LUISS Guido Carli
LIBERA UNIVERSITÀ INTERNAZIONALE DEGLI STUDI SOCIALI

Department of *Economics and Business*

Chair of Macroeconomics

The Effectiveness of Fiscal Policy with High Debt: an empirical analysis for a sample of countries

Supervisor:

Professor Giovanna Vallanti

Candidate: Luigi Maria Ferri

ID number: 214711

Academic year: 2018/2019

ABSTRACT

This thesis provides empirical characterisation of the relationship of public debt and the effectiveness of fiscal policy in a sample of 19 developed countries over the period from 1990 to 2018. To this end, two main channel trough which high debt ratios may hinder the efficacy of fiscal stimulus measures are identified. First, by the presence of Ricardian features in the responses of the private sector to fiscal policy measures, which lead to a decrease in consumption. Second, by the increasing responsiveness of government bonds long-term interest rates to budget deficits, which leads to higher debt service costs and the crowding-out of investments.

Table of contents

page

INTRODUCTION

In response to the financial and economic crisis, many developed countries adopted expansionary fiscal policy actions of unprecedented scale. The aim of the governments was to restore the stability of the financial sector, and to address the weakness of the consumer aggregate demand. However, as a side effect, the deterioration of fiscal positions due to fiscal imbalances led the sovereign debt[1] of many industrialized countries to approach historical heights. The debt surge also reflects the collapse in revenues due to the fall in output caused by the Great Recession. According to the IMF (2013), more than 50 percent of the debt accumulation was due to the decline of potential output, while anti-cyclical fiscal impulses accounted for about 17 percent. In particular, the Greek crisis of 2009 exposed the fragility of European countries with high debt ratios and consistent budget deficits. In addition, starting from 2010, a series of influential articles from Reinhart and Roghoff showed that high level of debt are detrimental to economic growth, and that this negative correlation fades when the debt is below the 90% of the GDP (Reinhart,and Rogoff 2012; Reinhart and Rogoff 2010). Even though these authors were careful in stating that there not exist a direct link of causality going from debt to economic growth, many policymakers interpreted these findings as a clear support for an urgent need of fiscal consolidation. Consequently, many countries replaced fiscal stimulus measures with fiscal austerity, with the result of reassuring the financial markets about the sustainability of their sovereign debt. On the other hand, fiscal consolidation led to a protracted phase of slow growth through the weakening domestic demand, and hence did not prevent the build-up of debt and persistent high unemployment. Recently, in the aftermath of the Great Recession, governors are questioning whether fiscal austerity was excessive and unsuccessful. The urge to maintain political consent and the real negative effects of fiscal contractions play a central role in some European government's decision to infringe the Maastricht's Treaty parameters through large budget deficits. Nowadays, the path for fiscal policy in Europe is still narrow, with too much fiscal consolidation potentially triggering another recession, and too little leading to explosive debt dynamics (Blanchard, Amighini, Giavazzi, 2017).

In this context of uncertainty, with no sign of recovery, the effectiveness of fiscal policy to stimulate the economic activity is at best mixed. In this respect, a large debate on debt stabilisation and fiscal policy among policymakers and academic shed light on the question whether large degree of indebtedness can drive varying responses of both financial markets

[1] In this analysis, the terms *sovereign debt*, *public debt,* and *debt* are used as synonyms, all referring to the same concept: the gross general government debt as a share of GDP.

and the private sector after a fiscal impulse. A substantial part of the empirical literature focuses on the existence of an "expansionary fiscal contraction", studying whether fiscal restraint can lead to a positive consumption growth. These studies give increasing relevance to the role of private agents' expectation, which are affected by fiscal policy measures, as they formed on both the country's current fiscal position and on the perception of the sustainability of its public finances. A more recent branch of the literature concentrates on the relationship between high debt level and growth. The main debate is around whether sovereign debt could be a vehicle to induce economic growth[2], or, as first introduced by Reinhart and Roghoff in 2010, there exists an inverted U-shaped relationship between government debt and economic growth, so that beyond a certain threshold debt has a detrimental effect on growth. Then, following the economic and financial crisis of 2008-2011, a growing number of papers focused on the increasing responsiveness of government bonds interest rates to the short-run fiscal policy actions of the Euro area member states. In this regard, many authors provide evidence supporting the idea that after the crisis, financial investors are much more concerned about the short term developments of government's fiscal budgets, and that this is valid especially for highly indebted countries[3].

The aim of this analysis is to empirically investigate how the effects of fiscal policy vary with the degree of indebtedness. In particular, I test the hypothesis that the positive effect of expansionary fiscal policy on the state of the business cycle may fade with increasing debt-to-GDP ratios. In this regard, I identify two channels through which the debt level may affect the effectiveness of fiscal expansion. First, by enhancing households and firms' expectation of future fiscal consolidations. According to this view, which is consistent with the Ricardian approach, after a fiscal stimulus, taxpayers will perceive the burden of future fiscal efforts as more tangible at high debt levels, so that they will reduce their demand for goods and services. Therefore, I analyse the possibility that at high government debt-to-GDP ratios, fiscal impulses may increasingly fail to stimulate aggregate consumers demand and hence to stabilise the output. The second channel through which large indebtedness may hinder the effectiveness of fiscal stimuli is its negative effect on the debt service costs and on investments. As the recent developments of the sovereign yield spread suggest, fiscal budget imbalances are the cause of increasing concerns on sustainability among financial investors, which in turn may ask for higher interest rate to compensate for the increased default risk. This leads to a rise in government bonds interest rates that increases the debt financing costs and have a negative impact on the demand for investments.

[2] See Afonso and Alves, 2014.

[3] See Haugh, Ollivaud and Turner (2009) and Sgherri and Zola (2009).

The structure of this research is as follows: in the first chapter, after a theoretical discussion on fiscal policy and the presentation of the most common theoretical models, there is an analysis of the determinants of fiscal policy and of the concept of fiscal sustainability. Then, chapter 2 probes into the concept of budget deficit and the mechanics of the government budget constraint, treating the macroeconomic effects of deficit spending. Chapter 3 is devoted to the dissertation of the theories supporting my thesis, which are the Ricardian equivalence and the impact of budget deficits on government bonds interest rates. In particular, this section highlights the relationship between high public debt and the effectiveness of fiscal policy, providing evidence for the concept of "contractionary fiscal expansions" at high degrees of indebtedness. The final chapter contains the description of the data employed for this analysis together with the definition of the empirical model and the comments on the results I obtained.

1 Fiscal Policy in the short run

1.1 Fiscal policy in a closed economy

During the last few years, fiscal policy has been at the centre of policy discussion. The recent crisis and the following years of growth stagnation have led some governments to run large budget deficits and increasing debt-to-GDP ratios. In most advanced economies, policymakers are aware of the need to adopt fiscal adjustments in order to bring down the debt-to-GDP ratio and reassure the investors about the sustainability of their sovereign debt.

To analyse the effects of an expansive fiscal policy on the business cycle it is necessary to introduce a common theoretical framework. We define the equilibrium in the goods market as an equilibrium condition that requires production to be equal to the demand for goods (Y=Z). In a closed economy, we can describe income Y, in equilibrium with demand (Z), with the equation

$$Y = C + I + G \tag{1}$$

Where consumption $(C = c_0 + c_1(Y - T))$ depends on the parameter c_0, defined as autonomous consumption, and on disposable income, that is the income remaining after the deduction of taxes and transfers; the effect of a change in disposable income on consumption is mediated by the marginal propensity to consume c_1. Investment $(I = d_0 - d_1 i + d_2 Y)$ is a function negatively affected by interest rate (i) and positively affected by the level of sales (Y). d_0 is the autonomous part of investment and $d_1$is the parameter measuring the responsiveness of investments to changes in Y. Government spending (G), that is considered exogenous in the model, indicates how much the government spends to purchase goods and services and, together with (T), it describes fiscal policy.

Substituting each component with their respective equation, and then, rearranging for Y, we obtain:

$$Y = \frac{1}{1 - c_1 - d_2}(c_0 - c_1 T + d_0 - d_1 i + G) \tag{2}$$

In this equation, it is possible to distinguish autonomous spending $(c_0 - c_1 T + d_0 - d_1 i + G)$, that is the part of the demand that does not depend on output, and the multiplier $\left(\frac{1}{1-c_1-d_2}\right)$ which is the ratio of the change in output to a change in autonomous spending. Since the

multiplier is a number greater than one (being c_1,$d_1 < 1$), it measures the extent to which an increase in autonomous spending brings about an increase in output bigger than the actual change in spending. We can then assume that autonomous spending is very likely to be positive, as c_0 and d_0 are positive, unless government revenues exceed government expenditures by a large amount. In fact, by adjusting spending and taxation decisions- a process referred to as fiscal policy- the government can affect the size of the autonomous spending, which in turns affects the output through the multiplier effect. Controlling the level of *G* and *T*, a government can either run a balanced budget, that requires taxes to be equal to government spending (G=T), a budget deficit, when $G - T < 0$, or a budget surplus, when $G - T > 0$. On the contrary, the difference between taxes net of transfers and government spending is defined as public saving $(T - G)$. Hence, in the presence of a budget surplus we will observe positive public saving, while a budget deficit indicates negative public savings.

Equation (2) characterises the equilibrium in the goods market. Another, yet equivalent condition for the equilibrium in the goods market is the IS relation, which requires investments equal to saving. The term saving refers to the sum of private saving (S), i.e. savings by consumers, and public saving $(T - G)$. Private saving is equal to consumer's disposable income minus consumption $(S \equiv Y - T - C)$. To derive the IS relation it is now necessary to rearrange the equation for equilibrium in the goods market by moving consumption (C) to the left side and subtracting taxes (T) from both sides:

$$Y - T - C = I + G - T$$

The left side of the equation is the private saving equation $(S \equiv Y - T - C)$. Thus, rearranging for investment (I), we can write:

$$I = S + (T - G) \tag{3}$$

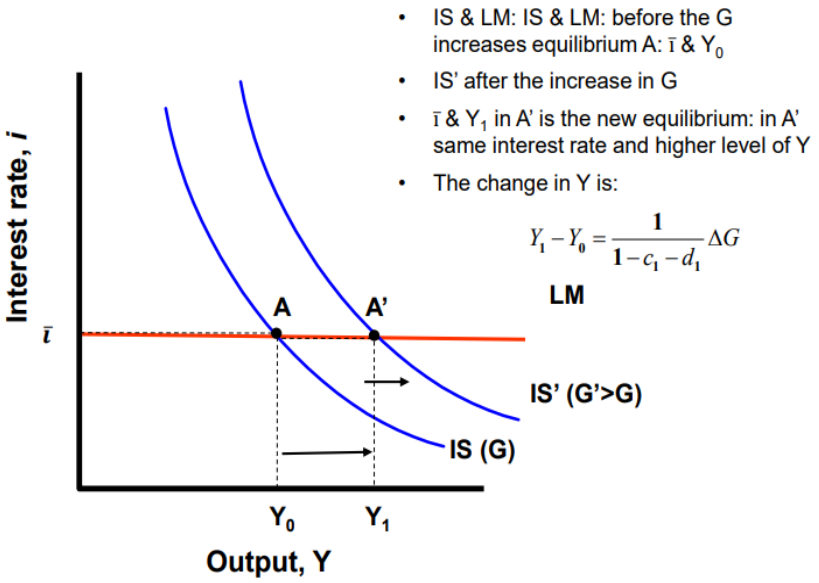
This alternative way of stating the equilibrium in the goods market, stressing that Investment (I) must be equal to the difference between private saving (S) and public saving $(T - G)$, highlights that firm's investment decisions are directly affected by the government's saving decisions. However, this does not imply that a government can just increase the level of investments, and thus the total output, just by improving the budget balance. In fact, given that private savings are equal to disposable income net of consumption, a increase in spending or, equivalently, an increase in revenue (namely, a *fiscal contraction*), is likely to decrease the disposable income of consumers, thus negatively affecting their saving decisions. The reduction in private savings counteracts the positive effect of the increase of private saving on

investments, and can potentially frustrate the intent of the fiscal policy or even lead to an opposite outcome, harming the level of investments. On the other hand, an increase in the deficit (which we refer to as *fiscal expansion*) can have an expansionary effect on output through either the increase of government spending (G) or the lowering of taxation (T). Unfortunately, also in the case of a fiscal expansion, the policy measure may not lead to the desired outcome. Many other factors come into play to complicate the government's task, such as the burden of a high debt, which will be the focal point of this analysis.

Now, to better understand the macroeconomic effects of a fiscal policy in the short run, and to predict which impact the budgetary decision of a government may have on output, it is convenient to introduce the IS-LM model. This model is a useful framework that captures the economic fluctuations in the short run through the determination of national income at the interception point between the IS curve and the LM curve. The IS curve represents the combinations of output and the interest rate at which the goods market is in equilibrium and it is described by equation (2). The LM curve is instead given by the relation $\left(\frac{M}{P} = L(i, Y)\right)$, and shows the combination of income (Y) and interest rate (i) at which the financial market is in equilibrium, that is the condition for which the real money supply is in equilibrium with the real money demand. By plotting these two curves in a graph measuring output on the horizontal axis and the interest rate on the vertical one, the resulting intersection constitutes the point in which the equilibrium condition for both markets is satisfied by the level of output (Y) and interest rate (i) associated to the point. In this version of the model, the interest rate $(\bar{i})$ is considered fixed, under the assumption that it is set by the central bank through the discretionary supply of money. Since the choice of the level of the interest rate is the main instrument of the monetary policy of a central bank, it is often called the *policy rate*. It follows that the LM curve appears as a straight line, allowing the interest rate to remain constant unless the central bank implements a monetary policy to achieve a different interest rate.

The IS-LM model shows the short-run effects of fiscal policy on output and interest rates. First, a fiscal expansion can be carried out through an increase in government spending (G) or a decrease in taxation (T). This corresponds to an augmentation of the budget deficit $(G - T)$, and it is said to have an *expansionary* effect on output. An increase of the policy variable G, for instance, is associated with a rightward shift of the IS curve, that, moving along the LM curve, brings the equilibrium output to a new, higher level (Y'):

Figure 1. Effect of an increase in G in the IS-LM model



Source: Vallanti G., Macroeconomics, LUISS University, 2017

Similarly, a fiscal stimulus implemented through a lowering in taxation lead to higher disposable income, which causes a higher level of consumption. On the other hand, a fiscal consolidation, corresponding to an increase of the budget deficit, has a contractionary effect on output, as it shifts the IS curve to the left, moving the equilibrium output to a lower level.

1.1 Fiscal policy in an open economy

We argued that the main objective of the fiscal policy is to affect the short-run equilibrium level of output. For this purpose, governments control expenditures and taxation to influence the level of investment and consumption, which in turn affect output through the multiplier effect.

Now, we shift our focus on the fiscal policy effect in an open economy. When a country is open to trade, a fiscal stimulus does not only lead to an increase in domestic demand for domestic goods, but also for the foreign ones. Similarly, fiscal stimuli abroad may lead to an increase in foreign demand for domestic goods, finally affecting the national income. Openness in the goods market therefore requires to expand our previous definition of equilibrium in a closed economy by integrating the domestic demand for goods $(C + I + G)$ with the trade balance (namely, imports minus exports):

$$Y = C + I + G - \frac{Q}{\varepsilon} + X$$

First, we subtract imports(Q), defined as the domestic demand for foreign goods. How much imports affect the national income depends on the value that imports have in terms of domestic goods. This is captured by the term $\left(\frac{Q}{\varepsilon}\right)$, in which (ε) is the real exchange rate and $\left(\frac{1}{\varepsilon}\right)$ is the price of foreign goods in terms of domestic goods. Second, we add exports (X), which indicates the part of foreign demand that falls on domestic goods. These five components give the overall demand for domestic goods, and by decomposing them into their determinants, we obtain:

$$Y = C(Y - T) + I(Y, i) + G - \frac{Q(Y, \varepsilon)}{\varepsilon} + X(Y^*, \varepsilon) \quad (4)$$

This last equation shows that that the components *C*, *I* and *G* have the same determinants we described when discussing the closed economy. Moving on, imports clearly depend on income, as they account for a portion of domestic demand for goods. Hence, a higher domestic income brings about an increase in domestic demand for both foreign and domestic goods. Imports also depend on the real exchange rate, as it determines the relative domestic value of a foreign good. An increase in the real exchange rate leads to a higher domestic demand for foreign goods, because it makes foreign goods cheaper with respect to domestic ones (assuming constant prices). However, the overall effect of a real depreciation on the *value* of imports $\left(\frac{Q}{\varepsilon}\right)$ is ambiguous, since a higher real exchange rate leads to an increase of (Q) but it reduces $\left(\frac{1}{\varepsilon}\right)$. Exports too depend on the real exchange rate. Unlike imports, a real depreciation makes domestic goods relatively more expensive to foreign consumers, and so it lowers the exports. Therefore, the evaluation of the result of an increase in (ε) on net exports can be tricky, as it has an ambiguous effect on imports and a negative effect on exports. In this respect, Marshall-Lerner condition[4] suggests that both imports and exports should be sufficiently elastic to the real exchange rate, in order to ensure that a real depreciation improves the trade balance. Lastly, exports positively depend on foreign income (Y^*), as it drives the foreign demand for domestic goods.

Now, having described the determinants of each component, we can derive the goods-market equilibrium condition in an open economy. As we said in the previous exposition of the IS-LM model, we assume prices to be fixed in the short run. Extending this assumption to both foreign and domestic prices, it follows that the nominal exchange rate and the real exchange rate (ε) move together. In fact, assuming that price levels are given, a nominal appreciation

[4]The Marshall-Lerner relation is formally written as $\frac{\partial NX}{\partial \varepsilon} < 0$.

corresponds to a real appreciation and vice-versa[5]. Hence, replacing (ε) by the nominal exchange rate (E) in equation (4), we can write:

$$Y = C(Y - T) + I(Y, i) + G + NX(Y, Y^*, E) \quad (5)$$

Going back to fiscal policy, it is now possible to derive the effects of its implementation in an open economy. A fiscal expansion leads to an increase in domestic demand, which in turn results in a higher domestic output and a deterioration of the trade balance. The opposite happens for a fiscal contraction. By comparison, the implementation of expansionary policies taking place abroad leads to a higher foreign demand, which increases output and improves the trade balance by affecting exports. These results have two main implications. First, it is clear that when countries trade a lot with each other, a change in policy in one country can affect all other countries. This also partially explains why, in the recent financial crisis of 2008, the drop in demand originated in the United States had a contagious effect to the rest of the world. Second, and more important for the purpose of this analysis, trade links complicate the dynamics of fiscal policy. In fact, a country that persistently runs trade deficits ends up accumulating debt towards its trading partners, and therefore is liable to pay higher interest payments to these other countries. Thus, governments find it more preferable to have an increase in foreign demand rather than an increase in domestic demand, as the former improves the trade balance, while the latter stimulates trade deficits. However, this preference may lead a country in recession not to promptly rely on expansionary fiscal policy in order to avoid a deterioration of the trade balance. They would rather prefer to wait for other countries to increase their internal demand, so as to gain improvements in the trade balance and a higher output. If more countries are currently experiencing recession and all of them opt for relying on other countries to increase their demand, they would remain stuck in a situation of protracted recession. A solution to this stalemate is represented by a policy coordination, which theoretically requires each country to coordinate their fiscal policy in order to increase their demand simultaneously. The reason is that, by doing so, they would have a recovery of output without worsening their trade balance (as the increase in imports is offset by an increase exports). In practice, a policy coordination is hard to implement. Countries can commit to coordinate, but they have a strong incentive to deviate, as they would gain from the increase in demand abroad and from the consequent improvement of their trade position. This is

[5] The real exchange rate (ε) can be described as $= EP/P^*$, where (E) is the nominal exchange rate, (P) is the domestic price level and (P^*) is the foreign price level. Given that prices are fixed in the short-run, for notation convenience we assume $P/P^* = 1$. Under this assumption, we obtain $\varepsilon = E$.

another complication that policy makers should take into consideration when dealing with an open economy.

1.2 The Twin Deficits

An interesting aspect of fiscal policy in an open economy is the existence of a link between budget deficits and the trade deficit. This can be shown by rewriting the equilibrium condition in the goods market as the equality between investment and savings in an open economy. Rearranging equation (5) we obtain:

$$Y - T - C = I + (G - T) + NX \text{ [6]} \tag{6}$$

When countries are open to trade, the income of domestic residents is given by the sum of production (Y), net transfers (NT) and net income from abroad (NI). By add these terms to both sides of equation and rearranging, we obtain

$$CA = S + (T - G) - I \tag{7}$$

On the right side, we define the sum of net transfers, net income and net exports as the *current account.* From this equation, the current account balance is equal to saving (i.e. the sum of private and public saving) minus investment. It follows that when a country runs a current account surplus, it saves more than it invests. Symmetrically, a current account deficit indicates that a country is investing more than it is saving. Another implication of this relation is given by the definition of current account in the balance of payments. Being a component of the balance of payments, together with the capital account, the current account (CA) consists of a country's net payments to and from the rest of the world. It is now clear that a current account surplus implies that the country is lending from the rest of the world, whereas in case of a current account deficit, it is borrowing. Equation (6) also indicates a relation between the current account and the budget deficit. A degeneration of the budget deficit $(T - G)$ is reflected through either an increase in saving, a reduction in investment, or else in a worsening of the current account. However, the equation does not clearly state that a government budget deficit implies a current account deficit, and does not say whether a budget deficit deterioration will have an effect on investment, or instead on saving, or on the current account balance (Blanchard, Amighini, Giavazzi, 2017).

[6] We moved consumption (C) to the left side of the equation and subtracted taxes (T) from both sides.

A stronger causal link between the government budget deficit and the current account deficit is provided by the twin deficit hypothesis. The term twin deficit refers to a condition in which a country runs simultaneously a trade deficit and a current account deficit. The twin deficit hypothesis firstly originated during the 1980s, when the United States saw the emergence of growing budget deficit together with increasing current account deficit. In fact, this hypothesis is the proposition that a consistent budget deficit induces a current account deficit. This hypothesis stems from the theoretical framework described by the Mundell-Fleming model, which captures the effects of policy in an open economy by putting together the goods market and the financial market under openness conditions. In this model, the IS relation is represented by an extension of the equation (5), in which the exchange rate (E) is replaced by the interest parity condition $\left(E = \frac{1+i}{1+i^*}\bar{E}^e\right)$[7]. The interest parity condition is the equilibrium condition in the exchange market, and it implies that the domestic interest rate is positively related to the exchange rate. The Mundell-Fleming model predicts that, starting from a roughly balanced budget, an increase in spending is associated with a higher output, which stimulates an increase in imports. Assuming that the central bank does not adjust the interest rate, the exchange rate remains unchanged. As a result, net exports decrease On the other hand, the model predicts that if the central bank raises the interest rate to word off an increase of inflation, then consequently output would decrease by less, and the exchange would appreciate. Therefore, the trade balance deteriorates for two reasons. First, the increase in output pushes imports up. Second, assuming that the Marshall-Lerner condition holds, the appreciation of the exchange rate leads to a weakening of the trade balance. We can see then, that in the Mundell-Fleming model, an increase in the budget deficit – or a decrease in budget surplus – causes an increase in the trade deficit, and so on the current account deficit.

On the other hand, according to equation (7), namely the national income accounting identities, the current account must be equal to the difference between saving and investment. Hence, the occurrence of twin deficits rests on the private saving and investment's response to a change in public spending. In particular, the reaction of private agents to a fiscal measure depends on how it is perceived, or by the context in which this measure is implemented (Nickel and Tudika, 2013). This implies that the response of the external balance to discretionary fiscal policy may vary according to the debt level of a country. Corsetti and Müller (2006) find that a worsening of the budget balance is typically associated to an increase in private consumption and a decrease in investment. This view confirms the Keynesian

[7] i^* denotes the foreign interest rate and E^e denotes the expected exchange rate. We assume that in the short-run expectations on the exchange rate are fixed, so we have $\bar{E}^e$. Then, the new equation for the goods-market equilibrium is $Y = C(Y - T) + I(Y, i) + G + NX\left(Y, Y^*, \frac{1+i}{1+i^*}\bar{E}^e\right)$.

paradigm, as it predicts that the increase in savings is relatively larger than the decrease in investment. Consequently, by the identity $\left(CA = S - I + (T - G)\right)$, an increase in budget deficit (or equivalently a decrease in budget surplus) would deteriorate the external balance, resulting in a twin deficit. However, a fiscal stimulus may raise concerns about the sustainability of public finances if the country is highly indebted. In fact, if private agents perceive the current situation as unsustainable, they may increase their precautionary savings, therefore lowering consumption. This mechanism is referred to as the Ricardian equivalence[8], which in its strict form predicts that an increase in budget deficit results in an increase in private savings, as private agents expect future consolidations (i.e. higher taxes) as necessary to remedy the increased deficit[9]. It follows that the higher the indebtedness, the more pressing the need for a fiscal consolidation is perceived to be. Therefore, the relationship between the government budget and the external balance may vary from being "Keynesian" at low levels of debt, to become more and more "Ricardian" with higher debt-to-GDP ratios[10]. Using an interacted panel VAR, Nickel and Tudyka (2013) find evidences supporting the argument that at low debt ratios, expansionary fiscal shocks are first followed by positive response of output and negative response of private investment and the trade balance, while as debt-to-GDP ratios grows, the private sector increasingly offsets the decrease in private savings. In this case, if the crowding-out effect of investment is consistent enough (i.e. if the investment decreases to the point that the combined effect of lower investment and higher private savings outweighs the increase in government consumption), the external balance and the public balance may diverge (Kim and Roubini, 2008). In fact, the increase in private savings and the simultaneous crowding-out of investments lead to a decrease in output. Consequently, the trade balance moves into surplus while the public balance is worsened by the expansionary fiscal measure. These results provide support to the purpose of this analysis, as it confirm that the effectiveness of fiscal stimuli to boost the economy and to solve trade deficits may fade with increasing debt-ratios (Nickel and Tudyka, 2013).

[8] Under full Ricardian equivalence, private saving would fully offset an increase in public spending if the latter was permanent. Instead, if the increase in government spending is temporary, the following increase in precautionary savings is lower such that an expansionary output effect (Nickel and Tudyka, 2013).

[9] See Ricardo (1817) and Barro (1974). The Ricardian equivalence is discussed in more detail in chapter 3.

[10] The debt-to-GDP ratio is defined as the ratio of debt to GDP. It is a useful indicator of the capacity of a country to repay its debt. Debt-to-GDP ratios are discussed extensively in chapter 2.

1.3 The role of the Fiscal Multiplier

Another important factor that determines the effectiveness of discretionary fiscal policy on output is the fiscal multiplier. The estimation and use of multipliers play a central role in forecasting the effects of a fiscal policy. Many countries experienced a dramatic turnaround in their fiscal position during the crisis, shifting from stimulus to consolidation. In this context of large-scale fiscal actions, GDP growth may be primarily driven by fiscal policy. Thus, it is essential to measure carefully the relationship between these two variables in order to outline and forecast the effect of policy actions (Batini, Eyraud and others, 2014).

Generally, the fiscal multiplier is defined as the ratio of a change in output (ΔY) to a discretionary change in government spending or tax revenue (ΔG or ΔT) with respect to their respective baselines (Spilimbergo and others, 2009). In particular, we distinguish the spending multiplier, which measure the sensitivity of output to a change in government spending, and a revenue multiplier, defined as the ratio of a change in output to a change in tax revenue. Hence, fiscal multipliers measure the impact of discretionary fiscal policy on GDP. Our focus is on short-term multipliers, which are significant in estimating the short-run effects of fiscal measures on output, but furnish little direction about relevant medium and long run variables such as income distribution and employment. Multipliers are one of the many factors that policy makers need to consider when designing fiscal policy. Misinterpreting fiscal multipliers may lead fiscal measures to be ineffective or counter-productive. For instance, with high fiscal multipliers, fiscal consolidations lead to a short-term increase of the debt ratio[11], as they have a contractionary effect on output (Eyraud and Weber, 2013). In addition, underestimating multipliers may lead governments to set unfeasible fiscal targets, undermining the credibility of their fiscal programs.

In spite of the importance of accurately measure multipliers, they can be particularly difficult to estimate. In fact, it is very hard to isolate the direct effect of fiscal measures on output, as these variables have a two-way relationship between each other: government spending and tax revenue react automatically to the business cycle through the so-called "automatic stabilisers[12]". Moreover, in many countries, the scarcity of available data constrains the scope for econometric and model-based research. For those countries, Batini, Eyraud and Weber (2014) propose to "guesstimate" the size of multipliers with the "bucket approach" method. The idea is to group together countries that have similar structural characteristics and therefore are likely to have similar multipliers. Starting with advanced economies, the existing literature

[11] The debt ratio is used as a short-cut for debt-to GDP ratio.

[12] The term automatic stabiliser refer to the fact that a decrease in output leads, under given tax and spending rules, to an increase in the budget deficit. This increase in deficit "stabilises" the economy, as it increases demand and thus the output (Blanchard, Amighini, Giavazzi, 2017).

shows different empirical results depending on the methodology. Structural vector autoregressive models (SVAR), which uses output elasticity of expenditure and tax revenue to separate the automatic stabilizer effect, infer that in "normal times", one-year multipliers tend to lie between 0 and 1. Mineshima and others (2014) surveyed 41 studies[13] that employ this methodology and found out that on average spending multipliers are higher than revenue multipliers. In particular, they showed that multipliers sum on average to 0.25 for government revenue and to 0.75 for government spending in advanced economies (AEs). This is in line with the Keynesian theory, which predicts that spending increases are more effective in stimulating output than tax reductions, as households may increase their saving even after a tax cut.

However, papers using the "narrative" approach find larger multipliers than the standard results. The narrative approach differs from the structural VAR methodology as it considers that government revenues are affected not only by discretionary fiscal changes and short-term macroeconomic fluctuations, but also by changes in commodities and asset prices (IMF, 2010). Hence, these studies seek to isolate the direct effect of exogenous[14] fiscal shocks, excluding the revenues from taxes raised in response to macroeconomic developments, and not considering spending for issues not strictly related to the state of the economy, such as military expenditures (Romer, 2011).

Moving on to the "basket" of emerging markets economies (EMs) and low-income countries (LICs), the scarce literature available suggests that they have smaller fiscal multipliers than AEs (Ilzetski and others, 2013). Similarly to fiscal instruments in AEs, Izetzki (2011) find that spending multipliers tend to be generally lower than revenue multipliers in EMEs, and they are both lower than in AEs. The authors suggest that this result may be due to several different factors, one being the composition effect: multipliers in developing countries are the sum of consumption multipliers close to zero and very low investment.

Generally, the size of fiscal multipliers is time, country and circumstance-specific (Spilimbergo and others, 2009). It depends on specific characteristics of the economy of each single country. The empirical literature identifies two main types of determinants: (i) structural country characteristics and (ii) conjectural characteristics. Structural characteristics are the determinants that affect the way the economy react to discretionary fiscal policy, and they include:

[13] The list of the papers is provided in Mineshima et al. (2014).

[14] In the literature, an "exogenous shock" is defined as an alteration in spending or revenue that is not caused by the economic system.

- **The degree of "leaking"**. If "leakages" are few (i.e. only a small portion of an increase in output of a fiscal stimulus is saved or spent on imports) the size of the multiplier will be larger (Spilimbergo and others, 2009);
- **Trade openness.** The size of fiscal multipliers tend to decrease as the openness to trade of a country increases, because a bigger part of demand leaks through imports (Iltzetzki and others, 2013).
- **The exchange rate regime**. In accordance with the Mundell-Fleming model, countries with floating exchange rate regimes tend to have smaller multipliers, as exchange rate movements partially wipe out the fiscal gains of expansionary fiscal measures (Batini and others, 2014).
- **Wage flexibility**. Markets with lower wage flexibility (i.e. countries where unions are stronger or with stronger regulations) are found to have higher fiscal multipliers, as rigid wages enhance the economy's response to fiscal shocks.
- **The size of the automatic stabilizer**. The larger are the automatic stabilizers, the smaller the fiscal multipliers, as the automatic response of taxes reduces the fiscal shock's effect on output. However, during downturns, stabilizers act as automatic fiscal stimulus, which can partly compensate for the lower multipliers (Spilimbergo and others, 2009).
- **The degree of efficiency in public expenditure and tax collection**. Multipliers are low when the effect of discretionary fiscal policy on output is constrained by inefficiencies in the public expenditure management and in revenue administration; this is in accordance with the "narrative" approach view, which measures the output's response to fiscal measures, rather than to mere changes in spending or revenue (Batini and others, 2014).
- **The level of indebtedness**. The debt level affect the size of fiscal multipliers. Iltzetzki and others (2013) suggest that in countries where the level of outstanding debt is high (i.e. exceeding 60 percent of GDP), fiscal multipliers are on average zero in the short-term and even negative over the longer horizon. In particular, Kirchner and others (2010) interpret these findings as the result of two effects. First, a spending shock in highly indebted countries may raise concerns about the fiscal sustainability[15] of such countries, and therefore may lead agents to expect further consolidation in the future, which encourages private saving and reduces demand and consumption[16]. Second, the fall in credibility and confidence may entail a stronger response of interest rate risk

[16]This is explained by the Ricardian equivalence, which is treated more in detail in chapter II.

premium, as markets are progressively becoming more concerned about fiscal fundamental (Sgherri and Zola, 2009). Thus, fiscal expansions can result contractionary if they reduce private agent's and investor's confidence and, in particular, if they raise concerns on the sustainability if public finances (Spilimbergo and others, 2009). In addition, Perotti (1999) suggests that the larger is the expected increase in taxation tomorrow, the larger the resulting decline in consumption today. Symmetrically, Giavazzi and Pagano (1990) introduced the "expansionary fiscal contraction" hypothesis, as they find that episodes of past fiscal consolidation and deficit cuts brought about positive consumption growth. These results represent the main topic of this analysis and will be discussed extensively in chapter 2 and 3 respectively.

Furthermore, fiscal multipliers are determined by temporary (or conjunctural) factors, which tend to deviate multipliers from their "normal" level (Batini and others, 2014). Among conjunctural determinants, we find:

- **The business cycle**. The economic theory suggests that multipliers should be higher when output is below potential. In fact, when the output gap is null or positive, a fiscal expansion puts pressure on inflation or/and deteriorates the trade balance, without increasing output (Cottarelli and Jaramillo, 2013). Evidence provided by the empirical literature confirm that multipliers are larger in downturns than in expansions. In particular, Batini and others (2014) find that this holds for both expansionary and contractionary policy: a stimulus is less effective in expansion, as the increase in spending reduces private demand and leaves output unvaried; symmetrically, a consolidation during downturn magnifies the depressing effect on the economy of the downturn, and therefore is more costly in terms of output.
- **Degree of monetary adjustment possibility**. As shown in the IS-LM model, a monetary expansion may abate the contractionary effect of a fiscal consolidation on output. However, monetary policy represent an effective policy tool up to a certain extent. Once reached the zero lower bound (ZLB)[17], for instance, the central bank cannot further decrease the nominal interest rate, and therefore monetary policy is constrained. At the LZB, the literature suggests that multipliers tend to exceed their "normal level" (Erceg and Linde, 2010).

[17] The Zero Lower Bound (ZLB) is the lowest interest rate that a central bank can achieve.

1.4 Fiscal Sustainability

We argued above about the importance of pursuing sustainable fiscal policies. The goal of the stabilisation of the public finances is that the State becomes a solvent macro-economic agent that endeavours to maintain budget deficit and the public debt within financially sustainable limits (Ehrhart and Llorca, 2008). Generally, econometric tests of fiscal sustainability consist in studying whether the government effectively respect the inter-temporal budget constraint on present value terms. This approach was initiate by Hamilton and Flavin (1986), on the conclusion that if the present value budget constraint is not respected, then the fiscal policy is not sustainable over the long run. The basic issue concerning long-term sustainability is central to the institutional setting of the Economic and Monetary Union (EMU), and gained in importance among both political leaders and academics. For emerging markets, the confidence on the sustainability of public finances has a strong direct effect on interest rate and economic performance. In particular, large increases in the risk premium or default on government debt have been the cause many of the deepest crises for these countries. However, the debate on fiscal sustainability started to concern the developed countries after the increase in government debt levels in the mid-70s. The lack of sustainable budgetary plans from the governments became known as the "deficit bias" of governments (Alesina and Tabellini, 1990). This "deficit bias" may arise because of past unsustainable fiscal policies that "tie the hands" of new elected governments, or simply a sign of a lack of courage as governments do not carry out substantial stabilisations of their public finances in order not to lose political consensus.

The concern on fiscal sustainability are particularly tangible in the Economic and Monetary Union (EMU) context. For these countries, the Maastricht Treaty identifies sustainability as the most important bias to deal within the context of the monetary union. The reason of the primary importance attributed to this topic, is that, within the single-currency area, unsustainable fiscal policies may lead to excessive macroeconomic volatility, hence making it harder for the European Central Bank (ECB) to maintain stability within the EMU. In a monetary union, in fact, the potential tensions between fiscal and monetary authorities are magnified by the fact that fiscal policy is decentralized and fiscal policy coordination might not be in the interest of single national governments (Fatas and Mihov, 2009). In this respect, the Statement of the Governing Council of the ECB, March 21 2005 states that *"sound fiscal policies and a monetary policy geared to price stability are fundamental for the success of a Monetary Union. They are prerequisites for macroeconomic stability and cohesion in the euro area"*. Prolonged unsustainable fiscal policy plans, under extreme circumstances, can lead to financial investors to fear that the country may not be able to repay its debt, raising the

expectations of a debt monetisation[18] and, therefore, of unexpected inflation. Within the EMU, fiscal dominance of monetary policy is not possible. However, the deficit bias might create externalities in term of credibility or through the interest rate channel.

While fiscal sustainability is about the long-term behaviour of fiscal policy, it has several implications on the fiscal policies for the stabilisation of the business cycle. First, if governments face unsustainable debt levels, they will have little to no room to restore on automatic stabilisers during downturns, and hence monetary policy intervention will be necessary. Therefore, the combination of budget deficits and procyclical fiscal stance reduces the effect of automatic stabilisers and, in turns, increases the output fluctuations (Melitz, 2000). Second, unsustainable fiscal plans are followed by fiscal consolidations that are likely to have a short-run negative effect on the economic activity. Finally, high debt levels raise the investors concerns about the solvency of the government, then leading to an increase in interest rates and thus a reduction in investments.

2. The Budget Deficit

2.1 The Government budget constraint

The basic issue concerning the sustainability of financial measures is strictly related with the commitment of a government to stabilise its finances. In particular, the government's budgetary decisions affect the sustainability of its public finances. To determine the sustainability of fiscal policies, econometric tests examine whether such measures are consistent or not with the government inter-temporal budget constraint. In fact, like households, governments are subject to budget constraint. Facing temporary or long-term financial needs, governments typically resort to borrowing from financial markets to complete their functions. Whenever a government runs a budget deficit, it incurs into debt towards the investors that decide to finance it. Hence, the one-period government budget constraint can be written as:

$$B_t - B_{t-1} = G_t - T_t + r_t B_{t-1} \tag{8}$$

Where G_t is the value of government expenditure on goods and services in year t, T_t are the taxes net of transfer during year t and $(G_t - T_t)$ is defined as the primary budget deficit. Then,

[18] Debt monetisation is referred to as the process in which the government finance itself by issuing bonds and forcing the central bank to buy its bonds in exchange for money.

B_{t-1} indicates the stock of government debt at the end of year $t-1$, or equivalently, what government owes at the beginning of year t as a result of past deficits. Lastly, given that r_t is the real interest rate at year t, the term $r_t B_{t-1}$ equals the one-year real interest payments on government debt. Therefore, $(B_t - B_{t-1})$ represents the deficit during year t, which is the one-year difference in the government debt, or equivalently, how much the government borrows during year t. Thus, the government budget constraint gives the arithmetic of the debt and deficit. First, it clearly shows that the deficit is determined by the difference between government outlays and revenues, referred to as the primary budget deficit$(G_t - T_t)$, and the interest payments on outstanding debt, $r_t B_{t-1}$. Therefore, we can describe the one-year change in government debt as the sum of the primary budget deficit (or, equivalently, of the primary budget surplus $(T_t - G_t)$, and the initial level of debt(B_{t-1}). Then, rearranging equation (8) we obtain:

$$B_t = (1 + r)B_{t-1} + (G_t - T_t) \tag{9}$$

This relation states that the current level of debt at the end of year t is equal to the sum of $(1 + r)$ times the debt at the end of year $t-1$ and the primary deficit during year t. Equation (9) has three important implications:

- The legacy of past deficits results in a larger government debt today;
- In order to stabilise the debt, the government must eliminate the deficits;
- The elimination of the deficit requires the government to run a primary surplus such that $(G_t - T_t) = rB_{t-1}$, i.e. a primary surplus equal to the real interest payment on the existing outstanding debt. This requires the government to impose higher taxes forever.

The level of the debt itself give little evidence on how much the debt is burdensome for a country. The sustainability of the debt is determined by the ability of a country to repay such debt. Economists use the Gross Domestic Product (GDP) as a meaningful measure of the government ability to pay, since the government raises its revenues by collecting taxes. Therefore, we find it preferable to estimate the country's "debt burden" (or the level of indebtedness) through the debt-to-GDP ratio and its evolutions. The debt-to-GDP ratio – the debt-ratio for short- is simply a percentage number using the size of the GDP as denominator and the level of outstanding debt as numerator. It is possible to derive the debt ratio by dividing each term of equation (9) by nominal GDP. Once obtained the government budget constraint in terms of ratios to GDP, we use some approximations and rearrangements to get the relation of the debt ratio:

$$\frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}} = (r - g)\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t} \quad (10)$$

Where Y is the output and g is the growth rate of output. This relation has a simple interpretation. The change in the debt-to-GDP ratio over time is equal to the sum of the two terms on the right side of the equation. The first term is the difference between the real interest rate and the growth rate of output times the debt ratio at the beginning of time t. The second represents the ratio of primary deficit to output. This has some important implications:

- The debt ratio increases more as the real interest rate r increases;
- A slowdown of the growth rate of output (a lower g) implies a larger increase of the debt-to-GDP ratio;
- The higher the initial debt ratio, the larger the increase in the debt ratio;
- The larger the primary deficit ratio, the higher increase in the debt ratio.

2.2 What drives the debt ratio?

The equation for the evolution of the debt ratio clearly shows the factors that influence such ratio. According to equation (10), changes is the debt-ratio are driven by movements in the real interest rate, the growth rate of output, the level of initial debt, and the size of the primary deficit. However, identifying the determinants of the ratio of debt to GDP is not always straightforward. In fact, correlations between the above-mentioned factors and debt ratios vary across country and time.

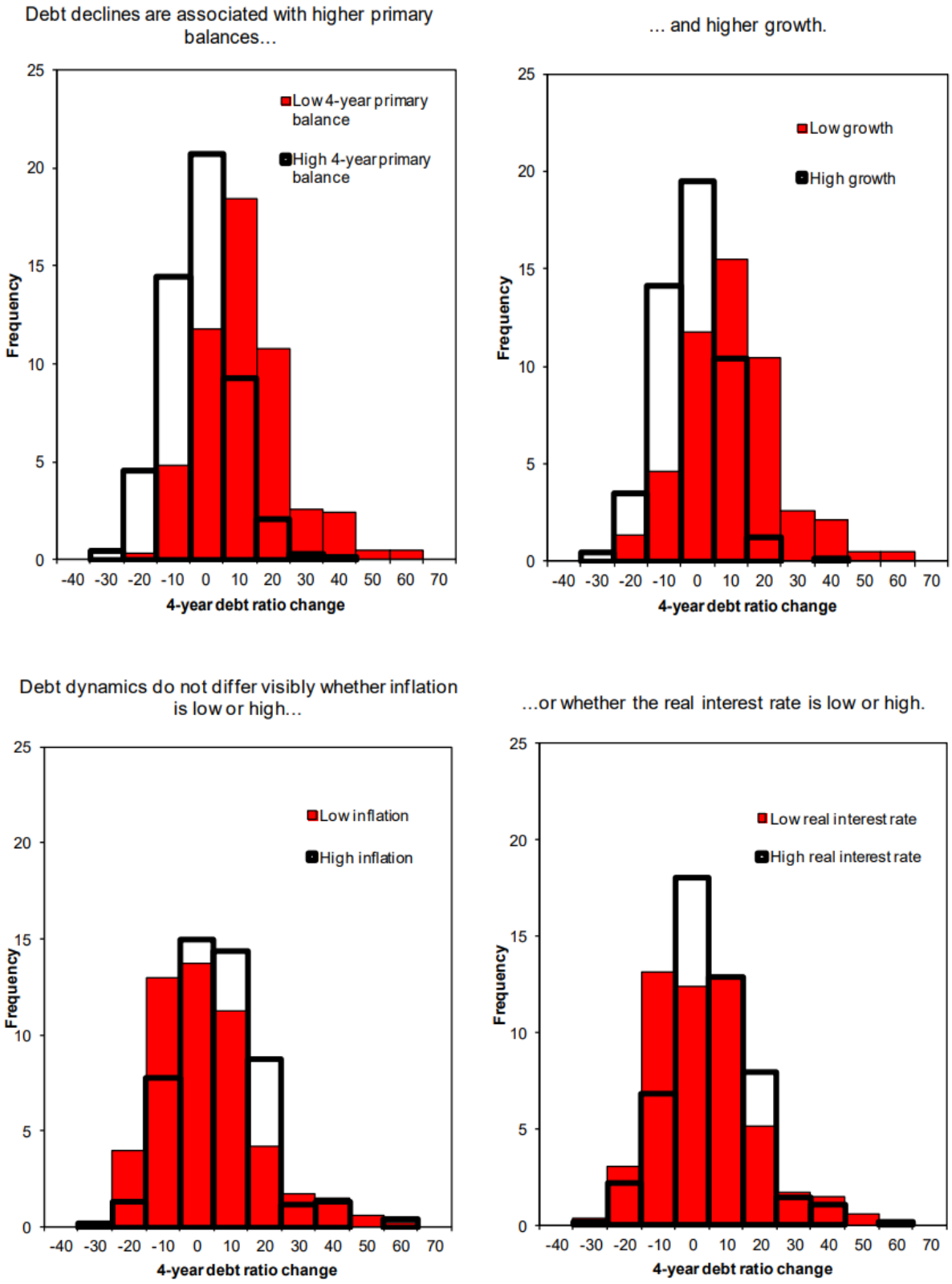
To begin with, the primary fiscal balance seems to play an important role. An empirical study by the International Monetary Fund (2013)[19], based on a sample of four-year changes in the debt-to-GDP ratio of 30 advanced economies from 1980 to 2011, suggests that debt reduction spells[20] are more recurrent when primary balances are relatively high. Symmetrically, debt ratios increases are more frequent during periods with lower primary fiscal balances. As shown in Figure 4 (top left panel), debt reduction spells (four year declines of debt ratios) are associated with periods in which the cumulative primary balance $(T_t - G_t)$ is above (high) the country-specific median. Therefore, these results suggests that discretionary fiscal policy actions consistently contribute to changes in debt-to-GDP ratio. Similarly, output growth

[19] The list of the 30 advanced economies included in the sample is available in the *Fiscal Monitor* (IMF, 2013).
[20] The term "debt-reduction spell" refers to a period of at least four years of declining debt ratios, allowing for one exception year (Abbas and others, 2013).

appears to be the other key factor. Figure 4 (top right panel) shows the 4-years debt ratio changes conditioned on whether real GDP growth rate is higher or lower than the country-specific median. Thus, debt ratio increases are more likely when the real GDP growth is low. In addition, there are other factors affecting the debt dynamics, such as interest rates, inflation, and stock-flow adjustments (SFAs)[21]. However, their impact on the debt dynamics appears to be less explicit than for fiscal efforts and GDP growth rate (Figure 4, bottom panels).

[21] SFAs describe the difference between the annual change in gross debt and the budget deficit, which may arise for different reasons, including valuation changes and other transactions that affect the debt but not the deficit (Baum and others, 2012).

Figure 2. Density of Debt Changes Conditional on Macroeconomic Variables



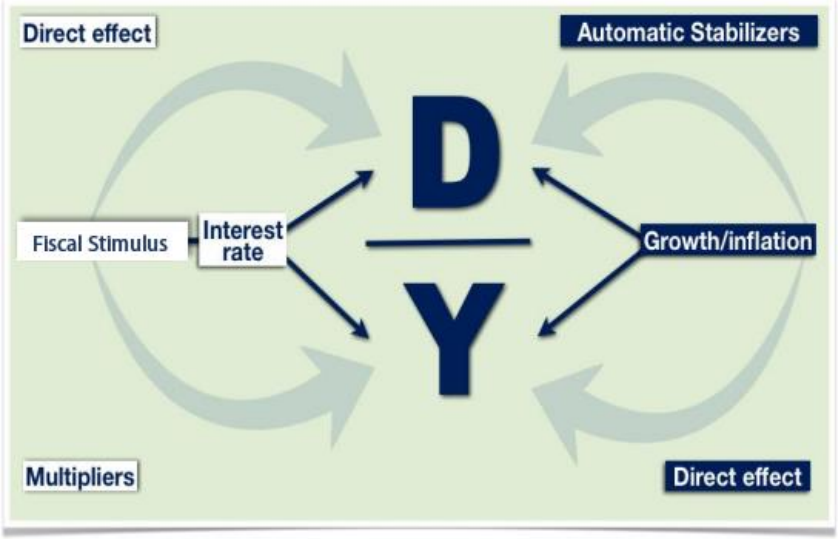
Sources: IMF, World Economic Outlook, and IMF staff calculations. Note: Each panel shows two densities of debt ratio changes where primary balances, growth rates, rates of inflation, and real interest rates are below (low) or above (high) the country median.

2.3 The Mechanics: Fiscal Policy, Growth, Interest Rates, and Debt Ratios

Fiscal expansions are crucial to stimulate the economy, but fiscal policy and output growth are not independent. Indeed, an increase in Y affects the primary balance through automatic stabilizers. Simultaneously, changes in the fiscal balance are linked to changes in output by fiscal multipliers. The deterioration of the budget balance in turns affect interest rates, with knock-on effects on both growth and debt-dynamics (Abbas and others, 2013). Therefore, fiscal policy and economic conditions interact in complex ways. In an effort to decompose the factors contributing to changes in the debt-ratio, we can understand how these factors interact with each other (Figure 5).

- First, fiscal stimuli worsen the primary balance, which directly increase the borrowings of the government, thus increasing the level of outstanding debt.
- However, higher government spending (or equivalently, lower government revenues), has a positive effect on output through fiscal multipliers, which reduces the debt ratio in the short run.
- Any change in the output level will have an effect on the fiscal deficit through the automatic stabilizers, thus augmenting the fiscal gains. Together with the fiscal multiplier effect, the fiscal stimulus may contribute to improve the debt-to-GDP ratios.
- However, as the government runs a budget deficit, the health of public finances worsens. Therefore, interest rates may raise due to the concerns about the sustainability of the fiscal measure. If this happens, the government interest payments on outstanding debt would be higher, thus increasing the debt-service costs. In addition, higher interest rates negatively affect the level of investments, leading to a contraction in output that offsets the fiscal stimulus.

Figure 3. Debt Ratio and the Economy



Source: Abbas and others, 2013. Personal elaborations.

2.4 Deficit Spending

The terms "deficit spending" and "fiscal policy" are not necessarily synonymous. While not all fiscal policies actions involve deficits, deficit spending implies that the government incur in a budget deficit. For example, a government may change certain marginal tax rates and expenditures by the same amount. However, this "balanced-budget" operation does not need to be "neutral": in fact, it will ultimately affect aggregate demand, as the marginal propensity to consume of the public sector (1) is higher than the one of the private sector($c_1 \leq 1$). Therefore, a change in government purchases affect aggregate demand more than an equivalent change in taxation, depending on the size of c_1, but it does not affect the deficit. In spite of the balanced budget operation, the extent of a fiscal policy action is usually measured by the size of the resulting government budget deficit. In fact, regardless of whether the deficits arise from an increase in government spending or a reduction in taxation, deficits and fiscal policy actions have the same qualitative effect on aggregate demand.

In order to assess the effects of deficit spending on the economy, it is important to distinguish between "cyclical" and "structural" deficit. During expansion phase of the business cycle, tax revenues increase as most taxes are proportional to output, and fall during contraction phases; on the contrary, certain government disbursements, such as unemployment benefits, fall during expansions and rise during contractions. That means that a decrease in output naturally leads to a larger deficit, and therefore a fiscal expansion, which partly counteracts the recession. This effect of counter-cyclical activity on the deficit is defined as "automatic stabiliser", as it stabilises the business cycle by smoothing the cyclical swings in income. On the other hand, the structural deficit tells what the deficit would be, under existing tax and spending rules, if output were at its potential level. Such measure comes also under the name of "cyclical adjusted deficit", as it considers the part of the deficit that is invariant to the phase of the business cycle. We can use the structural deficit as a benchmark against which to judge the direction of fiscal policy actions: for example, if the actual deficit is large but the cyclically-adjusted deficit is zero, the current fiscal policy's direction is consistent with no systematic increase of debt over time. Despite some substantial divergence at times, these two measures generally move together. For the purpose of this analysis, from now on the discussion will focus solely on "structural" deficits.

2.5 The Benefits from Deficit Spending

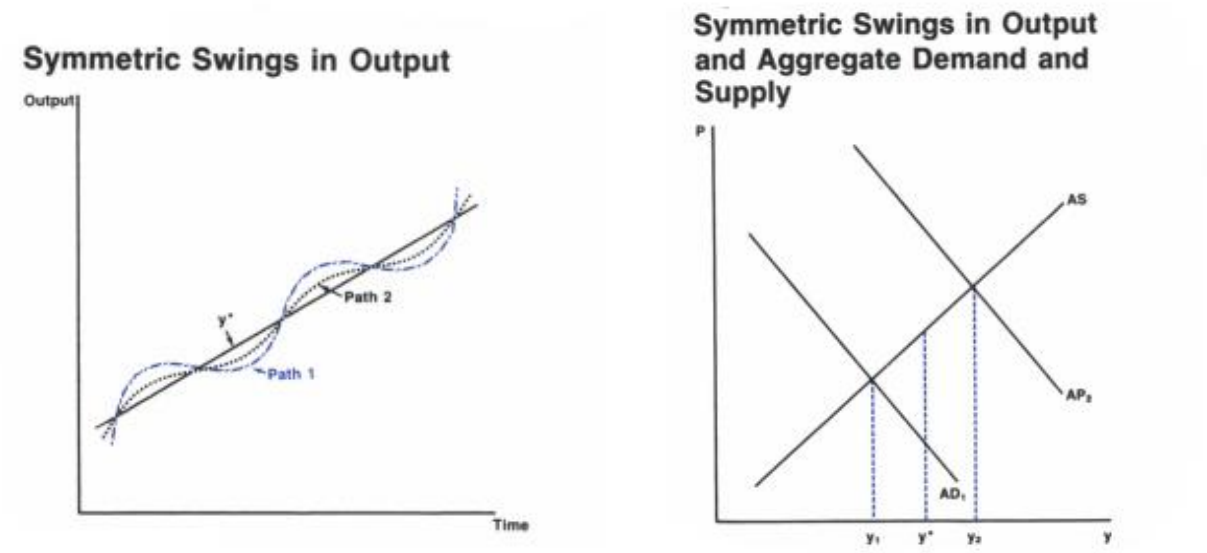
The expansionary effectiveness of deficit spending on the economy is based on the belief that market economy is unable to sustain aggregate demand at a level consistent with full-employment output (Chrystal and Thornton, 1988). As shown in figure 6, there is a gap between actual and "potential" output due to a persistent under-employment. Potential output is what an economy can produce if it is using all of its resources, and it is usually associated with some "full-employment" rate of unemployment (or "natural rate of unemployment"). The difference between real output and potential output is called **output gap**. When output is below potential, unemployment rate is above the natural rate; conversely, when the output gap is positive, unemployment is below the natural rate and output is above potential. Episodes of persistent under-employment equilibria are related to the concept of involuntary unemployment, which occurs when there is an excess supply of labour at the market wage rate. Consequently, individuals willing to work at the market wage are unable to find employment[22]. During periods of lasting unemployment due to deficient aggregate demand, the government could run a deficit large enough to make up for the deficiency. This would keep output closer to its potential level and could recovery the unemployment.

The gains of deficit on output are based on the assumption that cyclical output fluctuations around potential are determined by variation in the aggregate demand for goods and services. If fluctuations of aggregate demand around potential output were symmetric, then the cyclical troughs and peaks would be symmetric[23]. This is illustrated by "path 1" in figure 6 and the aggregate demand and supply curves in figure 7. Depending on the slope of the aggregate supply curve, symmetric shifts in aggregate demand produce symmetric variation in output about the potential level, y^*. Thus, deficit spending achieves no "net output gains" over the cycle, because deficits during positive output gaps would be matched by surpluses when output is below potential. Therefore, the budget would be balanced over the cycle and the average output level would be the same as without any fiscal policy intervention. However, a countercyclical fiscal policy action could stabilize aggregate demand and reduce the variability in output, as represented by path 2 in figure 1.

[22] Persistent under-employment equilibria and involuntary unemployment also result from real price rigidities in the output market, rigidities in real wages due to "efficiency wages" and frictional unemployment (Mankiw, 1988).

[23] However, the empirical literature provide evidences of the asymmetry of the business cycle, stating that cyclical downturns are longer and more pronounced that upturns. (Stickel, 1988)

Figure 4. Potential and actual output movements over the business cycle.



Source: Chrystal, K.A. and Thornton, D.L., November/December 1988, "The Macroeconomic Effects of Deficit Spending: a Review", Review (Federal Reserve Bank of St. Louis), p. 52

In fact, within the context of Keynesian models, under the assumption that consumers are constrained in liquidity, governments are expected to run budget deficits during downturns and surpluses during upturns, thus stabilizing the economy. A stable output is beneficial in many ways. Bruce and Purvis (1986) pp. 60-61 argue for the benefit of running a budget deficit to avoid cyclical downturns by stating that *"a government deficit will provide some stimulus to the economy and hence help reduce the dead-weight costs of unemployment that would have occurred in the absence of the deficit"*. In addition, gains from output stabilisation come from the reduction of risk associated to capital investment and, consequently, raise the level of investments. As a result, in the long run, capital stock would increase, bringing the output to a higher potential level.

Focusing on the short-term, the effectiveness of deficit spending mainly depends on two factors: the slope of the AS curve and the extent to which deficit spending shifts the AD curve. First, the aggregate supply curve is steeper than the potential output, as cyclical movements in real output tend to be asymmetric. In this case, the economy is more sensitive to changes in aggregate demand when output is below the potential level than above it. Of course, variation in government spending must be the same as if variations in aggregate demand are symmetric about potential output (Chrystal and Thornton, 1988). Stabilising discretionary fiscal policy smooths inflation and unemployment swings over the cycle and, therefore, reduces the cost of lost output related to both unemployment and inflation. Second, deficit spending could yield net benefits if it offsets downward shift of the aggregate demand curve.

For example, assuming that cyclical swings are symmetric over the so that there are no output gains from stabilising aggregate demand, deficit spending could still result in net output gain for society, as long as the government ran deficits during bad times and no surpluses were incurred during good times. Of course, in this case deficit spending adds to the stock of outstanding debt, resulting in a higher level of debt, both over the cycle and over time.

3. Criticism of the alleged benefits of Deficit Spending

As the efficacy of fiscal policy depends on the slope of the supply curve and the ability of the deficit spending to shift aggregate consumer demand, the criticism of deficit spending's benefits are based on the same two requirements. If these two conditions do not hold, deficit spending would not reduce the output loss due to unemployment, and therefore, it would not stabilise the output. A large debate about the effectiveness of fiscal policy actions, and in particular on budget deficits and their persistence, has highlighted that the effectiveness of deficit spending on output is often offset by several different factors, such as weak fiscal positions, the crowding-out of investments and the worsening of trade deficits. In particular, it has been shown that fiscal expansions have little to negative effect on output with increasing debt level. In fact, high debt ratios may lessen the effectiveness of deficit spending in the near term through two main channels: the expectation effect, referred to as the Ricardian equivalence, and the increasing responsiveness of government bonds interest rates to budget deficits.

3.1 The Ricardian Equivalence

One of the main criticism of the alleged benefits of budget deficit on output is the view that once government budget constraint is taken into account, neither deficit nor debt take effect on the economic activity. This argument is known as the Ricardian equivalence proposition, also known as the Ricardo-Barro proposition, named after Roberto J. Barro, which further developed and gave prominence to the Ricardian argument as an alternative approach to the strandard model. This standard analysis, by assuming that desired private savings rise less than a tax cut, so that desired national saving decline, states that a deficit-financed cut in current taxes brings about an increase in aggregate demand. Therefore, for a closed economy, real interest rate would have to rise to reduce the level of investment and restore the equality condition between national savings and investment demand $(I = S + (T - G))$. This reduction in private agent's demand for investment is known as "crowding-out" of investments, and in the long-term results in a smaller stock of productive capital. Thus, the

accumulation of budget deficit, namely the public debt, represents an intergenerational burden, as it leads to a smaller stock of capital for future generations (Modigliani, 1961). On the other hand, for an open economy, the substitution of budget deficit with current taxation leads to increased borrowing from abroad, rather than an increase in real interest rate. Therefore, this standard view suggests that budget deficits lead to current account deficits.

The Ricardian equivalence is alternative to the above-mentioned standard theory. To begin with, the equivalence theorem originates from the government budget constraint, according to which, total government expenditures for each period (including interest payments) are equal to government revenues from taxation and the net-issue of interest-bearing public debt. It follows that, for a given path of government spending, the substitution of deficit spending for current taxation brings about higher future taxes having the same present value of the initial cut. That is, the present value of taxes cannot change unless the government varies the present value of its expenditures. Barro (1989) refers to this concept as the notion of "absence of free lunch", meaning that government spending must be paid now or later, being the present value of total receipts fixed by the present value of spending. Hence, a deficit-financed cut in today's taxes must correspond to an equivalent increase in the present value of future taxes.

Now, supposing that consumption decisions depend not only on current income, but also on future disposable income, then household's demand for goods and services would depend on the expected present value of taxes. It follows that deficit spending could shift the aggregate demand curve only if it changed the expected value of taxes. However, as the preceding argument stated, the present value of current taxes could only be altered by a change in the total present value of spending. Therefore, the effect on consumption, and thus, on aggregate demand, of a tax cut (or any other rearrangement of the timing of taxes) would be small: as households expect an offsetting future increase in taxes, they would save most or all of the tax cut in anticipation of higher taxes to come. To put it in another way, as the government is dissaving, desired private saving increases, thus offsetting the fiscal gains on output and keeping the level of national saving unchanged. In this sense, deficit spending and taxation have an equivalent effect on the economic activity – hence the term, "Ricardian equivalence theorem". Furthermore, budget deficits do not affect investments. Now, in fact, given that desired national saving does not change, real interest rates do not have to rise in order to balance the equivalence between investment demand and national saving. Therefore, there is no "crowding-out" of investments, and no burden of the public debt in the sense of Modigliani (1961), as the private sector internalizes the decrease in government saving. In addition, in the Ricardian approach, even the effect of deficit spending for an open economy differs from the standard theory. In fact, the predicted expansion of desired private savings following a tax cut

is large enough to avoid lending from abroad. Hence, budget deficits would not lead to current account deficits (Barro, 1989).

3.2 Objections to the Ricardian Equivalence

Many economists raise points that invalidate the Ricardian equivalence. In this analysis, I will foucus on the first two criticisms that regard the strict assumptions of the so called "full Ricardian equivalence". First, the most dicussed theoretical objection raised against these assumptions is the one of infinitely lived households. This critique stems by the fact that people do not live forever, and thus they should unbothered by taxes raised after their death. For example, Albert Ando and Franco Modigliani (1963), in their life-cycle model, concluded that individuals are concerned only by the taxes that they expect to face before dying. Considering a deficit-financed tax cut, the burden of higher future taxes would be borne by an individual only during his expected lifetime and not thereafter. It follows that households would exclusively subtract from their expected present value of income the share of the expected present value of future taxes that they anticipate will occur while they are alive. Hence, after a deficit-financed tax cut, the net wealth of an individual currently alive would rise, thus increasing aggregate consumer demand as predicted by the standard model. It follows that the Ricardian equivalence would not hold, as private saving would not increase enough to fully compensate for the reduction in government saving.

However, the argument of a finite horizon fails if the typical individual would react to the government's shift of tax burden on his descendants (which is an imposed intergenerational transfer) with a compensating increase in voluntary transfers (Barro, 1974). In this setting, in which the typical individual is already giving his descendants out of altruism, households will capitalize the entire burden of expected future taxes, thereby planning effectively with an infinite horizon. Then, Barro (1989) argues that the Ricardian results also apply to a model with finite lifetimes, since there exist a network of intergenerational transfers that makes every typical individual part of an extended family that lasts on an infinite horizon. This idea also takes into account the existence of people without children, which are actually made wealthier when the government substitutes budget deficit for current taxation. In fact, the quantitative aggregate effect on output due to the existence of childless individual, in addition to being small[24], is also outweighed by the existence of individuals with a number of descendants above average, which, on the contrary, would experience a decrease in wealth in case of a deficit-financed tax cut. A variety of empirical studies[25] support the proposition that most people give

[24] For some related calculations, see Merton Miller and Charles Upton (1974, Chapter8).
[25] See Michael Darby (1979, Ch.3) and Kotlikoff and Summers (1981).

or receive intergenerational transfers, hence validating the Ricardian position. However, some authors, such as Bernheim, Shleifer and Summers (1985), challenge the belief that bequests and intergenerational transfers are driven by altruism. They suppose that the motivation of the transfer matters for the result, so that bequests, instead of having the purpose of altruism, are aimed at inducing their children to behave properly. In this context, if the government runs a budget deficit, the old generation would have no reason to save more in order to raise more transfers for future generations. Instead, they would be better off at the expenses of their descendants, hence increasing aggregate consumption. In addition, as in the standard model, deficit spending either crowds out investment trough the increase in interest rate or leads to a current account deficit as residents borrow more from abroad. Barro (1989) replies to these objections by observing that, if intergenerational transfers are not driven by altruism, parents would tend to pay wages to their children, rather than using bequests or other forms of transfers. He argues that these features could be better explained by introducing altruism alongside the parent's desire to influence their behaviour, as parents still care about their children's welfare. Now, the Ricardian equivalence still holds depending on the credibility of a parent's treat to induce their children to behave properly, and on whether the treat is large enough to induce the desired behaviour even when the government runs a budget deficit. Another objection moved against the Ricardian infinite horizon is that, as future taxes appear more distant and their timing more uncertain, individuals are more likely to ignore them. Consequently, since the time of death is uncertain, many bequests are unintended rather than intergenerational transfers, and hence, they are not related to budget deficits.

The second assumption that raised several objections on the Ricardian position is the one of perfect capital markets. Actually, private capital markets are "imperfect", in the sense that the typical individual's real discount rate exceeds the one of the government. Many households and small businesses, in fact, face higher borrowing rate than large businesses and pension funds, as they pay higher costs of evaluation and enforcement. Then, higher discount rate corresponds to a high rate of time preference for consumption and a high marginal rate of return on investments (Barro, 1989). Now, assuming that that the burden of higher future taxes is split equally on the two groups that face different borrowing rates, if the governments runs a debt-financed tax reduction, the two different groups would experience opposite changes in wealth. In fact, the individuals and firms that already faced the same borrowing rate of the government would not experience a net change in wealth, and they would be willing to buy their extra share of government bonds. By contrast, small firms and households that face a higher discount rate than the government would have their net wealth increased, as the present value of higher future taxes is lower than the one of the current tax cut. Then, deficit spending

leads to a reduction of the spread between the two borrowing rates, which in turn enables households and small firms to borrow at a lower interest rate, hence raising current consumption and investment. To conclude, the government, through deficit-financed tax cuts, enables the group of individuals that have a good access to credit market (the ones facing the same discount rate as the government) to hold more than their share of the extra public debt. On the other side, individuals with a poor access to credit market hold less than their share of government bonds, and hence receive loans from the first group. Thus, these evidences are "non-Ricardian" in the sense that loans take place even in an "imperfect market" and that, in this context, deficit spending shift the aggregate consumer demand.

3.3 Ricardian Equivalence and Public Debt

After the Great Depression, a wide consensus developed around the standard Keynesian view that discretionary fiscal policy can be effective in mitigating the business cycle. This has been illustrated in the standard IS-LM model as well as in the Mundell-Fleming model. However, by the 1990s, many economist rejected the alleged stabilisation effect of deficit spending, basing their objections on the Ricardian approach where people have rational expectations about the future (Barro, 1974). Some authors, such as Perotti (1999) and Alesina and Ardagna (2009), have even argued that large fiscal consolidations improve people's expectations about future tax burden to the point that an "expansionary fiscal contraction" may exist. The argument of an "expansionary fiscal effort" still holds also in the opposite case of a fiscal stimulus, especially in presence of large public debt. A fortiori, in fact, expectations about future higher taxes increase with the indebtedness of a country. The higher the level of outstanding debt, in fact, the less sustainable a fiscal stimulus is perceived to be. Then, public debt seems to play an important role in offsetting the deficit spending ability to shift the aggregate demand curve. In this respect, Nickel and Tudyka (2013) investigated the impact of a fiscal stimuli at different levels of government debt-to-GDP-ratios for a sample of 17 European countries from 1970 to 2010. They analysed empirically the effects of fiscal stimuli on macroeconomic variables such as output, trade balance and investment in view of rising outstanding debt in Europe. Moreover, they tried to answer the question whether increasing government debt-to-GDP ratios can drive a stronger response of the private sector, hence altering a fiscal stimulus effect on aggregate demand and the trade balance. The trade balance, in fact, may behave differently in response to a deficit-financed increase in spending (or decrease in taxation) according to the degree of government indebtedness.

Essentially, the occurrence of twin deficits depends on how desired private saving and investment respond to fiscal stimuli. In particular, they argue, individuals may adjust their

consumption levels depending on how they perceive the fiscal position of the country or the context in which fiscal policy actions take place. The standard Keynesian paradigm would predict that, if the government is dissaving, private consumption would increase and the rise in interest rate would crowd out investments. Consequently, deficit spending would deteriorate both the current account and the fiscal budget, leading to a twin deficit (Corsetti and Müller, 2006). In contrast, the Ricardian alternative predicts that, if private agents perceive the current fiscal situation to be unsustainable, they would respond to a fiscal stimulus by increasing their precautionary savings (and thus reducing their consumption) by a large degree. In this proposition, the decrease in public saving would be fully offset by an increase of desired private saving in anticipation for expected higher future taxes, whose introduction is imposed by the government budget constraint as a result of the increased deficit. Naturally, the burden of future higher taxes may be perceived more tangibly if the current fiscal situation of a country is weak, i.e. if a high level of indebtedness calls for an urgent fiscal consolidation in the near future.

The findings of Nickel and Tudyka's analysis (2013) support the hypothesis that the private sector increasingly internalizes the government budget constraint with increasing debt ratios. They find that exogenous expansionary fiscal shocks are first followed by an increase of real output and a weakening of investment demand and the trade balance. However, at higher level of debt-to-GDP ratios, the overall effect on output turns negative, and the consistent increase in real interest rates crowds out investments. As far as the trade balance is concerned, at high level of government indebtedness, it moves into surplus after a fiscal stimulus. The authors interpreted these results as a support for the presence of characteristics of Ricardian equivalence proposition. Finally, they conclude that the effectiveness of expansionary fiscal policy in raising the aggregate consumer demand or resolve external imbalances may lessen as the debt ratios increase. These findings provide additional support to the importance of a careful fiscal policy design at high levels of debt.

3.4 The Budget deficit and interest rates

The argument as to why deficit spending implies a rise of nominal interest rates comprehends two different channels. First, in the non-Ricardian approach, budget deficits decrease the total amount of savings, as private savings do not increase enough to compensate for the reduction in public savings. In a closed economy, this reduction in national savings represents a decrease in supply of capital, which in turns result in an increase of real interest rates. Second, the deficit increases the stock of government debt, and thus the relative amount of outstanding government bonds with respect to other financial assets. Under the assumption that government bonds and private bond are not perfect substitutes, the government has to offer a higher interest rate on government bonds in order to sell these additional government bonds on the market. In addition, deficit spending weakens the fiscal position of a country through the increase of the debt. Consequently, the default risk priced into government bonds may rise as well. In fact, as soon as investors start to worry that the government may not be able to repay its debt fully, they ask for a higher interest rate to compensate for what they perceive as a higher risk of default on the debt. A higher return on sovereign debt indicates that the creditworthiness of a country decreased, i.e. that the doubt about its ability to repay its debt increased. Usually, the merit of credit of a country is measured by benchmarking the return of its own bonds against that of the most creditworthy country (for example, Germany in the European Union). This sovereign risk premium differential goes under the name of "sovereign spread", and it reflects the markets' concerns that a government may default on its debt. An increase in spread raises the debt-financing cost for the government, and makes it more difficult to stabilise the debt. Following an increase in interest rates, the government would have to increase primary balance in order to maintain the debt stable. This needed fiscal contraction, in addition to be politically costly, may potentially generate more uncertainty, triggering a further increase in interest rates. In addition, fiscal efforts are likely to decrease the GDP growth rate of the country, so that the combined effect of increased interest rate and reduced output growth rate$(r - g)$ may require an even larger fiscal effort to stabilise the debt. At some point, the government may lose control on its budget and lead to an increase of the debt at such a level that it would be impossible to be repaid, thus confirming the investors' concerns. Therefore, at high levels of indebtedness, an increase in interest rates can trigger a vicious cycle with potential catastrophic dynamics.

In theory, the most at risk countries are the ones with lower growth since higher growth countries typically face lower financing costs as they are perceived to be able to "grow out" of their debt and therefore represent lower credit risk (Cottarelli and Jaramillo, 2013). Thus, markets should focus on medium and long-term growth, as it is the main determinant of

sustainability. However, recent studies suggest that the short-term fiscal fundamentals are at the centre of the market's attention. In this respect, Ewing and Yanochik (1999) tested the hypothesis that budget deficit have an impact on the term structure of interest rates in Italy. Their findings were consistent with those of Cebula (1991), which tested the hypothesis that budget deficit affect the yield spread on 20 years US Treasury bonds and three months US Treasury bills. These results suggest that budget deficits increase the government bond long-term interest rates relative to short-term yields. Furthermore, Schuknecht et al. (2010), finds that fiscal imbalances influence government bond spreads more strongly after the breakout of the financial crisis in 2008. In line with this view, Haugh, Ollivaud and Turner (2009) find that, after the financial crisis of 2008, markets have magnified the importance of fiscal performances of several euro countries, and that further deteriorations in fiscal performance lead to even larger increase in spread. This increase in global risk aversion is confirmed also by Sgherri and Zola (2009), which argue that, although sovereign spreads in the euro area tend to commove over time, markets have become more concerned about short-term fiscal positions. Moreover, focusing only European countries, a large empirical literature investigates whether the introduction of the EMU (European and Monetary Union) in 1999 and the adoption of the Stability and Growth Pact in 1997 had a significant impact on the relationship between budget deficit expectations and interest rate swap spreads. A swap spread measure the difference in the borrowing costs of the government relative to the private sector. The choice of swap spread as dependent variable is made in some recent studies, such as the one by Heppke-Falk and Hüfner (2004). The authors investigated whether the projected budget deficit ratio has a different disciplinary effect on fiscal policy before and after the introduction of the common currency and the adoption of the SGP, using monthly data for France, Germany and Italy. Their estimation results suggest that the start of EMU lead to an increase responsiveness of the markets to the deficit variable, so that an increase in the deficit-to-GDP ratio leads to a sharper decrease in the interest rate swap spread after 1999. Then, it is reasonable to assume, especially judging from recent developments in public finances, that financial markets are paying growing attention to the risk caused by deficit spending with high debt levels or in presence of a stringent fiscal regulation.

4. The empirical model

4.1 Data description

In this section, I present an econometric model for 19 developed countries in the period 1990-2018. The dataset used for this analysis is drawn from the Organisation for Economic Co-operation and Development (OECD) Statistics. The sample period is based on data availability for the output gap. The aim of this analysis is to assess whether the benefits of expansionary fiscal policy on the business cycle are offset by high debt levels. For this purpose, I analyse this effect by testing two different hypotheses:

I. The positive effect of fiscal stimuli on output gap (a proxy for the business cycle) fades with increasing debt level.
II. At high debt levels, expansionary fiscal policy measures leads to an increase in the long run interest rate of government bonds.

The following Table shows the countries selected for the empirical model and the mean of the used variables for each country.

Table1. Descriptive Statistics

			Mean		
Country	*Output_gap*	*Interest rate*	*Gov Spending*	*Debt*	*GDP growth*
Australia	-0.6052	5.9721	35.7082	47.3583	5.6176
Austria	-0.1328	4.3507	51.6371	80.6387	3.9066
Belgium	-0.3745	4.6110	51.8017	119.5658	3.6372
Canada	-0.5297	4.8600	43.4948	107.2054	4.2783
Denmark	-0.1745	4.5376	54.0504	57.2096	3.4938
Finland	-1.4621	4.9245	53.9345	57.0629	3.5486
France	-0.1983	4.4403	54.3462	90.5300	3.0162
Germany	-0.3632	3.9229	46.0533	69.4991	2.8819
Greece	-3.1492	8.1567	48.8517	129.1065	2.6643
Ireland	-0.6817	5.2369	36.6133	65.6515	8.0882
Italy	-1.0524	6.0497	48.8792	127.7678	3.4821
Japan	-1.0048	2.0069	38.5823	178.4552	0.9590
Netherlands	-0.2814	4.2455	44.8050	68.4883	4.0248
New Zealand	-0.3369	6.0986	40.9600	/	4.9162
Portugal	-0.6914	7.4072	45.9171	96.1454	5.2028
Spain	-1.8897	5.7745	41.8296	75.6700	5.0572
Sweden	-0.8559	4.9634	53.0379	63.0379	4.4076
UK	-0.4969	5.0531	40.7134	71.0442	4.3700
United States	-1.1579	4.5931	38.0261	104.8604	4.5652

Note: Government spending, Debt and GDP growth are expressed as percentage of GDP. Output gap is expressed as percentage of potential GDP.

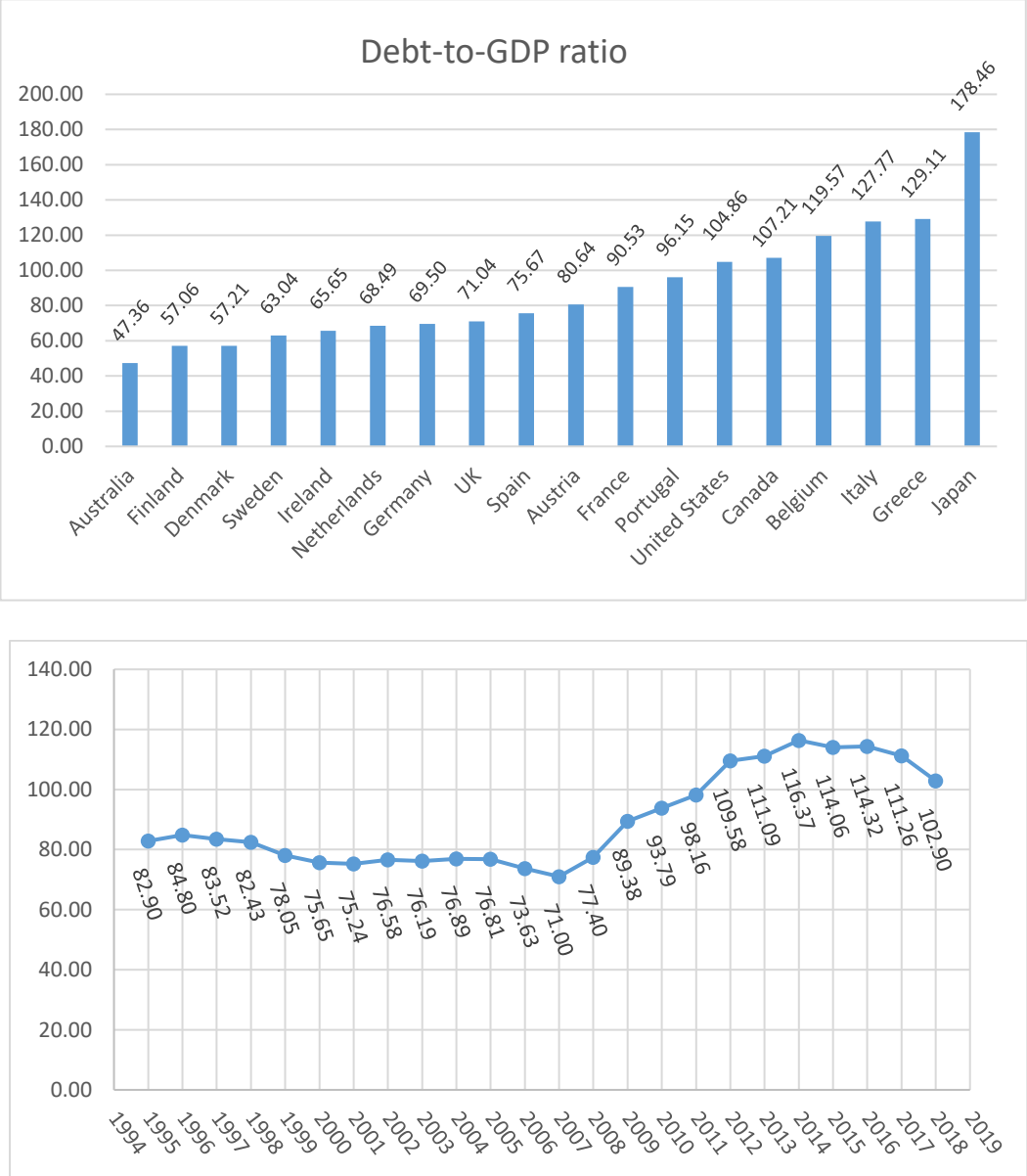
The variables selected for this model are:

- **Output gap**: defined as the OECD measure of the ratio between actual and potential output. The potential output is the highest level of production that a country can achieve (by fully employing its factors of production) without generating inflationary pressures. The concepts of potential output and output gap enable to separate the economy's real output into a long-term trend (identified with the potential output) and a short or medium economic cycle. A positive output gap occur when actual output is above potential output, and it means that the economic system is producing above it equilibrium capacity. Thus, unemployment decreases and inflation increases. A negative output gap, instead, depicts an economy that is producing below is equilibrium capacity, implying an increase in unemployment and an increase in inflation. Therefore, the role of output gap in fiscal policy is to quantify the nature of the economic cycle by identifying the actual economic situation within the cycle, and so to suggest counter-cyclical economic policies aimed at influencing the effects of the cycle itself. Expressed as percentage of potential output.
- **Long-term nominal interest rates on government bonds**: defined as the interest rate offered by government bonds. The interest rate at which a government sells its bonds depends on how creditworthy the market considers it to be. An increase in the government bonds interest rate reflect an increase in the credit risk of that country, i.e. an increase in the probability that the country would not be able to pay its financial obligations.
- **Government spending**: defined as the current general government disbursements as percentage of GDP. It measures the total amount of expenditures on goods and services of the general government. Expressed as percentage of GDP.
- **Government debt**: expressed as a debt-to-GDP ratio, is a key indicator that can be used to monitor the sustainability of government finances, and to assess the government's ability to incur additional debt or to manage the levels of its current debt. Changes in government debt over time reflect the behaviour of past fiscal balances; recurring large deficits will result in higher debt levels whereas a succession of surpluses will reduce debt levels. The higher a government's liabilities, the higher the probability of a government defaulting on its debt, as perceived by markets, the higher risk premium demanded by the market, resulting in an increase in the debt-financing cost. Expressed as % of GDP.
- **GDP growth**: expressed as percentage change in the Gross Domestic Product of a country compared to the previous year. Expressed as % of GDP.

The average level of the indebtedness of each country in the each year of the available period (1995-2018) is shown in Figure 7. In this sample, Japan appears to be by far the country with

the highest debt-to-GDP ratio (178.46%), while the least indebted country turns out to be Australia (47.35%). Looking at the trend of the average debt ratio of the 19 selected developed countries over the period, it is visible that it started to grow exponentially following the breakout of the financial crisis, jumping from the lowest point observed of 71% in 2007 to 116.37% of 2014.

Figure 7. Average debt ratio (debt) for each country of the sample during the selected period, and its trend over the period.



Source: OCSE Database. Personal elaborations.

Now, focusing on variables' trends, it can be noticed that they are consistent with the trend in average debt-ratio. The variation of the output gap, for example, provides indications about the

state of the business cycle. Figure 8 shows that for the country taken in consideration is this model, the output gap experienced a sharp decline between 2007 and 2009, meaning that the financial crisis lead the economy in recession during these years. Hence, the government ran large budget deficit during these years with the aim to smooth the recession, as shown in Figure 9.

Figure 8. Trends in average output gap (output_gap) for the countries in the sample over the period (1990-2018).

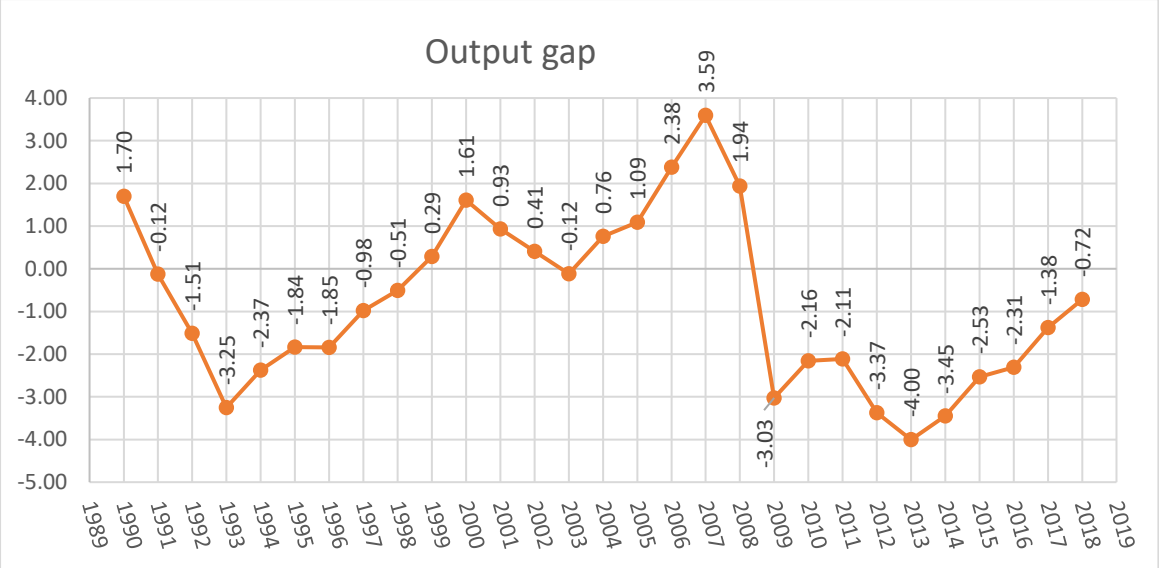
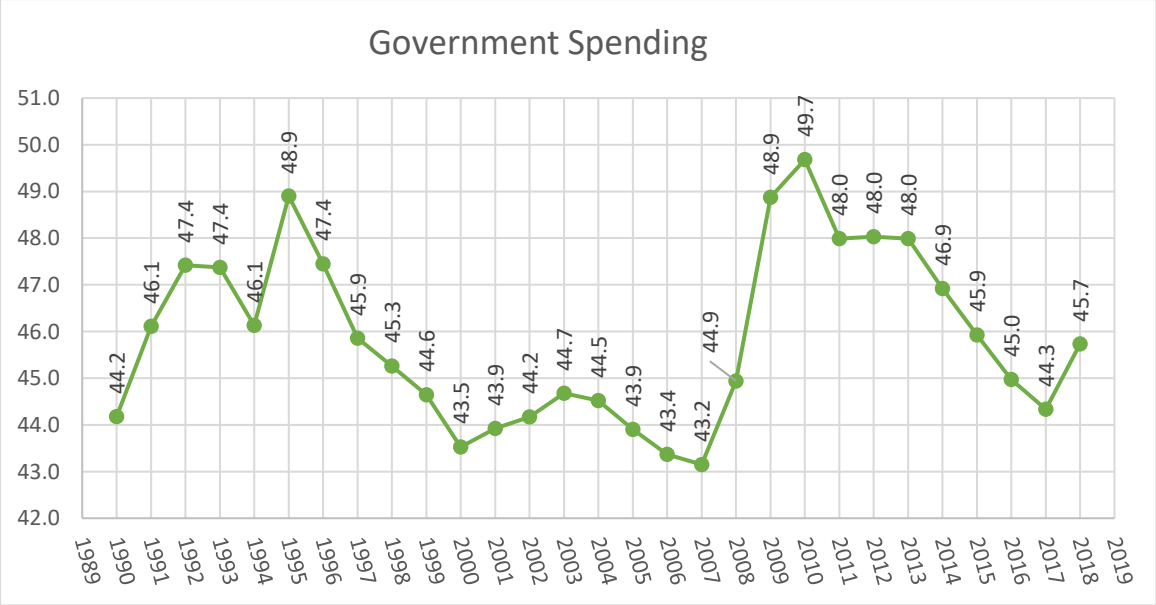


Figure 9. Trends in average government spending (g_spending) for the countries in the sample over the period (1990-2018)



Source: OCSE Database

4.1 The regression

The empirical specification for the effect of public debt on the efficacy of fiscal stimuli on output gap is the following:

I. $$y_{it} = \beta_0 + \beta_1 g\_spending_{it} + \beta_2 debt_{it} + \beta_3 g\_spending_{it} * debt_{it} + \varepsilon_{it}$$

Then, the regression for the influence of the government debt size on the effect of fiscal stimuli on long-term government bonds interest rates is specified as follows:

II. $$r_{it} = \gamma_0 + \gamma_1 g\_spending_{it} + \gamma_2 debt_{it} + \gamma_3 g\_\_spending_{it} * debt_{it} + \varepsilon_{it}$$

Where y_{it}= the output gap of country i at time t, and r_{it} is the long-term interest rates on government bonds of country i at time t. In addition, $i = 1, \dots, 19$ and $t = 1, \dots, 29$. The error ε_{it} is assumed to be uncorrelated with the dependent variables. ε_{it} can be specified as:

$$\varepsilon_{it} = c_i + \lambda_t + u_{it}$$

Where c_i represents the country fixed effects and λ_t represents the year fixed effects. The variable $g\_spending_{it}$ refers to the total amount of the general government expenditures, while $debt_{it}$ represents the government debt-to-GDP ratio.

In this model, I want to test the negative influence of the debt ratio on the effectiveness of fiscal policy on the output gap. Therefore, the efficacy of fiscal stimuli actions on output gap depends on the debt level as follows:

$$\frac{\partial y}{\partial g\_spending} = \beta_1 + \beta_3 * debt_{it} \quad (1)$$

Similarly, the effect of fiscal stimuli on the long-term interest rate of government bonds depends on the debt level as follows:

$$\frac{\partial r}{\partial g\_spending} = \gamma_1 + \gamma_3 * debt_{it} \quad (2)$$

In equation (1), I expect $\beta_1 > 0$, as government spending has a positive effect on output gap. If $\beta_3 < 0$, then the effectiveness of fiscal policy on the business cycle decreases with increasing debt level. Differently, for equation (2), I expect both γ_1 and γ_3 to be positive. If $\gamma_3 > 0$, it means that fiscal stimuli raise the long-term interest rates on government bonds more with increasing debt level.

In regression (I), I use two different dependent variables as a robustness check. First, I use the output gap as percentage of potential GDP, and then I use the annual GDP growth of each country.

4.2 Results

The results of the regression are displayed in Table 2.

Table 2. *Regression's results*

	(I)	**(2)**	**(3)**
Debendent variable	**Output gap**	**GDP growth**	**Interest rate**
Gov spending	**-0.025**	**-0.181** (***)	**-0.082**
	(-0.082)	(0.072)	(0.064)
Debt	**0.031**	**0.07** (*)	**-0.074** (**)
	(0.041)	(0.037)	(0.036)
*Gov spending *Debt*	**-0.002** (**)	**-0.001**	**0.002** (**)
	(0.001)	(0.001)	(0.001)
r2	0.635	0.665	0.758
N	408	407	408
		legend: **β**(level of significance)/(SE)	

The results on government spending are not consistent with the empirical literature, as they suggest that an increase in government spending has a negative effect on the business cycle. These results, in fact, are confirmed for both the two regression having as dependent variable the output gap and the GDP growth. On the other hand, this effect of government spending on output gap is not statistically significant. This result may be due to a simultaneity bias, which may arise in case of procyclicality of fiscal policy. In this regard, Fatas and Mihov (2009) find that the behaviour of fiscal policy in the euro area in mildly procyclical, and that, overall, it has not changed much since the introduction of the single currency. Conversely, the interaction

term is consistent with the Ricardian approach in the regression (1) and (2), and it is significant in the regression for the output gap. This suggests that the negative effect of government spending on the business cycle (which is abnormal) is worse in highly indebted countries (as the interaction term has the expected sign). In addition, the interaction term in regression (3) has the expected positive sign and it is statistically significant. Therefore, this result is consistent with the literature in the sense that, since financial markets perceive budget deficits more unsustainable with increasing debt ratios, then fiscal stimuli lead to a higher debt-financing cost as the debt level increases.

Once we obtained the results of the empirical model, it is possible to quantify the effect of government spending for the average level of debt-to-GDP ratio of the countries in our sample.

$$\frac{\partial y}{\partial gov\ spending} = \hat{\beta}_1 + \hat{\beta}_3 * \text{debt}_{it}$$

$$\frac{\partial y}{\partial gov\ spending} = -0.02486 + (-0.0018 * 89.426) = -0.1863$$

Therefore, our model finds that the negative effect of government spending on output gap is magnified by the average debt level. This result can be further explained by quantifying the effect of government spending for the average debt ratio of each different country, as shown in table 3.

Table 3. *Estimated effect of government spending for the average debt ratio of each different country*

Country	Debt	Effect
Australia	46.5348	-0.1087(*)
Finland	57.0629	-0.1277(**)
Denmark	57.2096	-0.128(**)
Sweden	63.0379	-0.1385(***)
Ireland	65.6515	-0.1432(***)
Netherlands	68.4883	-0.1483(***)
Germany	69.4991	-0.1501(***)
UK	71.0442	-0.1529(***)
Spain	75.67	-0.1613(***)
Austria	80.6387	-0.1702(***)
France	90.53	-0.188(***)
Portugal	96.1454	-0.1982(***)
United States	103.405	-0.2112(***)
Canada	107.205	-0.2181(***)

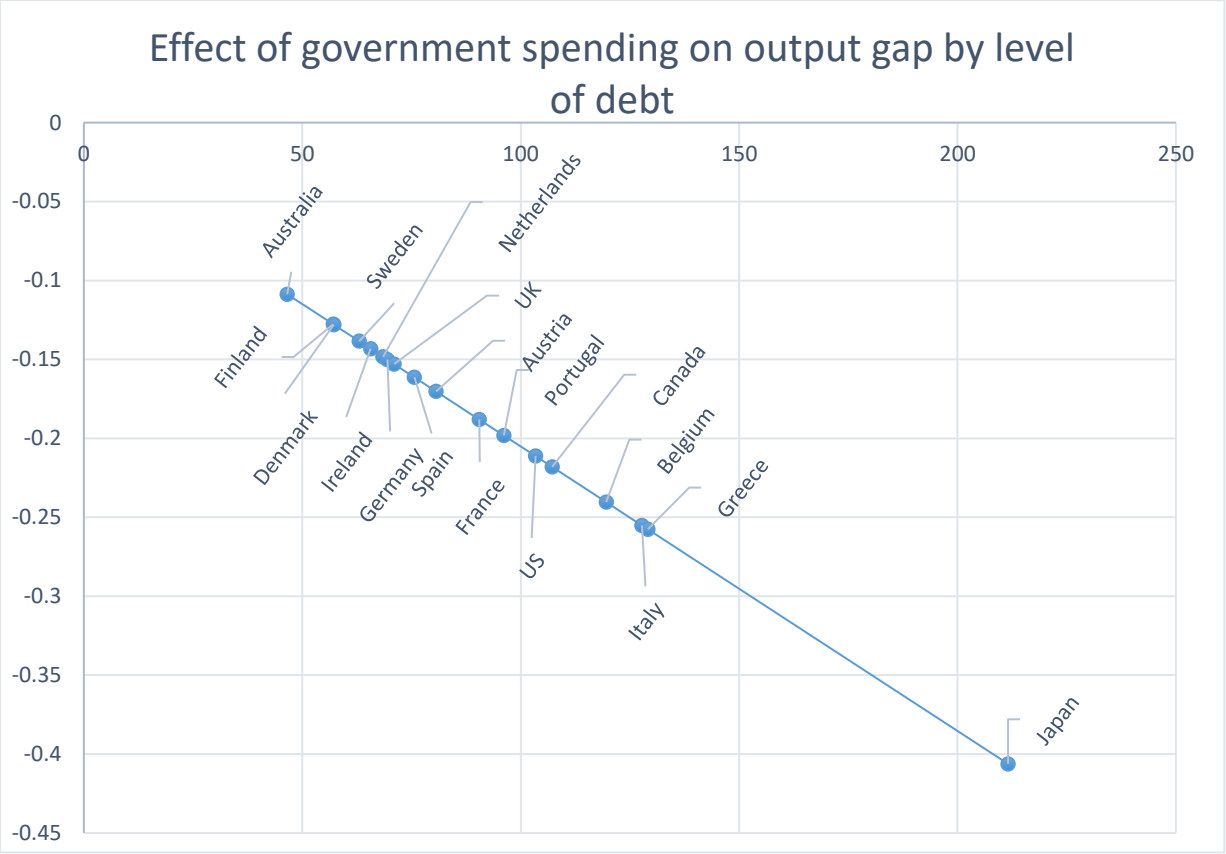
Belgium	119.566	-0.2404(***)
Italy	127.768	-0.2552(***)
Greece	129.107	-0.2576(***)
Japan	211.573	-0.4062(***)
Average	89.426	-0.1863(***)

*Denotes significance at 10% level
**Denotes significance at 5% level
***Denotes significance at 1% level

The results displayed in Table (3) show that the negative effect of government spending on output is higher with high debt ratios. In particular, the results are significant at the 10% and 5% level for very low debt ratios (Australia, Finland and Denmark), while their significance increases to the 1% level with higher debt levels.

Figure 10 shows the same results plotted on a graph measuring the debt ratio on the horizontal axis and estimated effect of government spending on the output gap on the vertical axis.

Figure 10. Effect of government spending on output gap by level of debt.



As we can assume from both Figure (10) and Table (3), the model suggests that the magnitude of the negative effect of government spending on output gap is higher with increasing debt levels. In particular, Australia is the least indebted country in our sample, and therefore it proves

to have the smallest effect of government spending on output gap (-0.1087). On the opposite, Japan, having the highest debt-to-GDP ratio level, shows the highest effect government spending on output gap (-0.4062).

Then, by using the coefficient for regression (II), it is possible to quantify the effect of a fiscal stimulus on the government bonds interest rates for the average debt level of the considered countries.

$$\frac{\partial r}{\partial g\_spending} = \hat{\gamma}_1 + \hat{\gamma}_3 * \text{debt}_{it}$$

$$\frac{\partial r}{\partial g\_spending} = -0.0876 + 0.0019 * 89.426 = 0{,}0823$$

These results confirm that, for the average size of the debt, a fiscal stimulus raises the long-term government bonds interest rates. In particular, the estimated negative effect of government spending on long-term interest rates (-0.0876) is increasingly out-weighed by the positive effect of the interaction variable (0.0019) as the debt level increases. Then, the estimated effect of government spending on long term interest rates for the average debt level of the countries in the sample turns out to be positive $(0{,}0823)$. Table 4 shows these effect by the level of debt of each different country.

Table 4. *Estimated effect of government spending on long-term government bonds interest rate for the average debt ratio of each different country.*

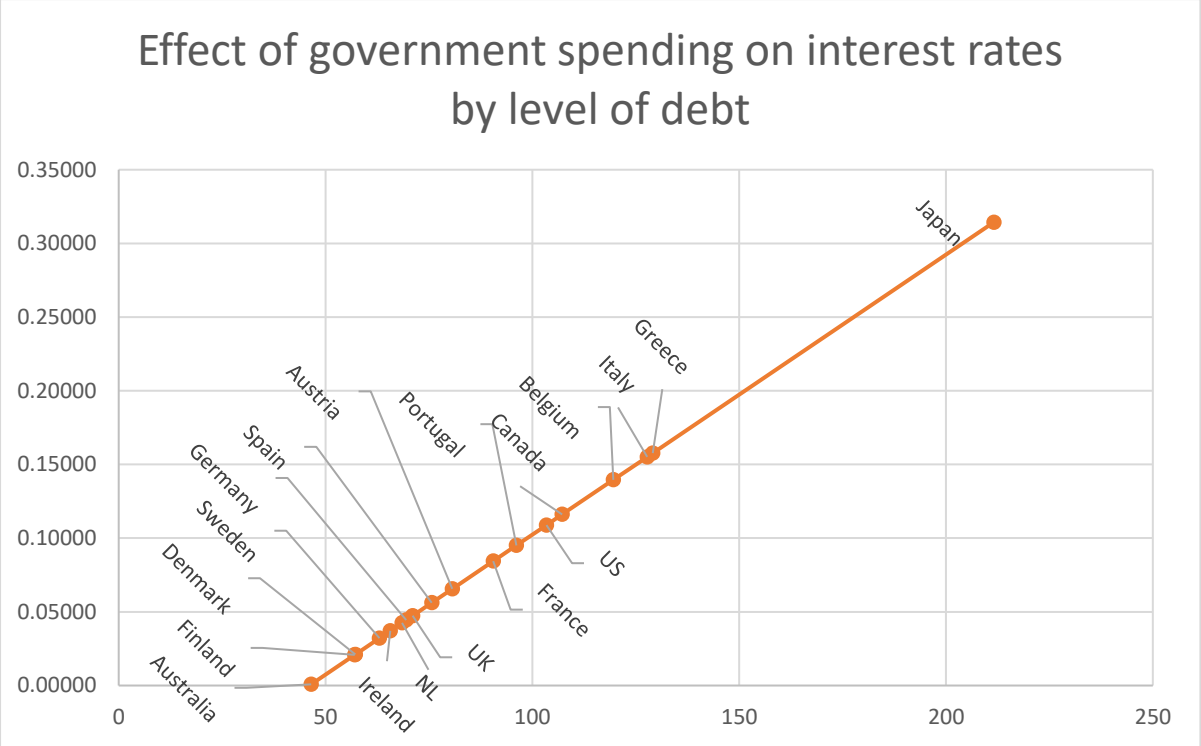
Country	Debt ratio	Effect
Australia	46.5348	0.0008
Finland	57.0629	0.0208
Denmark	57.2096	0.0211
Sweden	63.0379	0.0322
Ireland	65.6515	0.03714(*)
NL	68.4883	0.04253(*)
Germany	69.4991	0.04445(**)
UK	71.0442	0.04738(**)
Spain	75.67	0.05617(**)
Austria	80.6387	0.06561(***)
France	90.53	0.08441(***)
Portugal	96.1454	0.09508(***)
US	103.405	0.10887(***)

Canada	107.205	0.11609(***)
Belgium	119.566	0.13958(***)
Italy	127.768	0.15516(***)
Greece	129.107	0.1577(***)
Japan	211.573	0.31439(***)
Average	89.426	0,0823(***)

*Denotes significance at 10% level
**Denotes significance at 5% level
***Denotes significance at 1% level

Figure 11 shows the same results plotted on a graph measuring the debt ratio on the horizontal axis and estimated effect of government spending on the long-term government bonds interest rates by on the vertical axis.

Figure 11. Effect of government spending on output gap by level of debt.



The results shows that with increasing debt ratios, the rise of government bonds nominal interest rates is bigger. In particular, the effect is negligible for the least indebted country, which in our sample is Australia (0.00082). The size of the effect grows with increasing debt levels, with a considerable size in highly indebted countries such as Italy (0.15516) and Japan (0.31439). Moreover, the significance of the effect for the less indebted country turns out to be small, and increases with the debt ratio.

CONCLUSION

Following the financial and economic crisis, fiscal policy has been a central issue in the debate among policymakers and researchers. During those years, fiscal stimuli have been adopted by many industrialized countries to avoid a harsh recession and to stabilising the output. Consequently, over the years, debt ratios reached levels that were not seen since the years just after World War II. In recent years, a rising number of politicians and academics have questioned the validity of fiscal austerity as a stabilisation policy, calling for a renovated need of consistent governmental intervention to boost the economic activity. However, in highly indebted countries, these fiscal impulses are failing at raising aggregate demand from consumers and from a protracted phase of slow growth. Moreover, the shift from fiscal restraint to fiscal expansion is likely to affect the investors' expectations about the sustainability of public debts, putting markets under pressure and increasing the debt service costs. These factors brought renovated interest around the possible fiscal intervention in view of rising government debt.

In this analysis we explored the effectiveness of fiscal stimuli on the business cycle at varying degrees of public indebtedness. In particular, we identified two main channels through which increasing debt-to-GDP ratios my hinder the expansionary effect of fiscal stimulus measures: first, by the increasing internalization of fiscal expansion from the private sector, and secondly, by the increase in long run interest rate due to concerns on sustainability in the financial markets. To this end, I employed a panel of a sample of 19 developed countries for the period 1990-2018. The result of the first regression of this analysis confirm that the private sector increasingly displays Ricardian features as the government indebtedness rises. These findings qualify the debt as an important endogenous variable, which helps to capture the internalization of the government budget constraint by the private sector. In particular, I found that expansionary fiscal policy have a contractionary effect on the output gap, and that the size of this effect increases at high debt ratios.

Then, the other result of this analysis is that with high debt levels, budget deficits lead to a bigger increase in government bonds interest rates. These results provide evidence about the attention of financial investors not only on the long-term fiscal sustainability, but also about the short-run fiscal position of highly indebted countries, as they perceive them more likely to lose control of their public finances. Therefore, a rise in long-term interest rates on government bond after a fiscal expansion has two different "contractionary" effect: first, it increases the debt financing costs of the government, and in addition, it lowers the private agents' demand for investments, reducing the aggregate domestic demand. In particular, the results suggest that the

increase in sovereign spread yields after a fiscal stimulus is nearly zero for at very low debt ratios, while becomes increasingly consistent at high debt, suggesting caution for highly indebted countries in fiscal policy design.

Overall, the results of the two regression confirm the existence of the two channels through which the effectiveness of fiscal expansions on the business cycle is hindered by the high debt ratios. First, the private sector's response to fiscal expansion is proved to be increasingly Ricardian with high levels of indebtedness, in the sense that the fiscal stimulus results in an increase in precautionary savings rather than a positive consumption growth. On the other hand, prediction of "crowding-out" of investments due to expansionary fiscal policy seems to be caused by the increase in the risk premium on government bonds interest rates.

References

Abbas, S. M. Ali, Akitoby, B., Andritzky, J., Berger, H., Komatsuzaki, T., Tyson, J., (2013), "Dealing with High Debt in an Era of Low Growth", IMF Staff Discussion Notes No. 13/7 (Washington: International Monetary Fund).

Alesina, A., Ardagna, S., (2009). "Large Changes in Fiscal Policy: Taxes Versus Spending", NBER Working Papers No. 15438.

Alfonso, A., Alves, J., "The Role of Government Debt in Economic Growth*"*, Working Papers, 2183-1815, University of Lisboa, Department of Economics and Management.

Ando, Albert and Franca Modigliani, (1963), "The Life Cycle1 Hypothesis of Saving: Aggregate Implications and Tests," American Economic Review, 53. March 1963, pp. 55-84.

Auerbach, A.J., and Y. Gorodnichenko, (2012a), "Measuring the Output Responses to Fiscal Policy," American Economic Journal: Economic Policy, Vol. 4, pp. 1–27

Barrell, R., D. Holland, and I. Hurst, (2012), "Fiscal Consolidation: Part 2. Fiscal Multipliers and Fiscal Consolidations," OECD Economics Department Working Paper No. 933 (Paris: Organisation for Economic Co-operation and Development).

Barro, R. J. (1974). "Are government bonds net wealth?" Journal of Political Economy 82 (6).

"Batini, N., L. Eyraud, and A. Weber, (2014), "A Simple Method to Compute Fiscal Multipliers," IMF Working paper No.14/93.

_____, (1989), "The Ricardian Approach to Budget Deficits", Journal of Economic Perspectives – Volume 3, Number 2, pp.27-54.

Bruce, N., Purvis, D. D., (1986), "Consequences of Government Budget Deficits" in John Sargent, ed. Fiscal and Monetary Policy, University of Toronto Press, pp. 44-57.

International Monetary Fund, (2013), Fiscal Monitor, April 2013 (Washington).

Batini, N., L. Eyraud, L. Forni, A. Weber (2014). "Fiscal Multipliers: Size, Determinants, and Use in Macroeconomic Projections". Fiscal Affairs Department, Internationall Monetary Fund.

Baum, A., M. Poplawski-Ribeiro and A. Weber, (2012), "Fiscal Multipliers and the State of the Economy," IMF Working Paper 12/286 (Washington: International Monetary Fund).

Bernheim, B. D., Shleifer, A. and Summers, L. H., (1985) "The Strategic Bequest Motive," Journal of Political Economy, 93, December 1985, pp. 1045-1076.

Blanchard, O., A. Amighini, F. Giavazzi, (2017), "Macroeconomics, a European Perspective", Third Edition, Pearson.

Cebula, R.J., (1991), "Anote on federal budget deficits and the term structure of real interest rates in the United States", Southern Economic Journal, 57, pp. 1170-73.

Christal, A. K., Torthon, D. L., (1988), "The Macroeconomic Effects of Deficit Spending: A Review", Federal Reserve Bank of St. Louis Review, November 1988, pag. 48-60.

Corsetti, G. and Müller G. J. (2006). Twin deficits: Squaring theory, evidence and common sense. Economic Policy 21 (48), 597–638.

Cottarelli, C., Jaramillo, L. (2013). Walking Hand in Hand: Fiscal Policy and Growth in Advanced Economies. Review of Economics and Institutions, 4(2), Article 3. doi: 10.5202/rei.v4i2.113. Retrevied from http://www.rei.unipg.it/rei/article/view/113.

Darby, M. R., (1979), "The Effects of Social Security on Income and the Capital Stock, American Enterprise Institute", Washington D.C., 1979.

Dolls, M., C. Fuest, and A. Peichl, 2012. "Automatic Stabilizers and Economic Crisis: US vs. Europe," Journal of Public Economics, Vol. 96, pp. 279–94.

Ehrhart, C., Llorca, M., (2008), "The Sustainability of Fiscal Policy: evidence from a panel of six South Mediterranean countries", Applied Economics Letters, 15:10, 797-803.

Erceg, C. J., and J. Lindé, 2010, "Is There a Free Lunch in a Liquidity Trap?" International Finance Discussion Papers 1003 (Washington: U.S. Federal Reserve System).

Ewing, B. T., Yanochik, M. A., (1999), "Budget deficits and the term structure of interest rates in Italy", Applied Economics Letters, 6:3, 199-201, DOI: 10.1080/135048599353636.

Eyraud, L., and A. Weber, 2012, "Debt Reduction during Fiscal Consolidations: The Role of Fiscal Multipliers," unpublished paper presented at the IMF surveillance meeting seminar of April 10, 2012".

Fatas, A. and Mihov I. (2009), "The Euro and Fiscal Policy", NBER Working Paper 14722.

Giavazzi, F., and M. Pagano (1990): "Can Severe Fiscal Adjustments Be Expansionary?," in NBER Macroeconomics Annual, ed. by O. Blanchard, and S. Fischer. MIT Press, Cambridge, MA.

Hamilton, J.D. and Flamin M.A. (1986), "On the limitation of government borrowing: a framework for empirical testing", *American Economic Review*, 76, 808-19.

Haugh, D., Ollivaud, P., Turner, D., 2009. “What Drives Sovereign Risk Premiums? An Analysis of Recent Evidence of the Euro Area”. OECD Economics Department Working Papers No.718.

Heppke-Falk, K., Hüfner, F., (2004), “Expected budget deficits and interest rate swap spreads – Evidence for France, Germany and Italy”, Discussion Paper Series 1: Studies of the Economic Research Centre No. 40/2004, Deutsche Bundesbank.

Ilzetzki E., E. G. Mendoza, and C. A. Vegh, 2013, “How Big (Small?) Are Fiscal Multipliers?” Journal of Monetary Economics, Vol. 60, pp. 239–54.

Ilzetzki, E., 2011, “Fiscal Policy and Debt Dynamics in Developing Countries,” Policy Research Working Paper Series 5666 (Washington: The World Bank).

"International Monetary Fund, 2010, World Economic Outlook, October, Chapter 3, “Will It Hurt? Macroeconomic Effects of Fiscal Consolidation” (Washington)"

"Kim, S. and N. Roubini (2008). Twin deficit or twin divergence? Fiscal policy, current account, and real exchange rate in the U.S. Journal of International Economics 74 (2), 362–383."

Kirchner, M., J. Cimadomo, and S. Hauptmeier, 2010, “Transmission Of Government Spending Shocks In The Euro Area: Time Variation and Driving Forces,” ECB Working Paper Series 1219 (Frankfurt: European Central Bank)

Kotlikoff, Laurence J. and Lawrence El. Summers, (1981), "The Role of Intergenerational Transfers in Aggregate Capital Accumulation," Journal of Political Economy, 89, August 1981, pp. 706-732.

Mankiw, N. G., (1990), “Recent Developments in Macroeconomics: A Very Quick Refresher Course”, Journal of Economic Literature. 1990;28 (Dec) :1645-1660

Melitz, J. (2000), “Some Cross-Country Evidence About Fiscal Policy Behaviour and Consequences for EMU”, European Economy 2:3-21.

Miller, Merton H. and Upton, C. W., (1974) “Macroeconomics, a Neoclassical Introduction”, Irwin, Homewood Illinois.

Mineshima, A., M. Poplawski-Ribeiro, and A. Weber, 2014, “Fiscal Multipliers,” in Post-Crisis Fiscal Policy, ed. by C. Cottarelli, P. Gerson, and A. Senhadji (Cambridge: MIT Press, forthcoming).

Modigliani, Franco, (1961), "Long-run Implications of Alternative Fiscal Policies and the Burden of the National Debt," Economic Journal, 71, December 1961, pp. 730-755.

Nickel, C. and A. Tudyka (2013). “Fiscal stimulus in times of high debt: reconsidering multipliers and twin deficits”. IMF Working Papers 15/13, International Monetary Fund.

Perotti, R., (1999), “Fiscal Policy in Good Times and Bad”, Quarterly Journal of Economics 114, 1399-1436.

Reinhart, C.M., Rogoff, K.S., (2010), "Growth in a time of debt", American Economic Review: Papers & Proceedings 100 (May 2010): 573–578 http://www.aeaweb.org/articles.php?doi=10.1257/aer.100.2.573

"Ricardo, D. (1817). On the principles of political economy and taxation. In P. Sraffa (Ed.), Theworks and correspondence of David Ricardo, Volume 1, 1951. Cambridge University Press."

Romer, C.D., 2011, “What Do We Know About the Effects of Fiscal Policy? Separating Evidence From Ideology,” Hamilton College, November 7, 2011.

Schuknecht, L., von Haugen, J., Wolswijk, G., (2010), “Government Bonds Risk Premiums in the EU Rivisited: The Impact of the Financial Crisis”, ECB Working paper No.1152.

Sgherri, S., E. Zola, 2009. Euro Area Sovereign Risk During the Crisis. IMF Working Paper No. 09/222.

Spilimbergo A., Symansky S., Blanchard O., Cottarelli C. (2008), IMF Staff Position Note “Fiscal Policy for the crisis”.

"Spilimbergo, A., S. Symansky, and M. Schindler, 2009, “Fiscal Multipliers,” IMF Staff PositionNote 09/11 (Washington: International Monetary Fund)."