	0.686***	0.709***	0.717***	0.719***
	(0.054)	(0.033)	(0.031)	(0.030)	(0.029)
Investment	0.026	0.054*	0.044*	0.042*	0.038
	(0.050)	(0.030)	(0.027)	(0.025)	(0.025)
# Observations	143	333	419	461	480

† : All debt levels as a percentage of GDP

* : Significant P ≤ 0.1 (2-tailed)

** : Significant P ≤ 0.05 (2-tailed)

*** : Significant P ≤ 0.01 (2-tailed)

Standard errors are shown in parentheses

The size of the effect debt on growth is relatively constant, though diminishing a little in a linear fashion (with a coefficient of 0.031 for debt levels up to 50% of GDP, and 0.020 up to 80% of GDP). On average, for every 10 percentage point increase in the debt to GDP ratio for all significant effects, economic growth is enhanced by 0.24 percentage point. The effects turn out to be highly significant, even at the 1% level.

The effect of the control variable inflation on economic growth is stronger in upper bound low debt level datasets than it is in the total dataset. It could be the case that the effect of inflation is more severe in mildly indebted countries. However, it is hard to find economic theory to support this. The fact that the number of observations (mostly in the "less than 30" dataset) is much lower than in the full dataset (560 to 143) could also account for this. With every reduction in the number of observations, it becomes harder to determine the exact effect size of every predictor variable. This conjecture is supported by the fact that the coefficients of all consistently significant control variables (total gross investment is the only exception) are smaller in the "less than 80" dataset compared to "less than 30" data points (480 to 143).

Yet, could we think of any reason, other than from a statistical point of view, why the effect size of all significant predictor variables on economic growth becomes smaller with higher debt levels? It could be the case that, with higher debt levels, other forces comes into play that affect growth more intensely. What we can conclude from the analysis of the control variables is that there is no 'trade off' amongst the control variables (meaning that with higher debt levels one control variable will have a larger effect on growth while another starts to have a smaller effect). On the other hand, we might conclude from the results that the effects of exports and consumer expenditure (major determinants of output) become smaller with higher debt levels. This might indicate that demand side policy becomes less effective when debt levels rise. The literature study earlier in this paper, however, could not support these conclusions.

Table 3: Lower bound high debt levels

Unstandardized Coefficient β	More than 50	More than 60	More than 70	More than 80	More than 90	More than 100
Debt†	0.006	0.013**	0.022***	0.020**	0.018*	0.048
	(0.005)	(0.006)	(0.007)	(0.007)	(0.009)	(0.030)
Inflation	0.070***	0.084	0.158*	0.126	0.121	-0.099***
	(0.021)	(0.076)	(0.086)	(0.115)	(0.126)	(0.019)
Exports	0.042***	0.056***	0.095***	0.121***	0.112***	0.088***
	(0.011)	(0.014)	(0.018)	(0.022)	(0.029)	(0.024)
Consumer exp.	0.756***	0.659***	0.413***	0.378***	0.320*	0.727***
	(0.052)	(0.082)	(0.097)	(0.107)	(0.178)	(0.054)
Investment	0.049	0.090	0.159*	0.177	0.159	0.026
	(0.049)	(0.079)	(0.092)	(0.115)	(0.166)	(0.050)
# Observations	226	140	98	79	64	41

† : All debt levels as a percentage of GDP

* : Significant P ≤ 0.1 (2-tailed)

** : Significant P ≤ 0.05 (2-tailed)

*** : Significant P ≤ 0.01 (2-tailed)

Standard errors are shown in parentheses

Table 3 shows the effects for high debt levels set at certain minima. A level of 50% yields a very small positive and insignificant outcome. Debt levels of 60 till 100 are significant (at least at the 10% level), and tend to show a small parabola curvature, with a peak at a debt level of more than 70. This debt level has the highest

significance as well. For public debts higher than 100% of GDP, the result is again insignificant (though just slightly). On average, for the significant results, a 10 percentage point increase in the debt ratio, raises GDP growth by 0.183 percentage point.

We have to be careful in reaching conclusions when analysing the control variables for these datasets. The main reason is the quickly decreasing number of observations for the different debt levels (226 for "more than 50" against 41 for "more than 100"). With only 3 out 6 results for inflation significant, it is hard to conclude anything sensible. The changing sign (and highly significant result) for inflation at the "more than 100" debt level does draw the attention. Interestingly, for all results on inflation except for debt levels exceeding 100% of GDP, inflation seems to have a positive effect on economic growth. It could be the case that the regression captures two different effects in the case of financing the deficit through seigniorage: a positive short run effect through the increase in money supply, and a subsequent higher inflation. The effect of exports on economic growth varies, with largest estimated effect for countries with debt levels between 70-80%, to decline for higher debt levels. Consumer expenditure poses an interesting case, with a steady effect size decline for every 10 percentage point increase in public debt, with (again) the exception of debt levels above 100% of GDP. We could think of a possible reason why all predictor variables for a 100%+ debt level (both significant and insignificant) show a surprising break from the (often declining) trend. Both the number of observations (41) and the number of countries included (4) are far less than for other debt levels. With only 4 countries, the country specific dummies become less effective and precise, and the outcomes are very specific to the mere 4 countries considered. So, although significant, caution is warranted for interpreting results for excessively high debt levels.[19]

[19] On a side note: it is interesting that to see that for a debt level of 80% or higher, only 6 out of 18 OECD countries can be considered (as only these 6 have such high debt levels). Other studies claiming turning points around these (high) debt levels, hence can only base their conclusions on a greatly reduced dataset. The use of models in order to extrapolate therefore becomes an attractive option as an addition to existing empirics.

3.4. Robustness checks

To test the quality of the estimation, robustness checks on the regression were performed. Please refer to Appendix D for a tabulation of the different critical values.

1) Checking for unit roots

A Levin, Lin & Chu (LLC) test (optimised for panel data) was used to test the basic estimation equation for common unit roots (non-stationary processes). In running the full analysis, the null hypothesis of an existing unit root could be rejected for the dependent variable as well as 3 out of 5 predictor variables. The independent variables *Debt* and *Investment* were the variables for which the null hypothesis could not be rejected, and there is evidence of a unit root. As the dependent variable does not have a unit root, the quality of the regression is not necessarily compromised. However, after testing for a unit root in first differences, the null hypothesis for both *Debt* and *Investment* could then be rejected. Rerunning the regression with these variables in first differences did not yield significantly different results.

As a last test, the null hypothesis of a unit root could be rejected for the residual of the estimation as well. As this indicates the presence of cointegration, the presence of unit roots has not severely weakened the quality of the regression.

2) Heteroscedasticity and autocorrelation

The residual of the full basic estimation equation has been tested for heteroscedasticity using a residual plot. As can be seen from Figure D1 in Appendix D, no signs of heteroscedasticity were found. The plot shows a more or less consistent variance across different levels of the variable. Further correction for heteroscedasticity in the regression was therefore not necessary.

3.5. Discussion

Following from the empirical analysis, the results could be summarised as follows: 1) effects of debt on economic growth are not always significant but are never negative, 2) the effect of debt on the whole dataset is negligible, indicating a non-linear trend, 3) debt levels do not seem to matter much for debt levels lower than 30% of GDP, 4) debt levels produce a strong positive effect on economic growth starting somewhere between 30-50%, peak around 70%, and become weaker again and, lastly, 5) no significant effect of debt on growth existed above levels of 100%, but, if results were in fact significant, the sign of the effect is likely to be positive.

So, in contrast to several past studies (summarised in Table A1, Appendix A), no turning point after which debt starts to affect growth negatively, was proven. Data points became less readily available for high indebted countries (simply because the number of countries with very high debt is limited). It could therefore be the case that the applied country dummies are not affluent for the economies where debt is very high. In other words, at very high levels of debt, the analysis is in fact limited to only 5 countries, and there could be a chance that these economies together cannot form an evidence. Past studies have incorporated models which allowed for extrapolation within datasets, a technique not deployed in this regression.

It is interesting to see that when only country dummies are included, the result becomes highly insignificant. A logical thought is that, seeing as debt is significant for the whole dataset (with or without both dummies), some countries in the sample have a much stronger effect relationship of debt on growth than others. Why would debt not behave similarly in the sample countries, as countries are specifically chosen for their resemblances in features (HDI, GDP per capita, position in the international community)? A reasonable next step is to turn to the different channels through which debt can affect growth. It is likely that the working of the causal mechanism is different. For instance, the marginal propensity to save, invest or consume could vary across economies. Different behaviour of risk premiums could lead to different levels of interest rates: some countries are perceived to be more solvable than others. In other words, high debt in certain countries could signal (upcoming) economic distress, while in others excessive debt might be temporary and the economy is perfectly able to absorb an economic shock. Market reactions might therefore be different, affecting interest rate (risk premiums), savings/investment, and total factor productivity in

diverse ways. Using knowledge from the literature we might make another conjecture: initial debt levels affect the debt-growth relationship. Past studies showed how debt in most cases only affects growth when debt was high. In addition, some studies proved the existence of a positive effect of higher debt (mainly at levels below 60%) on a short term basis. We could, however, think of a reason why the fact that initial debt is not included in the analysis *has not* altered the results. When analysing the effect of debt on growth for debt levels of 80% or higher, the size of the dataset became smaller (79 observations), and mostly included countries with a consistent high debt. These countries did have a high initial debt, but nonetheless the results are roughly similar to those of countries with lower initial debt levels. We may therefore assume that country heterogeneity is relatively large, despite 'cherry-picking' sample countries for their equal characteristics.

A limitation to the study is that the direction of the asymmetric effect is not known. It is obvious that higher debt, especially when used for productive spending, raises GDP growth. On the other hand, we are considering a ratio: higher debt makes the ratio rise, but so does lower growth. There might be the issue of reverse causality, that lower growth increases the need for governments to borrow, so that the size of debt is increased. Either way, no negative relation of debt on GDP growth or GDP growth on debt has been found.

Another limitation could be the issue of short run vs. long run effects. Although the study does aim to minimise both common (time) and specific (country) effects, it is very hard to take time lags into account when using panel data. When observing the data, high debt episodes are often found in a trend, and the analysis will capture output effects directly generated by the change in debt. However, when episodes last for just a few years, 'matching' changes in debt levels to the corresponding years becomes a harder task. When, though, implementation lags become too large, both variables will have no further relation and results are likely to be highly insignificant. This way, we can make valid statements based on the data, although matching cause and effect relations will always remain difficult.

A third limitation to keep in mind is the problem of lurking variables. Multiple control variables have been included to project a holistic relationship. The possibility of some spurious relationship has therefore been diminished, but can never be ruled out. Further research could look closer at determinants of economic growth, and include even more factors that have not been considered in this analysis. Fourth, and

finally, the use of empirics alone in finding possible turning points in the effect of public debt on economic growth might be insufficient. As higher debt levels (above 80% of GDP) are analysed, the number of countries (and hence data points) available is greatly reduced (with 4/19 countries left for analysis on debt levels above 100% of GDP). As is sometimes seen in other studies, a combination of empirics and a model allowing for extrapolation could be applied to overcome this problem.

It is reasonable to say that by combining the literature study with the empirical analysis, we can draw reliable conclusions on the existence of a negative debt-output relationship, but only for high levels. Solely relying on the empirical results of this study, there is no evidence of a negative effect of high debt on growth. To the contrary, a higher debt seems to be beneficial to economic growth, though past studies claimed to have identified a stylised fact being a turning point of 80-90% after which debt negatively affects growth.

4. What the studies tell us: a message for Europe

Both the empirical analysis and the academic literature study show us that the existence of a negative relationship of debt on growth is to be questioned, and if it does exist, it is likely to be at high debt/GDP ratios. If there is clearly no economic motivation to keep debt levels at a minimum, why have the regulations been put in place at all? To answer this, we have to address multiple issues.

The arbitrary public debt rules couldn't show the intersection where economics meets politics any better. Following the news in the past months, economists in favour of major austerity measures in Europe become scarcer. Debt regulations combined with austerity measures are often presented to the public as the ultimate cure for the on-going economic distress in Europe. As this thesis has shown, policy moves might be self-fulfilling: cutting in times of economic contraction will strengthen the moves of the business cycle causing troughs to deepen. Political motivations remain.

And of these key reasons might be political solidarity. This topic has increased importance after the downgrading of Greek government debt in April 2010. Keeping in mind that the Stability and Growth Pact had been effective from 1998 onwards, never was much attention paid to actually complying with its terms and conditions. This changed drastically when Greece's high debt level (around 150% of GDP in

2010) raised doubt over its ability to pay off (the majority of) its debt. Injections from EU countries implied compulsory public and private reforms, and strict compliance with the deficit and debt rule. With this condition, and the debt crises of Ireland, Portugal and Italy that happened soon after, the question of high debt was now not just specified to Greece in isolation, but became an issue of every European Union Member State.

Excessive high government debt, as the case of the 'Southern-Europeans' made apparent, could lead to surprises taking its toll on Member States. It was then, in 2011, that the SGP was put forward on the political agendas. As Allen and Corselli-Nordblad (2013) show, bringing back debt as to comply with EU rules became increasingly popular as a tool to attract voters prior to parliamentary elections. Being a quite noteworthy achievement (as communicating possible austerity to the electorate does, for obvious reasons, not always lead to victories), leaders felt they had to act on the proposed budget cuts in the name of Europe, and for the good of the country (as we could see in recent instances in The Netherlands, Belgium and France).

It seems as if the Stability and Growth Pact has evolved from an instrument to keep budgets in line to sustain growth, to a disciplining tool that lacks economic justification, but is upheld by politicians who, eager to pursue earlier promises on austerity, wish not to reconsider. A recent paper by Creel, Hubert and Saraceno (2013) simulates a small-scale macroeconomic model, to test the costs and gains of the fiscal compact rule (3% deficit, 60% debt rule). Their conclusion is clear: "the fiscal compact rule, with its constant debt reduction rule, generally imposes large costs to the economy, while not necessarily performing better in terms of public finances' sustainability".

A large focus on keeping debt levels low can be economically dangerous for a reason not explained by the standard economic framework: fear. Financial markets are highly susceptible to uncertainty and subsequent anxiety. As long a politicians hold on to the idea that high debt inevitably leads to recession, debt exceeding the set levels will, rightly or not, alarm financial markets. Consequently, investments are often delayed and demand declines. To prevent self-fulfilment of the crisis, it is of great importance that the public is correctly informed (Krugman, 2009). The often-heard argument of "without austerity, costs would be shifted to next generations" is simply invalid, as (just like De Grauwe and Ji (2013) point out) the sovereign debt crisis with all its ill-timed austerity measures does just that. A lack of confidence

could worsen the debt/GDP ratio in two ways. First, declining demand is likely to lead to a decreased output, decreasing the denominator of the ratio. Second, with lowered demand, tax revenues drop, not aiding a government trying to reduce its budget.

Differences in political motivations might be explained by a differing economic interpretation (for example, as is shown, a monetarist vs. a neo-classical view). Politics does not directly exist within the economic framework applied in this paper. Political decisions (and inherent policy uncertainties), however, do effect the economy and its growth. Although dropping the fiscal rules would be preferred from an economic stance, some economists advice against this measure. As influential economists write in a newspaper article on the Dutch economy (Jonker, 2013), letting go of the 3% rule (of which the 60% limit follows), "will compromise both foreign credibility and confidence by Dutch citizens". Although both the literature study and empirical analysis might point in the direction of scratching the fiscal regulations, the political situation (which inheritably affects the economy) could demand otherwise.

In reality, the EU has taken a more lenient approach towards fiscal compliance in the past few years. With all major European economies (except for Germany) not meeting debt targets for several years (see Appendix E for the 2013 outlook), the SGP incorporated the Country-specific Medium-Term budgetary Objectives in 2005, allowing for country-specific analysis and providing a safety margin towards continuously respecting the government's 3% deficit limit, while ensuring fiscal sustainability in the long run (Report on Public finances in EMU 2005, 2005). As many economists point out, however, a combination of fiscal compliance and sustainable growth can only be achieved through actual economic reforms (Jonker, 2013; Krugman 2013). Though sanctions for countries not meeting debt limits are rarely imposed, a swift return to a maximum deficit of 3% and a debt level at or below 60% do form the core for next year's budget for many governments. In other words, economic policy is still too much directed towards achieving and maintaining EU fiscal goals, while (unpopular) reform is lacking.

The following steps would, when taken rigorously, most probably aid towards sustainable economic growth. First, EU Member States should acknowledge SGP's shortcomings and communicate this clearly to the public, as to prevent market anxiety. Second, to replace current fiscal regulation, flexible cyclically-adjusted fiscal rules should come into effect, to dampen the effects of the business cycle instead of

worsening them. Third, tax corrections are not preferred when the option of budgets cuts is available, but if they have to be taken, they should be evaluated on their output effects first. Fourth, and last, budget cuts are a possible way to reduce the debt ratio, but only the right austerity measures will do so, while others might actually worsen the structural balance. The threat of self-fulfilment of the European sovereign debt crisis is always looming, and could be provoked through badly timed austerity measures.

5. Concluding remarks

This paper has evaluated the maximum debt clause of the Stability and Growth Pact based on the analysis of past studies and own empirical analysis. So, *how, if at all, does compliance with a maximum debt to GDP ratio 60% of GDP as outlined in the Stability and Growth Pact affect economic growth?* The literature investigation has provided the following conclusions: 1) debt affects economic growth only at high levels of approximately 75-80% or higher, 2) spending cuts are preferred to tax based corrections for their efficiency and their trait to have a smaller effect on output, 3) the timing of fiscal consolidation is of immeasurable importance: the state of the economy seriously influences both output and the structural deficit, 4) there is evidence that the right mix of government expenditures targeted could in fact lead to stable debt, and a level that is allowed by EU fiscal regulation.

The empirical analysis has shown that there is no evidence of a negative relationship of debt on growth. Furthermore: 1) there is no proven relationship between debt and growth for low levels of debt (below 30%), 2) there is a proven positive relationship of debt on growth for debt levels above 30%, 3) there is no proven relationship for debt on growth for levels higher than 100% of GDP.

The results of the analysis should not be interpreted in a way that would support the sustainability or favourability of long excessive debt. Outstanding debt carries interest payments, and these payments will have to be made at some point. The analysis merely shows that high debt *does not* necessarily hamper economic growth. As the previous section shows, as soon as market anxiety (either led by grounded or invalid arguments) gains the upper hand, a relation between debt and growth might be witnessed. For levels below approximately 70% there is simply no such evidence.

The point this thesis is trying to make is that the pains of austerity measures and tax hikes do often not weigh up against the pain of higher public debt. Reducing debt from, say, 70% of GDP to 60% (and so complying with EU regulation) will, as the sections on fiscal consolidations and fiscal multipliers have shown, affect economic growth negatively. From an economic point of view, making the call of reducing debt at these levels, especially in a bad economic climate and a stable debt level (although being slightly high) is absolutely fruitless. Although a debt of 70% comes obviously closer to a possible 'critical' level of 80-90%, this reduced buffer is no reason for concern per se, as no relation between this kind of higher debt and lower economic growth is proven.

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7. Appendices

Appendix A

Table A1: Main conclusions literature review

Study	Debt	Interest Rate	Private Saving and Investment	Total Factor Productivity
Afonso and Jalles (2011)	Initial debt of 90% leads to decline of 0.2% with every 10 percentage points. Initial debt of 30% leads to positive growth of 0.1% for every 10 percentage point increase	-	-	-
Baum et al. (2012)	Short-run impact of debt on GDP is positive till debt ratio of 67%	-	-	-
Cecchetti et al. (2011)	Threshold at which debt starts to affect growth negatively is estimated to lie around 85% of GDP			
Checherita and Rother (2010)	Turning point of 90-100% from which debt negatively affects growth, however, confidence intervals suggest effect may start at 70-80%	One percentage point of acceleration in the change of public debt ratio account for a 7 basis point increase in sovereign long-term real interest rates	Private sector starts dissaving at 82-91% debt ratio	Turning point of 100% debt-to-GDP, above which debt affects TFP negatively
D'Adda and Scorcu (1997)	-	Every percentage point increase in the real interest rate, economic growth falls by 1/5 of a percentage point in the average growth rate	-	-
Engen and Hubbard (2005)		Estimate that for every percentage point increase in the debt to GDP ratio, real interest rates increase by 2.4 basis points		
Hubbard (2012)	-	Extensive literature study. No consensus: hard to extrapolate results across countries	-	-
Modigliani et al. (1989)	-	-	Small yet significant effect	-

			of higher government debt levels on lower private saving	
Kumar and Woo (2010)	10% increase in the debt-to-GDP ratio leads to a negative growth of 0.2% annually. Debt ratio of 90% or higher shows negative effect on growth.	-	-	-
Pattillo et al. (2004)	On average, doubling debt for hight debt (65+) countries will reduce per capita growth by about 1 percentage point	-	-	Doubling debt on average will lead to a decline in total factor productivity of about 1 percentage point
Patillo et al. (2011)	Impact of debt on GDP negative at 35-40 for developing countries			
Reinhart and Rogoff (2010)	Nonlinear debt-growth relationship, debt ratio below 90% shows no systematic link, threshold for emerging economies is 60% of GDP			
Salotti and Trecroci (2012)	-	-	-	A 30% difference in the debt/GDP ratio can cause a productivity growth deceleration of 0.26%.
Schclarek (2004)	-		No relation between high debt and private savings	Limited evidence on the relationship between external debt and TFP

Appendix B

B1: In-text abbreviations

EU	European Union
GDP	Gross Domestic Product
IMF	International Monetary Fund
IS	Investment Saving
LM	Liquidity preference money supply
OECD	Organisation for Economic Co-operation and Development
SGP	Stability and Growth Pact
TFP	Total Factor Productivity

B2: *Countries included in the study, with country abbreviations*

Country	*Official abbreviation*	*Statistics operator*
Australia	AUS	Austri
Austria	AUT	Austra
Belgium	BEL	BE
Canada	CAN	CA
Denmark	DNK	DE
France	FRA	FR
Germany	DEU	GE
Iceland	ISL	IC
Italy	ITA	IT
Japan	JPN	JA
Korea	KOR	KO
Mexico	MEX	ME
The Netherlands	NLD	NL
Norway	NOR	NO
Portugal	PRT	POR
Spain	ESP	SP
Sweden	SWE	SW
United Kingdom	GBR	UK
United States	USA	US

B3: Operator abbreviations in statistics regressions

Debt	Debt level as percentage of GDP
INF	Inflation in percentage change compared to previous year t, as measured in average consumer prices

EXP	Volume of exports of goods and services, percentage change
ConsExp	Final consumption expenditure, annual percentage growth
INVEST	Total investment as a percentage of GDP
SAV	Total gross national savings, as a percentage of GDP

Appendix C

Table C1: Correlation matrix for all regressed variables

Correlations								
		Debt	Growth	CtrlINVEST	CtrlSAV	CtrlINF	CtrlEXP	CtrlConsExp
Debt	Pearson Correlation	1	-,253**	-,313**	-,160**	-,098*	-,078	-,301**
	Sig. (2-tailed)		,000	,000	,000	,021	,066	,000
	N	559	559	559	559	559	559	523
Growth	Pearson Correlation	-,253**	1	,396**	,296**	-,096*	,488**	,816**
	Sig. (2-tailed)	,000		,000	,000	,024	,000	,000
	N	559	560	560	560	560	560	524
CtrlINVEST	Pearson Correlation	-,313**	,396**	1	,587**	,048	,186**	,434**
	Sig. (2-tailed)	,000	,000		,000	,255	,000	,000
	N	559	560	560	560	560	560	524
CtrlSAV	Pearson Correlation	-,160**	,296**	,587**	1	-,009	,159**	,291**
	Sig. (2-tailed)	,000	,000	,000		,834	,000	,000
	N	559	560	560	560	560	560	524
CtrlINF	Pearson Correlation	-,098*	-,096*	,048	-,009	1	,149**	-,080
	Sig. (2-tailed)	,021	,024	,255	,834		,000	,066
	N	559	560	560	560	560	560	524
CtrlEXP	Pearson Correlation	-,078	,488**	,186**	,159**	,149**	1	,202**
	Sig. (2-tailed)	,066	,000	,000	,000	,000		,000
	N	559	560	560	560	560	560	524
CtrlConsExp	Pearson Correlation	-,301**	,816**	,434**	,291**	-,080	,202**	1
	Sig. (2-tailed)	,000	,000	,000	,000	,066	,000	
	N	523	524	524	524	524	524	524

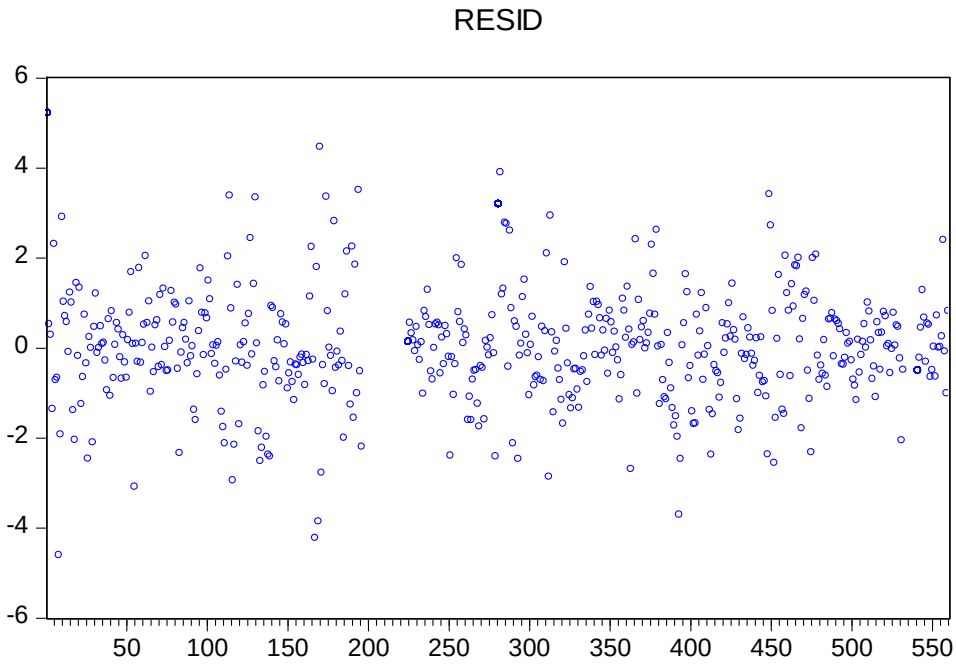
Appendix D

Table D1: Test statistics unit root Levin-Lin-Chu Test, full estimation, no dummies

Variable	Growth	Debt	Consumer Expenditure	Exports	Inflation	Investment	Residual
Test statistic	-6.39446	-0.87909	-2.75651	-8.33848	-6.71112	-1.26784	-5.08842
Critical P-value*	0.0000	0.1897	0.0029	0.0000	0.0000	0.1024	0.0000

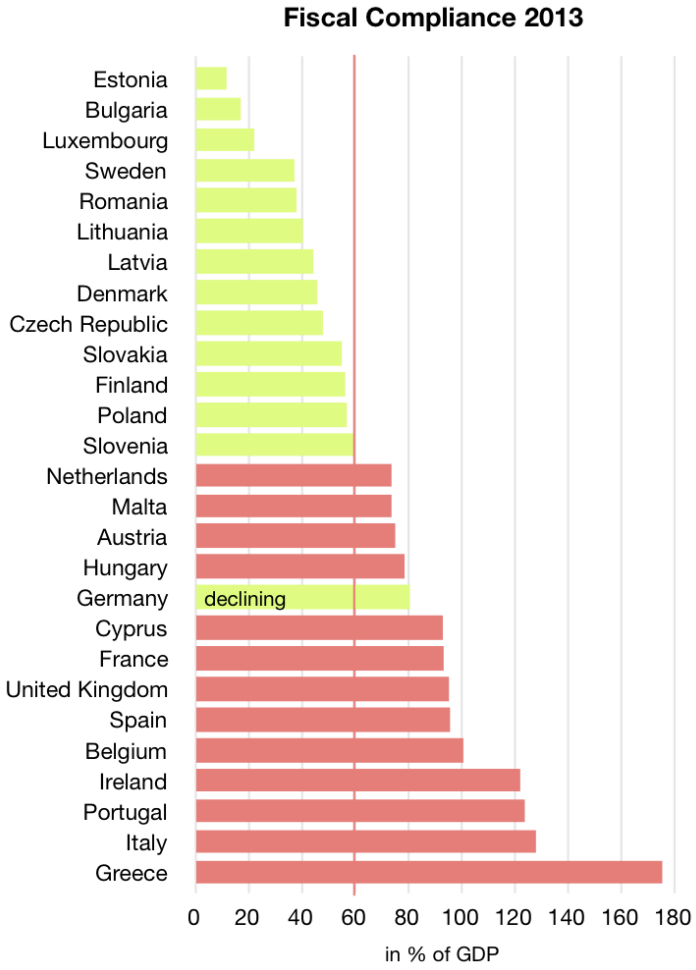
*Probabilities are computed assuming asymptotic normality

Figure D1: Residual plot of full estimation, no dummies



Appendix E

Figure E1: Projected Fiscal Compliance 2013



Source: Diagram drafted from figures in European Economic Forecast (2012)