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FEP FACULDADE DE ECONOMIA UNIVERSIDADE DO PORTO

INSIGHTS ON HOW TO FINANCE GOVERNMENT SPENDING: MAXIMIZING THE FISCAL MULTIPLIER DURING RECESSION PERIODS

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Dissertation

Master in Economics

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2018

Vita

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After completing the secondary education, in 2012, in Escola Secundária Eça de Queirós, Póvoa de Varzim, in the area of Socioeconomic Sciences, with the average of 20 (out of 20), Faculdade de Economia da Universidade do Porto (FEP) was the chosen faculty to study Economics. The Bachelor's degree was completed in 2015, with the average of 18.

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Acknowledgements

First, I want to emphasize that the opportunity of contributing, even in a very modest way, to the investigation within Economics science is of an inestimable value. Macroeconomics has always been a passion for me, ever since I started my path in Faculdade de Economia do Porto (FEP), a great institution, which gave me the knowledge that potentiated this work. For this, I want to thank every single teacher that I have been given the pleasure of listening to; all of them have been of great importance to my growth as a student, and many of them have contributed to my personal development, not only with motivational words, but also with constructive criticism, which I particularly appreciate.

In this context, I want to say a particular thank you to both my supervisors, Ana Paula Ribeiro and Vitor Carvalho, who have also been my teachers, and some of the best examples of patience, commitment, and support that I have had in FEP. Besides the humanitarian side, they have given an immeasurable contribute in terms of knowledge, ideas, and accurate evaluation of every step of my work. In my most stressful times, when everything seemed impossible to be done, they stood by my side, and believed me in a way I did not believe in myself. The path has not been easy, but everything is definitely easier with the right people by our side.

To my parents, the most special and loving thanks, not only for getting me to where I stand now, with this accomplishment, but for everything that I have ever had in my life, and for never letting me give up on my dreams. Everything that I have, every little step that I take towards a good future, and, especially, all that I am, I owe them. There will never be enough words to express how much I am thankful to have a family like mine.

To my sister, Sandra, whose steps I have always followed closely, and to who I look up to, not only as an academic model, but also as a woman, full of loyalty, responsibility, and a bright intelligence. Thank you for being the woman you are, and for the support you have always given me throughout my educational path.

To Filipa and Margarida, two special friends, who have never let me break down, have given me support through the toughest times of my academic and personal life, and with whom I have developed a lasting friendship. Truly, the real sense of receiving in double what you give is well represented with these two.

Finally, to all my closest friends, who have cheered me up and made me believe that I could be better at every step.

Abstract

Throughout the recent financial, economic, and sovereign debt crisis, the debate on the adequate decisions for public spending financing has been a crucial matter. In this dissertation we intend to discuss and understand the effects on the economy, particularly on GDP, generated by alternative sources of public spending financing, within the European Union, during periods of economic contraction. Considering the fact that there is scarce literature exhaustively covering all public spending financing methods during recession periods, particularly with the restrictions that some countries face in terms of public deficit or debt-limits and no access to monetization, this dissertation also intends to contribute to policy making through broadening the horizons of the existing literature.

Starting by reviewing the existent literature on the mechanisms through which the different methods of public spending financing create an impact on GDP, we apply an econometric model, using a vector autoregressive (VAR) methodology, taking as sample the EU-28 countries during recession periods since the 1990s (sample period – 1995 to 2016), in order to compute fiscal multipliers for governments' expenditures financed by alternative sources: (i) taxes (both direct, indirect, and social contributions; we also go a little further by studying separately taxes on personal income, on corporate profits, on property, on payroll, on goods and services, and social contributions); (ii) debt (short-term and long-term debt, foreign- or domestic-owned, and issued in national or in foreign currency); and (iii) monetization.

The main results obtained in this work point out monetization as the best financing method, even within recession periods, followed by debt (particularly long-term debt and/or debt issued in national currency), for the cases where significant results have been obtained. Raising taxes during recession periods seems to be highly distorting, usually generating negative multipliers, even under a simultaneous fiscal stimulus. Disaggregating taxation into its components, the results show positive spending multipliers for indirect-tax financing.

***Keywords*:** fiscal policy, fiscal multipliers, direct/indirect taxation, public debt, monetization

***JEL Codes*:** E60, E61, E62, G01

Resumo

Durante a recente crise financeira, económica e da dívida soberana, o debate em torno das mais adequadas formas de financiamento da despesa pública tem sido um assunto em voga. No âmbito desta dissertação, pretendemos discutir e compreender os efeitos na economia, particularmente no Produto Interno Bruto dos países Europeus, em períodos de recessão, gerados pela utilização de padrões diversos de financiamento das despesas Governamentais. Tendo em conta que existe escassa literatura que abranja exaustivamente os efeitos das diferentes formas de financiamento em períodos de recessão, e face às restrições que muitos países enfrentam no que toca aos limites ao défice e dívida pública, e o impedimento no uso da monetização, esta dissertação pretende dar um contributo para os decisores de política económica, fazendo uma extensão dos estudos já realizados.

Será feita uma apresentação do estado da Arte em relação aos mecanismos através dos quais as diferentes formas de financiamento geram impactos no Produto Interno Bruto, após a qual será aplicado um modelo econométrico de vetores autorregressivos (VAR), utilizando como amostra principal os países da UE-28, e tendo como horizonte temporal os períodos recessivos desde os anos 90 (período da amostra – 1995 a 2016), com o intuito de calcular os multiplicadores orçamentais resultantes de despesas financiadas através de fontes alternativas – impostos (diretos, indiretos e contribuições para a segurança social; será também feito um estudo separado dos impostos sobre rendimento singular, rendimento coletivo, sobre as propriedades, payroll, bens e serviços, e contribuições para a segurança social), dívida (de curto e longo-prazo, interna e externa, e em moeda nacional ou estrangeira), e monetização.

Os principais resultados deste trabalho apontam a monetização como a melhor forma de financiamento dos estímulos orçamentais, em recessão, seguindo-se a dívida (particularmente a dívida de longo prazo e/ou emitida em moeda nacional), para os casos em que foi obtida significância estatística para as regressões. O aumento de impostos em períodos de recessão parece fortemente repressor da atividade económica, tendo-se obtido, em muitos casos, multiplicadores negativos para a despesa financiada por este método. De notar que a consideração das diferentes categorias de impostos, separadamente, permitiu obter multiplicadores positivos para o financiamento via impostos indiretos.

Palavras-chave: *política orçamental, multiplicador orçamental, impostos diretos e indiretos, dívida pública, monetização*

Códigos JEL: *E60, E61, E62, G01*

"Whatever the mind of man can conceive and believe, it can achieve."

Napoleon Hill

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Abbreviations

EA – European Area

ECB – European Central Bank

EU – European Union

GDP – Gross Domestic Product

GIIPS – Greece, Ireland, Italy, Portugal, Spain

HICP – Harmonized Index of Consumers Prices

IMF – International Monetary Fund

IRF – Impulse Response Function

OECD – Organization for Economic Cooperation and Development

VAR – Vector Autoregressive

SC – Schwarz Criterion

SGP – Stability and Growth Pact

SVAR – Structural Vector Autoregressive

TFP – Total Factor Productivity

ZLB – Zero Lower Bound

1. Introduction

Economists have been studying the effects of Government expenditure in gross domestic product (GDP) for a long time, not only analyzing the impact of the expenses by themselves, dividing them into different categories, but also studying whether their influence on GDP might be different according to different sources of their financing.

Within the latter discussion, we can find the seminal controversy between the Ricardian authors and the Keynesian literature, the first contributes stating that consumers are indifferent between debt and taxes – debt neutrality[1] –, and the second disagreeing from this point of view, defending that public debt is seen as an increase in wealth, thus stimulating consumption (Afonso, 2008).

There are many studies covering different sets of countries when it comes to validating or rejecting debt neutrality, or comparing taxation and monetization, but there is not much literature comparing, in a quantified way, the effects of all the three forms of financing Government expenditure on GDP. According to, *e.g.*, Kandil (2006, 2013), different forms of financing have distinct effects on the sign and magnitude of the fiscal multipliers. Thus, following the mentioned studies, this dissertation aims at quantifying, through the computation of fiscal multipliers, the effects on GDP, in the European Union countries, caused by financing public expenses through different methods – taxes, debt or monetization – during recession periods since the 1990s. This study proposes to go even further, unfolding taxation into direct and indirect taxes (following, for example, the work by Arin *et al.,* 2016), and specifying particular categories within these two groups of taxation, debt into internal or foreign debt (this division is also done by Kandil, 2013, and Priftis and Zimic, 2017), and also considering short-term *versus* long-term debt, and debt issued in national or foreign currency.

The focus on recession periods, strongly motivated by the last financial, economic, and sovereign debt crisis, is justified, not only by the subsequent slow upturn in the global economy and the need for accurate fiscal policy, but also by two other facts. First, in the context of recessions, countries usually face an increased difficulty in meeting their debt obligations, which can lead to severe penalizations in the particular case of the Euro Area (EA) countries, which face predefined limits to deficit and debt. Moreover, EA countries do not have an autonomous monetary policy (it is conducted by the European Central Bank),

[1] This preposition has become widely known under the denomination of "Ricardian Equivalence".

and thus are unable to stimulate the economy using this instrument. These difficulties were particularly clear during the recent financial and economic crisis, which started in 2008, and the ensuing sovereign debt crisis. These arguments enhance the relevance of studying taxation as the remaining available financing method, and disentangling it in order to better understand its impacts on GDP. Second, many authors have been recently studying the amplitudes of the fiscal multipliers during recession periods *versus* expansion periods, mainly motivated by the recent cycle phase. Studies by Tagkalakis (2008) and Auerbach and Gorodnichenko (2012), for example, refer and prove that fiscal multipliers during recession periods are larger than those observed during expansions, which justifies a separate study of both phases. Parker (2011) goes a little further, stating that, not only the multipliers are influenced by the state of economy, but also that most studies ignore this fact, which can be misleading – different policies can have different results when applied in downturns or upturns, being state-dependent (this cannot be seen clearly if the computation of multipliers is done over complete cycles).

This dissertation is motivated by a two-tier research question. First, it will attempt to discuss the mechanisms through which alternative sources of public expenditure financing are more likely to lead to positive (and, ideally, maximum) fiscal multipliers. Thus, since the study will focus on contraction periods, increasing GDP through fiscal policies would smooth the cycle phase (contradicting the break caused by cycle-phase conditions). Second, due to the referred restrictions to public deficit and debt, and to the intertemporal restriction of the Government budget, the analysis will also focus on finding the least distorting methods of financing public spending in terms of budgetary constraints (trying to keep a balanced-budget).

Summarizing the ideas above, we will start by analyzing different scenarios and intrinsic conditions which may influence the efficiency of the fiscal policy, even if the same source of financing is used. After that, we will proceed to a review of the existing literature on alternative expenditure financing methods, and the subsequent enumeration of their costs and benefits. After having the overall view over the state of the art about this subject, we propose to make an empirical assessment of the impacts of the different public financing strategies in terms of the fiscal multiplier and Government budget, in the EU-28 countries. The extension of the literature will consist on the separate analysis of direct and indirect taxation (and specific categories) applied to the EU-28 countries, of long-term *versus* short-term debt, and debt issued in national and foreign currency; the coverage of all alternative

financing sources applied to this set of countries is, to the best of our knowledge, absent from the existing literature. This dissertation also proposes to make a contribution to policy making, through the referred extensions to the existing literature on the topic.

After this introductory section, this work is structured as follows: in chapter 2, a literature review is summarized, starting by defining the key concepts underlying this work, and the main macroeconomic conditions that may affect fiscal policy efficiency. Then, we analyze in detail the framework within which this dissertation fits in, presenting a critical analysis of the core literature on the topic, and concluding on the main advantages and disadvantages of the alternative methods of public expenditure financing. In chapter 3, both a description of the econometric methodology that anchored our work, and a sample delimitation are presented. Moreover, we present the variables to be used, and the model specifications. In chapter 4, we will expose our estimations and results, including a critical discussion and comparison with literature previously published. Finally, in chapter 5 we will summarize the main conclusions, and present some clues on the limitations of our study and potential insights for future investigation.

2. Literature review on the effectiveness of fiscal policy: general external constraints, and intrinsic mechanisms of each financing method

The debate on the effectiveness of the fiscal policy has been a great matter of discussion through times, since it can suffer modifications under the influence of several factors, such the method of financing, the component of expenditure used to stimulate the economy, the conjuncture, the markets' characteristics, etc. This can cause unpredicted effects on the real economy, thus disturbing the equilibrium.

This substantial sensibility justifies deep studies on each possible effect. Since this discussion is done under the scope of a social science (Economics), and that it implies the absence of direct testing of the hypothesis *a priori*, theoretical explanations need to be supported by empirical assessment. Several authors have been developing different models (Hebous, 2011), attempting to capture specific scenarios that can cause shifts on the predicted results of fiscal policy on real economy, thus aiming at avoiding erroneous actions of policymakers. The results prove to be different, depending on the methodology and samples, but one can detect a line of coherence between them. Thus, although, for example, the fiscal multipliers present a large spectrum of values within different approaches (Ramey, 2011), the overall base mechanisms for fiscal policy transmission are quite consensual.

Within this section, the aim is to assess, in general terms, the specific conditions that might affect the effectiveness of fiscal policy, not only in macroeconomic global terms, but also considering the specificities of each economy. Then, we will proceed to a specific explanation of the channels through which different methods of financing might affect the effectiveness of the fiscal policy, and present some empirical studies.

Whenever it seems pertinent, the two above mentioned topics will be related during our empirical analysis, in chapter 4.

As an attempt to have a *proxy* of the impacts of fiscal measures on the GDP (their efficiency), in order to potentiate a more assertive guidance for policymakers, many authors use the conceptualization and calculation fiscal multipliers (Batini *et al.*, 2014). There are several definitions for "fiscal multiplier", depending, for example, on the time frame used to calculate it. A generic one is given by Batini *et al.* (2014, p.1):

"Fiscal multipliers measure the short-term impact of discretionary fiscal policy on output. They are usually defined as the ratio of a change in output to an exogenous change in the fiscal deficit with respect to their respective baselines."

Despite being a very precise definition, the authors ignore the lasting effects that these changes in fiscal variables may have in the output – the fact that they might not be limited to the short-run.

Ilzetzki *et al.* (2013) briefly describe alternative definitions, which may capture the referred consequences. Taking as a starting point the most common definition of "fiscal multiplier" – the effect that a unitary variation on the Governments' expenses/revenues (or their specific components) causes on GDP –, the authors refer that the impact might be studied for an isolated and specific period, or also for a number of subsequent periods – cumulative multiplier. In the limit, the study can be done considering an infinite timeframe (the impacts of the fiscal shock will, probably, decrease after a few years, and disappear in the long-run) – long-run multiplier.

The choice of the type of multiplier being computed in each study should obey the rationale and specificities of each analysis. The cumulative multiplier has been used, also, by other authors, in renowned studies, namely by Mountford e Uhlig (2009), Batini *et al.* (2014) and Erceg and Lindé (2014).

Erceg and Lindé (2014) present, not only the cumulative multiplier definition, but also two others: marginal and average multipliers. The marginal multiplier represents the impact on GDP caused by an infinitesimal variation of the expenses, while the average multiplier represents the average response of GDP to a shock on the expenses considering a number of periods.

2.1. Macroeconomic variables' and conditions' impact on the effectiveness of fiscal policy

The divergence found when comparing different studies about the fiscal policy efficiency is not, though, limited to the different concepts that the fiscal multiplier can assume. In fact, the dimension of the fiscal multiplier can be strongly influenced by structural economic factors, and also by temporary shocks in the economy (Batini *et al.*, 2014).

Hebous (2011), on his survey about the effects of fiscal policy on macroeconomic variables, shed some light on the current state of the controversy about the efficiency of the fiscal policy, based on explanations about different scenarios considered on the models, that can lead to different results.

In terms of external factors that might bias them, the authors emphasize the degree of openness of the economies and the exchange rate regime. Ilzetski *et al.* (2013) corroborate the evidence about the influence of these two factors, and add two others – the countries' level of development, and the public debt level.

In this section, we address these matters in specific topics, gathering different contributes of the literature on each one of them. Moreover, we stress out other important factors that might influence the efficiency of the fiscal policy, and justify them by collecting theoretical explanations and empirical evidence.

2.1.1. Assessing the effects of cycle-asymmetry on the fiscal multipliers (the impact of GDP level)

Due to the current economic environment, with economies still struggling to boost the economic activity after the severe crisis, recessions are a "hot topic".

Many countries performed a shift in their fiscal policy orientation during the crisis, and the initial under-estimation of fiscal multipliers contributed to biased forecasting (Blanchard and Leigh, 2013). This biasing represents clear evidence of the necessity of further acknowledgment of the economic phase in order to determine the policy efficiency (*e.g.,* Huidrom *et al.,* 2016). In fact, Parker (2011) states that using linear regressions across entire cycles (putting together expansion and recession) can be misleading because policies are state-dependent, having different results when applied within different cycle-phases. This is an important critique to the existing literature, which is relevant to take into consideration.

A meta-analysis by Gechert and Rannenberg (2018), extending the work of Gechert (2015) by considering as a variable under analysis the cycle phase, aggregating 1882 observations registered in 98 previous studies about fiscal multipliers, proves that it is quite consensual that the cycle phase is determinant to the dimension of the fiscal multiplier. This type of study is heavily reliable, since it reunites a number of different methodologies and samples, avoiding biasing.

In terms of justifications to this asymmetry, there is also a common explanation that can be found within different studies, thus being well anchored in the literature – if the

financial constraints are higher and the resources are not fully occupied, which usually happens during recession periods, the consumers react more to a fiscal stimulus. Below, we present some examples of studies that are based on this explanation.

Tagkalakis (2008) proves, using yearly data from 1970 to 2002 of nineteen OECD countries, that consumers react more to fiscal policy if they face liquidity constraints. This usually happens during recession periods, when credit is riskier and thus more limited, and the economic activity slows down, because individuals take advantage of fiscal policy to find some relief. The author also concludes that the effects are particularly pronounced in economies with less developed credit markets, which is quite comprehensible as it stays in line with the idea of increased financial constraints.

Auerbach and Gorodnichenko (2012) also state that the strength of the fiscal policy is higher during recessions (higher fiscal multiplier), using a regime switching VAR (dual regime – expansions and recessions). This is due to the fact that, when the economic activity is shrunk, although State's intervention might increase the interest rate, agents do not tend to decrease too much their already low levels of consumption and investment – the crowding-out effect over private activity is not so severe. This crowding-out effect is also referred by Battini *et al.* (2014), using the opposite example – if the economy is facing an expansionary situation, a fiscal shock which increases the interest rates leads to higher saving rates, making it more attractive when compared to investing or consuming.

This idea is reinforced by Mittnik and Semmler (2012). This study proves, using as a sample the US economy, that the expansionary shock's magnitude is not relevant in times of expansion, mostly because since economies are already almost fully using their resources the crowding-out of private investment is significant. However, the same type of shock tends to have amplified results (bigger shocks produce more than proportionally higher multipliers and stronger effects employment wise) during recession periods, since there are idle resources, with potential to be utilized.

The work by Canzoneri *et al.* (2012) adds another important component to this conclusion, which is the amplitude of the cycle phase. The authors find that the multipliers tend to get higher when the amplitude of the recession rises, and lower when the expansionary periods' amplitude increases. The justification given to this behavior lies on the frictions of the financial markets. The authors prove that these frictions are countercyclical, decreasing in the margin when the output rises, and thus stimulating consumption.

Another important factor about recession periods, which may influence the results upon the fiscal multipliers is the higher market's rigidity. This factor is pointed out by many important studies, such as the ones by Auerbach and Gorodnichenko (2011), Christiano *et al.* (2011) and Corsetti *et al.* (2012). In particular, Auerbach and Gorodnichenko (2011) state that the higher rigidity of the internal markets during recession periods (there are high costs of dismissal, there is the prediction of the necessity of reinstalling productive capacity when the economies return to favorable conditions, implying added costs, etc.) is one of the factors that increases fiscal multipliers within downturns.

2.1.2. The Zero Lower Bound and its effects on fiscal multipliers (the impact of the interest rate level) – monetary policy and fiscal policy

The recent Global crisis presents a particularity, that is the Zero Lower Bound (ZLB). According to Erceg and Lindé (2014), this situation happens when nominal interest rate gets close to zero, which makes conventional monetary policy inefficient, due to the impossibility for the Central Banks to lower it even more, and to the lack of efficiency of money injection (markets face confidence issues and low return rates, thus not reacting to this stimulus); Central Banks have, then, started relying on the unconventional monetary policy (quantitative easing, credit facilities, etc.), which has produced quite good results in terms of economic stimulus, but also represents an added risk exposure to the authorities (Gambacorta *et al.*, 2014).

The positive relation between the ZLB and the fiscal policy efficiency is referred in many studies such as the ones by Christiano *et al.* (2011), Batini *et al.* (2014) ad Erceg and Lindé (2014).

Christiano *et al.* (2011) report that, in the case of ZLB, expansionary fiscal policy would generate a higher positive multiplier, and that the value scales up as the situation worsens. The authors emphasize the importance of the coincidence in time of the fiscal policy and the ZLB constraint – the fiscal multipliers increase as the percentage of the fiscal stimulus that occurs during the ZLB goes up (there is a positive relation). This is related to the fact that, during a ZLB situation, with nominal interest rates close to zero, the pressure over the demand generates a rise in expected inflation, thus decreasing the real interest rate. This generates an incentive to investment, which pushes demand even further, generating a snowball of growth.

It is important to note that the duration of the fiscal stimulus and the full coincidence between its implementation and the ZLB phase is critical to guarantee that the results are not biased. Woodford (2011) reports much smaller multipliers if the stimulus to the economy occurs partially after the ZLB stops binding the markets, finding negative results for stimulus that continue 2 years and a half before the ZLB constraint ceases. This justifies the results obtained by Cogan *et al.* (2010), which consist on small effects of fiscal stimulus on GDP in the US, even in a situation of ZLB – the model applied puts together ZLB and non-ZLB phases. Christiano *et al.* (2011) corroborate this evidence by stating that, if the stimulus is implemented during a period with normal nominal interest rates, a pressure over demand caused by a fiscal shock would drive up those rates, which crowds out private investment. Thus, the overall effect is significantly smaller than when the ZLB is effectively binding the markets.

The duration and the level of the stimulus is, therefore, a key concern to determine the dimension of the multipliers. The studies by Cogan *et al.* (2010), Christiano *et al.* (2011) and Woodford (2011) emphasize that fiscal policy should not be lagged in time; otherwise, the shocks may have the reverse effects to what was predicted at first – if the shock is not rapidly decided and executed, the evolution of the markets by themselves might determine that it arrives too late for the purpose – cycle phases quickly change, and the authorities should try to react as quickly as possible.

Even with the ZLB constraint, there are other parallel factors to be stressed out, such as the dimension of the stimulus or its composition.

Erceg and Lindé (2014), despite reaching the same conclusion for the ZLB, find another important effect – the marginal effects of expansionary policies decrease as the expenditure goes up. Thus, it might be important to conciliate fiscal policy programs with unconventional monetary policy, implying less distortion in terms of the balance of Government's budget.

Drautzburg and Uhlig (2015) use the American Recovery and Reinvestment Act of 2009 (USA) in order to study fiscal policy shocks in a ZLB. Their conclusions stay in line with what the authors referred above found out, but they also state that the composition of the stimulus to the economy and the introduction of distortionary taxes instead of *lump-sum* taxes lower the value of the fiscal multipliers.

2.1.3. The exchange rate regime

General macroeconomic models, such as the Mundell-Fleming model, point to a higher effectiveness of the fiscal policy when the economies are under a fixed exchange rate regime. In fact, the aforementioned model predicts that, within the context of expansionary fiscal shocks, there is the perception of increased wealth, which pushes demand forward (if the consumers are not Ricardian). This adds pressure over the monetary market (there is the need for more money to the increased transactions), that will have to readjust to equilibrium through a higher interest rate. Higher interest rates persuade foreign investors to increase the capital inflow for the economy that suffered the fiscal shock (if there is perfect capital mobility). There is, then, the pressure to the appreciation of the domestic currency, which leads to two alternative scenarios. If the economy has a regime that accommodates this, then the monetary authorities will let the currency appreciate, thus reducing net exports, and offsetting the initial increase in GDP caused by the shock. If the monetary authority is not willing to let the exchange rate fluctuate apart from the target, then it will expand the money supply (in terms of national currency) to the economy, detaining the referred appreciation (the supply offsets the higher demand from foreigners). Therefore, the economy does not lose competitiveness in the markets, which would happen if the authorities did not accommodate the growing demand for national currency. Although this model does not have a practical adherence to reality, the described mechanism is reported by many authors in their empirical studies, as it follows.

Ilzetzki *et al.* (2013) prove, within an SVAR model, that the fiscal multipliers are higher for countries with fixed exchange rates or with a very narrow band of fluctuation for the exchange rate. This group of authors finds evidence of significant positive fiscal multipliers for the case of economies under fixed exchange rate regimes, in opposition to the other set of economies (with a floating rates' regime), for which the empirical evidence points to insignificant or even negative fiscal multipliers. Batini *et al.* (2014) also find supportive results to the referred evidence.

However, Corsetti *et al.* (2012), although making an approach to this matter, warn the readers/investigators to the necessity of keeping in mind other intrinsic characteristics to the sampled economies. Otherwise, assuming a straight relation between the exchange rate regimes and the fiscal multipliers could lead to non-expected results.

Hebous (2011) includes the results above on his survey, and also addresses the case of a currency union. The author states that, in this situation, there are many externalities to considerate. Considering that the impact on GDP caused by an expansionary fiscal shock in a particular country is positive, the subsequent increase on GDP may lead to a rise in imports, creating more wealth to the trading partners (in the case of the Euro Area – EA, for example, there is a significant percentage of trade within the countries that belong to the currency union) – "free-riding" trade effect. However, the pressure over the interest rate becomes general to the union, which may lead to the loss of international competitiveness of all the countries (interest rate channel). This dilemma can only be solved in the presence of good coordination between the countries in the currency union, or the adoption of monetary accommodation by the monetary authority.

2.1.4. The degree of openness of the economies and other institutional constraints

According to Gechert and Rannenberg's (2018) meta-regression analysis, economies with a higher degree of openness to trade present significantly lower values for the multipliers. The mechanism underlying the explanation to this scenario is related to an economy's propensity to import goods (Batini *et al.*, 2014), which is, normally, lower for big economies or economies facing trading restraints.

This is confirmed and explained by a previous study by Coenen *et al.* (2010), in which the authors state that fiscal multipliers tend to be lower for the models applied to European economies than those for the United States. Among several factors mentioned by the authors, there is an important role played by the leakage for imports. This is comprehensible since an economy that performs a high volume of trade with international partners is more exposed to the exchange rate volatility. Actually, as the authorities implement a fiscal stimulus, there is a pressure over demand, which generates higher inflation rates. With the prices going up in the internal markets, there is a relative loss in competitiveness, which shifts demand towards foreign markets. Thus, the impact of the fiscal policy is partially contradicted. Beetsma and Guilidori (2011) reach the same conclusion in their study about EU countries – the trade balance deterioration is more significant among more open economies, translating into lower stimulating effects of expansionary policies. The authors also state that fiscal shocks in EU's most powerful economies have contagious effects to

their partners, which is explained by the referred leakage effects that have a direct impact on them.

The negative effect of an increase in the degree of openness of the economies in the fiscal multiplier is quite consensual. Ilzetzki *et al.* (2013), using the referred wide sample of developing and developed countries, stay in line with this conclusion, finding significant differences in the multipliers for open and closed economies, during at least five years. Actually, for the first group the spending multipliers tend to be negative, and for the second they tend to be close to one, being positive even in the long-run. The authors go even further to emphasize these conclusions, using two different criteria, adding up to the first one, in which they divided the two groups considering economies with exports plus imports above 60% as open economies, and closed if this indicator is below that value. They divided, then, the open and closed economies using two alternative methods – first, using a threshold for the markets' barriers, and second using the internal markets' dimension (considering that if an economy has a large and strong internal market, it will not have such a high volume of international trade, thus being more closed). Both divisions provide results that are consistent with the theoretical previsions, and with the empirical evidence found before.

If it is important to study the degree of openness to trade, there are also other market restraints, besides price rigidity, which deserve a special attention. In fact, labor and capital mobility may also contribute to changes in the fiscal policy efficiency.

Shen and Yang (2012) study the effects of fiscal policies under limited capital mobility. The authors conclude that the restrictions imposed to capital mobility have a two-folded effect – on the one hand, the possibility to use external financing sources reduces the internal crowding-out effect; on the other hand, the inflow of external funds can cause real appreciation, which decreases the competitiveness. Hence, the final dimension of the multiplier will depend on the magnitude of these two opposite effects. For developing countries, the real appreciation can lead to further imports and less exports. Since these countries mainly export low-added value goods, this fact can cause severe problems in the economy.

Also, for Alesina and Ardagna (2013), countries with less restrictions to labor mobility and to international trade present the best results during fiscal consolidations in terms of the multipliers. During a fiscal consolidation, there are usually cuts on public expenses and/or increases on public revenues (to balance the budget). This would, by the normal mechanisms, decrease economic activity, deepening the recession. However, what

the authors prove is that there are factors that can lead to "expansionary consolidations", inverting the expected effects that contractionary fiscal policy would imply. Thus, increased factors' mobility and more open economies can decrease the negative impact of the policy, which is in line with the exposed above theory (for example, if the economies were closed, than a negative shock would be amplified by even more negative multipliers; if the economy is open, the impact will be smoothed).

2.1.5. The degree of development and reliability of the financial markets

Authors such as Claessens *et al.* (2010) and Ilzetski *et al.* (2013) study the different behaviors between developed and developing economies, testing them in different sample groups. It is a well-known fact that the degree of development has usually some attached characteristics, which may disturb markets' reactions. In this section we will address the degree of development of the financial markets, which highly conditions the investors.

An empirical study conducted by Claessens *et al.* (2010), using as sample 23 emerging economies and 21 OECD countries finds that recessions tend to be much more intense on the first group. This is not related to the duration of the recession, but to its amplitude – the contraction of GDP during that period. The authors point out two facts that might explain these empirical findings: not only these economies are very dependent from international trade and do not have much trading power (they produce mostly low added value goods, and import much more expensive ones), but also, and mainly, the financial markets are weaker and disrupted. This leads to severe credit contraction and to shrinking equity prices (financial markets on emerging countries are very volatile, less transparent, and less ruled, which may lead the investors to panic easily under recession conditions, and massively sell their stocks).

The above mentioned factors might be a base for the findings of Ilzetzki *et al.* (2013), that point out negative short-run and cumulative multipliers for developing countries, in opposition to the ones found to developed economies. The authors state, then, that any fiscal stimulus implemented for the first group is fully crowded out by the shrinking of investment, consumption and net exports. This seems to be in line with the explanations given by Claessens *et al.* (2010): imagine an expansionary fiscal shock in order to boost a developing economy under recession. If the credit is shrunk and the investors are not willing to take a gamble due to markets' risks, the stimulus is, *per se*, quite useless, because there will not be a

transmission of the first impact to the overall economic activity. This will, in fact, lead to a low multiplier. Moreover, being dependent economies, as stated above, the loss of competitiveness caused by the pressure over internal demand (and consequent increase in the inflation rates) can be tragic to the already difficult balance between exports and imports (considering the low value of the goods traded, as explained before). This scenario clearly points out to very low or even negative fiscal spending multipliers.

2.1.6. Automatic stabilizers

The automatic stabilizers are factors which automatically respond to the economic conditions, decreasing the amplitude of shocks in the economy (Burda and Wyplosz, 2013). For example, during recessionary periods, the usual decline on employment rates decreases the available income for the individuals, which breaks the consumption levels, thus strengthening the recession phase. However, there are, for example, pension funds available for unemployed people, which usually cover a higher number of people during these periods, acting as a natural stabilizer for increasing income, and contradicting the contractionary effect.

However, it is important to refer that this generic explanation and the belief in the automatic stabilizers' relevance is based on the assumption that consumers react to temporary variations on available income, which is not consensual within the economic theory. For example, the theory exposed by Friedman (1957) – the Permanent Income Hypothesis – defends that the individuals try to stabilize their consumption over their life period, thus not reacting significantly to shocks which they believe that are merely temporary.

However, many authors, such as Coenen *et al.* (2010) and Batini *et al.* (2014), state and prove, within their models and samples, that the automatic stabilizers decrease the dimension of the fiscal multipliers underlying discretionary fiscal policy.

In particular, Coenen *et al.* (2010) conclude that automatic stabilizers are more effective in Europe when comparing to the US, referring this difference as one of the factors that justify lower multipliers for European countries. This means that, for example, as the fiscal stimulus, financed by any source, is implemented, the GDP increases, so that the tax base becomes higher, implying a higher volume of taxation, and the volume of transfers become lower (as the wealth increases), causing a "cooling" in the economy, that is an endogenous process.

2.1.7. Public indebtness

The matter of whether the debt level of a certain Government is important to determine the fiscal policy efficiency is highly important, being crucial to underline the direction of the discretionary fiscal policy.

Many authors have been studying this topic, and the conclusions seem to point to lower fiscal multipliers when the debt levels are high (*e.g.* Ilzetski *et al.*, 2013; Batini *et al.*, 2014; Huidrom *et al.*, 2016).

This phenomenon is mainly due to too channels – the Ricardian channel and the interest rate channel. The first one is related to the fact that individuals perceiving highly leveraged economies tend to cut their consumptions levels, because they realize that Governments will need to balance their budgets in the future, for example, by rising the taxation levels (Ilzetski *et al.*, 2013; Huidrom *et al.*, 2016). The second means that higher indebtedness leads to higher default risk – as the perceived risk rises, so does the risk premium required by the debtholders. As the sovereign debt interest rates reach the markets, the crowding-out effect on private consumption and investment becomes a reality.

This evidence points to the fact that an expansionary fiscal policy, when implemented within recession periods in economies with significant debt levels, may even generate negative multipliers, thus contracting the economic activity even more. This fact may justify pro-cyclical fiscal policies – austerity packages to overcome contractionary periods. However, this type of policies need to be anchored in high Government's credibility. In fact, following Alesina and Ardagna (2013), if the individuals perceive their Government to be highly reliable, they may face the consolidation as a change in the path for the future, thus avoiding the rise in the long-term interest rates and propelling the investment (this can be amplified by a credible monetary authority conduct, such as quantitative easing) ().

It is important to refer, as a summing note of this section, and leaning on the above mentioned facts about the debt levels, that all these scenarios need to be put together with the different financing methods – within which there is the debt-financing. Although we can theoretically conclude about the higher or lower efficiency of the fiscal policy, in general terms, within different structural and cyclical conditions, we cannot infer that there are not more beneficial ways to finance public expenditure within different contexts.

Below, we present a summary of the mentioned conditions, and their expected effect on fiscal policy efficiency, and then we proceed to an analysis of the financing methods of that fiscal policy.

Table 1 - Mechanisms of transmission of fiscal stimulus under different macroeconomic contexts

Factor		**Expected effect on fiscal policy efficiency**	**Transmission mechanisms**	**Relevant authors and studies**
Cycle phase		Higher multipliers within recession periods	• Reduced crowding-out effect of rising interest rates due to already low economic activity and unused resources; • Higher price rigidity	*e.g.*:Tagkalakis (2008) ; Auerbach and Gorodnichenko (2012)
ZLB		Higher multipliers within ZLB context	Pressure over demand → rise in expected inflation → lower real interest rate, which stimulates consumption and investment	*e.g.:* Christiano *et al.* (2011); Batini *et al.* (2014)
Exchange rate regime		Higher multipliers within fixed exchange rate regimes	Monetary accommodation	*e.g.:* Coenen *et al.* (2010)
Degree of oppeness	Trade	Lower multipliers for more open economies	Leakage to imported goods	*e.g.:* Ilzetzki *et al.* (2013)
	Capital mobility	Two-sided effect	• External financing reduces the internal crowding-out; • External funds bring real appreciation, with a negative impact in traded output balance	*e.g.:* Shen and Yang (2012)
Financial markets		Higher multipliers for more developed financial markets	Higher impact of the fiscal stimulus if the investors trust in the markets' behavior	*e.g.:* Ilzetzki *et al.* (2013)
Automatic stabilizers		Lower multipliers for economies with more reactive automatic stabilizers	Lower impact of the fiscal stimulus under the present of automatic adjustments	*e.g.:* Batini *et al.* (2014)
Public indebteness		Lower multipliers for higher levels of debt	• Ricardian channel; • Interest rate channel; • Confidence channel.	*e.g.:* Huidrom *et al.* (2016)

2.2. General contributions to the debate on the three methods of financing public expenses

Besides the general economic conditions that can affect the efficiency of the fiscal policy, there are specific mechanisms of its transmission to the real economy that depend on the source used by the Government to finance its expenditure.

Before deeply analyzing some theories on fiscal policy it is important to clarify that, both the funding of discretionary fiscal policy and of public spending can be categorized. In the context of this dissertation, the focus is on detailing financing methods for the overall public expenditure. These methods consist on: (i) direct and indirect taxation – the first affecting the private income and the second affecting its appliance through consumption; (ii) public debt – the Government can, *e.g.*, borrow money and issue bonds,[2] not only to families and companies within its country (domestic public debt), but also to the public abroad (foreign public debt), either in national or foreign currency (which might lead to exchange rate risk); and (iii) monetization, by "convincing" the Central Bank to increase the money supply, thus enhancing the money available to dispose in economic activities.

This section will address different methods of financing public spending, both from a theoretical and an empirical point of view.

2.2.1. Historical seminal theoretical frameworks and related evidence - Adam Smith, Ricardo vs. Keynes on debt, Haavelmo on taxation

The search for the best methods of financing government spending is not recent, nor is it a consensual matter. In this section, we present seminal contributes to economic theory, which deserve a special attention, since they have been underlying major studies throughout decades, or even centuries.

Starting by the roots of economy, Adam Smith (1776) (*apud* Butler, 2011) stated that markets should function without Governmental intervention. According to the author, individuals, willing to promote their own well-being, would end up maximizing the social welfare. The State should only promote justice and security, and care about the institutional

[2] Usually with lower interest rates than the private sector because of the low risk attached to sovereign insolvency. However, this perception has suffered a deep change with the last global crisis, with rating agencies attributing the category of "junk" to many countries' sovereign debt, warning for the danger of bankruptcy.

framework of economic activity. Thus, fiscal policy, in the common conceptualization of stabilization or redistributive policy, is absent in Smith's vision.

However, this theory is proved to have some limitations, since markets present quite a few failures that are not solved in a decentralized way. This led to the idea of Welfare State, defended by Keynes, which became widely accepted during the Great Depression of the 1930s, when the mechanisms of the markets were not able to contradict the severe downturn by themselves (Kandil, 2013).

The Keynesian theory stated that fiscal policy could improve the use of idle resources, in economies with severe inefficiencies due to market failures. The State's intervention could be a way to reduce uncertainty and boost GDP, namely through public investment. In terms of the method of financing public expenditure, Keynes (*apud* Afonso, 2008) stated that public debt could be seen by the agents as an increase in their wealth, being an incentive to investment and consumption. Monetization and tax financing would have the same effects on consumers, although the first seemed more pleasant for them (Keynes, 1924) (*apud* Végh, 1989). This is explained by Végh (1989) – monetization, leading to an increase in private spending, tends to create higher inflation. As the prices go up in the economy, taxation, although proportionally equal, becomes higher in absolute value, since the tax base is now higher as well. This might be unperceived by the consumers, which does not happen so often in the case of financing through direct or indirect taxation. The author also states that the increase in taxation caused by the inflationary process is efficient for most Governments, since individuals do not easily evade from its charges.

Ricardo (1817) (*apud* Buchanan, 1976), in opposition, defended that there was actually "debt neutrality" – the effects of public financing through taxation or debt produced equivalent results in terms of incentives to the economy. This led to the Ricardian equivalence theorem, that stated that consumers, being aware of the intertemporal budget restriction of the Government, would increase savings in the present (when new debt is issued) in order to be able to pay future higher taxation, that would be imposed by the necessity of debt service repayment. Thus, consumers would not see the increase in debt as net wealth available for consumption, choosing to smooth it across the years (not boosting the economic activity, as predicted by Keynes).

A close look at this theory leaves some room for discussion. Here, some authors can be referred. Bailey (1962) and Tobin (1971) follow closely Ricardo, stating that, as debt service will be repaid in the future, issuing public bonds is not perceived as an increase in net

private wealth (consumers know that they will be highly charged in the future). In opposition, Thompson (1967) defends that, as future taxation will be spread across different generations, the net wealth effect is positive for current generations. Mundell (1971) (*apud* Barro, 1974) also presents a vision that discards Ricardo's theory – in the case of imperfect capital markets, considering that the Government is more efficient than the private sector in obtaining loans, there is a net wealth effect in issuing public debt (private loans would imply a higher interest rate, thus being costlier).

In this context, Barro (1974) introduced some conditions required for Ricardo's theory to hold. First, there is the need for a society with altruist bonds and transfers between overlapping generations. Otherwise, if present generations were not worried about the well-being of the future ones, they could increase consumption when debt is issued, because taxation would be diluted across future generations, not cutting the present generation's future wealth by the whole amount (this comes in line with Thompson, 1967). Ricardo's theory could also be verified only if capital markets were perfect, with no transaction costs in terms of issuing bonds or implementing a taxation system (this could make both methods of financing substitutes), no asymmetric information (otherwise agents would not have the perception of how taxes would be distributed in the future), and with the Government not having the monopoly of bonds' issue (if the Government was proved to be more efficient than households or firms in obtaining credit, then there could be a net wealth effect, already explained) – this condition broadens Mundell's (1971) (*apud* Barro, 1974) idea, exposed in the previous paragraph. Also, the issuing of new debt could not have implications on the risk and uncertainty of the economy. The enumerated factors would be necessary for the effectiveness of the Ricardian equivalence. Otherwise, there would be distortions on the economy that could lead to different patterns of consumption arising from different methods of financing.

Despite being closer to validity by the introduction of these conditions, the Ricardian theory faces some other consistency problems, such as the existence of distortionary taxes (Adji *et al.*, 2009). Actually, the theory is only plausible in the short-run if *lump-sum* taxes are considered. This kind of taxation would enable the Government to establish the amount of taxes by the exact same value of the net wealth created with the new debt issued in the past (considering the time value of money as an opportunity cost). In the presence of distortionary taxation, the agents might have incentive to change their behavior in order to pay less taxes in the future, since they do not represent a predefined amount.

There are many empirical and theoretical studies trying to assess the adaptability of Ricardian and Keynesian theories to the countries' reality, reaching different conclusions, which are dependent on the model assumptions and the sample. For example, Bernheim (1987), using a set of 39 countries for a horizon between 1972 and 1983, validates the Keynesian theory; Lopez *et al.* (2000) reject the Ricardian equivalence theorem, using as sample the OECD countries over the period 1975-1992, and Evans (1993), using as sample 19 OECD countries, for the period of 1966 to 1988, does not reject debt neutrality for its sample. However, Afonso (2008) finds contradicting evidence for EU countries – for the period 1970-1991, the results lead to the rejection of debt neutrality, whilst for the period of 1992 to 2006, the hypothesis is not rejected. The author also finds evidence that a higher debt level can actually produce a Ricardian effect. Adji *et al.* (2009) prove, within a theoretical model for overlapping generations, that, in the presence of distortionary taxation, the Keynesian theory has more adherence to reality.

Theoretical models replicate the ideas by Ricardo and Keynes, by introducing different assumptions. The presence of strictly forward-looking individuals in the models (Real Business Cycles Theory) leads to complete absence of the necessity of implementing fiscal policy. This happens because the agents make their decisions knowing with certainty all the information available at each moment, and adjust immediately their behavior to the new optimum of the economy (they rationally react to expected changes in the variables). This scenario is close to what happens with Ricardian Equivalence Theorem, in which the consumers foresee the future higher taxation, therefore saving more in the present, resulting in an inefficient fiscal policy (Hebous, 2011).

In opposition, if the agents have their expectations anchored to the past (Sticky Prices Business Models), considering inflation indexed wages and other costs in prices' adjustment (*e.g.*, menu costs), and choosing their behavior based on the current income, fiscal policy may be helpful for the economy to reach an equilibrium faster and, eventually, with less economic and social losses (Hebous, 2011). This follows closely the ideas by Keynes.

The distinction between models with partially forward-looking agents (New-Keynesian) *versus* backward-looking agents is done, for example, by Cogan *et al.* (2010), and the calculation of fiscal multipliers to each situation reinforces what was said above. If the agents are forward-looking and can, thus, use the best information to predict the fiscal shocks, the stimulus generates lower multipliers, due to the adaption of the expectations even before the discretionary shock hits the markets.

Haavelmo (1945) presents a different point of view on taxation, stating that public expenditure financed by this method has a positive effect on employment and national income, even if the revenue (taxes) equals the expenses. In this case, there can be a redistributive effect, causing an increase in average consumption. Usually, people with a lower income, and that will probably benefit the most from public expenditures, have a higher marginal propensity to consumption. If they are endowed with a higher disposable income (*e.g.* through public allowances) or have more of their income released from primary expenses (this refers to an indirect redistributive effect of higher public spending, such as better healthcare and education, etc.), consumption will probably increase, in proportion. Even if this does not happen, an economy with idle resources will also benefit from this method of financing – according to the author, fiscal policies would imply an increase in employment (due to the additional public demand for goods or services). Thus, although net income could remain unaltered if taxation equals the wealth created by the Government expenditure (and this would depend on the propensity to consumption/saving), the efficiency in resources' allocation could be improved.

In the sequence of these theories, we are going to present further developments that have been done throughout the years in the context of different financing methods.

2.2.2. Theoretical and empirical exposition on tax financing

Although there is much literature on the relation between forms of taxation and growth (*e.g.*, Arnold, 2008 and Zhang *et al.,* 2016), the short-run effects (on GDP), which are contemplated by this dissertation, are still quite unexplored in terms of quantification through fiscal multipliers.

However, the mechanisms of transmission of raising taxes in the economy are highly recognized, and quite consensual.

In fact, the baseline for the discussion on tax financing relies on the immediate cut on disposable income that increased taxation provokes (*e.g.*, Kandil, 2013). For example, Gechert and Rannenberg (2018), in their meta-analysis, state that using taxation as a fiscal policy instrument generates low multipliers across the entire cycle, whether it is under recession or expansionary conditions.

Papaoikonomou and Hondroyiannis (2015) particularly emphasize the snowball effect that increasing the tax burden can generate in the economies. In fact, usually, people

with lower buying power present a higher marginal propensity to consumption – if taxes on income increase, these consumers will have to cut down their consumption. A lower disposable income also translates into the acquisition of more primary goods, which are low-taxed (decreasing, also, the revenue resulting from indirect taxation).

For Coenen *et al.* (2010), however, financing spending through heavier taxation might generate positive multipliers (although referring tax multipliers as being small) if its reinforcement is limited in time – the wealth cut effect might be, in this case, insignificant. This translates, clearly, the Permanent Income Hypothesis, a theory formulated by Friedman (1957), which refers that consumers tend not to react significantly to temporary changes in their income, smoothing their consumption patterns throughout their life cycle.

Although the cut on disposable income seems to be a central matter, studies have been agreeing on the necessity of distinction between distortionary and non-distortionary taxation (*e.g.*, Fatás and Mihov, 2001; Coenen *et al.*, 2010; and Arin *et al.*, 2016), in order to assess the dimension of the impacts of financing public spending through heavier taxation. To clarify the denominations, and ease the reading of the following paragraphs, usually, the term non-distortionary taxes is related to lump-sum taxes (fixed value), and distortionary taxes are the ones that are typically correlated with capital or labor income, thus being variable upon changes on these factors. Considering these definitions, direct taxes, as we know, are under the distortionary taxation category, and indirect taxes are under the non-distortionary one.

Many studies have been relating distortionary taxation to lower fiscal policy efficiency (*e.g.*: Fatás and Mihov, 2001 and Afonso *et al.*, 2010). In fact, either under lump-sum tax-raising or distortionary tax-raising, there is an immediate cut on disposable income, which tends to decrease consumption, as referred above. However, the additional substitution effect deriving from distortionary taxes sinks the productive activity even further, thus reducing fiscal policy efficiency, and contributing to very low or even negative fiscal multiplier. If distortionary taxation increases as the capital or labor income goes up, so it increases with higher economic activity; therefore, there is an incentive to substitute labor supply for leisure and even to reduce investment – this would reduce the tax base, thus reducing the overall taxation (Fatás and Mihov, 2001; Moreno-Dodson and González-Páramo, 2003; Coenen *et al.*, 2010; Arin *et al.*, 2016). Summing up, the use of lump-sum taxes to finance public expenses is more efficient than for the case of distortionary taxation.

The study by Koester and Kolodziejak (1992) explains in depth the above referred additional effect of raising/decreasing direct taxation, which seems to be responsible for the differences encountered in terms of fiscal policy efficiency, when financed by lump-sum *versus* direct/distortionary taxes. Although the study refers to cuts on direct taxation, one can make the opposite reasoning for direct-tax raising. On their survey about taxation models developed by several international institutions, the authors find that a decrease in direct taxation generates a positive impact on output. The authors address the impact of lower direct taxation on wages, considering two points of view – the consumer's point of view, and the investor's/firm holders' perspective. Actually, with lower direct taxation, consumers will be able to maintain their buying power without having to bargain a higher nominal wage. Thus, this represents an improvement to firms' profitability and a boost in economic activity, following the above referred substitution effect (in this case, it is worth it to substitute leisure *per* work, generating more employment in the economy) and incentive to investment. A higher tax base will arise, which might compensate partially the initial impulse of tax cutting. The authors also study a balanced budget decrease on direct taxation – decrease on taxation that is compensated by lower public spending –, and find that some models still produce positive multipliers, but others do not.

The analysis done by Coenen *et al.* (2010) follows the exact same logic, using structural models from several institutions from Europe and the US. The authors find that the multipliers generated by movements in direct taxation (corporate income taxes and labor income taxes) are lower than the ones generated by changes in indirect taxation. In accordance to what has been argued when listing Ricardian equivalence's flaws, for Coenen *et al.* (2010) distortionary taxes can cause severe crowding-out effects, dragging down the multipliers (they can disincentive work and capital investment, so that the individuals can pay less taxes on both labor and capital income). Also, the authors point out another reason – the fact that a transitory decrease in direct taxation can lead to an increase in potential GDP, since the costs to the employers decrease, thus allowing a profit maximization with a higher amount of resources' appliance. This increase in the capability of the economies to produce generates a higher offer that compensates the pressure over the demand, dragging the inflation to lower values. In fact, this reduces the necessity of monetary accommodation (the interest rate level does not have to stay at such low levels) in order to control the inflation, and therefore boosts the economy.

The authors also state that, due to the higher long-run elasticity on the capital supply, corporate income taxes might be the most distorting to the growth of the economy (in the long-run).

Arin *et al.* (2016), in their study about the tax-based fiscal stimulus in the US, using a SVAR approach, agree that distortionary taxes (labor and corporate taxes) generate lower multipliers than non-distortionary taxes (indirect taxation), but have a much more persistent effect in the long-run (direct taxation has a negative and lasting effect on output, while for indirect taxation there is some evidence of positive correlation). In agreement with what was defended by Coenen *et al.* (2010), Arin *et al.* (2016) found that the long-run effect of corporate income taxation is the most persistent of all the cited categories for the period after 1981.

Moreno-Dodson and González-Páramo (2003) develop a model for Governments' revenues, not only in developed but also in developing countries, that assesses the efficiency and also the equity side of public spending for each method of financing. For taxation, the authors recommend relying basically on indirect taxation (taxes on consumption), and moderating taxes on labor and capital incomes, which seems in agreement with the idea defended by Coenen *et al.* (2010) and Arin *et al.* (2016) for the long-run distortionary effects. The explanation provided within this study is that taxing income (whether it is corporate or personal) affects, not only the income resulting from the productive activity, but also the savings' income. For indirect taxes, only the first component is targeted.

Lastly, there is an important consideration to add-up to the above said, and that does not depend in the type of taxes we are dealing with. Tamoya and Rioja (2017), using a micro-based model for Latin America, found that it is important to look at the initial level of taxation of the country in order to assess the effects on GDP that an increase on taxes to finance more spending would imply. The authors find that there exists a turning point – if the tax rates are above a certain level, then the results of increasing them even more might disturb the economic growth, while if they are initially moderate, there can be positive effects in the long-run. This is a result that is expected from economic theory, such as the Laffer curve. This might be an important clue for investigating the differences on fiscal multipliers within a fiscal shock financed by taxation, although the authors' results are focused in the long-run, while our analysis relies in the short-run.

2.2.3. Theoretical and empirical exposition on debt financing

It is widely known that debt raised significantly between 2008 and 2009 in countries worldwide, and continued to accumulate at a high pace in the subsequent years. Thus, it is important to study the consequences of further raises in debt in order to finance public spending.

It is important to clarify that debt financing consists on increasing the Government budget's deficit, which implies deepening the public debt levels of the economy. Thus, debt financing by itself propels the negative consequences deriving from high levels of public indebtedness, which are here further explored. Summing up, fiscal multipliers can be a way of measuring the impacts of increasing debt.

Many studies have been agreeing on the existing negative correlation between the countries' fiscal positions and the fiscal policy efficiency, translating into lower values for the fiscal multipliers as the economy's leveraging goes up (*e.g.*, Kandil, 2006, 2013 and Huidrom *et al.*, 2016). For Kandil (2013), the drawbacks pointed of debt financing are largely amplified as the debt level scales up. After concluding empirically that the method of financing public spending which is more likely to generate negative fiscal multipliers is debt financing, the author also mentions the importance of studying the correlation between the debt level and the efficiency of the fiscal policy, as a clue for future investigation.

The above mentioned studies refer two main channels of transmission of a fiscal policy anchored on debt financing – the interest rate channel and the Ricardian channel, which are explained below, also following both Kandil (2013) and Huidrom *et al.* (2016).

The interest rate channel is the mechanism through which higher interest rates on sovereign debt are transmitted to the private markets. In fact, higher public indebtedness leads to an increasing default risk, which is transferred to the debtholders. Thus, creditors start asking for higher risk premiums, in order to compensate for their added risk exposure to the case where the Government can no longer meet its debt service obligations. Soon, the transmission of the higher interest rates to the private markets starts crowding out the investment and consumption, through an increase in borrowing costs (financing economic activity becomes more expensive), slowing down the economic activity. This reality leads to a slower response from investors when Governments try to stimulate a highly leveraged economy. The increase in the interest rate can also be propelled by the deficit itself – since it represents a decrease in total savings, the capital offer gets lower, thus increasing interest

rates. This will lead to a higher probability of yielding a negative spending multiplier under this method of financing. The higher the sensibility of investment to changes in the interest rate, the higher is the crowding-out effect, because an increase in the interest rate caused by new debt, as explained above, will diminish investment by a higher proportion. The lower the sensibility of money demand to alterations in the interest rate, the higher the crowding-out effect. This is due to the fact that monetary markets will take more time to adjust, especially if not accommodated by monetary policy,[3] since interest rates will remain higher for a longer period of time.

It is important to note that, furthermore, if the economy is under a flexible exchange rate regime, the pressure over the markets' interest rate, by attracting foreign capital, can lead to national currency appreciation, deteriorating the external balance because the exports tend to increase, while the imports tend to decrease, under a stronger national currency (Corsetti *et al.*, 2012).

On the other hand, the Ricardian channel is related to the fact that individuals living in economies with high debt ratios can anticipate future heavier taxation, in order for the Government to be able to repay the debt and fulfill the intertemporal budget constraint that it faces. As the level of debt scales up, individuals know that future taxation will be heavier, in order to rebalance the public budget. Thus, stimulating economic activity in a context of high degrees of public indebtedness is quite difficult, since households will increase saving, adopting a precautionary behavior. The investors also understand the higher risk they would face by investing under these conditions, thus refraining their investment. For Diamond (1965), the added tax burden that results from debt service reduces the agents' disposable income and, consequently, not only consumption, but also savings. Thus, investment is dragged down also by this channel, adding up to the increased interest rates mentioned in the previous paragraph.

The effects of these channels can cause a significant decrease in the fiscal spending multipliers.

Checherita and Rother (2010) analyze, following studies such as the one by Clements *et al.* (2003), one other channel, alongside the referred ones – the total factor productivity (TFP) channel. They conclude that as the indebtedness of the economies goes up, fiscal stimulus might be less efficient in increasing the TFP, thus slowing down the economies.

[3] For further details, see Coenen *et al.* (2010).

Significant debt accumulation before the global recession that affected most countries in the recent years can be pointed out as one of the recessions' causes, dragging the markets to panic, as referred, for example, by Checherita and Rother (2010) and Eggertsson and Krugman (2012). This matter can also be particularly relevant in the contemporary scenario since, during the referred crisis, many countries indulged into fiscal policies financed by cumulative and significant deficits, aiming at stabilizing the economies.

This is a very concerning situation, as can be seen in some studies, which aimed at finding a turning point for the debt level – a point where the markets do not react to stimulus anymore, since all the triggers have been enacted, and their confidence levels are very low (*e.g.*, Perotti, 1999; Checherita and Rother, 2010; Corsetti *et al.*, 2012 and Ilzetski *et al.*, 2013). Above the turning point, it can be counterproductive to use deficit as a financing method for raising fiscal spending.

The study by Ilzetzki *et al.* (2013), using a sample of 44 developed and developing economies, sets 60% of GDP as a critical value for this matter. Exceeding this percentage can lead to fiscal multipliers very close to zero in the short-run, turning negative in the long-run. Checherita and Rother (2010) find a higher threshold for 12 Euro Area countries, around 90 to 100% of the GDP, despite admitting that the confidence interval incorporates values starting from 70-80%. Also, for Perotti (1999) and Corsetti *et al.* (2012), the turning point begins at the barrier of 100% of the GDP.

It is important to understand that the fiscal policy will not maintain the same level of efficiency as deficits and debt-levels raise. If for low debt-levels, one can verify Keynesian effects of a fiscal stimulus, non-Keynesian effects may arise if debt scales up, because the individuals no longer have confidence in their economy in order to keep consuming/investing, and interest rates become unbearable for profitable investments (Sutherland, 1997; Berben e Brosens, 2007; de Mello, 2013).

Although the effects above are quite consensual, it is important to refer that not all types of debt produce the same results on the economies. Thus, it might be important to study different debt categories, and their transmission channels, in order to try to understand which would be suitable to generate higher efficiency of the fiscal policy and, therefore, higher fiscal multipliers.

In the following sections, we are going to address the impacts of six types of debt commonly found in the markets, grouped into three categories, for comparison purposes:

1. Issued internally (for domestic markets) *versus* issued for foreign debtholders;

2. Issued in national currency *versus* issued in foreign currency;
3. Long-term debt *versus* short-term debt.

2.2.3.1 Domestic *versus* foreign debtholders

In this section, we are going to present some literature addressing the impacts of Government external and internal borrowing on investment (thus affecting GDP), through several channels, explaining the underlying mechanisms.

Within the studies contemplated in this section, only the one by Priftis and Zimic (2017) uses explicitly the dimension of the fiscal multipliers that result from using internal *vs.* external debt to assess the efficiency of fiscal policy under these two financing instruments. For the authors, financing Government expenses through foreign debt can lead to a higher spending multiplier because the internal resources remain available for investment applications by the private sector; in contrast, local financing could cause a severe negative wealth effect (see also, for example, Diamond, 1965 and Illing and Watzka, 2013). The authors emphasize the fact that the crowding-out of private investment due to internal borrowing may not be verified if the capital markets are open, and the investors can borrow abroad. In the limit, if capital markets were perfect, the scarcity of internal funds could be totally compensated by external private borrowing, thus leading to similar fiscal multipliers for the two types of debt. However, Priftis and Zimic (2017) point out a financial friction that leads to private credit constraints – capital markets are imperfect, thus presenting failures that lead to the fact that Government has an easier (and usually cheaper) access to foreign capital, since there is, *a priori*, less default risk than within the private sector.

Broner *et al.* (2014) state that, during the sovereign debt crisis, debt has been relocated mostly to domestic entities, and especially to the public sector. The cause pointed out by the authors to the shift in favor of domestic debtholders is that Governments tend to treat their citizens in a preferential way (they are less exposed to the default risk), which increases their relative expected rate of return (when compared to foreign debtholders). The authors also state that the mentioned fact, allied with a growing mistrust on the credit markets and the increasing spreads, led to the reduction of investment, contracting even more the economies. This only happens because, due to the existence of limited funds (financial markets present friction, such as credit constraints), their alternative uses (productive investment or bonds' purchase) are mutually exclusive. Thus, the increase in public bonds' purchase implies a misplace of investment, generating a crowding-out effect.

Notwithstanding, according to Clements *et al.* (2003), besides the immediate impact of higher deficits, examined above, it is also important to study the debt service impacts. The authors state that higher external debt service tends, on the one hand, to reduce public savings, rising the interest rate, and, on the other, to diminish the credit available for private investment.

The merit underlying this discussion on the disadvantages of financing public spending through external debt may be attributed to Myers (1977). The author launched the theory of debt overhang, but under a corporate finance perspective – he examined the fact that, although companies can get a tax relief by deducting the interest rates to their profit levels, they do not tend to rely so much in financing though borrowing externally. This is due to the fact that external debt distorts the possibility of making optimal decisions on investment, since companies know that part of the future earnings will be used to compensate the creditors.

In the 1980s, with the default of many developing countries, this theory started to be applied to sovereign debt.

Krugman (1988) gives an important contribute to this topic, by explaining the concept of "debt overhang" as a situation in which the indebted country does not seem to be able to comply with its external debt service obligations. In fact, individuals are aware that the future returns generated by investing in the economy will be used, in part, to repay the debt service. Thus, the net profit of the investments decrease, discouraging the economic activity. Moreover, a high level of external debt can bias the Government's willing to perform structural and fiscal reforms, because a better economic and fiscal health can add-up to the pressure of foreign debtholders to have their credit repaid. Therefore, debt financing may affect the economic activity both directly and indirectly, through biasing the incentives to the introduction of reforms in the economy and to investment, respectively.

This effect is also referred by Moreno-Dodson and González-Páramo (2003), that defend that an efficient funding of Governments' spending should rely only on internal debt up to a certain limit, above which it would imply deterring private investment. The authors also present their recipe for external debt financing – its service payments should not exceed an amount resulting from the combination of the real growth rate and the international interest rates.

This seems to be in line with the idea previously presented by Cohen (1993), who concluded that external debt can promote investment up to a certain threshold of debt

accumulation. Clements *et al.* (2003) explain this logic, taking as an analogy the Laffer curve – typically, increasing debt is partly used to finance more investment, thus increasing the capital stock, and, ideally, the GDP; the increase on GDP leads to a higher capacity of the economy to meet its debt obligations. However, since capital accumulation is subject to decreasing marginal productivity, the returns on investment start to be reduced after a certain point of saturation. This mechanism disincentives additional investment, slowing down the economic activity.

Broner *et al.* (2014) point two potential solutions to the problem of the asymmetry between domestic and external creditors – to eliminate the favorable discrimination of domestic creditors, or to reduce the overall percentage of debt. The first is quite difficult to implement since there is asymmetric information in the markets, and it would require a public and credible compromise of the Governments. The second would require austerity packages, which could offset the referred effect on spreads, and thus, the crowding-out effect.

Although Broner *et al.* (2014) may, at first sight, seem in agreement with what has been done during the recent attempt to implement fiscal consolidation, their model actually leads to a threshold – if the total debt is not reduced below the amount domestically held, then austerity does not generate non-Keynesian/expansionary effects. The authors mention that this threshold has not been attained within most austerity packages implemented (particularly in Greece, Italy, Ireland, Portugal, and Spain – GIIPS), thus leading to fiscal inefficiency.

Priftis and Zimic (2017) also address the problem of the austerity packages, relating it to the higher multipliers generated within mainly foreign-financed economies, and emphasizing the relevance of this conclusion to policy making, since there can be a miscalculation of the effects of expenses' cuts on economic activity. Austerity packages usually contemplate restrictions on public spending, which can cause non-expected negative impacts on investment, in the case of countries relying mainly in foreign debt, since the impact on GDP will be amplified.

To end this section, we present a more specific point of view. For Shen and Yang (2012), the capital mobility is particularly critical in developing countries, which may be problematic in the case of external debt issuing. The authors conclude that, due to the characteristics of these economies, the capital inflows that would result from external funding of Government spending could cause a severe slowdown in economic activity, due to the real appreciation of the currency (this leads to lower exports and higher imports, *ceteris*

paribus). Since these countries usually specialize in products with low added value, being very sensitive to competition, lowering the volume of exports and increasing the imports can cause a current account deficit. This could lead to a reversion of the positive effect caused by the absence of internal crowding-out of the investment (when compared to the situation where the debtholders are resident individuals). The referred effect is particularly relevant if these economies are under a flexible exchange rate regime.

2.2.3.2 Debt issued in foreign currency

To the best of our knowledge, there is not much literature on the quantification of the effects that issuing debt in national or foreign currency has on fiscal policy efficiency. Although the studies found about this matter do not explicitly address the impacts on fiscal policy efficiency, one can infer some information about them, which might be usual to understand the behavior of the fiscal multipliers under these two different types of debt.

The theoretical mechanisms underlying both types of debt issuing are explored in the literature under the denomination "Original Sin". The hypothesis under this theory, as exposed, for example, by Eichengreen and Hausmann (1999), Eichengreen *et al.* (2002) and Hausmann and Panizza (2003), is that some countries are unable to borrow internationally (even short-term) or long-term in their own currency (even domestically). This difficulty is particularly prominent in emerging markets, with less developed financial structures, and volatile trade terms. Thus, if the countries need external financing, they have to choose either to borrow in foreign currency, dealing with the exposition to exchange rate risk due to currency mismatch, or short-term, facing the interest rate risk associated to maturity mismatch. The exchange rate risk may also yield a defensive behavior from the lenders, once they understand that the volatility of the relative value of currencies might disrupt the ability of the borrowers to completely service debt.

Two causes are presented by the referred authors for the verification of the impossibility of borrowing externally in national currency. The first is related to the risk aversion of the investors. If one imagines a country with a history of depreciation and inflation, it is easy to understand why external investors are not willing to take the gamble of investing in its currency – if it loses value, the credit acquired by the investor floats in the same direction as the currency; if inflation rises in the economy, then the real interest rate underlying the capital invested becomes lower, *ceteris paribus*, thus decreasing the real

remuneration of the investor. The second is related to moral hazard, as economies could devaluate their currencies after obtaining the external loans, thus benefiting from a real reduction of the value to repay. Thus, most of the countries that have external debt denominated in their own currencies are developed countries with a reputation and legislation that brings enough confidence and transparency to the lenders (Eichengreen and Hausmann, 1999).

Krugman (1999) and Aghion *et al.* (2001) reinforce that economies with debt issued in foreign currencies have an added risk exposure, since the exchange rates are, more or less, volatile.

If debt is denominated in a currency that starts losing its comparative value, then the debtholders have to repay a lower debt service, which implies the loss of money for the issuer.

An added risk exposure can decrease the fiscal multipliers when public spending is financed by debt issued in foreign currency, since the agents will have the perception of an increased probability of losing their funds. However, if the debt is issued in a currency that is losing value, then the debtholders will predict real gains, which may incentive consumption and investment, thus boosting the multipliers. It seems, thus, important to understand if the chosen currency is "strong", and its recent and expected behavior.

One of the main reasons why Governments tend not to limit external borrowing in foreign currencies is, according to Eichengreen *et al.* (2002), because that could deter investment, and retard economic activity, especially for the countries in which the "Original Sin" is verified.

2.2.3.3 Short-term *versus* long-term debt

The issue of debt maturity and its implications rely on the necessity of matching its term and its use. In other words, short-term debt might be useful if the purpose is financing treasury, working capital or inventory needs, for example. On the other hand, if we are dealing with investment which is expected to generate returns in the long-run – in here, we address, for example, fixed assets and equipment –, long-term financing would be more appropriate (Caprio and Asli, 1998).

According to the studies by Eichengreen and Hausmann (1999) and Eichengreen *et al.* (2002), short-term debt implies an added risk exposure, especially if there is a mismatch

between the term of the funds' application, and the maturity of the loan. Due to the volatility of the interest rates in the markets, their rise can cause the difficulty in obtaining credit renewal. Thus, it may interfere in the correct prosecution of the financed projects.

Despite this reality, sometimes Governments have the necessity of borrowing short-term funds, due to the potentially lower interest rates, and/or to the markets' trust issues. In fact, countries without regulatory measures to ensure the information disclosure to the investors and other types of investors' protection schemes, are more exposed to the risk aversion factor, thus having to rely on short-term debt to finance illiquid investment. This generates a snowball effect, since these investments only potentially produce results in the medium/long-term, which implies debt accumulation meanwhile (Diamond and Rajan, 2000).

One can easily infer an *a priori* result of the above mentioned fact – not only issuing short-term debt will cause a strong Ricardian (precautionary) behaviour in the individuals (because they can clearly foresee the necessity of the Government to repay the referred loan in the near future), dragging down the spending multipliers when the chosen method of financing the referred expenses is short-term debt, but it will also have an amplified negative impact due of the referred added risk exposure.

Despite the evident negative short-term debt consequences, Diamond and Rajan (2000) state that, if a Government has already started an illiquid investment (which means that the funds invested cannot be immediately recovered without severe losses), it can be more of a prejudice to interrupt it than to keep financing it based on short-term debt. Therefore, the authors recommend the Governments not to ban short-term debt, but to create better transparency and regulatory conditions, in order to enable long-term financing instead.

Caprio and Asli (1998) conclude that long-term financing tends to increase the productivity, since an active stock market and a more stable funding incentives productive investment, and allows firms to grow faster.

2.2.4. Theoretical and empirical assessment of monetary financing – monetization

Despite being unavailable for many countries, such as the Euro Area countries, which operate under the ECB centralized monetary policy, monetization has been widely used throughout the years, and its importance is still not to be forgotten.

The recent financial crisis of 2007-2009 led to a sovereign debt crisis, which made it difficult for the Governments to stimulate their highly leveraged economies by using the typical instruments (Palacio-Vera, 2011). As argued by Sokolova (2015), the threat of Governments' default, by that period, implied an urgent increase in budget surpluses; on the other hand, and at the same time, fiscal austerity was highly feared, since the already slowed-down economies would not be able to cope with further deceleration on economic activity.

Since the direct monetization of government deficits is forbidden by many countries' legislation, due to the high risk of disruptive use of this kind of policy (if Governments know that central banks can directly finance their debt obligations, this fact can become an incentive to debt accumulation – Cooper *et al.*, 2010), monetary authorities recently resorted to unconventional monetary policy measures, such as the Quantitative Easing, in order to face the dilemma between high debt and low economic activity. In fact, several central banks started large-scale purchases of sovereign debt, which is, essentially, an indirect method of money injection (Palacio-Vera, 2011).

Illing and Watzka (2013) explain the mechanism through which monetary accommodation can lead to higher efficiency for the fiscal policy. Usually, monetary authorities respond either to inflation gaps or output gaps. In the case of expansionary fiscal shocks, the authorities would tend to rise nominal interest rates, in order to compensate for the upwards movement from the inflation and/or the GDP (admitting that the economy is, in the first place, at its target for inflation and fulfilling its potential GDP). This movement tends to rise the real interest rates, which drags down the economic activity and, particularly, the investment. This effect would be avoided if the monetary authorities accommodated the fiscal policy shock. Although Illing and Watzka (2013) address the case where the interest rate is used as the instrument for monetary policy-making, the same logic could be applied for money base manipulation. If monetary authorities choose to reduce the money base in order to avoid higher inflation in the sequence of the positive fiscal shock, the interest rates

would rise, dragging down the economies. In opposition, money issuing would accommodate the expansionary shock.

Studies as the ones by Coenen *et al.* (2010), Christiano *et al.* (2011), Woodford (2011), and Kandil (2013) summarize the main benefits of monetization: it avoids the unpopularity of increasing taxation, which is highly perceived by the consumers and, thus, may be an incentive to strongly reduce their activity, and also avoids the unsustainability of deficit accumulation. Also, monetization tends to reduce crowding-out – public spending puts pressure over the demand for money, tending to increase the interest rate, which shrinks private activity, especially investment. By issuing more money, this pressure is compensated, balancing the monetary and the exchange markets, which maintains the interest rate at a lower level, more favorable for the economic activity. Moreover, in the case of issuing new debt, if consumers know that the Government will use monetization to repay debt in the future, they tend not to have the precautionary behavior predicted for the case of expected future higher taxation.

Moreover, as mentioned by Coenen *et al.* (2010) and Kandil (2013), anticipating monetization implemented with the aim of repaying the debt service could adjust the interest rates quicker, and also lead the agents to relax the precautionary behavior. Therefore, it could be a useful financing method in times of sovereign debt crises.

However, monetary accommodation might have long-run implications, if the monetary authority does not announce explicitly its intentions to revert the policy orientation when economy starts its recovery process, nor is it a trustable institution, with firm reputation. As referred by Moreno-Dodson and González-Páramo (2003), there are important inflationary effects attached to monetization, which might cause distortions on the economies' growth. Although the immediate effect is to increase the money available and, thus, the transactions, in the medium-run the pressure over the demand can cause the prices to go up in the markets, and the loss of purchasing power, thus offsetting the initial boost in economic activity. In fact, individuals might anchor their expectations to the new level of inflation, causing the effective inflation to be shifted upwards, overshooting the long-run target. Thus, these policies must be clearly perceived as temporary.

There are many studies and much controversy regarding the comparison between income-tax financing and monetization, which point out some of the advantages and disadvantages of monetization, when compared to other financing methods. De Gregorio (1993) states that monetization is more distorting, because of the effects on the rate of

inflation. Palivos and Yip (1995), on the other hand, although admitting the inflationary effect of monetization, defend that income tax is more penalizing for the economies, due to the biasing of stimulus to pursue economic activities. Pecorino (1997) finds a mid-term, suggesting a mix of both forms of financing public expenditure, since both have their flaws – income-tax decreases the return on capital, while inflation penalizes consumers as their real money holdings decrease.

In the works of Holman and Neanidis (2006) and Bose *et al.* (2007), the authors claim that, although income taxation decreases deposits (lower income available) and the lending capacity, monetization is more distorting in countries with less-developed financial markets because of the higher default risk. However, according to the first two authors, developing countries usually rely heavily on monetization since they often have inefficient income-tax collection systems (which decreases the amount of tax-based revenues), and a low degree of currency substitution (this detains inflation tax avoidance).

Summing up the ideas above, monetization can contribute to increase debt sustainability, ensuring the stability of the financial system, but needs a special care in what concerns the inflationary targets. The objective of keeping the financial stability and low inflation rates are some of the main goals of a central bank, especially under the presence of high sovereign debt (Uribe, 2006). Although monetization seems to be the most efficient method of financing public expenses within the ones enumerated, generating the higher fiscal multipliers, most of the developed countries defend the independence of the Monetary Authorities from the Governments, thus not being possible to finance public deficits by using direct money injection (Kandil, 2013).

Below, we present a Table that summarizes the main expected effects of using different methods to finance public spending, considering the empirical and theoretical ideas exposed within this section.

Table 2 – Impacts of the different financing methods on fiscal policy efficiency

Methods of financing	Overall effect, mechanisms and relevant studies	Specific categories, transmission mechanisms and relevant studies
Taxation	• Low efficiency of spending stimulus financed by increases in taxation • Main mechanism: cut on the disposable incom3 • *e.g.,* Kandil (2013); Gechert and Rannenberg (2018)	**Direct taxation** • Lower efficiency when chosen as the method of financing public spending (when compared to indirect taxation) • Besides the cut on disposable income: disincentive to labor and investment • *e.g.*, Fatás and Mihov (2001); Afonso *et al.* (2010)
		Indirect taxation • Higher efficiency when chosen as the method of financing public spending (when compared to direct taxation) • No other relevant economic distortions besides the cut on disposable income • *e.g.*, Fatás and Mihov (2001); Arin *et al.* (2016)
Debt	• Lower multipliers for public spending as the debt levels scale up (especially after a critical turning point) • Main mechanisms: Ricardian channel, interest rate channel and TFP • *e.g.*, Kandil (2013); Huidrom *et al.* (2016)	**Domestic *vs.* foreign debt** • Two-folded effect: domestic debt causes an immediate negative wealth effect, deterring private investment; however, foreign debt implies the future outflow of capital through debt service • *e.g.,* Clements *et al.* (2013); Priftis and Zimic (2017)
		Debt issued in national *vs.* foreign currency • Added risk exposure to exchange rate volatility when choosing issuing debt in foreign currency • However, some countries have difficulties in obtaining financing in their own currencies • *e.g.,* Eichengreen *et al.* (2002)
		Short-term *vs.* long-term debt • Short-term debt represents and added risk exposure: ◦ mismatch between the positive cash flows that may result from investment, and the debt maturity; ◦ difficulty in obtaining credit renewal; ◦ interest rate risk (higher costs at the time of the renewal) • *e.g.*, Eichengreen and Hausmann (1999)
Monetization	• Higher multipliers within all the methods of financing • Accommodation of pressures over the interest rates • *e.g.,* Illing and Watzka (2013); Kandil (2013)	• Non-applicable • Note to the main con of using monetization: inflationary pressures

Despite the above summed-up theoretical and empirical evidence, we have also seen that the biasing of the predicted fiscal policy effects might be a reality, under different external scenarios. The following section addresses some examples of studies that prove so.

2.3. Financing public spending under different macroeconomic conditions

We have studied some conditions that can affect the predicted effects of fiscal policy. Then, we went through some particularities of each financing scheme. In this final section, we give some insights on the relations that can arise between certain methods of financing public spending, and markets' conditions. Particularly, we present some specificities of recession periods and the liquidity trap (ZLB).[4]

Many studies have been discussing whether the Governments should implement austerity packages in times of recession or stimulate the economy – pro-cyclical *versus* counter-cyclical fiscal policy (*e.g.*, Alesina *et al.*, 2002; Papaoikonomou and Hondroyiannis, 2015; Riera-Crichton *et al.*, 2015; Aristovnik *et al.*, 2017; Gechert and Rannenberg, 2018), but there is lacking evidence on testing the different methods of financing fiscal stimulus under different macroeconomic contexts, namely considering economic downturns. In fact, for example, Riera-Crichton *et al.* (2015) and Aristovnik *et al.* (2017) conclude that, due to the increased magnitude of the fiscal multipliers during recession periods, an optimal fiscal policy would imply stimulating the economy during downturns, since the acceleration would be potentially larger; applying the reverse measures could create even deeper recessions. On the other hand, Alesina *et al.* (2002) explain in a simple way the non-Keynesian effects of fiscal shocks, that consist on the fact that fiscal consolidation (cuts in the Governments' expenses) can lead to an actual boost on the economy, contradicting the traditional Keynesian predictions. Actually, cutting down, for example, the wages, can increase the revenues of the companies, stimulating more investment and the entry of new producers in the markets. Alesina and Ardagna (2013), using annual data from 21 OECD countries within 1970 and 2010, prove that a cut on public spending during a recession period can produce positive cumulative multipliers for the subsequent years, while an increase on revenues (that would allow more public spending) would generate negative multipliers.

[4] The liquidity trap is characterized by being a period marked by nil nominal interest rate levels and depressed GDP (Mertens and Ravn, 2014).

We have seen some of the different factors that may influence the fiscal policy efficiency and, consequently, the public spending multipliers. Also, we have studied the fiscal policy efficiency under different methods of financing. However, it is particularly important for us to study the possible biasing of fiscal policy efficiency, when using different methods of financing under different conditions.

For example, Arin *et al.* (2016) find that, within expansion periods, when funds are abundant, the increase, for example, in corporate taxes would be an incentive to move abroad if there is free movement of capital, producing a higher negative multiplier due to the decrease in internal investment (the higher the degree of openness, the more sensitive the GDP becomes to variations on the corporate income taxes, since there is increased competition among the economies). During recession periods, a decrease in corporate taxes to incentive the investment would not have such an important impact on the economy since the constraints in the markets are normally increased (credit limits, etc.). Thus, for this particular case, the recession framework implies a smoother effect of the corporate taxation on GDP, which contradicts, for this particular case, the evidence presented in section 2.1.1.

Röhn (2010) and Christiano *et al.* (2011) find that, under the liquidity trap (ZLB), the fiscal policy efficiency is higher if financed through distortionary taxes (when compared to non-distortionary taxes), which contradicts the main conclusion reported in section 2.1.2. With the reduction of labor supply due to higher taxation over labor income, for example, there is a pressure to increase real wages (there are costs in adjusting prices in the short-run, which causes rigidity to a certain extent). That pressure is reflected in higher costs for the companies, thus generating higher inflation. In a ZLB context, real interest rates tend to go negative, thus stimulating the economy, especially the investment. In result, an offsetting effect is created, and a snowball effect is created.

Mertens and Ravn (2014), using a New-Keynesian model, show the importance of considering the type of shock that drags the economy towards a ZLB situation, as explained below.

In section 2.1.2., we have seen many contributes in favor of higher spending multipliers for ZLB periods. More specifically, Eggertsson (2009) predicts that temporary cuts on consumption taxes become more effective under the liquidity trap, and that cuts on labor income taxes or capital taxes lose efficiency within this situation. Cuts on labor income taxes attract lower expected inflation and, thus, higher real interest rates. Since the Governments cannot decrease the nominal interest rate under a ZLB, investment tends to

slow-down, dragging the GDP levels down as well. Also, capital taxes incentive people's savings, which become more lucrative. On the other hand, cuts on consumption taxes directly stimulate the demand.

The above exposed mechanisms, however, have a limited scope. For Mertens and Ravn (2014), a liquidity trap caused by a state of low confidence by the individuals can lead to opposite effects, reducing the spending multiplier when the ZLB is binding. In fact, if there is a lack of confidence in the markets about the future, increased public spending can be faced as a signal of a real struggle of the Governments, causing panic in the markets, and even stronger aversion to consumption and investment.

The studies above described, and their conclusions, are an important contribute to take into consideration – different macroeconomic scenarios generate different amplitude and direction for the fiscal multipliers, even under the same types of fiscal shocks.

This statement justifies the importance of assessing the different methods of financing public spending, under a specific context – recession periods –, in order to understand the specific impact of different measures, when coping with this scenario.

The main goal of the next chapter will be, exactly, the assessment of the efficiency different financing methods for public spending within recession periods. To do so, we will apply a vector autoregressive model (VAR model), in order to stress out the spending multipliers that result from using different financing sources, in those periods.

3. Methodology and data

3.1. General overview on methodology and data

3.1.1. VAR approach

The choice of a vector autoregressive (VAR) approach to our empirical assessment of the fiscal multipliers was mainly due to the simplicity and widespread use of this methodology. VAR models have also been quite refined during the recent years, allowing for a reasonable degree of confidence on the results they provide when assessing the fiscal policy shocks' impacts on GDP.

In general terms, this kind of model allows us to study the reaction of endogenous variables to random shocks, through Impulse Reaction Functions (IRF), *i.e.*, through level or accumulated responses over time.

The basic formulation of a VAR model consists on the following equation:

$$X_t = \sum_{i=1}^{k} M_i X_{t-i} + e_t, \qquad (3.1)$$

X: vector containing the endogenous variables;

M: matrix of the estimated coefficients;

k: number of (optimal) lags introduced in the model;

e: vector of the residuals of the estimation, including the responses of the automatic stabilizers, systematic discretionary fiscal policy reactions and random discretionary fiscal policy shocks.[5]

According, for example, to Hebous (2011), the optimal number of lags to incorporate in the model might be determined using different criteria, such as the *Akaike* or *Schwarz*. For our model, these tests will be performed in section 3.1.2.

According, *e.g.*, to Hebous (2011), this basic version of the model does not allow for a distinction between the effects incorporated in the vector of residuals. Thus, there is the need of an approach that stresses out the endogeneity that might injure the model

[5] This decomposition follows Perotti (2007). The two former categories capture the eventual correlation between the variables in the model (for example taxes may rise as a result of the rise on GDP, even without any fiscal intervention – automatic stabilizers; Governments may, for example, systematically decrease taxation during recession periods, as a stimulus to the economy), and the latter captures the "structural" responses of the fiscal policy, which are not correlated with shocks on other variables.

specification and the results obtained, in terms of causality.[6] We will further analyze this problem in section 3.2. The role of a structural VAR (SVAR) approach appears in this context, describing the contemporaneous relations between the variables of the model as:

$$A_0 X_t = \sum_{i=1}^{k} A_i X_{t-i} + B v_t \quad (3.2)$$

A_0 is a matrix of coefficients that describes the contemporaneous relations between the endogenous variables in the model. Matrix *B* captures the relation between the residuals of the basic formulation (e) and the residuals of the SVAR, allowing for the "structural" impact – the purely discretionary fiscal policy.

3.1.2. Sample, endogenous variables and lags

We decided to use as sample the EU-28 countries (see Annex A.2), from 1995 to 2016. The choice of the time frame was based on the availability of the chosen variables, particularly the data on the disaggregated components of debt financing.

In terms of the data frequency, it seems quite important to use high-frequency data (as done, for example, by Blanchard and Perotti, 2002, Ilzetski *et al.*, 2013, Arin *et al.*, 2016), since the response of the Governments is lagged in time, but not quite as lagged as annual data would suggest. However, due to the lack of empirical data for quarterly frequency, particularly for the disaggregated variables, we proceed with annual data. Indeed, and in what concerns public financing, which is our main focus, instruments such as discretionary tax rates and deficits are discussed and approved on an yearly basis. Moreover, annual data across 28 countries ensures a large enough number of observations, despite being clearly insufficient for single-country studies.

A baseline regression for our estimations will rely on a set of five endogenous variables: real GDP (D_GDP), public spending (D_SPEND), public revenue (D_TAXES), public debt (D_DEBT), and real long term interest rate (REAL_INT_RATE). The names in between brackets beginning with "D" refer to log first-differences and are the denominations used in *Eviews* and, thus, reported on the results, below. Further information on the detailed description, data sources and denominations of the variables used in the model can be found in Annex A.1.

[6] For example, Batini *et al.* (2014) emphasize the difficulty of isolating the effect of the fiscal policy on GDP, since there is clearly a two-sided causal relation between the GDP and the fiscal variables (the GDP also affects the fiscal policy through automatic stabilizers, etc.).

In order to control for differences in scale (data before 1999 and for the countries that are not part of the EA is still expressed in national currency) and to ensure stationarity of the time series, all variables are expressed in logarithmic first differences, with the exception of the real interest rate, which is expressed in levels (percentage). Enabling stationarity of the series ensures that there are no biasing noises in the estimation, which allows for the statistic properties of the model to remain accurate, enabling the detection of the causality between the variables, and resulting in a trustworthy statistic inference.

To test for the variables' stationarity, we used the ADF – unit root test on each of the core variables. The conclusion taken by analyzing the six criteria defined by *Eviews* is that the variables of the core regression are stable when lagged one period (log first-differences). In the case of the interest rate, the test conducted for the variable in level (percentage) formulation yields evidence of stability, as well.

Table 3 - P-values for the unit root tests

Method\Variable	**First difference (*p-value*)**				**Level (*p-value*)**
	Public expenditure	GDP	Taxes	Debt	Interest rate
Levin, Lin & Chu	0.0000	0.0000	0.0000	0.0054	0.0000
Im, Pesaran and Shin	0.0000	0.0000	0.0000	0.0006	0.0013
Fisher ADF	0.0000	0.0000	0.0000	0.0076	0.0010
Fisher PP	0.0000	0.0000	0.0000	0.0000	0.0109

Note: *EViews9* output (formatted by the author).

After estimating the core regression, we intend to disaggregate fiscal instruments further. In particular, we intend to assess the multipliers generated by financing public expenditure by alternative means within taxation and debt, namely through direct (DIRECT_TAX), indirect taxation (INDIRECT_TAX), and social contributions (S_SECURITY), and by some well-known taxes' specific categories – taxes on personal income, on corporate profits, on property, on payroll, on goods and services, and social security contributions (TD_PINCOME, TD_CPROFIT, TD_PROPERTY, T_PAYROLL, TI_G_S, T_SS) –, or through issuing internal/external debt (DEBT_R, DEBT_NR, respectively), long-term/short-term debt (namely, LT_DEBT, ST_DEBT), and debt in national/foreign currency (DEBT_NC, DEBT_FC).

Monetization will be omitted from a first approach, since the ECB is not allowed to directly monetize the economies that are part of our sample. However, since it is consensual

in the literature that monetary accommodation produces larger multipliers (*e.g.*, Galí, 2017), we found it important to evaluate this financing method, even in an hypothetic scenario. Thus, in order to test, and compare, money financing with the alternatives for financing public expenditures, we will reduce the sample to the EA countries (note that, although the ECB is not allowed to directly monetize the EA economies, it can affect the monetary base of the EA as a whole). We will use a *dummy* variable to code with "1" the countries that are part of the EA.

Before analyzing the estimation results of the baseline VAR, we took a few preliminary tests, in order to control for eventual misspecification of the model.

The overall stability of the VAR estimation (VAR Stability Condition Check, on *EViews9*) using the core variables can be seen in Annex A.3. The diagnosis of the program *EViews9* confirms the stability of the overall equation. This is due to the fact that all the values in "Modulus" are below 1.

Since the disaggregation of the variables conduced in order to proceed to the referred estimations will always sum up the total value of each one of the core variables, the stationarity will remain unchanged. However, we the output for stability checks for the estimated equations will be presented as Annexes.

In what regards lag definition, the Schwarz criterion pointed to variables lagged one period (minimal value obtained for the referred criterion).

Table 4 - Optimal number of lags for the model (Schwarz criterion)

Lag	SC
0	-8.954870
1	-9.728047*
2	-9.599063
3	-9.328775
4	-9.001882
5	-8.646203
6	-8.315496
7	-8.030328
8	-7.667516

*indicates lag order selected by the criterion
SC : Schwarz information criterion

Note: *EViews9* output.

3.2. Endogeneity

As already mentioned above, it is important to control for endogeneity and contemporaneous effects of the variables within the model, which has raised a debate on the most effective resolution methods.

Ilzetski *et al.* (2013) and Arin *et al.* (2015), following the idea previously proved by Romer and Romer (2010), state that tax-driven fiscal policies can lead to endogeneity problems (as GDP increases a higher tax base will arise, which increases the revenue. But a higher revenue can also stimulate the economy and increase the GDP. This points out to a circle-effect between GDP and tax revenues). Thus, there is the necessity to distinguish between purely discretionary changes in taxes, from the ones that result merely from the economy's endogenous mechanisms.

Hebous (2011) provides a literature review on this controversy, based on the work by Perotti (2007), and summarizing four main perspectives which are potential solutions for the endogeneity problematic.

First, we address the Cholesky decomposition, or recursive formulation, used, for example, in the already mentioned work by Fatás and Mihov (2001). It consists in ordering the variables of the model taking into consideration the economic theory, chaining them in terms of predicted causal relations. The first variable of the chain only responds contemporaneously to its own exogenous shocks; the second reacts contemporaneously to shocks on the first variable and also to its own's, and so on. This methodology is quite *a priori*, since there is no empirical support, and may leave significant room for inconsistent ordering. The order relies on the assumptions made for the specific study and there is the need for searching for robustness (the causal relations, if incorrectly specified, may lead to biased results).

The second methodology was first used by Blanchard and Perotti (2002). The intuition is that the structural shocks that these models try to assess are lagged in time – there is evidence that the study and implementation of fiscal policies after the verification of unexpected economic conditions takes at least one quarter (economic variables do not affect fiscal spending shocks within the same period). Therefore, fiscal variables present no contemporaneous response to variations on the GDP. The information about the coefficients that may represent the contemporary reactions of the other variables in the model is determined by analyzing institutional evidence.

Then, we have the methodology used by Mountford and Uhlig (2009) – the sign restriction approach. According to this formulation, the main assumption is not on the timing of the chain effects between the variables, but on the signal of the relation between them. For example, a positive spending shock contemporaneously increases output and the budget deficit (positive signal) – see Pappa (2009).

The fourth approach – the narrative one – includes *dummy* variables in the model, in order to capture the exogenous shocks on fiscal policy, using announced dates for its implementation, as done by Romer and Romer (2010). The problem of this formulation is that there is the possibility of misidentifying parallel shocks on the economy, and thus presenting distorted results (Hebous, 2011 and Ramey, 2011).

We decided to follow the Cholesky decomposition. The chaining between the endogenous variables incorporated in the baseline VAR (without further disaggregation and omitting monetization at this stage) is described as follows:

Public spending (D_SPEND) → GDP (D_GDP) → Taxes (D_TAXES) → Interest rate (REAL_INT_RATE) → Debt (D_DEBT) (O.1)[7]

This particular ordering relies on both economic theory and previous studies, such as the one by Blanchard and Perotti (2002). We consider that the GDP responds contemporaneously to shocks on public spending, but the reverse is not true (as referred above, the implementation of fiscal policy is usually lagged in time, not responding immediately to shocks on the economic activity – Blanchard and Perotti, 2002). Also, following the same logic, GDP affects tax revenues within the same period (it is easily understandable since a higher tax base will arise), but the contrary is not true (taxes are usually levied on past income). These facts might be explained by the delay in the implementation of fiscal policy, not only in terms of changes in taxation, but also on the expenditure side. Moreover, decisions on consumption and investment might take some time to react to fiscal policy shocks. Next, we introduce the real interest rate, which affects the last chain-variable of our model, debt. The assumption is that decisions on public debt issuing within a certain period are related to the interest rates in the market, but will only affect them after the propagation of the interbank interest rates to the general consumers' markets.

Moreover, the chaining of specific taxation schemes follows Arin *et al.* (2016) – the authors state that indirect taxation should come before direct taxation. Lastly, we have

[7] The equations that represent the ordering of the variables within the several estimations conducted will follow this sequence.

incorporated Social Security contributions (following the disaggregation done for taxes in AMECO database). As argued in previous sections, indirect taxation is usually described as non-distortionary, thus being easier to manipulate without distorting economic activity. Thus, according to Arin *et al.* (2016), indirect taxation decisions should come prior to direct taxation decisions.

Public spending (D_SPEND) → GDP (D_GDP) → Indirect taxes (D_INDIRECTTAX) → Direct taxes (D_DIRECTTAX) → Social security contributions (D_SSECURITY) → Interest rate (REAL_INT_RATE) → Debt (D_DEBT) (O.2)

Also, following Arin *et al.* (2016) labor taxes (including personal income taxes and property taxes), and social security contributions should come before corporate taxes. The disaggregation done in OECD Database allows us to follow this recommendation, in a regression with the following ordering:

Public spending (D_SPEND) → GDP (D_GDP) → Taxes on goods and services (D_TIGS) → Taxes on personal income (D_TPINCOME) → Taxes on property (D_TDPROPERTY) → Taxes on payroll (D_TPAYROLL) → Social security contributions (D_TSS) → Taxes on corporate profit (D_TDCPROFIT) → Other taxes (D_TOTHERS) → Interest rate (REAL_INT_RATE) → Debt (D_DEBT) (O.3)

For the debt detailed components, we use the following ordering schemes (the first component of debt presented in the scheme will always be the one with the lowest risk associated for the Government, *ceteris paribus*). We have no *a priori* on this chaining but we are assuming that external markets are consulted after domestic creditors and that long-term debt depends on short-term debt but not the other way round. The accuracy of the results provided by this ordering will be tested in section 4.6.

Public spending (D_SPEND) → GDP (D_GDP) → Taxes (D_TAXES) → Interest rate (REAL_INT_RATE) → Internal debt (D_DEBT_R) → Foreign debt (D_DEBTNR) (O.4)

Public spending (D_SPEND) → GDP (D_GDP) → Taxes (D_TAXES) → Interest rate (REAL_INT_RATE) → Debt issued in national currency (D_DEBTNC) → Debt issued in foreign currency (D_DEBTFC) (O.5)

Public spending (D_SPEND) → GDP (D_GDP) → Taxes (D_TAXES) → Interest rate (REAL_INT_RATE) → Short-term debt (D_STDEBT) → Long-term debt (D_LTDEBT) (O.6)

Finally, the regression incorporating monetization will have a different formulation, since, not only the structure changes within a mixed-policies' scheme, but also it seemed important, within this context, to incorporate inflation (reflected by the variation of the HICP[8]), since its rise is referred in the literature as one of the main cons associated to monetizing the economies.

The chosen chaining is supported by the findings of Muscatelli *et al.* (2002):

Public spending (D_SPEND) → GDP (D_GDP) → Taxes (D_TAXES) → Inflation rate (HICP) → Monetary base (D_BM) → Debt (D_DEBT) (O.7)

This ordering follows the ideas previously described for the fiscal policy side. As for the monetary policy side, it adds up the idea that it reacts to fiscal measures within the same period, but not *vice-versa* (Muscatelli *et al.*, 2002). We can give as an example the fact that increasing indirect taxation can lead to higher prices, thus propelling inflation, which can trigger monetary policy reactions (especially if the monetary authorities are inflation averse, thus focusing their actions on a quite strict target for inflation). On the other hand, fiscal policy usually presents a slower reaction, which is lagged in time, since it is dependent on a yearly-based approval of the Governments' budget.

3.3. Recession periods

The literature shows consensual evidence on the differences of magnitudes, and even of signal, of the fiscal multipliers during recession/expansion periods. *E.g.*, Auerbach and Gorodnichenko (2012), use a STVAR – switching vector autoregressive model –, and Arin *et al.* (2015) use a Markov-switching model, in order to capture the differences between the two cycle phases, thus not biasing the final estimations. Therefore, it is clearly important to differentiate the cycle phases, in order to obtain more precise results (see discussion in section 2.1.1.).

In order to assess the different magnitude of the fiscal multipliers for different cycle phases, we collected data for the effective GDP and the potential GDP for each country in

[8] HICP – Harmonized Index of Consumer Prices.

our sample to compute the output gap per year for each country. This process consisted in subtracting the value for the potential GDP from the effective GDP. Then, we created a dummy variable (DUMMY_YGAP as defined in *Eviews*), which takes the value of "1" in recession periods when the output gap is negative, and "0" otherwise.

3.4. Balanced-budget, debt-financed and money-financed spending multipliers

The methodology used to the computation of multipliers pertaining to capture the combined effects on GDP from Government spending shocks fully financed by either taxes, debt or monetization follows a three-step approach:

1. Compute the elasticity of the policy instrument to GDP (impulse response functions) through dividing the accumulated response of GDP to the shock over the years by the initial shock itself on the fiscal instrument/variable, $\left(\frac{\frac{\Delta Y}{Y}}{\frac{\Delta X}{X}}\right)$.
2. Compute the sample average (inverse) weight of the fiscal instrument on GDP, $\left(\frac{Y}{X}\right)$.[9]

To compute the fiscal multiplier attached, in general, to variable X, as:

$$\frac{\frac{\frac{\Delta Y}{Y}}{\frac{\Delta X}{X}}}{\frac{X}{Y}} = \frac{\frac{\Delta Y}{Y}}{\frac{\Delta X}{X}} * \frac{Y}{X} \qquad (3.3)$$

3. In order to compute spending multipliers through different financing methods we subtract the impact on GDP from a unit shock on debt or taxes (debt or tax multiplier) to the spending multiplier. This procedure allow us to obtain the deficit-financed spending multiplier, the balanced-budget multiplier, and the monetary-financed multiplier (see, for example, Caldara and Camps, 2008).

[9] Note that the sample will vary within our regressions, since there is some data missing for some of the variables used in our estimations. The weighting is adjusted taking into consideration available observations for each regression.

4. Analysis of results

In this section, we present the results of our models estimations, always ensuring stability of all regressions, in order to assess how Government spending multipliers are shaped by different sources of financing during recessions.

We first assess the impacts of different (aggregate) instruments of financing on the effectiveness of Government spending. Second, we address differences between cycle phases to then focus on recession periods. Within the latter context, we further assess how the size of spending multipliers relates with financing through alternative taxation instruments and types of debt. Finally, and considering as a sample only the EA countries, monetization will be included in the regression, simulating its effects on spending multipliers. Throughout this analysis, we try to link our conclusions with those from the existing literature, providing some theoretical insights to our results.

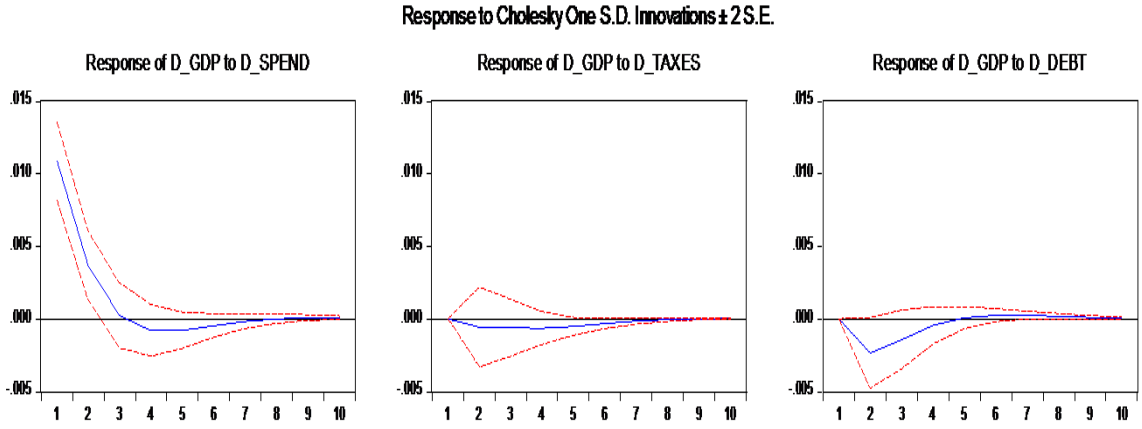
To end this section, we perform some robustness tests in order to confirm results under some alternative model assumptions.

4.1. General estimation

Annex A.4. reports VAR estimation outputs for the whole sample period and taking aggregated financing variables among the endogenous ones: public spending, output, public revenue (taxes and social contributions), real interest rate, and public debt. As explained before, variables were ordered considering the Cholesky decomposition (see O.1, above) and the stability of the regression was already tested before. From the output, we do not reject the global significance of each regression at a 5% significance level (F-statistic in *Eviews* output is higher than the F-critic).

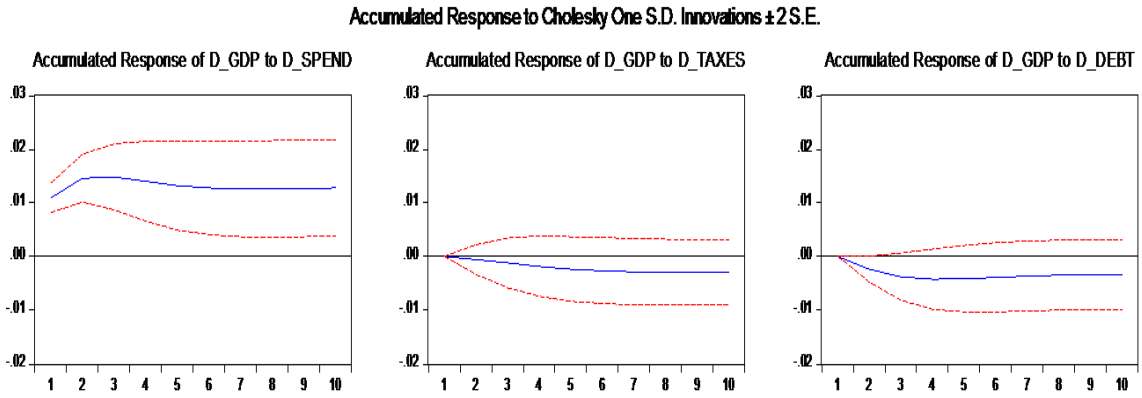
Selected impulse functions and accumulated impulse responses depicted in Figures 1 and 2, respectively, show the impact on GDP caused by public spending, taxes, and public debt innovative shocks.

Figure 1 - Impulse responses: spending, taxes, debt (impact on GDP)



Note: *EViews9* output.

Figure 2 - Accumulated responses - spending, taxes, debt (impact on GDP)



Note: *EViews9* output.

Figures 1 and 2 show that public spending might have a positive impact on GDP throughout the first two or three years after the shock, whilst debt produces a negative initial effect but a slight positive effect in the later periods. For those two variables, and apart from the referred impacts, we cannot infer any other conclusions from the impulse responses, since zero is comprehended between the confidence interval represented by the red lines. Thus, we cannot reject a null impact for the rest of the periods under analysis. In the case of taxes, impacts on GDP are never statistically significant. Thus from the analysis of accumulated impulse responses, shocks on spending produce a positive and lasting effect on

GDP while, in the case of debt, inference about the cumulative multiplier is only statistically significant for the first years after the shock.

Table 5 shows the cumulative multipliers computed through using the procedure described in section 3.4. Please note that values in grey are not statistically different from zero (according to the IRF results).

Table 5 - Balanced-budget and deficit-financed spending multipliers (1995-2016)

Core estimation (1995-2016)					
Period	**Public spending**	**Public revenue[10]**	**Debt**	**Balanced-budget multiplier[11]**	**Deficit-financed spending multiplier[12]**
1	0.6866	0.0000	0.0000	0.6866	0.6866
2	0.9171	-0.0539	-0.0536	0.9171	0.8635
3	0.9318	-0.1124	-0.0861[13]	0.9318	0.8457
4	0.8810	-0.1729	-0.0961	0.8810	0.8810
5	0.8317	-0.2216	-0.0942	0.8317	0.8317
6	0.8027	-0.2522	-0.0884	0.8027	0.8027
7	0.7920	-0.2672	-0.0829	0.7920	0.7920
8	0.7921	-0.2722	-0.0788	0.7921	0.7921
9	0.7967	-0.2723	-0.0764	0.7967	0.7967
10	0.8018	-0.2707	-0.0751	0.8018	0.8018

Notes: Author's calculations; values in grey are not statistically significant.

It is important to clarify the reading of the multipliers. The values on the first three columns of Table 5 mean that a change of one monetary unit in spending, taxes, or debt (respectively) generates an increase/decrease (depending on whether the signal reported is positive/negative) of X monetary units (being X the value reported on the table) on GDP. Since we are dealing with cumulative multipliers, the value for the second period corresponds to the sum of the impacts for the first and second periods; the same applies to subsequent periods.

[10] These multipliers do not have statistical significance as we have pointed out when analyzing the IRFs.
[11] Since we cannot statistically infer that the taxes' multipliers are different from zero, the spending multiplier when the expenditure is financed through taxes is assumed to be equal to the one caused by a pure spending shock.
[12] From the third year onwards, we dealt with the situation reported in footnote number 9, following the same procedure.
[13] After the third year, the values do not have statistical significance as we have pointed out when analyzing the IRFs.

The values in the last two columns of Table 5 refer to the cumulative effects of a simultaneous change of one monetary unit in both public spending and in taxation/debt (respectively) on GDP, being the sum of the former (corresponding) individual columns, when significant.

It was quite predictable, taking into consideration the relevant literature (*e.g.*, Gechert and Rannenberg, 2018), that the multipliers for taxation would be very low. For our sample, we cannot even infer that they are different from zero. Thus, balanced-budget multipliers (spending multiplier derived from financing public expenditure through taxation) equal the values of the spending multiplier. For the case of the deficit-financed spending, multipliers are only statistically different from those of the pure spending shock for the first three years after the shocks. Thus, debt-financing produces lower multipliers in the short-run when compared to balanced-budget multipliers.

Our results fail to support the Keynesian view according to which debt financing is perceived as an increase in net wealth (since the future higher tax burden will be distributed over several generations), being expected a larger effect on GDP when public spending is financed by debt instead of taxes.

For Kandil (2013), both columns (simple multipliers for taxation and debt) should yield negative values, especially for the case of debt. The first method of financing tends to reduce consumption, while debt might, besides increasing savings for precautionary behavior, also shrink investment through the propagation of increasing interest rates to the markets. Our results are in line with this rationale since balanced-budget multiplier is larger than the deficit-financed one. Apparently, the wealth effect caused by an increase in spending might offset the negative impact of higher taxes (see, for example, Coenen *et al.*, 2010). In the case of debt-financing, although precautionary behavior and the interest rate crowding-out effects are small when compared to the stimulus of increasing public spending, they still reduce the impact of a fiscal stimulus per se by more compared to tax-financing.

In the next section, we assess the above-mentioned mechanisms for different cycle phases. Indeed, it is important to test whether the cycle phase affects multipliers since the EU countries (and most of the countries, in general) have just surpassed a severe crisis, and the literature is quite consensual on the importance of separating recession from expansion periods (see, for example, Parker, 2011, and Huidrom *et al.*, 2016). Moreover, most of the EU countries are deprived from monetary policy for stabilization purposes and, most of

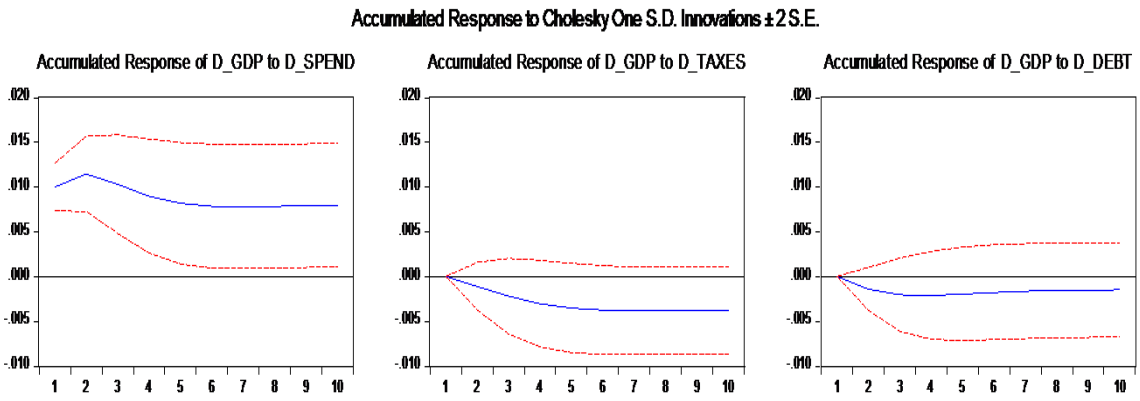
them, are also limited by the Stability and Growth Pact (SGP) rules on the deficit and debt dynamics.

4.2. Assessing the impact of the cycle phase on the fiscal multipliers[14]

The conditions of the markets are quite different across cycle phases. Actually, during recession periods, individuals face liquidity constraints (*e.g.*, employment shrinks, thus reducing the disposable income; credit markets become riskier and costlier), economies tend to have unused resources and face reduction in the volume of trade of goods and capital (Tagkalakis, 2008). Thus, fiscal policy stimulus is faced as a "pump of fresh air", causing higher reactions on the economic activity, that do not happen when the economy is operating at its maximum capacity. Moreover, fiscal stimulus does not crowd out so much private activity, since investment and consumption, already at very low levels, become less reactive to increases in interest rates.

When we include in the model a dummy variable (*DUMMY_YGAP*) that codes with "1" the recession periods, as explained in section 3.3., IRF become as represented in Figure 3.[15]

Figure 3 - Accumulated responses - spending, taxes, debt (impact on GDP), with DUMMY_YGAP as an exogenous variable



Note: *EViews9* output.

[14] The output and stability check for this and the following regressions will be reported from Annex A.5. onwards; for the stability tests only the results of the tests will be exposed within the main text.
[15] Output of the estimation in Annex A.5.; stability check in Annex A.6.

The accumulated impact of shocks in public spending on GDP remains significant when introducing the dummy variable, but for taxes and debt it is not possible to take any inference since zero is inside the 95% confidence interval bands. However, for the case of taxes, the interval of confidence is not symmetric, being biased towards negative-signal values, which can point out to a negative impact of taxation shocks on GDP.

In Table 6 we report equal multipliers for debt and taxes-financed spending shocks because we cannot take any conclusions from the values presented in columns 3 (public revenue) and 4 (debt) – the values are not statistically different from zero.

Table 6 - Balanced budget and deficit-financed spending multipliers (1995-2016), with DUMMY_YGAP as an exogenous variable

Estimation including dummy for recession/expansion periods (1995-2016)					
Period	**Public spending**	**Public revenue[16]**	**Debt[17]**	**Balanced budget multiplier[18]**	**Deficit-financed spending multiplier[19]**
1	0.6353	0.0000	0.0000	0.6353	0.6353
2	0.7290	-0.1043	-0.0320	0.7290	0.7290
3	0.6542	-0.2091	-0.0471	0.6542	0.6542
4	0.5701	-0.2877	-0.0485	0.5701	0.5701
5	0.5193	-0.3341	-0.0448	0.5193	0.5193
6	0.4986	-0.3555	-0.0406	0.4986	0.4986
7	0.4949	-0.3624	-0.0376	0.4949	0.4949
8	0.4978	-0.3627	-0.0358	0.4978	0.4978
9	0.5019	-0.3612	-0.0348	0.5019	0.5019
10	0.5050	-0.3597	-0.0344	0.5050	0.5050

Notes: Author's calculations; values in grey are not statistically significant.

The interpretation of the results when an exogenous binary variable is included in a VAR model is not straightforward. When considering the baseline model, the endogenous variables are under the effect we are trying to particularize by the use of the dummy variable. When we explicitly introduce it as an exogenous variable, the endogenous variables are

[16] These multipliers do not have statistical significance as we have pointed out when analyzing the IRFs.
[17] See note 14.
[18] Since we cannot statistically infer that the taxes' multipliers are different from zero, the spending multiplier when the expenditure is financed through taxes is assumed to be equal to the one caused by a pure spending shock.
[19] The same conclusion taken in note 16 is here applied (for the case of debt).

expurgated from the referred effect. Then, analyzing the only column of multipliers that present statistically significant values, that is the one related to the pure spending shock, we can see that adding up the dummy variable to the model results in lower multipliers. Thus, we can infer that when the variables were under the effect of recessionary conditions (in the baseline estimation, without the dummy), multipliers were higher. This is consistent with the literatures' findings already presented. Note that the fiscal multipliers within the recent financial, economic, and sovereign debt crisis might have been more amplified due to the presence of a special condition – the ZLB – in the markets (see, for example, Christiano *et al.*, 2011, or Drautzburg and Uhlig, 2015).

Since the main objective of this dissertation is to assess spending multipliers under alternative financing patterns during recessions, we will proceed with estimations using a sample including only recession periods.[20] Moreover, the literature gives us some clues about different magnitudes, and even signals, of the multipliers when considering shocks on different categories of taxes and debt. In the following sections, we will disaggregate financing variables, and present the corresponding multipliers. We will relate our findings with the ones in the literature, whenever results are statistically significant.

4.3. Revenues' components

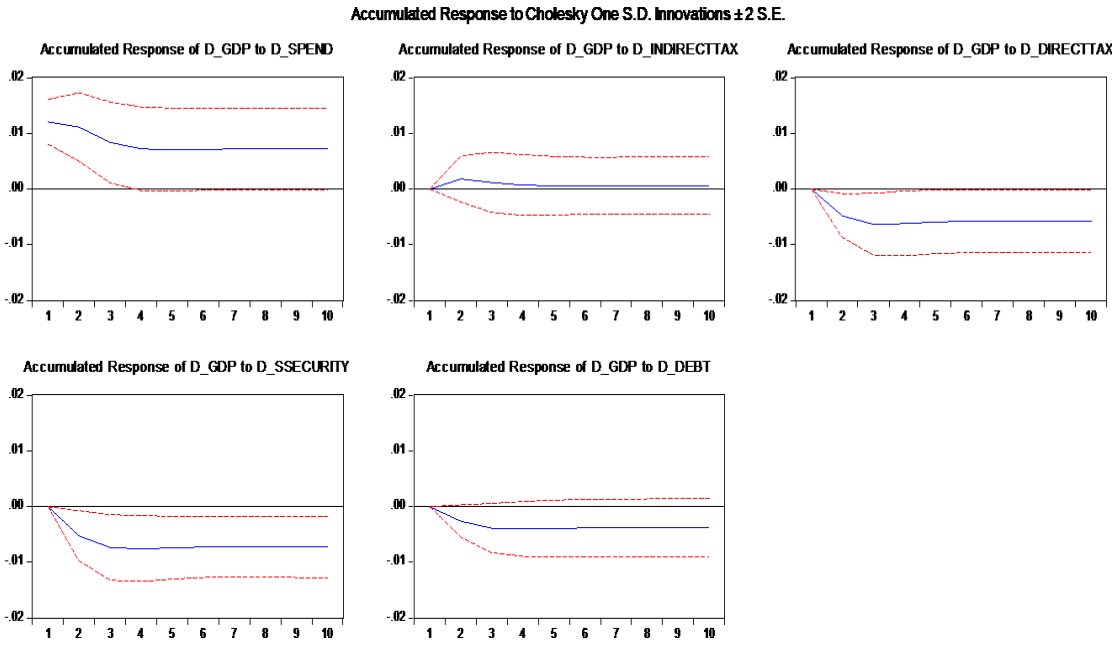
In this section we assess whether particular components of taxation have different impacts on spending multipliers during recessions.

4.3.1. Direct and indirect taxes and social security contributions

A first, broader, disaggregation disentangles public revenues into three components: direct taxes, indirect taxes, and social security contributions.[21]

[20] *I.e.*, instead of including DUMMY_YGAP, we now restrict the sample to observations that register a negative output gap.
[21] The regression including the referred variables (equation O.2), and reported in Annex A.7., is, overall, stable, as reported in Annex A.8.

Figure 4 - Accumulated responses - spending, direct and indirect taxes, social contributions, and debt (impact on GDP), recession periods



Note: *EViews9* output.

Analyzing the accumulated responses in Figure 4, we can state, with 95% confidence, that the responses of GDP to shocks in public spending, direct taxes, and social security contributions are significant, being positive for the first mentioned variable and negative for the other two. In the case of debt, we are going here to assume that the effect is overall significant and negative, since the confidence interval is clearly biased towards negative-signal values, being the superior standard deviation band of the interval very close to zero. Tables 7 and 8 show the corresponding multipliers and the combined "spending-financing source" multipliers, respectively.

Table 7 - Fiscal multipliers considering revenues' disaggregation into direct and indirect taxes, and social contribution (recessions)

Period	Public spending	REVENUES			Debt
		Direct taxes	Indirect taxes	Social security contributions	
1	0.7174	0.0000	0.0000	0.0000	0.0000
2	0.6611	-0.8070	0.2796	-1.2255	-0.0597
3	0.4970	-1.0640	0.1843	-1.7115	-0.0885
4	0.4291	-1.0388	0.1114	-1.7678	-0.0921
5	0.4196	-0.9870	0.0914	-1.7215	-0.0894
6	0.4243	-0.9664	0.0929	-1.6929	-0.0875
7	0.4275	-0.9642	0.0962	-1.6864	-0.0870
8	0.4284	-0.9659	0.0975	-1.6873	-0.0871
9	0.4284	-0.9671	0.0976	-1.6885	-0.0871
10	0.4282	-0.9674	0.0975	-1.6890	-0.0872

Notes: Author's calculations; values in grey are not statistically significant.

Table 8 - Balanced budget and deficit-financed spending multipliers – financing through direct and indirect taxes, social contributions, and debt instruments (recessions)

Period	SPENDING MULTIPLIERS			
	Financing through direct taxes	Financing through indirect taxes	Financing through social security contributions	Deficit-financed spending multiplier
1	0.7174	0.7174	0.7174	0.7174
2	-0.1459	0.6611	-0.5644	0.6014
3	-0.5670	0.4970	-1.2145	0.4085
4	-0.6096	0.4291	-1.3387	0.3370
5	-0.5674	0.4196	-1.3020	0.3302
6	-0.5422	0.4243	-1.2687	0.3368
7	-0.5367	0.4275	-1.2589	0.3405
8	-0.5375	0.4284	-1.2589	0.3414
9	-0.5387	0.4284	-1.2602	0.3412
10	-0.5392	0.4282	-1.2607	0.3411

Note: Authors' calculations.

From Tables 7 and 8 we conclude that direct taxes and social contributions produce a great distortion on GDP – distortionary taxes –, as expected according to, *e.g.*, Arin *et al.* (2016). Particularly, the negative effect can be seen as long-lasting and persistent, as reported by the referred authors. Thus, the values for the balanced-budget multipliers are negative for

distortionary taxes, meaning that the stimulus to the economy given by an increase in public spending is not enough to compensate the cut in disposable income, thus creating an overall negative effect on the economy. In fact, both direct taxes and social security contributions affect, not only the labor force, but also firms (due to corporate taxes and contributions on the employer). Thus, one can infer that the rise of these components of the public revenues tend to decrease both consumption and investment. Also, there is a "snow ball" effect, since higher corporate taxes and higher social charges increase the costs for firms, that will have to decrease the number of employees (if the market power held by the company is not enough to allow the reflection of the costs in market prices). This will represent a decrease in disposable income, which sums up to the direct cut (caused by taxes on labor income, for example, and social security contributions made by the employees).

Once again compliant with the literature, the results obtained for indirect taxes are the most favorable to the economies, since there are no significant distortions caused by the increase on this type of taxation to the stimulus of higher public spending, delivering the highest spending multiplier across all financing methods.

For the case of deficit-financing, the cumulative spending multipliers are positive. Although a shock on debt produces a negative impact on GDP, the sum of the spending multipliers with the negative value from the debt shock (due to precautionary savings and private demand crowding-out) still produces positive impacts on output.

4.3.2. Detailed disaggregation of revenues

In this section, we will further disaggregate public revenues following the categories in the OECD database: i) Taxes on goods and services (indirect taxes); ii) Taxes on personal income (direct taxes); iii) Taxes on property (direct taxes); iv) Taxes on payroll; v) Social security contributions; vi) Taxes on corporate profit and vii) Other taxes.

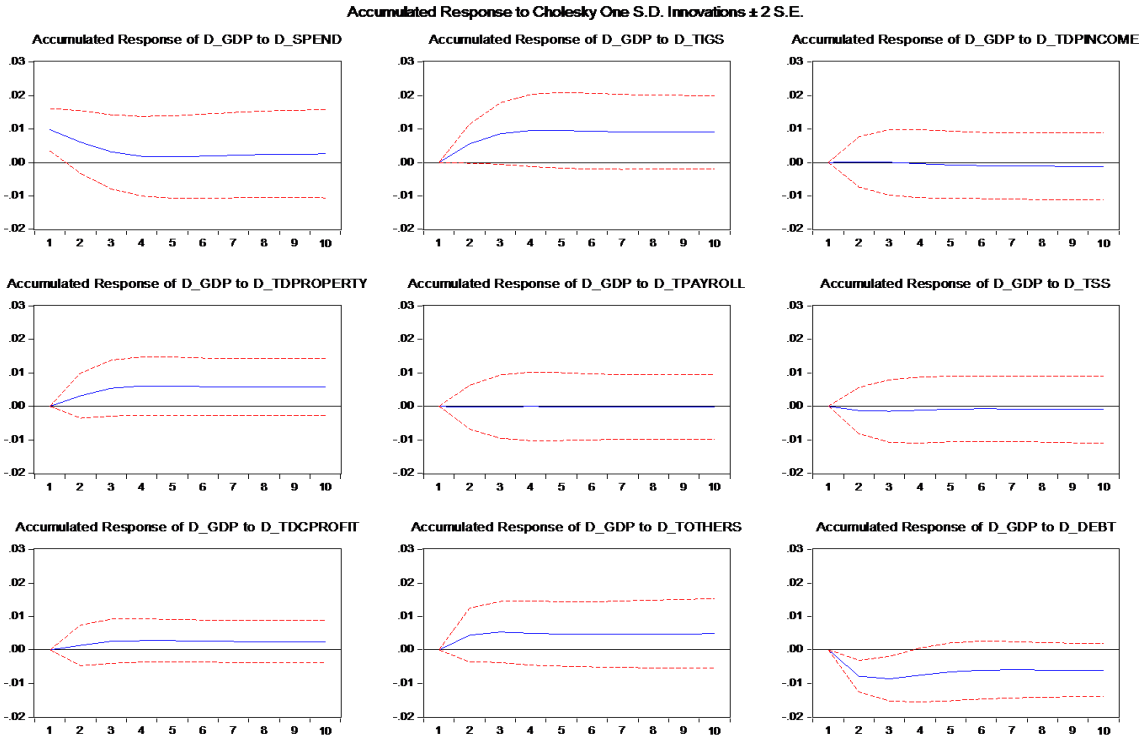
We will refer this decomposition as "complete revenues' disaggregation", in order to simplify the reading of tables and titles.

The ordering of the variables was based on the work by Arin *et al.* (2016), as referred in section 3.2. (equation O.3), and the overall stability of the regression has been confirmed (see Annex A.10.).

Since the sample comprises only recession periods, this raises a particular problem because this database has records only up until 2015, and data is missing for six countries

within this disaggregation. Thus, for this estimation we use only 77 observations, creating additional concerns in the interpretation of the estimates, even when significant. Figure 5 depicts the corresponding accumulated impulse responses. In order to assess the dimension of this problem, we estimated the same regression using the whole sample period, in order to make a robustness check on the presence of significant distortions that could be related to the reduced number of observations. The estimation output, stability test and the accumulated impulse responses' for the whole sample estimation are reported in Annexes A.11. to A.13. Accumulated responses of GDP to fiscal shocks show no significant differences on signals when compared to those in Figure 5 (the exception being shocks on taxes on property that generate a clear positive effect on GDP for the whole sample while, considering recession periods only, the result is not significant, although clearly biased towards positive values), nor in the magnitude of the confidence bands. Thus, we may be in the presence of robust results, even though the number of observations covering recession periods is quite low.

Figure 5 - Accumulated responses - spending, complete revenues' disaggregation, and debt (impact on GDP), recession periods



Note: *EViews9* output.

However, for most of the cases, results are not statistically significant. Public spending is only statistically significant for the first period. For the categories of taxes on income, taxes on payroll, social security contributions, taxes on profit and other taxes, we cannot take any conclusions, since the confidence intervals contain the value zero, and furthermore, are quite symmetric around this value.

For taxes on goods and services, we can state that the response of GDP is positive, which is in accordance with evidence collected by Arin *et al.* (2016) who state that indirect taxation could generate positive effects on GDP (the author refers, particularly, to the long-run). In line with this evidence, Table 9 shows that positive multipliers arise from a shock of one monetary unit on this type of taxes. A possible explanation for this result is that the loss of competitiveness caused by taxes on production and sales might be compensated by taxes on imports and, eventually, on exports. Taxes on imports protect domestic firms, thus increasing the volume of sales, being an incentive to invest and to employment, etc. Taxes on exports might penalize firms operating in the national market, but might also increase competition by restraining the market available. These positive effects of taxes on imports/exports might be related with the degree of openness of the economies (section 2.1.4.). Authors such as Gechert and Rannenberg (2018), Coenen *et al.* (2010), and Ilzestzki *et al.* (2013) refer that more closed economies (lower volume of foreign trade) yield higher fiscal multipliers. Particularly, Beetsma and Guilidori (2011) state that the cause for lower multipliers in more open economies is the deterioration on trade balance that slows down the economic activity.

Taxes on property appear to have a positive effect on GDP, since the lower band for the standard deviation is very close to zero, and the estimation for this regression using a wider sample clearly points to positive values. Takes on property (which include taxes on capital transactions, according to the OECD database) might negatively affect capital mobility. Blanchard and Perotti (2002) and Arin *et al.* (2016) state that capital mobility leads to smoother fiscal multipliers. According to Shen and Yang (2012), the effect of high capital mobility on fiscal policy efficiency may yield a positive effect on GDP if the possibility of financing through external sources overwhelms the real appreciation that comes with the inflow of external funds. A rise in taxes on capital may decrease the inflow of external funds, thus leading to lower pressure on national currency, and potentially generating real depreciation (which is favorable for trade conditions). Moreover, an increase in taxes on property works as a limit to liberalization, therefore increasing multipliers. However, since

the confidence interval contains the value zero (despite being biased towards positive values), we are going to highlight the values for the multipliers in a lighter shade of grey in Table 9. The values of the multipliers obtained for this component of taxation are quite high, and need to be carefully interpreted; since the sample is very small to take accurate inference (information about the signal of the multiplier – positive – is more reliable than their values).

Table 9 - Fiscal multipliers considering revenues' complete disaggregation (recessions)

Period	G.S.	REVENUES							Debt
		T. G&S	T.I.	T.Prop.	T.Pay.	S.S.	T.C.P.	Others	
1	0.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.49	1.58	0.03	3.11	-0.20	-0.16	0.53	3.98	-0.20
3	0.25	2.44	0.00	5.39	-0.08	-0.18	1.00	4.82	-0.22
4	0.15	2.72	-0.08	6.00	-0.06	-0.14	1.09	4.51	-0.19
5	0.13	2.72	-0.16	5.97	-0.10	-0.11	1.08	4.27	-0.17
6	0.15	2.64	-0.21	5.84	-0.14	-0.10	1.02	4.19	-0.15
7	0.17	2.59	-0.23	5.74	-0.15	-0.10	0.98	4.21	-0.15
8	0.19	2.56	-0.24	5.72	-0.15	-0.11	0.96	4.28	-0.15
9	0.20	2.56	-0.25	5.74	-0.14	-0.12	0.95	4.34	-0.15
10	0.21	2.57	-0.25	5.77	-0.13	-0.12	0.94	4.39	-0.15

Notes: Author's calculations; values in grey are not statistically significant.[22]

In face of the results presented in Table 9, we do not compute multipliers for spending financed through different methods, since spending multiplier is significant only for the first period and thus significant (and positive) multipliers resume to indirect taxes.

To summarize the results in this section, including models with both aggregated and disaggregated revenues, indirect taxes are clearly the best financing method for public spending stimulus, and debt is the runner-up. Direct taxation, including social security contributions is the most distortionary among financing methods, significantly reducing the values of the multipliers.

[22] G.S. – Government spending; T. G&S – taxes on goods and services; T.I. – taxes on personal income; T. Prop. – taxes on property; T. Pay. – taxes on payroll; S.S. – Social security contributions; T.C.P. – Taxes on corporate profit; Others – other taxes.

4.4. Debt categories

We turn now to alternative forms of debt financing. In this section, we consider three decompositions of total debt, in accordance to the ECB Statistical Data Warehouse classification: i) by holder (internal or external debt); ii) by currency (national or foreign currency); and iii) by maturity (short-term or long-term debt).

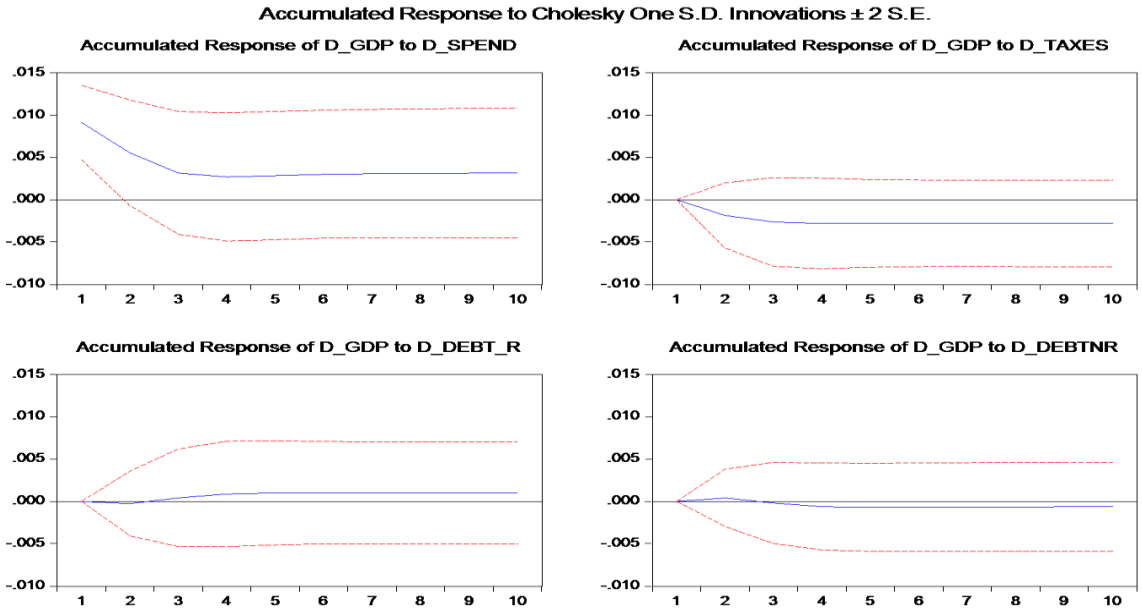
Similarly to the previous analysis on detailed tax sources, we try to assess which particular components of debt might be more distorting in terms of GDP during recessions.

4.4.1. Decomposition of debt by holder (internal versus external debt)

In this section, we will proceed with the debt disaggregation by holder: debt can be issued to domestic/resident holders – internal debt –, or to foreign/non-resident debtholders – external debt. Including these two components in our regression (see ordering O.4, above), we will attempt to find some explanations for the results generated in terms of impact on GDP.

The accumulated impulse response functions are depicted in Figure 6.[23]

Figure 6 - Accumulated responses - spending, taxes, and internal/external debt (impact on GDP), recession periods



Note: *EViews9* output.

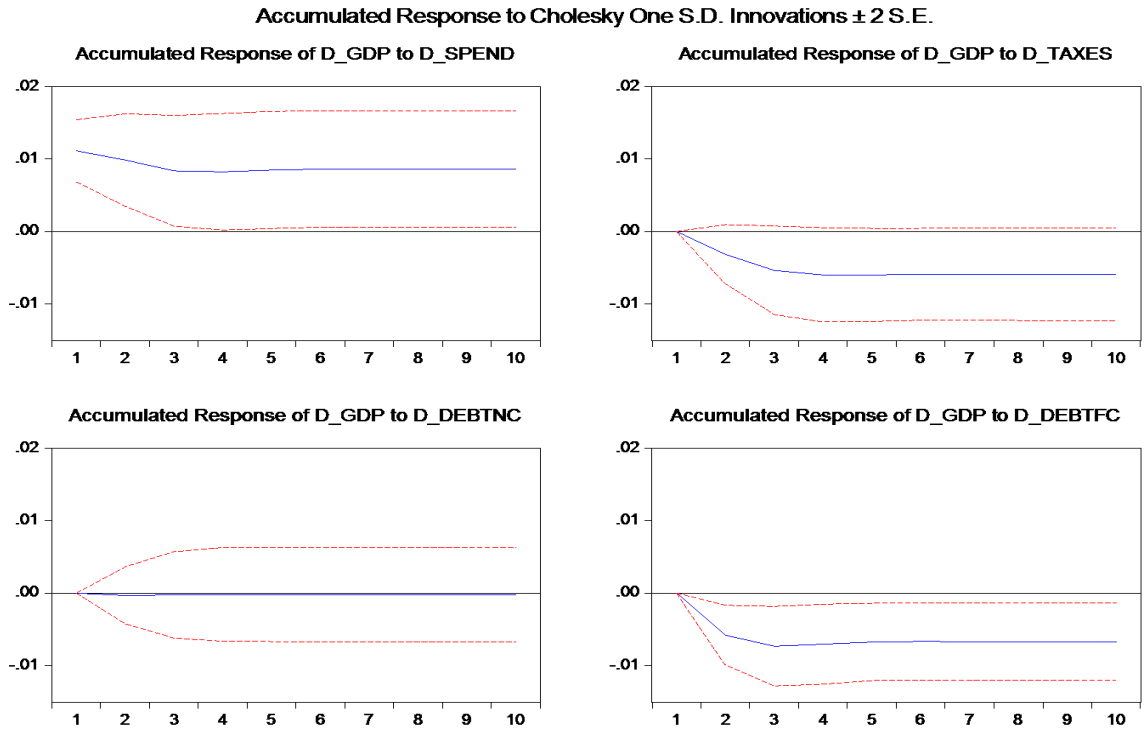
[23] Outputs and stability test in Annex A.14 and Annex A.15, respectively.

None of the shocks to endogenous variables of the model produce significant responses on GDP. Thus, fiscal spending multipliers reveal to be nil, with the exception of the first two periods, regardless the financing method. Relying on the mechanisms exposed in section 2.2.3.1., financing public spending through internal or external debt can constitute a stimulus to the investment up to a certain point as both types of debt issuing have their own disadvantages. Domestic debt implies shortage of funds for private investment while external debt service repayment takes resources out of the economies.

4.4.2. Decomposition of debt by currency (national *versus* foreign currency)

In this section, we consider debt issued in national and foreign currency. After estimating the corresponding model (ordering O.5; output in Annex A.16 and checking for stability in Annex A.17), we obtained the accumulated impulse response functions reported in Figure 7.

Figure 7 - Accumulated responses - spending, taxes, and debt issued in national and foreign currency (impact on GDP), recession periods



Note: *EViews9* output.

Analyzing these response functions, on the financing methods' side, we can see that both taxes and debt issued in foreign currency generate a negative impact on GDP throughout the years. Debt issued in national currency does not affect output. Public expenditure delivers statistically significant positive impacts on output. Table 10 shows the corresponding multipliers.

Table 10 - Fiscal multipliers considering shocks in spending, taxes, and debt issued in national/foreign currency, recession periods

Period	Public spending	Public revenue	Debt	
			National currency	Foreign currency
1	0.6828	0.0000	0.0000	0.0000
2	0.6047	-0.3197	-0.0055	-0.0508
3	0.5141	-0.5464	-0.0043	-0.0642
4	0.5058	-0.6119	-0.0035	-0.0619
5	0.5206	-0.6111	-0.0038	-0.0592
6	0.5287	-0.6032	-0.0040	-0.0586
7	0.5302	-0.6007	-0.0041	-0.0587
8	0.5297	-0.6010	-0.0041	-0.0588
9	0.5294	-0.6013	-0.0040	-0.0589
10	0.5294	-0.6014	-0.0040	-0.0589

Notes: Author's calculations; values in grey are not statistically significant.

The negative results yielded for public revenues (taxes) are in accordance to some authors, such as Kandil (2013), and are related to the effects of direct taxation as already addressed in previous sections.

In the case of debt, the cumulative effect on GDP is negative for debt issued in foreign currency. This is in line with the literature, exposed in section 2.2.3.2., which states that debt issued in foreign currency is associated with a higher risk exposure, due to the volatility of the exchange rates[24] (see, for example, Krugman, 1999, and Aghion *et al.*, 2001). Excessive reliance on debt issued in foreign currency increases both liquidity premia and exchange rate volatility (International Monetary Fund and World Bank, 2014). Exchange rate risk is particularly important for some of the out-of-EMU countries (Original Sin effect). These mechanisms add up to the mechanisms already mentioned for debt multipliers – the

[24] An increase in risk exposure usually generates higher interest rates spreads. Due to the interest rate channel, the transmission to the overall economic activity drags down investment.

Ricardian channel, and the interest rate channel –, thus dragging down multipliers to lower values.

Table 11 - Results for the spending multipliers – financing through taxes, and debt issued in national/foreign currency (recession periods)

Period	SPENDING MULTIPLIERS		
	Financing through taxes	Financing through debt issued in national currency	Financing through debt issued in foreign currency
1	0.6828	0.6828	0.6828
2	0.2850	0.6047	0.5539
3	-0.0322	0.5141	0.4499
4	-0.1061	0.5058	0.4440
5	-0.0905	0.5206	0.4614
6	-0.0745	0.5287	0.4702
7	-0.0705	0.5302	0.4715
8	-0.0713	0.5297	0.4708
9	-0.0719	0.5294	0.4705
10	-0.0720	0.5294	0.4705

Note: Authors' calculations.

Table 11 reports the combined "spending-financing source" multipliers. Foreign debt-financed public spending generates positive multipliers, although the impact decreases with time, while for the financing through taxes the results are negative from the second year onwards. Due to lower risk exposure (when compared to debt issued in foreign currency), multipliers for national debt-financed public spending are the highest among the reported.

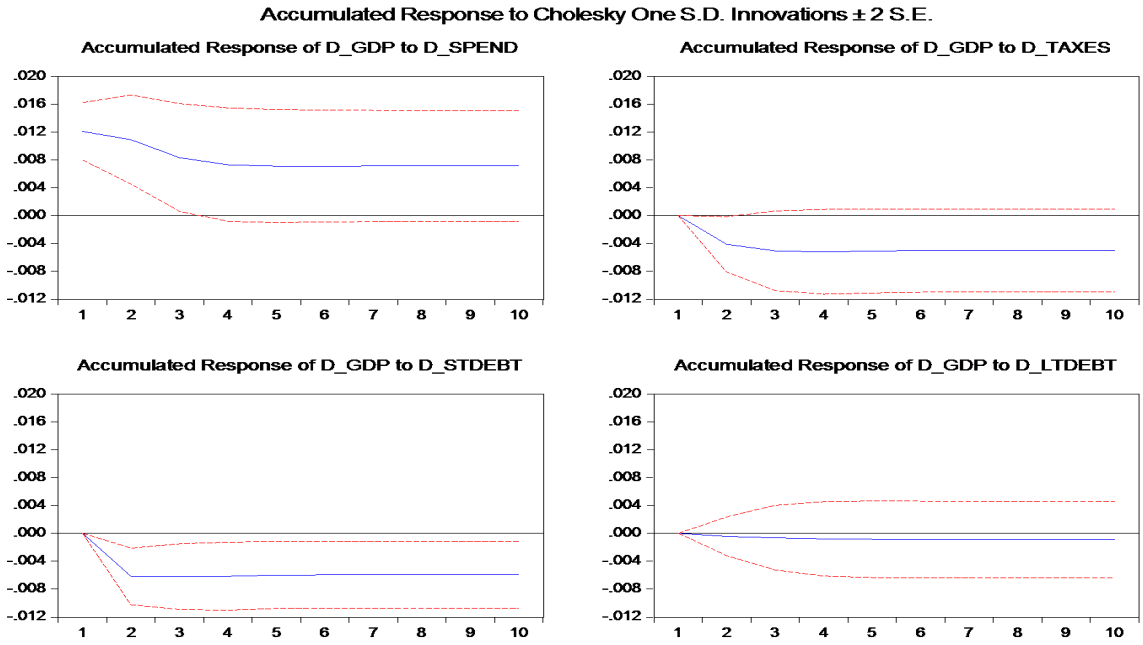
4.4.3. Decomposition of debt by maturity (long-term and short-term debt)

The maturity of loans is a matter of discussion within financial markets' theory. Since it introduces important variations in terms of risk and spreads, among others, it seems adequate to control for this effect on debt as a financing source. Considering the classification of debt by maturity, Figure 8 shows the accumulated impulse responses of

GDP to shocks on spending, taxes, short-term debt, and long-term debt, following the ordering in (O.6).[25]

Although we did not find solid literature relating the debt maturity with the effects on multipliers, International Monetary Fund and World Bank (2014) emphasize the importance of debt maturity profile to reduce the risks of default. Their guidelines refer that the Governments' focus in cost savings conducts to an added exposition of their budgets to financial market conditions, namely due to the excessive use of short-term debt.

Figure 8 - Accumulated responses - spending, taxes, and short-term/long-term debt (impact on GDP), within recession periods



Note: *EViews9* output.

From inspection of Figure 8, long-term debt is the only fiscal instrument unable to affect significantly GDP. We assume overall significance for public spending and taxes, since the lower/upper boundary of standard deviation on spending/taxes, respectively, is very close to zero, and the interval is clearly biased, respectively, towards positive/negative values. For the case of variations on short-term debt, the accumulated impact on GDP is clearly negative and significant.

[25] Output and stability check in Annex A.18 and Annex A.19, respectively.

Table 12 - Fiscal multipliers considering shocks in spending, taxes, and short-term versus long-term debt (recessions)

Period	Public spending	Public revenue	Debt	
			Short-term debt	Long-term debt
1	0.7101	0.0000	0.0000	0.0000
2	0.6401	-0.4337	-0.1419	-0.0115
3	0.4892	-0.5313	-0.1427	-0.0169
4	0.4295	-0.5465	-0.1413	-0.0213
5	0.4170	-0.5340	-0.1372	-0.0232
6	0.4177	-0.5276	-0.1364	-0.0239
7	0.4190	-0.5258	-0.1364	-0.0241
8	0.4192	-0.5258	-0.1366	-0.0242
9	0.4191	-0.5261	-0.1367	-0.0243
10	0.4190	-0.5263	-0.1367	-0.0244

Notes: Author's calculations; values in grey are not statistically significant.

As before, overall taxes lead to negative multipliers. For the case of short-term debt, the negative signal of the cumulative effect on GDP might also be justified by the Ricardian and interest rate channels, as already explained. The variation of one monetary unit on short-term debt creates an impact on GDP that is higher than when we considered aggregated debt.[26] This might mean that, for the long-term debt, the impact would probably be lower than for aggregate debt (the mean between the two components, short-term and long-term debt, would, thus, result in a lower value than for short-term debt alone).

The trade-off between short-term and long-term debt is also described in International Monetary Fund and World Bank (2014). Short-term debt yields lower costs in terms of debt service (since the interest rates and spreads are lower for a shorter maturity, due to lower insolvency and liquidity risk of the borrower), and the procedure for obtaining a short-term lending is usually less bureaucratic, generating lower transaction costs. However, there is a serious exposure of the Governments to overall market volatility in terms of interest rates (the rollover of debt might end up being done at significantly higher costs), and also in terms of ratings, for example (if the country's rating goes down, the renewal of borrowings to pay long-term liabilities might be done at a higher cost, or, in the limit, it might be denied, leading to insolvency) – rollover risk.

[26] Except for the estimation with total disaggregation of the revenues where, due to lack of data, results might not be very robust.

The relative importance of the rollover risk *versus* the direct costs of borrowing might be responsible for the introduction of significant differences between the impacts of shocks in short-term and long-term debt. If the higher rollover risk of short-term debt offsets the lower direct borrowing costs, there is a larger distorting effect for this kind of debt, as our results seem to suggest.

Table 13 - Results for the spending multipliers – financing through taxes, and long-term/short-term debt (recessions)

Period	SPENDING MULTIPLIERS		
	Financing through taxes	**Financing through short-term debt**	**Financing through long-term debt[27]**
1	0.7101	0.7101	0.7101
2	0.2064	0.4982	0.6401
3	-0.0421	0.3465	0.4892
4	-0.1170	0.2882	0.4295
5	-0.1171	0.2798	0.4170
6	-0.1099	0.2813	0.4177
7	-0.1069	0.2826	0.4190
8	-0.1066	0.2827	0.4192
9	-0.1070	0.2824	0.4191
10	-0.1074	0.2822	0.4190

Note: Authors' calculations.

Once again, we obtain values for the spending multipliers that are negative under general tax financing while positive if debt financed. Moreover, positive effects are smaller for short-term debt financing than for long-term debt financing (see Table 13). However, it is important to keep in mind that the efficiency of debt financing might suffer some distortions for different levels of debt (as percentage of GDP), as reported, for example, by Ilzetski *et al.* (2013).

In summary, debt financing of public spending entails higher multipliers than financing through public revenue. Moreover, debt financing should rely, preferably, on national currency, and should be of long-term maturity.

[27] In this column, we assume that, since we cannot reject of the hypothesis of nil impact on GDP of shocks on long-term debt, the multiplier generated by this financing method is equal to the one yielded by a pure spending shock.

4.5. Monetization

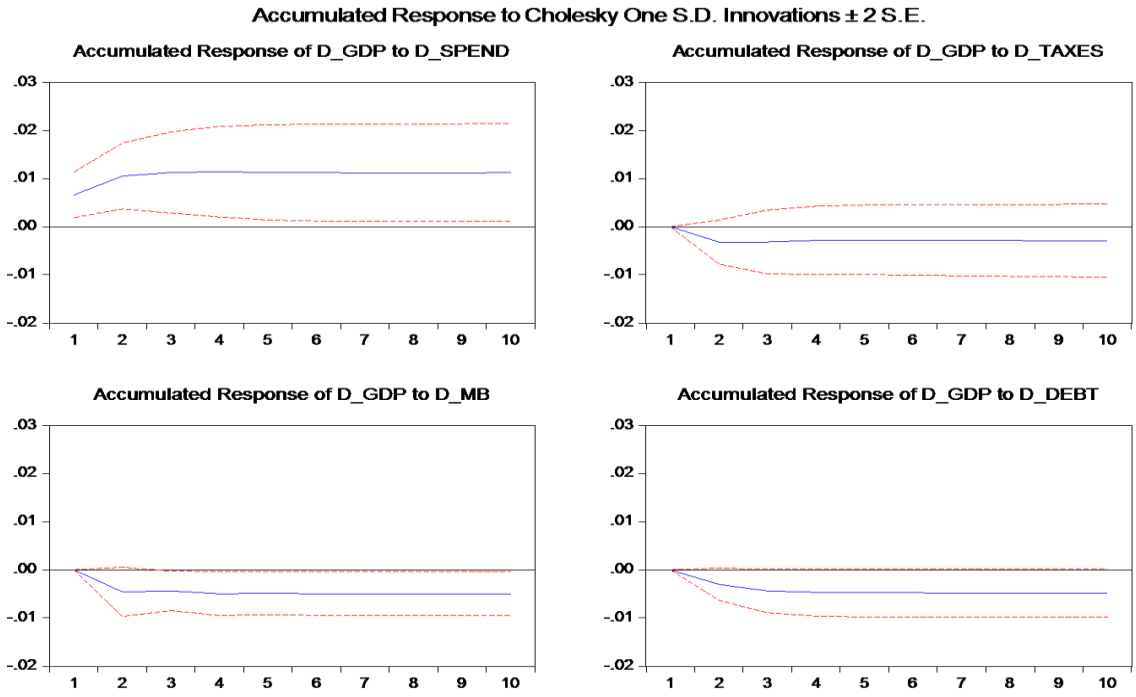
The next step into our analysis is to consider a last form of financing public spending, monetization. In our sample, most of our countries belong to the EA, thus sharing a common monetary base controlled by the ECB; other EU countries have their own central banks, which control their monetary base. In this context, this section is merely exploratory in providing a hypothetic scenario to assess the impacts of deficit monetization. We redefined the sample as to include countries since their inception as EA member. Although monetization is not possible within the EA countries, the ECB can actually manipulate the monetary base available in the markets (for example, by changing minimum reserves, etc.). This constitutes a form of monetary policy, although centralized in the figure of the ECB (despite the fact that manipulating the interest rates is the main method of implementation of the monetary policy, in a ZLB this is ineffective).

We have assessed the stationarity of the variable representing monetization, when defined in first (log) differences, using the methodology described in section 3.1.2., and conclude for stationarity (see Annex A.20).[28]

In Figure 9 we present the accumulated impulse response functions (for shocks on taxes, base money, and debt). For pure spending shocks, the overall impact on GDP is positive, while for debt shocks it is negative, being consistent with previously disclosed results. For taxes, we cannot take any conclusions (the presented results are not significant). As for shocks on the base money, controlled by the ECB, we can see that the relation seems to be negative, which seems to prove that the inflationary effects offset wealth creation. The inflationary impacts of monetization can be clearly seen in Figure 10, which presents que accumulated response of the HICP to shocks on monetization (the impacts are positive, and quite explosive). Also, for the considered period, liquidity injection (shocks to the base money) tends to have low efficiency, since the markets are under severe mistrust conditions, thus compelling individuals to save, rather than to consume/invest.

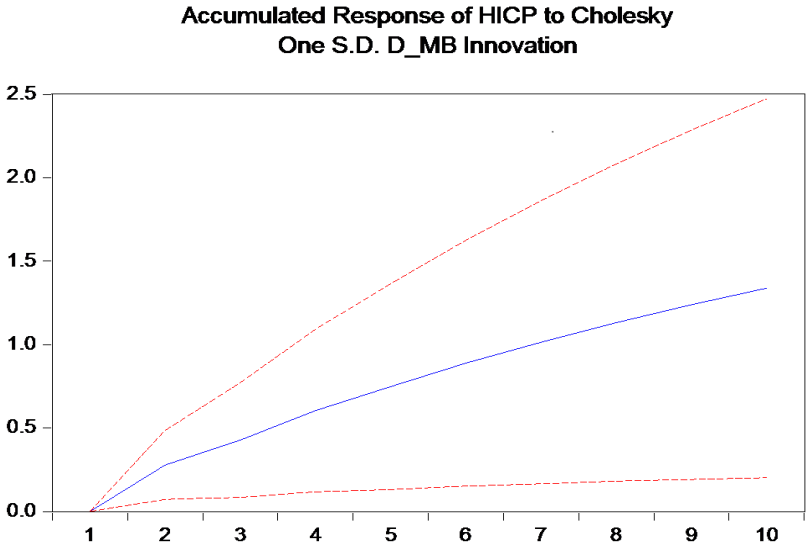
[28] Model stability check and output in Annex A.21 and A.22, respectively.

Figure 9 - Accumulated responses – spending, taxes, and debt (impact on GDP) for different debt levels, within recession periods



Note: *EViews9* output.

Figure 10 – Accumulated response of inflation rate (HICP) to shocks on the money base, within recession periods



Note: *EViews9* output.

For the impact of each variable on GDP, the results are negative, both for taxes and debt shocks. However, the effect on GDP from shocks to the base money are smoother than the ones resulting from debt shocks. The negative reaction of GDP yielded by a pure shock on base money can be mainly explained by its positive effect on inflation, which can shrink GDP to a certain extent (Moreno-Dodson and González-Páramo, 2003). This effect can be reinforced by a centralized monetary policy conducted by the ECB, which causes different impacts in each economy (economies are, most of the time, not perfectly synchronized in terms of cycle phases and amplitudes, and each of them possesses particular characteristics that might influence the overall efficiency of fiscal policy shocks) (Illing and Watzka, 2013).

One can see that, within the statistically significant methods of financing for this estimation – debt and monetization – monetization is, thus, the least distorting in terms of GDP (in accordance to what has been stated, for example, by Kandil, 2013). The overall wealth effect of spending is dominant, which is in line with the literature, which refers monetization as being the preferable method of financing public spending, in spite of the inflationary effects.

Table 14 - Fiscal multipliers considering shocks in spending, taxes, debt, and monetization, within recession periods

Period	Public spending	Public revenue	Debt	Monetization
1	0,4104	0,0000	0,0000	0,0000
2	0,6502	-0,2923	-0,0525	-0,0012
3	0,6969	-0,2900	-0,0768	-0,0011
4	0,7051	-0,2606	-0,0815	-0,0013
5	0,6969	-0,2531	-0,0834	-0,0013
6	0,6935	-0,2548	-0,0836	-0,0013
7	0,6912	-0,2583	-0,0837	-0,0013
8	0,6913	-0,2617	-0,0837	-0,0013
9	0,6919	-0,2650	-0,0838	-0,0013
10	0,6929	-0,2679	-0,0838	-0,0013

Notes: Author's calculations; values in grey are not statistically significant.

Table 15 - Results for the spending multipliers – financing through taxes, debt, and monetization (recession periods)

Period	SPENDING MULTIPLIERS		
	Financing through taxes	Financing through debt	Financing through monetization
1	0,4104	0,4104	0,4104
2	0,6502	0,5977	0,6490
3	0,6969	0,6201	0,6958
4	0,7051	0,6236	0,7038
5	0,6969	0,6134	0,6956
6	0,6935	0,6099	0,6922
7	0,6912	0,6075	0,6899
8	0,6913	0,6076	0,6900
9	0,6919	0,6081	0,6906
10	0,6929	0,6091	0,6916

Note: Authors' calculations.

4.6. Robustness and sensitivity tests

Relying on the literature survey presented throughout chapter 2, the efficiency of the fiscal policy is quite sensitive, and can suffer major changes, depending on several factors, such as the cycle phase, the level of debt, the degree of openness, etc.

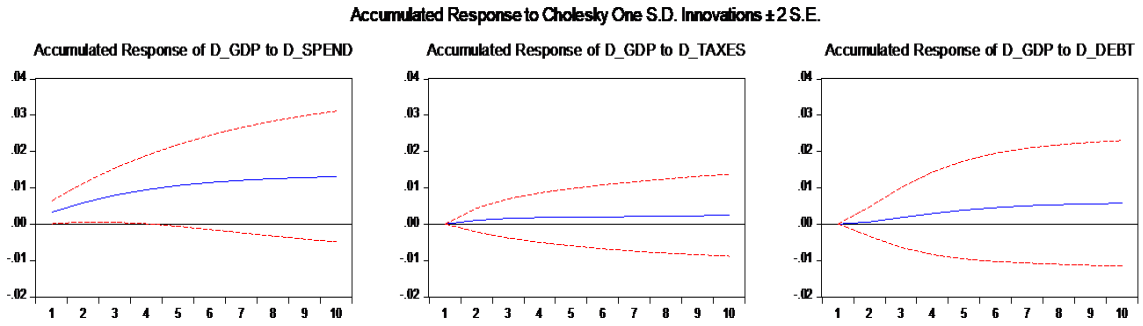
Although we have just explored, somehow, different behaviors over the cycle, in this section we provide additional analysis in order to provide robustness to the above results. Moreover, the recent sovereign debt crisis shed light on the importance that debt levels have, even to countries in our sample, for fiscal policy efficiency. In section 4.4., we have addressed the impact on GDP deriving from variations in the deficit in order to finance public spending; in this section, we will perform some tests on the impact of different debt levels on the multipliers, studying the sensitivity of the results obtained.

Finally, and besides controlling the effects of macroeconomic conditions on the fiscal policy efficiency, there are potential problems arising from model specification itself. As mentioned in section 3.2., the Cholesky decomposition method relies heavily on assumptions on the variables' ordering, which might bias results. Therefore, we perform some tests on the variables' ordering, namely in what concerns the chain between types of debt, since we have followed raw theoretical ideas, not basing our work in specifications already tested by other authors.

4.6.1. Sensitivity to the cycle phase (recession *versus* expansion periods)

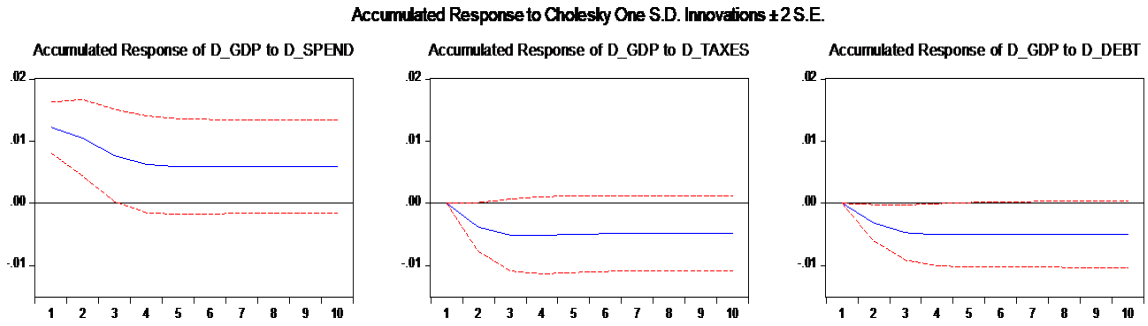
We have already tested, in section 4.2., the impact of introducing a *dummy* variable to expurgate the effect of the recessions. We have then determined that the multipliers obtained in the presence of the *dummy* were different from the ones obtained without this variable in the model. In this section, we are going to compare, specifically, the IRF resulting from the baseline regression for two separate samples: recession and expansion periods. The corresponding accumulated impulse responses are represented in Figure 11 and 12, respectively for the sample of expansion and recession periods.

Figure 11 - Accumulated responses – spending, taxes, and debt (impact on GDP) for expansion periods



Note: *EViews9* output.

Figure 12 - Accumulated responses – spending, taxes, and debt (impact on GDP) for recession periods



Note: *EViews9* output.

One can clearly see that the bands for the confidence intervals are quite different in expansions and recession periods. For the case of public spending, the impact is growing through time in expansion periods, while in recessions the impact is potentially higher in the first periods (the interval of confidence is biased towards higher values).

For the case of taxes and debt, the impact on GDP is clearly negative in recession periods, while in expansion the response of the GDP is not statistically different from zero. This is in accordance with the facts reported in the literature, since the multipliers, in modulus, are higher in recession than the ones generated under expansion times. These results lend robustness to our model as they also confirm those obtained in section 4.2., above, for the whole sample, but where a *dummy* variable, instead, captures the cycle phase.

In order to reinforce the conclusions above, we have also performed the same distinction for the model that includes internal and external debt (for which we did not obtain statistical significance for most of the variables). Output and the stability check for the sample of expansions are reported in Annexes A.27 and A.28. (*cfr.* Annexes A.14. and A.15., for recession periods, following the exposed in section 4.4.1.). The results for the accumulated responses, for both recession and expansion periods, are reported in Annex A.29. Comparing the accumulated responses, one can clearly see that the bands for standard deviations are different both in terms of configuration and trend, as well as in terms of upper and lower limits. For the case of public spending and foreign debt, the use of expansion periods as sample allows us to obtain positive and significant responses on GDP, which result in higher fiscal multipliers when compared to financing public spending through taxes or domestic debt (for which variables the multipliers remain non-significant). Thus, for expansion periods, the effect of financing through external sources, remaining the internal ones available for private investment and consumption is clearly beneficial when compared to using internal financing sources. This can be explained, for example, by the fact that, during recessions, economic activity is usually slowed-down, and investors become more cautious. The differences between financing public spending through borrowing internally or externally would be insignificant. According to Broner *et al.* (2014), during the recent sovereign debt crisis, there has been a shift towards domestic-debt financing, and there has also been an increase in credit constraints and in interest rates (which lowers the multipliers, due to the contraction of investment). These facts might have ended up generating not very significant multipliers for external debt during this period that is covered in our sample for recession periods.

4.6.2. Sensitivity to variables' ordering (Cholesky decomposition)

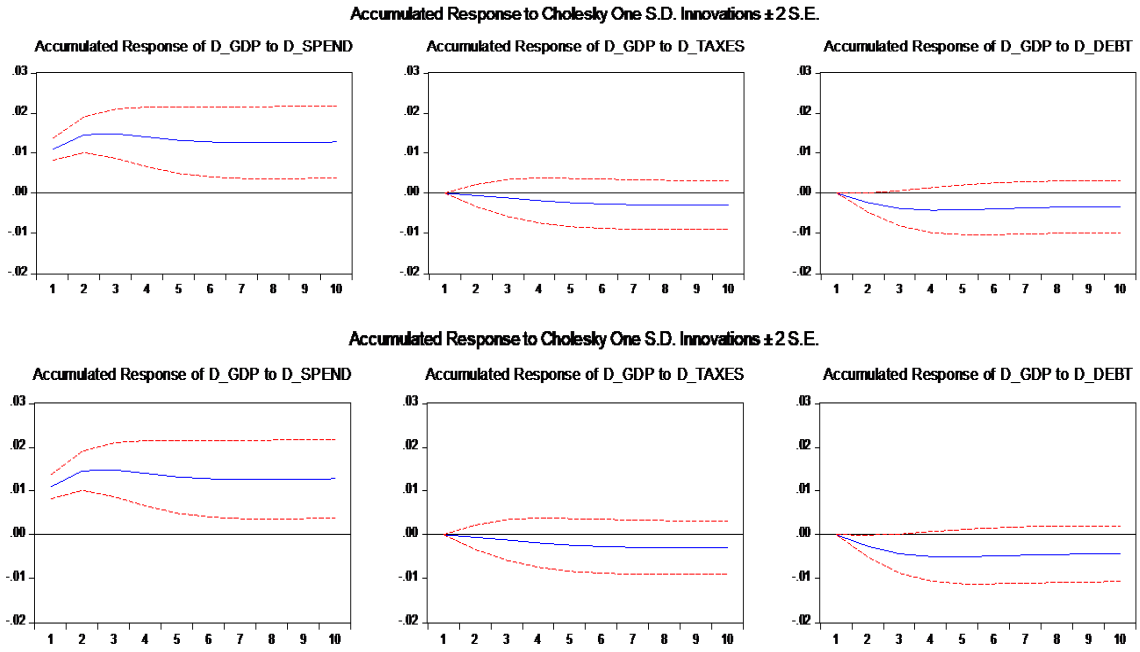
In this section, we propose to perform four tests – new estimations –, in order to detect any inconsistency in our baseline model's specifications, which could be biasing our results. Since we based most of our orderings in previously published works, we do not exhaustively test multipliers statistical differences, but rather assess if signs and confidence intervals for the impulse response functions differ with selected changes in ordering.

The first estimation consists in changing the ordering of the core model (Ordering O.1) to:

Public spending (D_SPEND) → GDP (D_GDP) → Taxes (D_TAXES) → Debt (D_DEBT) → Interest rate (REAL_INT_RATE) (O.8)

where debt influences market interest rate but not the other way around.[29] The accumulated response functions for the two cases are presented in Figure 13, where the top panel depicts the response functions previously presented in section 4.1. and the bottom panel considers the new ordering.

Figure 13 - Accumulated responses core regression, ordering test



Note: *EViews9* output.

[29] Output and the stability check are presented in Annexes A.30 and A.31, respectively.

Apparently, there is no distortion attached to different ordering between interest rate and debt for the Cholesky decomposition.

The following exercise has consisted in a different ordering for the taxation components, following, for example, Pereira and Roca-Sagalés (2011) who consider, instead, a contemporaneous reaction of indirect taxation to direct taxation, since higher direct taxation would imply a decrease in disposable income, thus reducing consumption and, therefore, the base for indirect taxes. The ordering of the variables would, then, became as follows:

Public spending (D_SPEND) → GDP (D_GDP) → Direct taxes (D_DIRECTTAX) → Social security contributions (D_SSECURITY) → Indirect taxes (D_INDIRECTTAX) → Interest rate (REAL_INT_RATE) → Debt (D_DEBT) (O.9)

Output and stability check for the new model are presented in Annexes A.32. and A.33, respectively, and the results for the accumulated responses, for both the previously used ordering and for the new one, are reported in Annex A.34. Again, accumulated impulse responses remain unaltered when considering the new ordering.

We also assess the chain links between different types of debt, since we decided baseline on *a priori* theoretical basis. In alternative to baseline, we now test for the following selected orderings:

Public spending (D_SPEND) → GDP (D_GDP) → Taxes (D_TAXES) → Interest rate (REAL_INT_RATE) → Internal debt (D_DEBT_R) → Foreign debt (D_DEBTNR)) (O.10)

Public spending (D_SPEND) → GDP (D_GDP) → Taxes (D_TAXES) → Interest rate (REAL_INT_RATE) → Debt issued in national currency (D_DEBTNC) → Debt issued in foreign currency (D_DEBTFC) (O.11)

Public spending (D_SPEND) → GDP (D_GDP) → Taxes (D_TAXES) → Interest rate (REAL_INT_RATE) → Short-term debt (D_STDEBT) → Long-term debt (D_LTDEBT) (O.12)

Outputs and stability checks are presented throughout Annex A.35 to Annex A.40. Annexes A.41 to A.43. compare accumulated responses obtained in section 4.4. with those considering the new ordering for the variables, to conclude that the model results are also not sensitive to changes in the ordering of debt components.

4.6.3. Impact of the debt level on the fiscal multipliers

As we have already referred, debt levels appear to be crucial to the effectiveness of alternative methods of financing public spending (see section 2.3.).

Following Ilzetski *et al.* (2013), we include a new *dummy* variable (*DUMMY_DEBT)*, in order to assess the impacts of higher levels of debt on the spending multipliers. The *dummy* takes the value of "0" for low-debt observations (debt-to-output ratio lower than 60%); "1" otherwise. We proceeded with the estimation of the core model in recession periods but including the new *dummy* variable.[30]

The accumulated responses are shown in Annex A.46. Although biased towards positive values, the impact of pure spending shocks on GDP loses significance after the second period, when the *dummy* is included in the model. For taxes and debt shocks, we can still state that there are significant negative impacts on output. Corresponding multipliers (Annex A.47) get lower for the cases of spending shocks and tax shocks, and higher for the debt shocks in the model including debt-level *dummy*. This means that, under the effect of debt, the impacts were higher for the case of pure spending and tax shocks, and lower for debt shocks. This may be a signal of non-Ricardian evidence – as debt rises, consumers perceive a net wealth effect that affects them in the present (while future compensations to fulfill the budgetary constraints are expected to be spread across future generations). On the other hand, for shocks on debt itself, multipliers become weaker when introducing the referred *dummy*. This might reflect that, under high levels of debt, shocks on this variable itself, may lead to additional precautionary behavior and mistrust.

[30] Output and stationarity test in annexes A.44 and A.45, respectively.

Table 16 - Results for the spending multipliers – financing through taxes and debt, considering debt levels as an exogenous variable (recession periods)

Period	SPENDING MULTIPLIERS			
	Financing through taxes		Financing through debt	
	Core	*Dummy_debt*	Core	*Dummy_debt*
1	0,721	0,663	0,721	0,663
2	0,236	0,089	0,546	0,342
3	-0,060	-0,446	0,345	-0,132
4	-0,145	-0,440	0,256	-0,136
5	-0,152	-0,423	0,233	-0,134
6	-0,145	-0,417	0,232	-0,132
7	-0,140	-0,416	0,233	-0,133
8	-0,139	-0,417	0,234	-0,133
9	-0,140	-0,418	0,234	-0,134
10	-0,140	-0,418	0,233	-0,134

Note: Authors' calculations.

For the combined "spending-financing source" multipliers, we can infer that they were higher (or, at least, less negative) when the variables were under the effect of the debt level (core model). Actually, although leveraging can propitiate the precautionary behavior of the consumers, the overall net wealth effect seems to be generating positive effects on the multipliers in our sample. It is important to note that the threshold here included was 60% of the GDP. Considering higher levels of debt, namely, for example, a debt ratio above 100% of the GDP could cause further distortions on the multipliers.

5. Conclusions

The episode of sharp crisis that the world economy recently experienced with the Great Recession that started in 2007-2008, has crucially re-launched the study on the options for implementing discretionary fiscal and monetary measures, with the aim of enabling a softer cycle phase and less economic distortions.

When a recession period begins, it requires urgent measures, which may yield immediate economic relief and avoid further consequences. Thus, it urges to understand which kind of discretionary measures should be undertaken by the authorities and, the better the knowledge on the direction and dimension of their impact on the economy, the better the results to be attained. Especially, and prior to determining the type of measures to be implemented, it is important to understand how macroeconomic conditions may influence the results of the policies conducted. In the case of the present work, we decided to study the specific case of the recession periods. In particular, we focus on the effectiveness of fiscal policy during recession periods and on how different forms of financing government expenditure impinge on output. In fact, monetary policy is less effective for solving asymmetric effects of shocks in, *e.g.*, the Euro Area, and also because the zero lower bound scenario for interest rates strongly limited the use of conventional monetary stimulus.

In fact, according to the relevant literature, the study of the impacts deriving from the implementation of fiscal stimulus should be accompanied by the perception of the macroeconomic conditions that may bias the results. Namely, and considering our sample period, especially in what concerns the most recent years, we have given special attention to the contributes of renowned studies in terms of the implications of the cycle phase (specifically, recession periods), the debt level, and the zero lower bound in terms of fiscal policy efficiency. Particularly, we have found out the importance of separating the sample into recession *versus* expansion periods, since the literature provides strong evidence of amplified effects of fiscal policy under recession periods. Also, we have concluded about the potential disturbance introduced by high debt levels on fiscal stimulus (eventually, fiscal policy can lose its efficiency if implemented under high debt ratios), which is important to take into consideration when assessing debt financing. Moreover, the authors find quite consensual evidence about the fact that the zero lower bound on the interest rates, a characteristic of the Great Recession of 2007-2008, seems to rise fiscal policy efficiency.

A fiscal stimulus can be financed through a wide range of instruments: different types of taxation, different debt structures and monetization. In terms of taxation, we assess the impact of direct and indirect taxes and social contributions, or disentangle them even further (taxes on personal income, on corporate profits, on property, on payroll, on goods and services). The importance of disentangling taxation into several typologies is motivated by the fact that the growing levels of debt that have been verified recently in economies worldwide have proven to be growth-distorting. Therefore, with Governments facing a situation of insolvency and of increasing difficulties in renewing their loans, and being monetization forbidden in developed countries, taxation seems to be, sometimes, the only possible financing tool. This being said, and despite the well-known negative effects of increasing taxation on the economies, it is important to study which types of taxes are the least distorting for economic activity, allowing, at the same time, the maintenance of balanced budgets.

Debt financing alternatives can, in turn, be typified, *e.g.*, into short-term and long-term debt, internal and external debt, and debt issued in national or in foreign currency.

According to the relevant literature, both theoretical and empirical, monetization would be the preferable method of financing public spending, despite the necessity of controlling for its potential inflationary effects. In terms of taxation, there is a consensus on the more distortionary effects that may arise from rising direct taxes, when compared to indirect taxes, due to the increased incentive to substitute labor for leisure. In what concerns debt financing, the evidence points clearly to disadvantages of issuing debt in foreign currency, due mainly to the exchange rate risk, and short-term debt (despite the lower costs, there is a high rollover risk). In terms of issuing internal *versus* external debt, the literature points a two-sided effect: financing public spending through foreign debt allows internal funds to remain available for private investment; however, it may be a disincentive to investment, since future returns on capital will be used to repay foreign investors, leaving the country.

In order to proceed with an assessment on the effectiveness of alternative financing sources for fiscal stimulus, we estimate several VAR models, using panel data comprising annual data 1995-2016 on output and fiscal variables for the EU-28 countries. Relative to existing studies, our assessment covers the EU group of countries and focuses on recession periods. It further exhaustively details tax and debt financing structures relative to literature and proposes an assessment on debt monetization through a hypothetical experiment using

the selected sample of EA countries. This comparison between different sources of financing, and their specific categories, may be an important contribute, filling a gap in the literature.

Our results show that, in general, and despite the negative multipliers obtained for almost all the categories of debt and taxation, in line with the relevant literature, debt seems to have softer effects on output than tax raising during recession periods, when revenues are taken in aggregate form (*i.e.*, including direct and indirect taxes, and social contributions). Moreover, while the negative effect of taxation on output overrides the positive effect of a similar shock on government spending, producing net negative fiscal multipliers, the positive impacts of a fiscal stimulus more than compensates the negative impacts of debt on output, yielding net positive multipliers.

However, results on detailed tax financing show that indirect taxes, including taxes on goods and services, present nil or even positive effects on output thus contributing to enlarge spending multipliers when financed by these taxes. Indirect taxation appears to be the best financing method, even overpowering debt financing. Clearly, the biasing component on taxation that generates negative impacts on output, and that makes it a "worse" financing method than debt, is direct taxation (including, also, social security contributions). In fact, a depressed economy may suffer even more when direct taxation goes up. Besides the immediate cut on disposable income, biasing incentives to work and invest may reveal harmful to the already slow rhythm of the economy.

In terms of debt financing, our results pointed debt issued in national currency and long-term debt as being the best financing methods to finance a fiscal stimulus. Despite the fact that debt-financing seems to produce good economic results, it is important to always keep in mind that the threshold for public debt level that might trigger a precautionary behavior by the individuals may be strong enough so that the overall net positive fiscal multiplier may disappear.

An important extension, for future work, should also allow for the analyses under different types of spending stimulus, namely considering consumption spending *versus* investment spending, and combining these policies with the different methods of financing. Moreover, it would be important to distinguish between positive and negative spending shocks (fiscal stimulus *versus* fiscal austerity), in order to control for eventual non-Keynesian effects that may arise from cutting expenditure.

Moreover, the model, as specified for our work, suffers from some debilities, namely regarding database construction, due to the lack of higher-frequency information, especially for the disaggregated variables; a more complete data collection would, perhaps, lead to more robust results. We were also unable to fully compare results across models, since different specifications result in different number of observations and on different mechanisms captured by different set of variables included. Cholesky decomposition may also pose some limitations. Although we tried to link, whenever possible, the choice of the shock ordering to as predicted by the relevant literature and also covered for selected alternative orderings for robustness, results can still be biased by ordering, and alternative assumptions on the identification of shocks would refine results further.

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Annexes

A.1. Variables

In this Annex, we provide further information on the variables used to elaborate the model. We are going to refer each one's source and the database code, alongside their division into groups. The names are presented as they appear on the *Eviews* regressions.

Gross Domestic Product

REAL_GDP – Gross Domestic Product at 2010 reference levels (constant prices), in national currency. *AMECO – OVGD.*

POTENTIAL_GDP – Potential Gross Domestic Product at constant prices (2010 reference level), in national currency. *AMECO – OVGDP.*

Inflation rate

HICP – Harmonized Index of Consumer Prices[31], annual average index (constant prices). EUROSTAT.

Long-term Interest Rate

REAL_INT_RATE – Real long-term interest rates, deflator GDP (National data weighted with current GDP in ECU/EUR). *AMECO – ILRV.*

Public expenditure:[32]

G_SPEND=G_STK+G_SB+G_SUBS+ G_OCE+G_WAGES+G_ICO+G_INVEST

G_STK – Social transfers in kind (national currency). *AMECO – UCIG0.*

G_SB – Social benefits other than social transfers in kind: general government (National currency). *AMECO – UYTGM.*

[31] According to the Eurostat, *in* http://ec.europa.eu/eurostat/cache/metadata/en/prc_hicp_esms.htm, the HICP is utilized in the EA to assess the inflation convergence (in order to fulfill the Maastricht criteria, that regulates the possibility of the countries joining the EA), and to guide the monetary policy (being an inflation rate around 2% – price stability – one of the main goals of the ECB). It allows the measurement of changes over time on the prices practiced on goods and services' markets, for the consumers (*proxy* to the inflation).

[32] G_SPEND was calculated by the author as the sum of the data for the variables presented in the box.

G_SUBS – Subsidies: general government (National currency). *AMECO – UYVG.*

G_OCE – Other current expenditure: general government (National currency). *AMECO – UUOG.*

G_WAGES – Compensation of employees: general government (National currency). *AMECO – UWCG.*

G_ICO – Intermediate consumption: government revenue, expenditure and main aggregates [gov_10a_main] (National currency). *EUROSTAT – P2.*

G_INVEST – Gross fixed capital formation: general government (National currency). *AMECO – UIGGO.*

Public financing

1.1. Public revenue[33]:

Following AMECO's database division, we calculated public revenue as:

TAXES=D_TAX+I_TAX+S_SECURITY

DIRECT_TAX – Current taxes on income and wealth (direct taxes): general government (National currency). *AMECO – UTYG.*

INDIRECT_TAX – Taxes linked to imports and production (indirect taxes): general government (National currency). *AMECO – UTVG.*

SSECURITY – Social contributions received: general government (National currency). *AMECO – UTSG.*

In order to further disaggregate these categories of taxation, we have also considered, other formulation, following the information by the OECD's database on tax revenue[34]:

TAXES=TD_PINCOME+T_CPROFIT+TD_PROPERTY+T_PAYROLL+TI_G&S+ T_SS+T_OTHERS

[33] TAXES were calculated by the author as the sum of the data for the variables presented in the box.

[34] The OECD data on the referred taxes is given as a percentage of total taxation. Thus, the calculation of the value is done by multiplying the tax rate by the values collected for the countries' public revenue, calculated as referred in this section.

TD_PINCOME – Taxes on Personal Income. *OECD; authors' calculation.*

TD_CPROFIT – Taxes on Corporate Profit. *OECD; authors' calculation.*

TD_PROPERTY[35] – Taxes on Property. *OECD; authors' calculation.*

T_PAYROLL[36] – Tax on payroll. *OECD: authors' calculation.*

TI_G_S – Taxes on Goods and Services. *OECD: authors' calculation.*

T_SS[37] – Social Security Contributions. *OECD: authors' calculation.*

T_OTHERS[38] – Other categories of taxation that are not disentangled within this approach. *Authors' calculation.*

1.2. Public debt:

TOTAL_DEBT – Government Debt (consolidated)[39]. *ECB Data Warehouse.*

LT_DEBT – Long-term Government debt (Maastricht debt)[40]. *ECB Data Warehouse.*

ST_DEBT – Short-term Government debt (Maastricht debt)[41]. *ECB Data Warehouse.*

DEBT_R – Government debt held by residents (Maastricht debt)[42]. *ECB Data Warehouse.*

DEBT_NR – Government debt held by non-residents[43]. *Authors' calculation.*

DEBT_NC – Government debt denominated in national currency (Maastricht debt)[44]. *ECB Data Warehouse.*

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[35] Taxes on ownership and transfer of property.

[36] Compulsory payments made by employers and employees to general Government that do not entitle the payer to a future social benefit.

[37] Compulsory payments made to general Government that entitle the payer to a future social benefit.

[38] The category "tax revenue" on the OECD database contemplates this category but the database does not present information for it. It was, thus, calculated by the author as a residual category, being obtained as the percentage lacking to attain the 100% revenue.

[39] Maturity: all original maturities; counterpart area: World; counterpart sector: Total economy; domestic currency.

[40] Maturity: long-term original maturity (over 1 year or no stated maturity); counterpart area: World; counterpart sector: Total economy; domestic currency.

[41] Maturity: up to 1 year; counterpart area: World; counterpart sector: Total economy; domestic currency.

[42] Maturity: all original maturities; counterpart area: Domestic (home or reference area); counterpart sector: Total economy; domestic currency.

[43] Taking into consideration the information on internal debt (held by residents), and on the total, the foreign debt (held by non-residents) has been calculated residually.

[44] Maturity: all original maturities; counterpart area: World; counterpart sector: Total economy; domestic currency.

DEBT_FC – Government debt denominated in currencies other than national currency (Maastrich debt)[45]. *ECB Data Warehouse and authors' calculations*[46].

1.3. Monetization (Base money)

BM – base money for the EA countries (changing composition) – millions of euros. *ECB Data Warehouse.*

Dummy **variables:**

DUMMY_YGAP[47] – Recession periods (1 – recession; 0 – expansion).

DUMMY_EA – 1 if the country is in the EA[48]; 0 if not.

DUMMY_DEBT – 1 if the debt in percentage of GDP[49] is higher than 60%; 0 if the contrary is true.

[45] Maturity: all original maturities; counterpart area: World; counterpart sector: Total economy; domestic currency.

[46] Note: There was another category available within debt's distinction by currency: "Debt denominated in euros". For the countries entering the EA, debt denominated in euros is, before the date of the entrance, considered as issued in foreign currency, being added to the debt denominated in other currencies – DEBT_FC, and, after that, as issued in national currency – DEBT_NC. For the rest of the countries, debt in euros is summed up to debt denominated in other currencies for the whole sample period – DEBT_FC. There is debt denominated in euros before 1999, which is explained in the ECB *website: "The term "issues in euro", where used for pre-1999 data, also covers items expressed in the national currencies of those EU Member States which subsequently adopted the single currency, as well as items expressed in ECU; thereafter it refers to euro-denominated issues or to any remaining issues expressed in the national denominations of the euro."*
Source:*https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/securities_issues/debt_securities/html/index.en.html*

[47] The definition of the recession periods was done by calculating the difference between the effective GDP and the potential GDP for the 28 sample countries for each year (for the available data).

[48] Considering the information reported in A.2., the observations were coded with "1" from the joining date onwards (when applicable).

[49] In order to make this division, we have collected, from *AMECO Database*, the information on: General government consolidated gross debt: Excessive deficit procedure (based on ESA 2010) – *UDGG*.

A.2. Countries

The countries included in our sample are the EU-28: Austria, Belgium, Bulgaria, Czech Republic, Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Polonia, Portugal, Romania, Slovenia, Slovakia, Spain, Sweden, United Kingdom.

The countries utilized for the EA's estimations are as follows (only the first year for each country – entrance date – will be presented):

Country	Joining EA date[50]
Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain	1999
Greece	2001
Slovenia	2007
Cyprus and Malta	2008
Slovakia	2009
Estonia	2011
Latvia	2014
Lithuania	2015

[50] Data collected from EUROSTAT: http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Euro_area_enlargements.

A.3. Base VAR specification stability check (section 4.1.)

Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_TAX...
Exogenous variables: C
Lag specification: 1 1
Date: 07/25/17 Time: 17:47

Root	Modulus
0.663515	0.663515
0.493182 - 0.262160i	0.558531
0.493182 + 0.262160i	0.558531
0.201909 - 0.122936i	0.236390
0.201909 + 0.122936i	0.236390

No root lies outside the unit circle.
VAR satisfies the stability condition.

Note: *EViews9* output.

A.4. Base VAR, 1995-2016 (section 4.1.)

Vector Autoregression Estimates
Date: 07/16/17 Time: 15:46
Sample (adjusted): 1997 2016
Included observations: 490 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_TAXES	REAL_INT_...	D_DEBT
D_SPEND(-1)	0.392244	0.000209	0.034647	5.002930	0.713575
	(0.04340)	(0.03859)	(0.05738)	(2.97990)	(0.10548)
	[9.03691]	[0.00542]	[0.60379]	[1.67889]	[6.76489]
D_GDP(-1)	0.291980	0.509794	0.468428	-14.21907	-0.265552
	(0.07070)	(0.06286)	(0.09347)	(4.85404)	(0.17182)
	[4.12967]	[8.11048]	[5.01141]	[-2.92933]	[-1.54550]
D_TAXES(-1)	0.242095	0.005830	0.286705	-0.259591	-0.137667
	(0.05025)	(0.04467)	(0.06643)	(3.44960)	(0.12211)
	[4.81818]	[0.13051]	[4.31607]	[-0.07525]	[-1.12742]
REAL_INT_RATE(-1)	0.000823	0.001824	0.002359	0.520977	-0.000141
	(0.00068)	(0.00060)	(0.00090)	(0.04661)	(0.00165)
	[1.21244]	[3.02276]	[2.62855]	[11.1783]	[-0.08546]
D_DEBT(-1)	-0.027241	-0.030307	-0.004825	4.110978	0.343978
	(0.01764)	(0.01568)	(0.02332)	(1.21118)	(0.04287)
	[-1.54413]	[-1.93235]	[-0.20688]	[3.39419]	[8.02311]
C	0.007814	0.008169	0.015263	0.772486	0.018503
	(0.00404)	(0.00360)	(0.00535)	(0.27765)	(0.00983)
	[1.93200]	[2.27196]	[2.85464]	[2.78218]	[1.88260]
R-squared	0.528447	0.255866	0.276478	0.384513	0.253316
Adj. R-squared	0.523576	0.248179	0.269004	0.378155	0.245602
Sum sq. resids	0.584295	0.461798	1.021222	2753.991	3.450788
S.E. equation	0.034745	0.030889	0.045934	2.385385	0.084438
F-statistic	108.4794	33.28411	36.99002	60.47386	32.83987
Log likelihood	954.0002	1011.643	817.2044	-1118.248	518.8918
Akaike AIC	-3.869389	-4.104666	-3.311039	4.588768	-2.093436
Schwarz SC	-3.818029	-4.053306	-3.259678	4.640128	-2.042076
Mean dependent	0.046311	0.022603	0.047286	2.180719	0.063773
S.D. dependent	0.050338	0.035624	0.053725	3.024944	0.097216

Determinant resid covariance (dof adj...	1.93E-11
Determinant resid covariance	1.82E-11
Log likelihood	2582.635
Akaike information criterion	-10.41892
Schwarz criterion	-10.16212

Note: *EViews9* output.

A.5. Estimation output for cycle asymmetry assessment (baseline VAR with DUMMY_YGAP as an exogenous variable, section 4.2.**)**

Vector Autoregression Estimates
Date: 07/21/17 Time: 13:52
Sample (adjusted): 1997 2016
Included observations: 490 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_TAXES	REAL_INT_...	D_DEBT
D_SPEND(-1)	0.365550	-0.032079	-0.007124	5.728566	0.768373
	(0.04354)	(0.03827)	(0.05725)	(3.02203)	(0.10620)
	[8.39607]	[-0.83822]	[-0.12443]	[1.89560]	[7.23484]
D_GDP(-1)	0.230397	0.435305	0.372061	-12.54500	-0.139131
	(0.07197)	(0.06326)	(0.09464)	(4.99540)	(0.17556)
	[3.20136]	[6.88110]	[3.93124]	[-2.51131]	[-0.79252]
D_TAXES(-1)	0.222634	-0.017710	0.256252	0.269436	-0.097716
	(0.04995)	(0.04391)	(0.06569)	(3.46700)	(0.12184)
	[4.45723]	[-0.40337]	[3.90121]	[0.07771]	[-0.80199]
REAL_INT_RATE(-1)	0.000364	0.001269	0.001640	0.533466	0.000802
	(0.00068)	(0.00060)	(0.00090)	(0.04741)	(0.00167)
	[0.53235]	[2.11276]	[1.82586]	[11.2517]	[0.48142]
D_DEBT(-1)	-0.017159	-0.018112	0.010952	3.836908	0.323280
	(0.01766)	(0.01552)	(0.02322)	(1.22582)	(0.04308)
	[-0.97161]	[-1.16672]	[0.47156]	[3.13007]	[7.50424]
C	0.018662	0.021291	0.032239	0.477588	-0.003767
	(0.00502)	(0.00442)	(0.00661)	(0.34868)	(0.01225)
	[3.71502]	[4.82166]	[4.88022]	[1.36971]	[-0.30742]
DUMMY_YGAP	-0.013361	-0.016161	-0.020907	0.363189	0.027427
	(0.00375)	(0.00330)	(0.00493)	(0.26019)	(0.00914)
	[-3.56417]	[-4.90448]	[-4.24111]	[1.39584]	[2.99942]
R-squared	0.540532	0.291167	0.302455	0.386986	0.266970
Adj. R-squared	0.534824	0.282361	0.293790	0.379371	0.257864
Sum sq. resids	0.569321	0.439891	0.984557	2742.926	3.387688
S.E. equation	0.034332	0.030179	0.045149	2.383052	0.083749
F-statistic	94.70257	33.06692	34.90473	50.81836	29.31812
Log likelihood	960.3606	1023.550	826.1625	-1117.262	523.4133
Akaike AIC	-3.891268	-4.149185	-3.343520	4.588824	-2.107809
Schwarz SC	-3.831348	-4.089265	-3.283600	4.648744	-2.047889
Mean dependent	0.046311	0.022603	0.047286	2.180719	0.063773
S.D. dependent	0.050338	0.035624	0.053725	3.024944	0.097216

Determinant resid covariance (dof adj...	1.82E-11
Determinant resid covariance	1.69E-11
Log likelihood	2600.642
Akaike information criterion	-10.47201
Schwarz criterion	-10.17241

Note: *EViews9* output.

A.6. Stability check for the regression with DUMMY_YGAP as an exogenous variable

(section 4.2.)

Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_TAX...
Exogenous variables: C DUMMY_YGAP
Lag specification: 1 1
Date: 07/26/17 Time: 13:30

Root	Modulus
0.630051	0.630051
0.434939 - 0.252182i	0.502760
0.434939 + 0.252182i	0.502760
0.206962 - 0.124758i	0.241656
0.206962 + 0.124758i	0.241656

No root lies outside the unit circle.
VAR satisfies the stability condition.

Note: *EViews9* output.

A.7. Estimation output considering revenues' disaggregation in direct and indirect taxes, and social security contributions – recession periods (section 4.3.1.)

Vector Autoregression Estimates
Date: 07/21/17 Time: 13:42
Sample: 1995 2016 IF DUMMY_YGAP=1
Included observations: 246
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_INDIREC...	D_DIRECTT...	D_SSECURI...	REAL_INT_...	D_DEBT
D_SPEND(-1)	0.178762	-0.081393	-0.222317	-0.606570	0.079308	19.60055	0.863300
	(0.06555)	(0.06034)	(0.10554)	(0.15114)	(0.08136)	(4.99470)	(0.14694)
	[2.72713]	[-1.34896]	[-2.10656]	[-4.01328]	[0.97484]	[3.92427]	[5.87534]
D_GDP(-1)	0.450164	0.416938	0.319935	0.886125	0.265651	-24.90254	-0.149012
	(0.10482)	(0.09648)	(0.16876)	(0.24168)	(0.13009)	(7.98680)	(0.23496)
	[4.29476]	[4.32134]	[1.89583]	[3.66649]	[2.04204]	[-3.11796]	[-0.63421]
D_INDIRECTTAX(-1)	0.028237	0.053160	0.059300	0.164538	0.170092	2.386936	-0.095856
	(0.05028)	(0.04629)	(0.08096)	(0.11594)	(0.06241)	(3.83144)	(0.11271)
	[0.56155]	[1.14854]	[0.73249]	[1.41916]	[2.72551]	[0.62299]	[-0.85043]
D_DIRECTTAX(-1)	-0.059396	-0.081122	-0.037936	0.008289	-0.007585	8.873638	-0.093167
	(0.03303)	(0.03041)	(0.05318)	(0.07617)	(0.04100)	(2.51703)	(0.07405)
	[-1.79808]	[-2.66790]	[-0.71330]	[0.10882]	[-0.18502]	[3.52544]	[-1.25821]
D_SSECURITY(-1)	0.061427	-0.135521	-0.061379	-0.179575	-0.025592	2.093015	0.196481
	(0.06307)	(0.05806)	(0.10155)	(0.14543)	(0.07828)	(4.80602)	(0.14139)
	[0.97390]	[-2.33422]	[-0.60443]	[-1.23478]	[-0.32692]	[0.43550]	[1.38968]
REAL_INT_RATE(-1)	-0.000234	0.000146	0.001088	0.000129	-0.000284	0.637585	0.004163
	(0.00089)	(0.00082)	(0.00144)	(0.00206)	(0.00111)	(0.06792)	(0.00200)
	[-0.26225]	[0.17751]	[0.75846]	[0.06255]	[-0.25670]	[9.38735]	[2.08349]
D_DEBT(-1)	-0.033147	-0.036247	-0.024096	-0.050262	-0.008178	5.879149	0.270820
	(0.02158)	(0.01987)	(0.03475)	(0.04977)	(0.02679)	(1.64458)	(0.04838)
	[-1.53581]	[-1.82448]	[-0.69343]	[-1.00999]	[-0.30530]	[3.57487]	[5.59768]
C	0.017650	0.015015	0.036154	0.038474	0.015787	-0.311165	0.012144
	(0.00532)	(0.00490)	(0.00857)	(0.01227)	(0.00660)	(0.40540)	(0.01193)
	[3.31730]	[3.06597]	[4.22059]	[3.13623]	[2.39079]	[-0.76754]	[1.01824]
R-squared	0.292383	0.174851	0.074544	0.218530	0.164710	0.389274	0.334303
Adj. R-squared	0.271571	0.150582	0.047325	0.195545	0.140142	0.371312	0.314724
Sum sq. resids	0.301514	0.255476	0.781574	1.602994	0.464450	1750.609	1.515052
S.E. equation	0.035593	0.032763	0.057306	0.082069	0.044175	2.712102	0.079786
F-statistic	14.04859	7.204704	2.738641	9.507722	6.704417	21.67148	17.07429
Log likelihood	475.5664	495.9458	358.4097	270.0565	422.4257	-590.4325	276.9966
Akaike AIC	-3.801353	-3.967039	-2.848859	-2.130540	-3.369315	4.865305	-2.186964
Schwarz SC	-3.687358	-3.853045	-2.734864	-2.016546	-3.255320	4.979300	-2.072969
Mean dependent	0.023531	0.007782	0.030531	0.018039	0.021918	2.879061	0.079286
S.D. dependent	0.041703	0.035549	0.058712	0.091501	0.047640	3.420491	0.096381

Determinant resid covariance (dof adj...	2.95E-16
Determinant resid covariance	2.34E-16
Log likelihood	1983.472
Akaike information criterion	-15.67050
Schwarz criterion	-14.87254

Note: *EViews9* output.

A.8. Stability check for the regression considering revenues' disaggregation in direct and indirect taxes, and social security contributions – recession periods (section 4.3.1.)

Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_INDI...
Exogenous variables: C
Lag specification: 1 1
Date: 07/26/17 Time: 16:08

Root	Modulus
0.674398	0.674398
0.210772 - 0.289372i	0.357996
0.210772 + 0.289372i	0.357996
0.265194 - 0.177385i	0.319051
0.265194 + 0.177385i	0.319051
-0.138827	0.138827
0.058597	0.058597

No root lies outside the unit circle.
VAR satisfies the stability condition.

Note: *EViews9* output.

A.9. Estimation output considering revenues' complete disaggregation, within recession periods (section 4.3.2.)

Vector Autoregression Estimates
Date: 07/21/17 Time: 15:25
Sample: 1995 2016 IF DUMMY_YGAP=1
Included observations: 77
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_TIGS	D_TDPINC...	D_TDPROP...	D_TPAYRO...	D_TSS	D_TDCPRO...	D_TOTHER...	REAL_INT_...	D_DEBT
D_SPEND(-1)	0.434222	-0.078343	-0.023165	-0.046463	-0.477933	-1.130048	0.568175	-0.981967	-0.889773	32.02247	0.771979
	(0.11184)	(0.12201)	(0.14863)	(0.32949)	(0.40178)	(1.19972)	(0.36993)	(0.91200)	(1.48818)	(9.09111)	(0.35616)
	[3.88237]	[-0.64210]	[-0.15586]	[-0.14101]	[-1.18953]	[-0.94192]	[1.53589]	[-1.07672]	[-0.59789]	[3.52240]	[2.16751]
D_GDP(-1)	0.166575	-0.038687	-0.404878	0.044252	-1.501519	-1.432743	-0.513895	0.450744	0.552904	-5.791328	0.861221
	(0.17568)	(0.19165)	(0.23346)	(0.51755)	(0.63109)	(1.88445)	(0.58107)	(1.43251)	(2.33753)	(14.2797)	(0.55943)
	[0.94818]	[-0.20187]	[-1.73428]	[0.08550]	[-2.37923]	[-0.76030]	[-0.88440]	[0.31465]	[0.23653]	[-0.40556]	[1.53946]
D_TIGS(-1)	0.196697	0.143050	0.534196	0.268096	1.121856	0.252647	0.133053	0.675289	-0.551246	-14.76661	-0.368375
	(0.09757)	(0.10643)	(0.12965)	(0.28743)	(0.35049)	(1.04655)	(0.32270)	(0.79556)	(1.29818)	(7.93044)	(0.31069)
	[2.01605]	[1.34403]	[4.12021]	[0.93274]	[3.20085]	[0.24141]	[0.41231]	[0.84882]	[-0.42463]	[-1.86202]	[-1.18567]
D_TDPINCOME(-1)	0.018914	-0.021483	-0.038064	0.011299	-0.014344	-0.786874	0.031673	0.042825	0.901149	-6.224592	0.130463
	(0.05317)	(0.05800)	(0.07066)	(0.15664)	(0.19101)	(0.57036)	(0.17587)	(0.43357)	(0.70749)	(4.32197)	(0.16932)
	[0.35572]	[-0.37037]	[-0.53871]	[0.07213]	[-0.07510]	[-1.37962]	[0.18009]	[0.09877]	[1.27373]	[-1.44022]	[0.77051]
D_TDPROPERTY(-1)	-0.002340	0.020403	0.088211	0.001683	0.070970	0.449327	0.057418	0.348254	-0.226618	1.474858	-0.154687
	(0.03582)	(0.03907)	(0.04760)	(0.10552)	(0.12867)	(0.38420)	(0.11847)	(0.29206)	(0.47658)	(2.91135)	(0.11406)
	[-0.06533]	[0.52217]	[1.85330]	[0.01595]	[0.55157]	[1.16951]	[0.48467]	[1.19241]	[-0.47551]	[0.50659]	[-1.35622]
D_TPAYROLL(-1)	-0.019720	-0.020574	-0.028063	-0.048328	-0.009050	0.232242	-0.001970	-0.093259	0.011798	1.547427	-0.014750
	(0.01170)	(0.01276)	(0.01555)	(0.03447)	(0.04203)	(0.12551)	(0.03870)	(0.09541)	(0.15569)	(0.95111)	(0.03726)
	[-1.68531]	[-1.61176]	[-1.80479]	[-1.40196]	[-0.21529]	[1.85033]	[-0.05090]	[-0.97743]	[0.07578]	[1.62698]	[-0.39587]
D_TSS(-1)	-0.064250	-0.025224	-0.036164	-0.094836	-0.061470	-0.132535	0.038313	0.018531	0.279237	1.430017	0.151767
	(0.04136)	(0.04512)	(0.05496)	(0.12183)	(0.14856)	(0.44361)	(0.13679)	(0.33722)	(0.55027)	(3.36156)	(0.13169)
	[-1.55358]	[-0.55911]	[-0.65804]	[-0.77840]	[-0.41376]	[-0.29876]	[0.28009]	[0.05495]	[0.50745]	[0.42540]	[1.15242]
D_TDCPROFIT(-1)	-0.027507	0.021706	0.022709	0.142394	0.048130	0.308495	-0.020364	-0.139048	0.076152	3.638256	-0.058665
	(0.02002)	(0.02184)	(0.02661)	(0.05899)	(0.07194)	(0.21480)	(0.06623)	(0.16328)	(0.26644)	(1.62767)	(0.06377)
	[-1.37366]	[0.99364]	[0.85339]	[2.41376]	[0.66907]	[1.43621]	[-0.30747]	[-0.85157]	[0.28581]	[2.23525]	[-0.91999]
D_TOTHERS(-1)	0.018072	0.014195	0.025392	0.024050	0.012827	0.044406	0.043144	0.052205	-0.133951	-0.295105	-0.041829
	(0.01206)	(0.01316)	(0.01603)	(0.03554)	(0.04334)	(0.12942)	(0.03991)	(0.09838)	(0.16053)	(0.98068)	(0.03842)
	[1.49787]	[1.07853]	[1.58373]	[0.67665]	[0.29596]	[0.34312]	[1.08114]	[0.53065]	[-0.83441]	[-0.30092]	[-1.08872]
REAL_INT_RATE(-1)	0.003331	0.002772	0.005459	0.012405	0.007590	-0.004472	0.004563	0.000614	0.024082	0.358781	0.008169
	(0.00139)	(0.00152)	(0.00185)	(0.00410)	(0.00500)	(0.01494)	(0.00461)	(0.01136)	(0.01853)	(0.11320)	(0.00443)
	[2.39155]	[1.82462]	[2.94941]	[3.02352]	[1.51712]	[-0.29934]	[0.99067]	[0.05406]	[1.29953]	[3.16934]	[1.84205]
D_DEBT(-1)	-0.173610	-0.119464	-0.172392	-0.290728	-0.187496	0.042807	-0.134658	-0.465668	-0.423466	16.23648	0.329854
	(0.03179)	(0.03468)	(0.04225)	(0.09366)	(0.11421)	(0.34102)	(0.10515)	(0.25924)	(0.42301)	(2.58415)	(0.10124)
	[-5.46083]	[-3.44460]	[-4.08051]	[-3.10411]	[-1.64172]	[0.12553]	[-1.28058]	[-1.79631]	[-1.00107]	[6.28310]	[3.25819]
C	0.015305	0.012392	0.016066	0.019708	0.035532	0.065813	-0.001204	0.032703	0.048843	-0.493494	0.002244
	(0.00741)	(0.00808)	(0.00985)	(0.02183)	(0.02662)	(0.07948)	(0.02451)	(0.06042)	(0.09860)	(0.60231)	(0.02360)
	[2.06542]	[1.53305]	[1.63152]	[0.90281]	[1.33483]	[0.82799]	[-0.04913]	[0.54124]	[0.49538]	[-0.81933]	[0.09509]
R-squared	0.642674	0.391128	0.600517	0.390712	0.328848	0.162308	0.104348	0.262444	0.107304	0.699765	0.461669
Adj. R-squared	0.582203	0.288088	0.532913	0.287602	0.215269	0.020544	-0.047224	0.137626	-0.043768	0.648956	0.370567
Sum sq. resids	0.044832	0.053353	0.079170	0.389095	0.578553	5.158479	0.490462	2.980892	7.937232	296.2059	0.454620
S.E. equation	0.026263	0.028650	0.034900	0.077370	0.094344	0.281711	0.086865	0.214149	0.349444	2.134716	0.083631
F-statistic	10.62788	3.795890	8.882767	3.789269	2.895310	1.144920	0.688439	2.102624	0.710283	13.77247	5.067593
Log likelihood	177.5141	170.8153	155.6202	94.31958	79.04643	-5.186464	85.40595	15.92767	-21.77700	-161.1274	88.32751
Akaike AIC	-4.299067	-4.125072	-3.730395	-2.138171	-1.741466	0.446402	-1.906648	-0.102017	0.877325	4.496815	-1.982533
Schwarz SC	-3.933799	-3.759804	-3.365126	-1.772902	-1.376197	0.811670	-1.541380	0.263251	1.242593	4.862083	-1.617264
Mean dependent	0.027531	0.008299	0.026749	0.026377	0.043505	0.011201	0.024681	-0.009100	0.049246	2.833917	0.083556
S.D. dependent	0.040631	0.033955	0.051065	0.091666	0.106501	0.284650	0.084884	0.230605	0.342039	3.602960	0.105413

Determinant resid covariance (dof adj...	4.93E-23
Determinant resid covariance	7.65E-24
Log likelihood	847.4168
Akaike information criterion	-18.58225
Schwarz criterion	-14.56430

Note: *EViews9* output.

A.10. Stability check for considering revenues' complete disaggregation, recession periods (section 4.3.2.)

Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_TIG...
Exogenous variables: C
Lag specification: 1 1
Date: 07/25/17 Time: 18:37

Root	Modulus
0.706132	0.706132
0.415308 - 0.298689i	0.511562
0.415308 + 0.298689i	0.511562
-0.231176 - 0.158188i	0.280118
-0.231176 + 0.158188i	0.280118
0.279136	0.279136
0.185243 - 0.104025i	0.212453
0.185243 + 0.104025i	0.212453
0.027724 - 0.156043i	0.158487
0.027724 + 0.156043i	0.158487
-0.081275	0.081275

No root lies outside the unit circle.
VAR satisfies the stability condition.

Note: *EViews9* output.

A.11. Estimation output considering revenues' complete disaggregation, whole sample period (section 4.3.2.)

Vector Autoregression Estimates
Date: 07/27/17 Time: 00:53
Sample (adjusted): 1997 2015
Included observations: 158 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_TIGS	D_TDPINC...	D_TDPROP...	D_TPAYRO...	D_TSS	D_TDCPRO...	D_TOTHER...	REAL_INT_...	D_DEBT
D_SPEND(-1)	0.533582	-0.011153	0.288481	-0.030868	0.027941	-0.896350	0.824960	-0.322302	0.865217	12.50263	0.456228
	(0.07909)	(0.08378)	(0.11601)	(0.19561)	(0.24457)	(1.07245)	(0.64988)	(0.53413)	(1.06062)	(6.11440)	(0.27043)
	[6.74657]	[-0.13313]	[2.48671]	[-0.15780]	[0.11424]	[-0.83580]	[1.26940]	[-0.60342]	[0.81576]	[2.04478]	[1.68705]
D_GDP(-1)	0.169968	0.414482	-0.138866	0.166328	-0.892538	0.640022	-0.848169	1.310409	-1.638942	-12.89218	0.080504
	(0.13730)	(0.14544)	(0.20139)	(0.33958)	(0.42457)	(1.86172)	(1.12816)	(0.92722)	(1.84119)	(10.6143)	(0.46945)
	[1.23797]	[2.84994]	[-0.68955]	[0.48981]	[-2.10224]	[0.34378]	[-0.75181]	[1.41326]	[-0.89015]	[-1.21460]	[0.17149]
D_TIGS(-1)	0.173970	0.081999	0.306982	0.406411	0.703464	0.435195	0.371841	0.376143	0.841632	-13.42396	0.077432
	(0.06926)	(0.07337)	(0.10160)	(0.17131)	(0.21419)	(0.93922)	(0.56914)	(0.46777)	(0.92886)	(5.35479)	(0.23683)
	[2.51170]	[1.11760]	[3.02157]	[2.37235]	[3.28434]	[0.46336]	[0.65333]	[0.80412]	[0.90609]	[-2.50691]	[0.32695]
D_TDPINCOME(-1)	0.020097	-0.020723	-0.023263	0.075093	-0.032109	-0.457390	-0.110306	0.125276	0.517776	-2.191053	0.142241
	(0.03402)	(0.03604)	(0.04990)	(0.08414)	(0.10520)	(0.46129)	(0.27953)	(0.22975)	(0.45621)	(2.62999)	(0.11632)
	[0.59075]	[-0.57508]	[-0.46621]	[0.89248]	[-0.30522]	[-0.99154]	[-0.39461]	[0.54528]	[1.13496]	[-0.83310]	[1.22285]
D_TDPROPERTY(-1)	0.040614	0.070564	0.144141	0.085907	0.231217	0.087628	0.211320	0.427956	0.165453	-2.514167	-0.160684
	(0.02810)	(0.02977)	(0.04122)	(0.06950)	(0.08689)	(0.38103)	(0.23090)	(0.18977)	(0.37683)	(2.17239)	(0.09608)
	[1.44534]	[2.37065]	[3.49712]	[1.23607]	[2.66090]	[0.22998]	[0.91521]	[2.25511]	[0.43907]	[-1.15733]	[-1.67238]
D_TPAYROLL(-1)	-0.009116	-0.005148	-0.001503	-0.008074	-0.014416	-0.057091	-0.011147	0.016006	0.017003	0.298326	-0.005205
	(0.00606)	(0.00641)	(0.00888)	(0.01498)	(0.01873)	(0.08211)	(0.04976)	(0.04089)	(0.08121)	(0.46814)	(0.02071)
	[-1.50540]	[-0.80262]	[-0.16923]	[-0.53908]	[-0.76984]	[-0.69529]	[-0.22402]	[0.39139]	[0.20939]	[0.63726]	[-0.25136]
D_TSS(-1)	-0.006010	0.001650	0.001556	0.001815	-0.030307	-0.042703	-0.002248	0.077845	-0.295698	0.449874	0.017753
	(0.00992)	(0.01050)	(0.01455)	(0.02453)	(0.03067)	(0.13447)	(0.08148)	(0.06697)	(0.13298)	(0.76664)	(0.03391)
	[-0.60604]	[0.15709]	[0.10694]	[0.07400]	[-0.98833]	[-0.31757]	[-0.02759]	[1.16237]	[-2.22356]	[0.58681]	[0.52356]
D_TDCPROFIT(-1)	-0.031982	-0.008540	0.014864	0.063691	0.002856	0.193947	0.171229	-0.185905	0.058906	3.974799	-0.067302
	(0.01564)	(0.01656)	(0.02294)	(0.03867)	(0.04835)	(0.21203)	(0.12849)	(0.10560)	(0.20969)	(1.20887)	(0.05347)
	[-2.04535]	[-0.51558]	[0.64806]	[1.64683]	[0.05907]	[0.91470]	[1.33266]	[-1.76043]	[0.28091]	[3.28802]	[-1.25878]
D_TOTHERS(-1)	0.004104	0.003983	0.009790	0.013250	-0.009140	-0.095399	0.136834	0.039082	0.092847	0.212294	-0.032190
	(0.00626)	(0.00663)	(0.00918)	(0.01549)	(0.01936)	(0.08491)	(0.05145)	(0.04229)	(0.08397)	(0.48410)	(0.02141)
	[0.65536]	[0.60052]	[1.06592]	[0.85553]	[-0.47201]	[-1.12353]	[2.65937]	[0.92415]	[1.10566]	[0.43853]	[-1.50345]
REAL_INT_RATE(-1)	0.000999	0.002983	0.005545	0.007163	0.007696	0.003820	0.013146	0.001574	0.034788	0.429012	-0.003176
	(0.00113)	(0.00120)	(0.00166)	(0.00280)	(0.00350)	(0.01536)	(0.00931)	(0.00765)	(0.01519)	(0.08758)	(0.00387)
	[0.88217]	[2.48631]	[3.33714]	[2.55645]	[2.19691]	[0.24868]	[1.41236]	[0.20574]	[2.29002]	[4.89877]	[-0.81988]
D_DEBT(-1)	-0.134583	-0.064357	-0.127082	-0.116129	-0.106886	-0.198583	-0.041175	-0.209020	-0.290439	10.86638	0.435315
	(0.02700)	(0.02860)	(0.03960)	(0.06677)	(0.08349)	(0.36609)	(0.22184)	(0.18233)	(0.36205)	(2.08720)	(0.09231)
	[-4.98496]	[-2.25038]	[-3.20909]	[-1.73913]	[-1.28029]	[-0.54245]	[-0.18561]	[-1.14639]	[-0.80221]	[5.20621]	[4.71564]
C	0.012517	0.003812	0.003487	0.001780	0.012513	0.051840	-0.048499	-0.008883	-0.067329	0.809847	0.021428
	(0.00615)	(0.00652)	(0.00903)	(0.01522)	(0.01903)	(0.08344)	(0.05056)	(0.04156)	(0.08252)	(0.47570)	(0.02104)
	[2.03416]	[0.58491]	[0.38639]	[0.11699]	[0.65760]	[0.62131]	[-0.95921]	[-0.21376]	[-0.81594]	[1.70242]	[1.01847]
R-squared	0.682372	0.366149	0.409437	0.295843	0.203126	0.049061	0.084382	0.214724	0.083933	0.568558	0.329889
Adj. R-squared	0.658441	0.318393	0.364942	0.242790	0.143088	-0.022585	0.015397	0.155559	0.014914	0.536052	0.279401
Sum sq. resids	0.111953	0.125621	0.240871	0.684855	1.070564	20.58520	7.559053	5.106143	20.13362	669.1271	1.308905
S.E. equation	0.027691	0.029333	0.040618	0.068489	0.085631	0.375492	0.227540	0.187012	0.371351	2.140809	0.094684
F-statistic	28.51423	7.667087	9.201967	5.576382	3.383268	0.684769	1.223194	3.629257	1.216082	17.49090	6.534020
Log likelihood	348.7370	339.6368	288.2088	205.6580	170.3660	-63.18851	15.95579	46.94762	-61.43618	-338.2192	154.4866
Akaike AIC	-4.262493	-4.147301	-3.496314	-2.451368	-2.004633	0.951753	-0.050073	-0.442375	0.929572	4.433155	-1.803628
Schwarz SC	-4.029891	-3.914699	-3.263712	-2.218765	-1.772031	1.184356	0.182529	-0.209773	1.162174	4.665757	-1.571026
Mean dependent	0.044800	0.021760	0.041681	0.043870	0.047291	0.021042	0.042782	0.038759	0.070099	2.281782	0.063523
S.D. dependent	0.047381	0.035529	0.050969	0.078707	0.092504	0.371323	0.229312	0.203510	0.374151	3.142991	0.111540

Determinant resid covariance (dof adj...	3.19E-21
Determinant resid covariance	1.34E-21
Log likelihood	1330.953
Akaike information criterion	-15.17662
Schwarz criterion	-12.61800

Note: *EViews9* output.

A.12. Stability check for the regression considering revenues' complete disaggregation, whole sample period (section 4.3.2.)

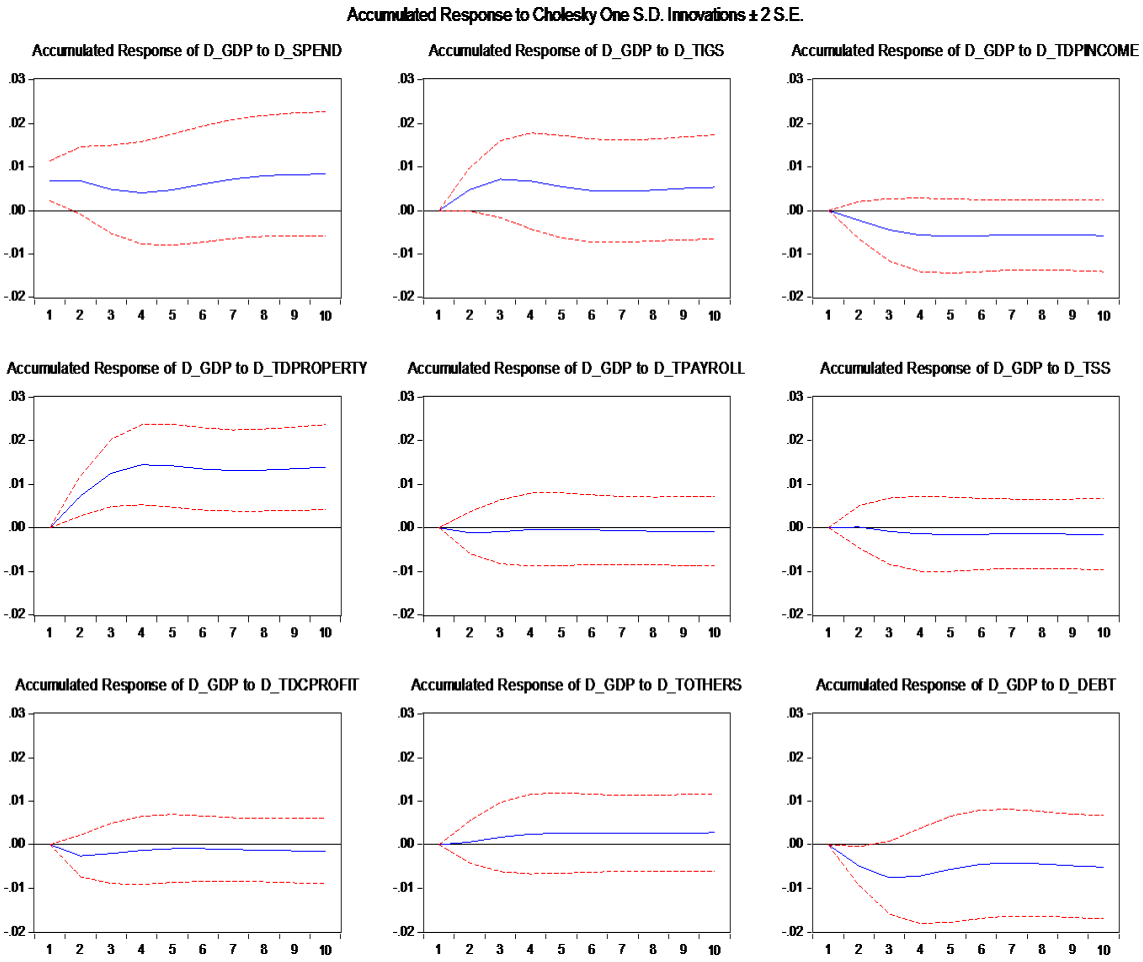
Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_TIG...
Exogenous variables: C
Lag specification: 1 1
Date: 07/27/17 Time: 00:56

Root	Modulus
0.668354	0.668354
0.433401 - 0.451374i	0.625759
0.433401 + 0.451374i	0.625759
0.445792	0.445792
0.344006	0.344006
-0.236571	0.236571
-0.003832 - 0.202670i	0.202706
-0.003832 + 0.202670i	0.202706
0.192017	0.192017
0.000274 - 0.040393i	0.040394
0.000274 + 0.040393i	0.040394

No root lies outside the unit circle.
VAR satisfies the stability condition.

Note: *EViews9* output.

A.13. Accumulated responses (effects on GDP) for the regression considering revenues' complete disaggregation, whole sample period (section 4.3.2.)



Note: *EViews9* output.

A.14. Estimation output of the regression containing internal and external debt, recession periods (section 4.4.1.)

Vector Autoregression Estimates
Date: 07/21/17 Time: 17:41
Sample: 1995 2016 IF DUMMY_YGAP=1
Included observations: 206
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_TAXES	REAL_INT_...	D_DEBT_R	D_DEBTNR
D_SPEND(-1)	0.257510	-0.148714	-0.264400	17.73234	0.985823	0.929968
	(0.05893)	(0.05938)	(0.07668)	(3.85499)	(0.21165)	(0.20876)
	[4.36968]	[-2.50448]	[-3.44790]	[4.59983]	[4.65774]	[4.45465]
D_GDP(-1)	0.374026	0.325817	0.413640	-9.195147	-0.005958	-0.243469
	(0.11032)	(0.11116)	(0.14355)	(7.21642)	(0.39621)	(0.39080)
	[3.39046]	[2.93117]	[2.88149]	[-1.27420]	[-0.01504]	[-0.62300]
D_TAXES(-1)	-0.014575	-0.062070	0.087208	7.209353	-0.245841	0.138497
	(0.07705)	(0.07763)	(0.10026)	(5.04001)	(0.27671)	(0.27294)
	[-0.18917]	[-0.79953]	[0.86985]	[1.43042]	[-0.88843]	[0.50743]
REAL_INT_RATE(-1)	-0.000125	0.000867	0.000846	0.571415	0.002428	0.007310
	(0.00102)	(0.00103)	(0.00133)	(0.06670)	(0.00366)	(0.00361)
	[-0.12287]	[0.84354]	[0.63780]	[8.56708]	[0.66295]	[2.02386]
D_DEBT_R(-1)	-0.045985	-0.001863	0.036724	1.596711	0.252147	0.145645
	(0.01715)	(0.01728)	(0.02232)	(1.12191)	(0.06160)	(0.06076)
	[-2.68125]	[-0.10778]	[1.64553]	[1.42320]	[4.09350]	[2.39721]
D_DEBTNR(-1)	0.033594	0.003972	0.040676	-0.583054	0.017263	0.212581
	(0.01645)	(0.01658)	(0.02141)	(1.07622)	(0.05909)	(0.05828)
	[2.04196]	[0.23958]	[1.90003]	[-0.54176]	[0.29215]	[3.64749]
C	0.014588	0.010805	0.021486	0.230276	0.020285	-0.003613
	(0.00516)	(0.00520)	(0.00672)	(0.33775)	(0.01854)	(0.01829)
	[2.82540]	[2.07684]	[3.19803]	[0.68179]	[1.09391]	[-0.19753]
R-squared	0.297019	0.090401	0.134835	0.319718	0.194098	0.195826
Adj. R-squared	0.275823	0.062975	0.108749	0.299207	0.169800	0.171579
Sum sq. resids	0.202558	0.205651	0.342983	866.7759	2.612808	2.541955
S.E. equation	0.031904	0.032147	0.041515	2.087021	0.114585	0.113021
F-statistic	14.01336	3.296270	5.168970	15.58761	7.988051	8.076458
Log likelihood	420.9330	419.3723	366.6877	-440.3025	157.5461	160.3778
Akaike AIC	-4.018767	-4.003614	-3.492114	4.342743	-1.461613	-1.489105
Schwarz SC	-3.905684	-3.890531	-3.379031	4.455826	-1.348529	-1.376021
Mean dependent	0.025014	0.008718	0.026203	2.554643	0.071742	0.081808
S.D. dependent	0.037491	0.033210	0.043975	2.493055	0.125758	0.124174

Determinant resid covariance (dof adj...	2.31E-13
Determinant resid covariance	1.88E-13
Log likelihood	1264.527
Akaike information criterion	-11.86919
Schwarz criterion	-11.19069

Note: *EViews9* output.

A.15. Stability check for the regression containing internal and external debt, recession periods (section 4.4.1.)

Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_TAX...
Exogenous variables: C
Lag specification: 1 1
Date: 07/25/17 Time: 18:36

Root	Modulus
0.625861	0.625861
0.220922 - 0.283809i	0.359658
0.220922 + 0.283809i	0.359658
0.228397 - 0.151784i	0.274233
0.228397 + 0.151784i	0.274233
0.182179	0.182179

No root lies outside the unit circle.
VAR satisfies the stability condition.

Note: *EViews9* output.

A.16. Estimation output of the regression containing debt issued in national and foreign currency, recession periods (section 4.4.2.)

Vector Autoregression Estimates
Date: 07/21/17 Time: 17:02
Sample: 1995 2016 IF DUMMY_YGAP=1
Included observations: 219
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_TAXES	REAL_INT_...	D_DEBTNC	D_DEBTFC
D_SPEND(-1)	0.231626	-0.140580	-0.307384	15.96527	0.784940	-0.338211
	(0.06098)	(0.05819)	(0.07574)	(4.29284)	(0.22792)	(1.32729)
	[3.79835]	[-2.41597]	[-4.05849]	[3.71904]	[3.44392]	[-0.25481]
D_GDP(-1)	0.386247	0.353231	0.295584	-15.88136	0.779181	0.613786
	(0.10643)	(0.10156)	(0.13219)	(7.49234)	(0.39779)	(2.31653)
	[3.62912]	[3.47820]	[2.23610]	[-2.11968]	[1.95876]	[0.26496]
D_TAXES(-1)	0.011176	-0.104960	0.135900	9.023209	-0.601946	1.372512
	(0.07575)	(0.07228)	(0.09408)	(5.33234)	(0.28311)	(1.64869)
	[0.14755]	[-1.45217]	[1.44454]	[1.69217]	[-2.12618]	[0.83249]
REAL_INT_RATE(-1)	-0.000841	-8.52E-05	-0.000627	0.692223	0.006163	0.022634
	(0.00093)	(0.00089)	(0.00115)	(0.06537)	(0.00347)	(0.02021)
	[-0.90574]	[-0.09614]	[-0.54327]	[10.5892]	[1.77581]	[1.11985]
D_DEBTNC(-1)	-0.002294	0.018358	0.035901	0.115977	0.273537	0.232639
	(0.01696)	(0.01618)	(0.02106)	(1.19364)	(0.06337)	(0.36906)
	[-0.13528]	[1.13466]	[1.70473]	[0.09716]	[4.31622]	[0.63036]
D_DEBTFC(-1)	-0.001278	-0.008687	-0.012788	0.403948	-0.004496	0.072465
	(0.00321)	(0.00306)	(0.00399)	(0.22598)	(0.01200)	(0.06987)
	[-0.39827]	[-2.83618]	[-3.20755]	[1.78753]	[-0.37477]	[1.03714]
C	0.015865	0.012007	0.030086	0.225985	0.018201	-0.066796
	(0.00506)	(0.00483)	(0.00629)	(0.35638)	(0.01892)	(0.11019)
	[3.13387]	[2.48566]	[4.78500]	[0.63411]	[0.96190]	[-0.60620]
R-squared	0.306111	0.116096	0.168454	0.417737	0.173798	0.021327
Adj. R-squared	0.286473	0.091080	0.144919	0.401258	0.150415	-0.006371
Sum sq. resids	0.250763	0.228321	0.386825	1242.711	3.503061	118.7985
S.E. equation	0.034393	0.032817	0.042716	2.421125	0.128545	0.748579
F-statistic	15.58742	4.640845	7.157787	25.34948	7.432650	0.769968
Log likelihood	430.8213	441.0877	383.3571	-500.8372	142.0825	-243.7727
Akaike AIC	-3.870514	-3.964271	-3.437051	4.637783	-1.233630	2.290161
Schwarz SC	-3.762187	-3.855945	-3.328724	4.746109	-1.125304	2.398488
Mean dependent	0.023236	0.007144	0.024946	2.978602	0.074287	0.050531
S.D. dependent	0.040715	0.034422	0.046194	3.128941	0.139461	0.746205

Determinant resid covariance (dof adj...	2.44E-11
Determinant resid covariance	2.01E-11
Log likelihood	832.6567
Akaike information criterion	-7.220610
Schwarz criterion	-6.570651

Note: *EViews9* output.

A.17. Stability check for the regression containing debt issued in national and foreign currency, recession periods (section 4.4.2.)

Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_TAX...
Exogenous variables: C
Lag specification: 1 1
Date: 07/25/17 Time: 18:36

Root	Modulus
0.675448	0.675448
0.188218 - 0.329643i	0.379593
0.188218 + 0.329643i	0.379593
0.304370 - 0.059331i	0.310099
0.304370 + 0.059331i	0.310099
0.098356	0.098356

No root lies outside the unit circle.
VAR satisfies the stability condition.

Note: *EViews9* output.

A.18. Estimation output of the regression containing short-term and long-term debt, recession periods (section 4.4.3.)

Vector Autoregression Estimates
Date: 07/21/17 Time: 17:47
Sample: 1995 2016 IF DUMMY_YGAP=1
Included observations: 239
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_TAXES	REAL_INT_...	D_STDEBT	D_LTDEBT
D_SPEND(-1)	0.208021	-0.110236	-0.218370	16.24630	3.396516	0.773756
	(0.06229)	(0.05708)	(0.07479)	(4.74505)	(0.94282)	(0.13254)
	[3.33957]	[-1.93122]	[-2.91991]	[3.42384]	[3.60249]	[5.83776]
D_GDP(-1)	0.504161	0.468230	0.556021	-30.67179	0.504247	-0.337962
	(0.10848)	(0.09941)	(0.13024)	(8.26354)	(1.64194)	(0.23083)
	[4.64760]	[4.71022]	[4.26915]	[-3.71170]	[0.30711]	[-1.46415]
D_TAXES(-1)	-0.062833	-0.162956	-0.035344	20.26684	-2.202885	0.075469
	(0.07879)	(0.07221)	(0.09460)	(6.00226)	(1.19263)	(0.16766)
	[-0.79744]	[-2.25685]	[-0.37361]	[3.37653]	[-1.84708]	[0.45013]
REAL_INT_RATE(-1)	6.89E-05	0.000114	0.000181	0.611167	0.016714	0.001791
	(0.00091)	(0.00083)	(0.00109)	(0.06910)	(0.01373)	(0.00193)
	[0.07597]	[0.13694]	[0.16578]	[8.84432]	[1.21729]	[0.92774]
D_STDEBT(-1)	-0.005268	-0.011567	-0.017358	0.933280	-0.179803	0.046644
	(0.00408)	(0.00374)	(0.00490)	(0.31086)	(0.06177)	(0.00868)
	[-1.29104]	[-3.09320]	[-3.54290]	[3.00227]	[-2.91102]	[5.37172]
D_LTDEBT(-1)	-0.006765	-0.006035	0.037090	1.762259	-0.623765	0.355148
	(0.02162)	(0.01982)	(0.02596)	(1.64724)	(0.32730)	(0.04601)
	[-0.31284]	[-0.30456]	[1.42864]	[1.06983]	[-1.90579]	[7.71856]
C	0.017022	0.014627	0.028547	-0.054829	-0.013671	0.015623
	(0.00532)	(0.00487)	(0.00639)	(0.40515)	(0.08050)	(0.01132)
	[3.20046]	[3.00102]	[4.47056]	[-0.13533]	[-0.16982]	[1.38043]
R-squared	0.262955	0.164948	0.197593	0.361939	0.084108	0.409346
Adj. R-squared	0.243893	0.143352	0.176841	0.345437	0.060422	0.394071
Sum sq. resids	0.300768	0.252574	0.433560	1745.352	68.90698	1.361814
S.E. equation	0.036006	0.032995	0.043230	2.742821	0.544989	0.076615
F-statistic	13.79505	7.637862	9.521678	21.93358	3.550852	26.79751
Log likelihood	458.8803	479.7492	415.1801	-576.7220	-190.5034	278.4074
Akaike AIC	-3.781425	-3.956061	-3.415733	4.884703	1.652748	-2.271191
Schwarz SC	-3.679604	-3.854239	-3.313912	4.986524	1.754570	-2.169370
Mean dependent	0.024149	0.008160	0.026194	2.804171	0.019919	0.084057
S.D. dependent	0.041408	0.035649	0.047647	3.390173	0.562239	0.098425

Determinant resid covariance (dof adj...	5.64E-12
Determinant resid covariance	4.72E-12
Log likelihood	1081.757
Akaike information criterion	-8.700898
Schwarz criterion	-8.089972

Note: *EViews9* output.

A.19. Stability check for the regression containing short-term and long-term debt, recession periods (section 4.4.3.)

Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_TAX...
Exogenous variables: C
Lag specification: 1 1
Date: 07/28/17 Time: 12:36

Root	Modulus
0.641864	0.641864
0.298572 - 0.168046i	0.342615
0.298572 + 0.168046i	0.342615
0.213904 - 0.266154i	0.341457
0.213904 + 0.266154i	0.341457
-0.239397	0.239397

No root lies outside the unit circle.
VAR satisfies the stability condition.

Note: *EViews9* output.

A.20. P-value for the unit root test for monetization (section 4.5.)

Panel unit root test: Summary
Series: D(MB)
Date: 08/25/18 Time: 13:41
Sample: 1995 2016
Exogenous variables: Individual effects
User-specified lags: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-section...	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-13.7576	0.0000	28	448
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-sta...	-17.6571	0.0000	28	448
ADF - Fisher Chi-square	340.649	0.0000	28	448
PP - Fisher Chi-square	362.286	0.0000	28	448

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Note: *EViews9* output.

A.21. Estimation output of the regression containing monetization, recession periods

(section 4.5.)

Vector Autoregression Estimates
Date: 08/11/17 Time: 08:54
Sample: 1995 2016 IF DUMMY_YGAP=1 AND DUMMY_EA=1
Included observations: 138
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_TAXES	HICP	D_MB	D_DEBT
D_SPEND(-1)	0.374750	0.069168	-0.075869	-2.828331	0.238928	0.631608
	(0.07090)	(0.06582)	(0.09068)	(2.64789)	(0.43262)	(0.18128)
	[5.28551]	[1.05080]	[-0.83662]	[-1.06815]	[0.55228]	[3.48419]
D_GDP(-1)	0.272625	0.240716	0.211808	-0.954245	0.108863	0.482304
	(0.13498)	(0.12531)	(0.17264)	(5.04101)	(0.82361)	(0.34511)
	[2.01973]	[1.92089]	[1.22684]	[-0.18930]	[0.13218]	[1.39752]
D_TAXES(-1)	0.063420	-0.152582	0.080262	10.07797	-0.021447	-0.656312
	(0.09268)	(0.08604)	(0.11854)	(3.46116)	(0.56549)	(0.23696)
	[0.68431]	[-1.77336]	[0.67710]	[2.91173]	[-0.03793]	[-2.76976]
HICP(-1)	-0.001059	-0.000187	-0.000643	0.930085	-0.008646	0.001827
	(0.00046)	(0.00042)	(0.00058)	(0.01705)	(0.00279)	(0.00117)
	[-2.31967]	[-0.44041]	[-1.10084]	[54.5539]	[-3.10400]	[1.56534]
D_MB(-1)	0.008145	-0.026761	-0.012224	1.623243	-0.411633	0.121348
	(0.01586)	(0.01473)	(0.02029)	(0.59249)	(0.09680)	(0.04056)
	[0.51338]	[-1.81692]	[-0.60242]	[2.73971]	[-4.25232]	[2.99164]
D_DEBT(-1)	-0.017705	-0.045591	-0.030179	1.253710	0.214437	0.166314
	(0.02738)	(0.02542)	(0.03502)	(1.02266)	(0.16708)	(0.07001)
	[-0.64657]	[-1.79333]	[-0.86167]	[1.22593]	[1.28341]	[2.37548]
C	0.107850	0.026181	0.082498	7.522972	0.858949	-0.121494
	(0.04359)	(0.04046)	(0.05575)	(1.62775)	(0.26595)	(0.11144)
	[2.47445]	[0.64702]	[1.47986]	[4.62169]	[3.22978]	[-1.09023]
R-squared	0.437891	0.119329	0.077421	0.969085	0.184423	0.255701
Adj. R-squared	0.412145	0.078993	0.035166	0.967669	0.147069	0.221611
Sum sq. resids	0.120996	0.104287	0.197938	168.7559	4.504730	0.790952
S.E. equation	0.030391	0.028215	0.038871	1.134995	0.185438	0.077703
F-statistic	17.00846	2.958369	1.832222	684.4029	4.937096	7.500766
Log likelihood	289.8951	300.1490	255.9331	-209.6963	40.31316	160.3487
Akaike AIC	-4.099929	-4.248536	-3.607727	3.140526	-0.482799	-2.222445
Schwarz SC	-3.951445	-4.100052	-3.459243	3.289010	-0.334316	-2.073961
Mean dependent	0.018389	0.003420	0.018738	95.15514	0.056584	0.075026
S.D. dependent	0.039638	0.029400	0.039573	6.312250	0.200790	0.088073

Determinant resid covariance (dof adj...	6.60E-14
Determinant resid covariance	4.83E-14
Log likelihood	940.7096
Akaike information criterion	-13.02478
Schwarz criterion	-12.13387

Note: *EViews9* output.

A.22. Stability check for the regression containing monetization, recession periods (section 4.5.)

Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_TAX...
Exogenous variables: C
Lag specification: 1 1
Date: 08/11/17 Time: 08:56

Root	Modulus
0.919946	0.919946
-0.447526	0.447526
0.385478 - 0.155308i	0.415589
0.385478 + 0.155308i	0.415589
0.068558 - 0.200852i	0.212230
0.068558 + 0.200852i	0.212230

No root lies outside the unit circle.
VAR satisfies the stability condition.

Note: *EViews9* output.

A.23. Estimation output of the core regression, expansion periods – robustness check (section 4.6.1.)

Vector Autoregression Estimates
Date: 08/25/18 Time: 13:19
Sample: 1995 2016 IF DUMMY_YGAP=0
Included observations: 244
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_TAXES	REAL_INT_...	D_DEBT
D_SPEND(-1)	0.519294	0.045084	0.278885	-6.997380	0.394635
	(0.05676)	(0.04988)	(0.07741)	(3.25531)	(0.17365)
	[9.14833]	[0.90393]	[3.60256]	[-2.14953]	[2.27264]
D_GDP(-1)	0.136352	0.545372	0.449499	-8.477151	-0.056817
	(0.08647)	(0.07598)	(0.11792)	(4.95875)	(0.26451)
	[1.57693]	[7.17830]	[3.81184]	[-1.70953]	[-0.21480]
D_TAXES(-1)	0.354513	0.068287	0.290015	-7.472422	-0.005168
	(0.05995)	(0.05267)	(0.08176)	(3.43799)	(0.18339)
	[5.91355]	[1.29639]	[3.54726]	[-2.17349]	[-0.02818]
REAL_INT_RATE(-1)	-0.000591	0.002332	0.001582	0.487300	-0.006266
	(0.00096)	(0.00084)	(0.00131)	(0.05497)	(0.00293)
	[-0.61650]	[2.76909]	[1.20994]	[8.86534]	[-2.13695]
D_DEBT(-1)	-0.030723	0.007922	0.076007	1.343572	0.445340
	(0.02973)	(0.02612)	(0.04054)	(1.70480)	(0.09094)
	[-1.03352]	[0.30331]	[1.87482]	[0.78811]	[4.89717]
C	0.004720	0.002257	0.005049	1.912909	0.019353
	(0.00581)	(0.00510)	(0.00792)	(0.33305)	(0.01777)
	[0.81269]	[0.44236]	[0.63749]	[5.74362]	[1.08933]
R-squared	0.664032	0.286855	0.393254	0.550116	0.214052
Adj. R-squared	0.656974	0.271873	0.380508	0.540664	0.197541
Sum sq. resids	0.187012	0.144380	0.347821	615.0498	1.750073
S.E. equation	0.028031	0.024630	0.038229	1.607558	0.085751
F-statistic	94.08016	19.14663	30.85133	58.20493	12.96383
Log likelihood	528.9767	560.5409	453.2739	-459.0143	256.1553
Akaike AIC	-4.286694	-4.545417	-3.666179	3.811592	-2.050453
Schwarz SC	-4.200698	-4.459421	-3.580184	3.897588	-1.964457
Mean dependent	0.069278	0.037545	0.069641	1.476653	0.048132
S.D. dependent	0.047861	0.028864	0.048570	2.371928	0.095726

Determinant resid covariance (dof adj...	5.75E-12
Determinant resid covariance	5.08E-12
Log likelihood	1441.622
Akaike information criterion	-11.57067
Schwarz criterion	-11.14069

Note: *EViews9* output.

A.24. Stability check for the core regression, expansion periods – robustness check (section 4.6.1.)

Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_TAX...
Exogenous variables: C
Lag specification: 1 1
Date: 08/25/18 Time: 13:20

Root	Modulus
0.788147	0.788147
0.515921 - 0.133559i	0.532928
0.515921 + 0.133559i	0.532928
0.363457	0.363457
0.103875	0.103875

No root lies outside the unit circle.
VAR satisfies the stability condition.

Note: *EViews9* output.

A.25. Estimation output of the core regression, recession periods – robustness check (section 4.6.1.)

Vector Autoregression Estimates
Date: 08/25/18 Time: 13:20
Sample: 1995 2016 IF DUMMY_YGAP=1
Included observations: 246
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_TAXES	REAL_INT_...	D_DEBT
D_SPEND(-1)	0.206379	-0.134782	-0.288677	18.75572	0.986699
	(0.05933)	(0.05518)	(0.07577)	(4.53664)	(0.13260)
	[3.47849]	[-2.44276]	[-3.81012]	[4.13427]	[7.44101]
D_GDP(-1)	0.454226	0.419154	0.443931	-23.83561	-0.082462
	(0.10499)	(0.09764)	(0.13407)	(8.02793)	(0.23465)
	[4.32643]	[4.29294]	[3.31110]	[-2.96909]	[-0.35143]
D_TAXES(-1)	-0.034572	-0.143732	0.047834	16.16914	-0.215685
	(0.07462)	(0.06940)	(0.09530)	(5.70599)	(0.16678)
	[-0.46329]	[-2.07112]	[0.50196]	[2.83371]	[-1.29321]
REAL_INT_RATE(-1)	-0.000112	-1.45E-05	1.63E-05	0.629600	0.004398
	(0.00089)	(0.00083)	(0.00114)	(0.06812)	(0.00199)
	[-0.12604]	[-0.01746]	[0.01432]	[9.24197]	[2.20860]
D_DEBT(-1)	-0.031674	-0.043858	-0.036677	5.877192	0.280219
	(0.02144)	(0.01994)	(0.02738)	(1.63972)	(0.04793)
	[-1.47704]	[-2.19920]	[-1.33933]	[3.58427]	[5.84669]
C	0.018560	0.017902	0.034705	-0.399485	0.012784
	(0.00528)	(0.00491)	(0.00675)	(0.40395)	(0.01181)
	[3.51325]	[3.64371]	[5.14424]	[-0.98894]	[1.08274]
R-squared	0.280412	0.143500	0.160068	0.374582	0.327025
Adj. R-squared	0.265421	0.125657	0.142569	0.361552	0.313005
Sum sq. resids	0.306615	0.265183	0.500025	1792.724	1.531616
S.E. equation	0.035743	0.033240	0.045645	2.733072	0.079886
F-statistic	18.70484	8.042060	9.147465	28.74863	23.32509
Log likelihood	473.5030	491.3591	413.3477	-593.3566	275.6591
Akaike AIC	-3.800837	-3.946009	-3.311770	4.872818	-2.192350
Schwarz SC	-3.715341	-3.860513	-3.226274	4.958314	-2.106855
Mean dependent	0.023531	0.007782	0.025112	2.879061	0.079286
S.D. dependent	0.041703	0.035549	0.049294	3.420491	0.096381

Determinant resid covariance (dof adj...	2.20E-11
Determinant resid covariance	1.94E-11
Log likelihood	1288.560
Akaike information criterion	-10.23219
Schwarz criterion	-9.804712

Note: *EViews9* output.

A.26. Stability check for the core regression, recession periods – robustness check (section 4.6.1.)

Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_TAX...
Exogenous variables: C
Lag specification: 1 1
Date: 08/25/18 Time: 13:21

Root	Modulus
0.661858	0.661858
0.297123 - 0.260052i	0.394853
0.297123 + 0.260052i	0.394853
0.163542 - 0.170613i	0.236336
0.163542 + 0.170613i	0.236336

No root lies outside the unit circle.
VAR satisfies the stability condition.

Note: *EViews9* output.

A.27. Estimation output of the regression containing internal and external debt, expansion periods – robustness check (section 4.6.1.)

Vector Autoregression Estimates
Date: 07/27/17 Time: 18:04
Sample: 1995 2016 IF DUMMY_YGAP=0
Included observations: 179
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_TAXES	REAL_INT_...	D_DEBT_R	D_DEBTNR
D_SPEND(-1)	0.504765	0.065457	0.238594	-0.664528	0.677145	1.486241
	(0.06873)	(0.04723)	(0.09539)	(3.47274)	(0.25519)	(0.34243)
	[7.34366]	[1.38588]	[2.50126]	[-0.19136]	[2.65350]	[4.34024]
D_GDP(-1)	0.449880	0.639997	0.733524	-17.24854	0.011920	-1.098799
	(0.12912)	(0.08873)	(0.17919)	(6.52372)	(0.47939)	(0.64328)
	[3.48414]	[7.21312]	[4.09345]	[-2.64397]	[0.02486]	[-1.70812]
D_TAXES(-1)	0.211946	0.005511	0.162724	-1.830284	0.369364	-0.524462
	(0.07205)	(0.04951)	(0.09999)	(3.64019)	(0.26749)	(0.35894)
	[2.94169]	[0.11131]	[1.62742]	[-0.50280]	[1.38083]	[-1.46113]
REAL_INT_RATE(-1)	-0.002793	0.001467	0.000540	0.622704	0.002568	0.009671
	(0.00125)	(0.00086)	(0.00174)	(0.06330)	(0.00465)	(0.00624)
	[-2.22894]	[1.70414]	[0.31036]	[9.83738]	[0.55209]	[1.54940]
D_DEBT_R(-1)	-0.023790	0.018359	0.061527	-1.018934	0.226733	-0.039207
	(0.02040)	(0.01402)	(0.02831)	(1.03063)	(0.07573)	(0.10163)
	[-1.16626]	[1.30975]	[2.17338]	[-0.98866]	[2.99379]	[-0.38579]
D_DEBTNR(-1)	-0.006929	0.020519	0.028516	0.422938	-0.114864	0.446048
	(0.01377)	(0.00946)	(0.01911)	(0.69579)	(0.05113)	(0.06861)
	[-0.50312]	[2.16832]	[1.49202]	[0.60785]	[-2.24652]	[6.50127]
C	0.007508	0.000368	0.006358	1.248410	-0.047155	0.012157
	(0.00663)	(0.00455)	(0.00920)	(0.33477)	(0.02460)	(0.03301)
	[1.13318]	[0.08081]	[0.69147]	[3.72914]	[-1.91685]	[0.36828]
R-squared	0.681535	0.400440	0.404463	0.592715	0.273642	0.332517
Adj. R-squared	0.670426	0.379525	0.383688	0.578508	0.248304	0.309233
Sum sq. resids	0.121555	0.057396	0.234110	310.2854	1.675497	3.016949
S.E. equation	0.026584	0.018267	0.036893	1.343125	0.098698	0.132440
F-statistic	61.34851	19.14619	19.46913	41.71820	10.79963	14.28074
Log likelihood	398.8925	466.0527	340.2319	-303.2245	164.0892	111.4510
Akaike AIC	-4.378688	-5.129081	-3.723262	3.466196	-1.755186	-1.167051
Schwarz SC	-4.254041	-5.004434	-3.598615	3.590842	-1.630540	-1.042404
Mean dependent	0.064018	0.034084	0.065048	1.668821	0.023903	0.075071
S.D. dependent	0.046307	0.023191	0.046994	2.068815	0.113838	0.159351

Determinant resid covariance (dof adj...	3.79E-14
Determinant resid covariance	2.99E-14
Log likelihood	1263.281
Akaike information criterion	-13.64559
Schwarz criterion	-12.89772

Note: *EViews9* output.

A.28. Stability check for the regression containing internal and external debt, expansion periods – robustness check (section 4.6.1.)

Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_TAX...
Exogenous variables: C
Lag specification: 1 1
Date: 07/28/17 Time: 11:51

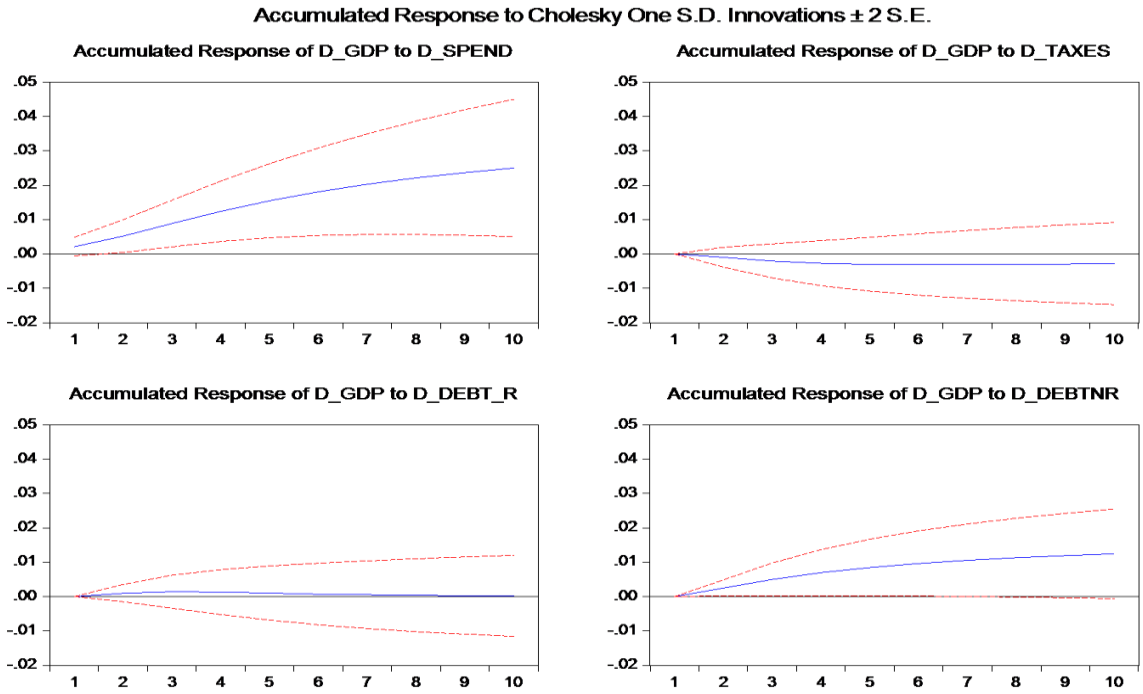
Root	Modulus
0.856068	0.856068
0.529363 - 0.101550i	0.539015
0.529363 + 0.101550i	0.539015
0.253621 - 0.167039i	0.303687
0.253621 + 0.167039i	0.303687
0.180935	0.180935

No root lies outside the unit circle.
VAR satisfies the stability condition.

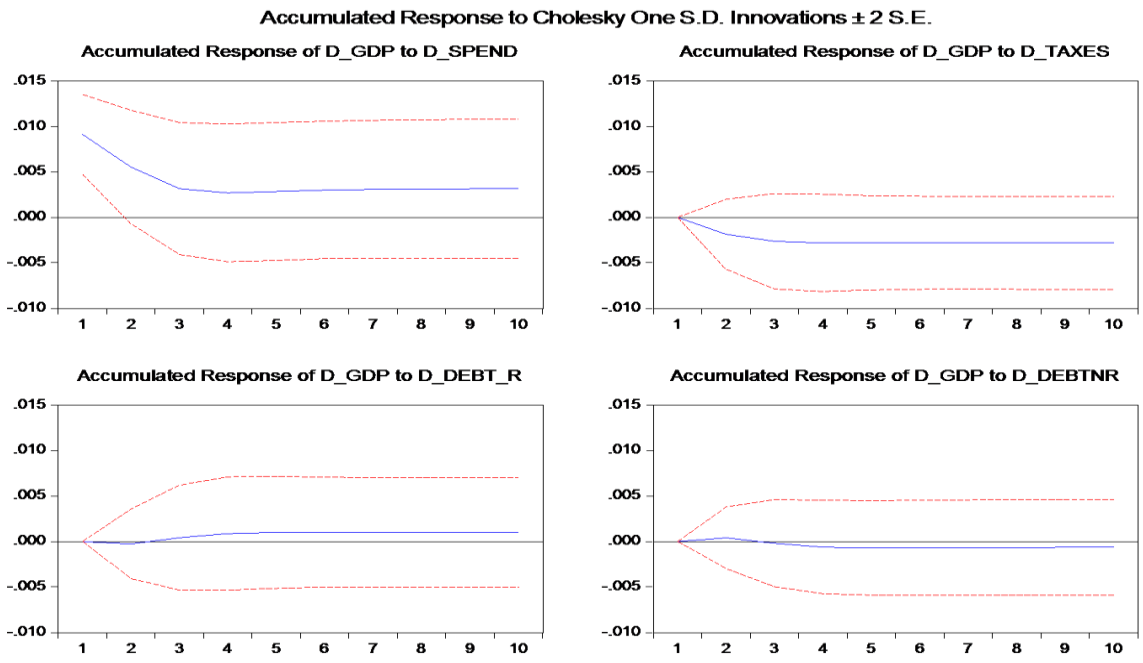
Note: *EViews9* output.

A.29. Accumulated responses (effects on GDP) for the regression containing internal and external debt, recession versus expansion periods – robustness check (section 4.6.1.)

Expansion periods



Recession periods



Note: *EViews9* output.

A.30. Estimation output of the core regression, ordering test (section 4.6.2.)

Vector Autoregression Estimates
Date: 08/21/18 Time: 19:01
Sample (adjusted): 1997 2016
Included observations: 490 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_TAXES	D_DEBT	REAL_INT_...
D_SPEND(-1)	0.392244	0.000209	0.034647	0.713575	5.002930
	(0.04340)	(0.03859)	(0.05738)	(0.10548)	(2.97990)
	[9.03691]	[0.00542]	[0.60379]	[6.76489]	[1.67889]
D_GDP(-1)	0.291980	0.509794	0.468428	-0.265552	-14.21907
	(0.07070)	(0.06286)	(0.09347)	(0.17182)	(4.85404)
	[4.12967]	[8.11048]	[5.01141]	[-1.54550]	[-2.92933]
D_TAXES(-1)	0.242095	0.005830	0.286705	-0.137667	-0.259591
	(0.05025)	(0.04467)	(0.06643)	(0.12211)	(3.44960)
	[4.81818]	[0.13051]	[4.31607]	[-1.12742]	[-0.07525]
D_DEBT(-1)	-0.027241	-0.030307	-0.004825	0.343978	4.110978
	(0.01764)	(0.01568)	(0.02332)	(0.04287)	(1.21118)
	[-1.54413]	[-1.93235]	[-0.20688]	[8.02311]	[3.39419]
REAL_INT_RATE(-1)	0.000823	0.001824	0.002359	-0.000141	0.520977
	(0.00068)	(0.00060)	(0.00090)	(0.00165)	(0.04661)
	[1.21244]	[3.02276]	[2.62855]	[-0.08546]	[11.1783]
C	0.007814	0.008169	0.015263	0.018503	0.772486
	(0.00404)	(0.00360)	(0.00535)	(0.00983)	(0.27765)
	[1.93200]	[2.27196]	[2.85464]	[1.88260]	[2.78218]
R-squared	0.528447	0.255866	0.276478	0.253316	0.384513
Adj. R-squared	0.523576	0.248179	0.269004	0.245602	0.378155
Sum sq. resids	0.584295	0.461798	1.021222	3.450788	2753.991
S.E. equation	0.034745	0.030889	0.045934	0.084438	2.385385
F-statistic	108.4794	33.28411	36.99002	32.83987	60.47386
Log likelihood	954.0002	1011.643	817.2044	518.8918	-1118.248
Akaike AIC	-3.869389	-4.104666	-3.311039	-2.093436	4.588768
Schwarz SC	-3.818029	-4.053306	-3.259678	-2.042076	4.640128
Mean dependent	0.046311	0.022603	0.047286	0.063773	2.180719
S.D. dependent	0.050338	0.035624	0.053725	0.097216	3.024944

Determinant resid covariance (dof adj...	1.93E-11
Determinant resid covariance	1.82E-11
Log likelihood	2582.635
Akaike information criterion	-10.41892
Schwarz criterion	-10.16212

Note: *EViews9* output.

A.31. Stability check for the core regression, ordering test (section 4.6.2.)

Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_TAX...
Exogenous variables: C
Lag specification: 1 1
Date: 08/21/18 Time: 19:13

Root	Modulus
0.663515	0.663515
0.493182 - 0.262160i	0.558531
0.493182 + 0.262160i	0.558531
0.201909 - 0.122936i	0.236390
0.201909 + 0.122936i	0.236390

No root lies outside the unit circle.
VAR satisfies the stability condition.

Note: *EViews9* output.

A.32. Estimation output of the regression containing direct and indirect taxes, and social contributions, new ordering (section 4.6.2.)

Vector Autoregression Estimates
Date: 08/25/18 Time: 14:13
Sample: 1995 2016 IF DUMMY_YGAP=1
Included observations: 246
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_DIRECTT...	D_SSECURI...	D_INDIREC...	REAL_INT_...	D_DEBT
D_SPEND(-1)	0.178762	-0.081393	-0.606570	0.079308	-0.222317	19.60055	0.863300
	(0.06555)	(0.06034)	(0.15114)	(0.08136)	(0.10554)	(4.99470)	(0.14694)
	[2.72713]	[-1.34896]	[-4.01328]	[0.97484]	[-2.10656]	[3.92427]	[5.87534]
D_GDP(-1)	0.450164	0.416938	0.886125	0.265651	0.319935	-24.90254	-0.149012
	(0.10482)	(0.09648)	(0.24168)	(0.13009)	(0.16876)	(7.98680)	(0.23496)
	[4.29476]	[4.32134]	[3.66649]	[2.04204]	[1.89583]	[-3.11796]	[-0.63421]
D_DIRECTTAX(-1)	-0.059396	-0.081122	0.008289	-0.007585	-0.037936	8.873638	-0.093167
	(0.03303)	(0.03041)	(0.07617)	(0.04100)	(0.05318)	(2.51703)	(0.07405)
	[-1.79808]	[-2.66790]	[0.10882]	[-0.18502]	[-0.71330]	[3.52544]	[-1.25821]
D_SSECURITY(-1)	0.061427	-0.135521	-0.179575	-0.025592	-0.061379	2.093015	0.196481
	(0.06307)	(0.05806)	(0.14543)	(0.07828)	(0.10155)	(4.80602)	(0.14139)
	[0.97390]	[-2.33422]	[-1.23478]	[-0.32692]	[-0.60443]	[0.43550]	[1.38968]
D_INDIRECTTAX(-1)	0.028237	0.053160	0.164538	0.170092	0.059300	2.386936	-0.095856
	(0.05028)	(0.04629)	(0.11594)	(0.06241)	(0.08096)	(3.83144)	(0.11271)
	[0.56155]	[1.14854]	[1.41916]	[2.72551]	[0.73249]	[0.62299]	[-0.85043]
REAL_INT_RATE(-1)	-0.000234	0.000146	0.000129	-0.000284	0.001088	0.637585	0.004163
	(0.00089)	(0.00082)	(0.00206)	(0.00111)	(0.00144)	(0.06792)	(0.00200)
	[-0.26225]	[0.17751]	[0.06255]	[-0.25670]	[0.75846]	[9.38735]	[2.08349]
D_DEBT(-1)	-0.033147	-0.036247	-0.050262	-0.008178	-0.024096	5.879149	0.270820
	(0.02158)	(0.01987)	(0.04977)	(0.02679)	(0.03475)	(1.64458)	(0.04838)
	[-1.53581]	[-1.82448]	[-1.00999]	[-0.30530]	[-0.69343]	[3.57487]	[5.59768]
C	0.017650	0.015015	0.038474	0.015787	0.036154	-0.311165	0.012144
	(0.00532)	(0.00490)	(0.01227)	(0.00660)	(0.00857)	(0.40540)	(0.01193)
	[3.31730]	[3.06597]	[3.13623]	[2.39079]	[4.22059]	[-0.76754]	[1.01824]
R-squared	0.292383	0.174851	0.218530	0.164710	0.074544	0.389274	0.334303
Adj. R-squared	0.271571	0.150582	0.195545	0.140142	0.047325	0.371312	0.314724
Sum sq. resids	0.301514	0.255476	1.602994	0.464450	0.781574	1750.609	1.515052
S.E. equation	0.035593	0.032763	0.082069	0.044175	0.057306	2.712102	0.079786
F-statistic	14.04859	7.204704	9.507722	6.704417	2.738641	21.67148	17.07429
Log likelihood	475.5664	495.9458	270.0565	422.4257	358.4097	-590.4325	276.9966
Akaike AIC	-3.801353	-3.967039	-2.130540	-3.369315	-2.848859	4.865305	-2.186964
Schwarz SC	-3.687358	-3.853045	-2.016546	-3.255320	-2.734864	4.979300	-2.072969
Mean dependent	0.023531	0.007782	0.018039	0.021918	0.030531	2.879061	0.079286
S.D. dependent	0.041703	0.035549	0.091501	0.047640	0.058712	3.420491	0.096381

Determinant resid covariance (dof adj...	2.95E-16
Determinant resid covariance	2.34E-16
Log likelihood	1983.472
Akaike information criterion	-15.67050
Schwarz criterion	-14.87254

Note: *EViews9* output.

A.33. Stability check for the regression containing direct and indirect taxes, and social contributions, new ordering (section 4.6.2.)

Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_DIR...
Exogenous variables: C
Lag specification: 1 1
Date: 08/25/18 Time: 14:14

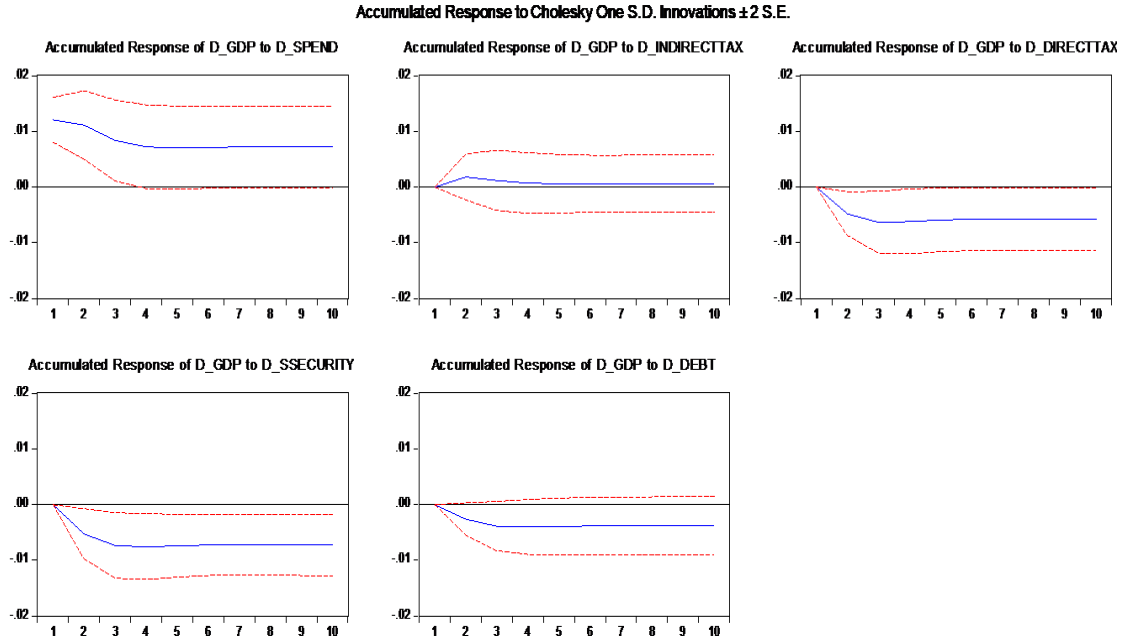
Root	Modulus
0.674398	0.674398
0.210772 - 0.289372i	0.357996
0.210772 + 0.289372i	0.357996
0.265194 - 0.177385i	0.319051
0.265194 + 0.177385i	0.319051
-0.138827	0.138827
0.058597	0.058597

No root lies outside the unit circle.
VAR satisfies the stability condition.

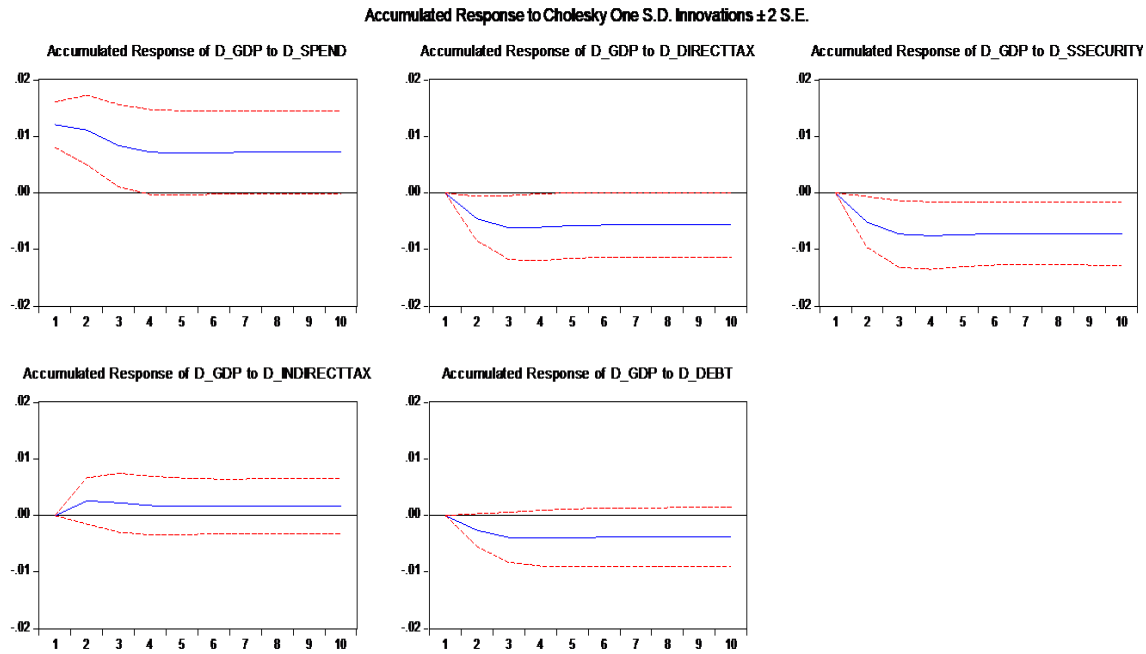
Note: *EViews9* output.

A.34. Accumulated responses (effects on GDP) for the regression containing direct and indirect taxes and social contributions, recession periods – robustness check (section 4.6.2.)

First ordering



New ordering



Note: *EViews9* outputs.

A.35. Estimation output of the regression containing internal and external debt, new ordering (section 4.6.2.)

Vector Autoregression Estimates
Date: 08/26/18 Time: 15:21
Sample: 1995 2016 IF DUMMY_YGAP=1
Included observations: 206
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_TAXES	REAL_INT_...	D_DEBTNR	D_DEBT_R
D_SPEND(-1)	0.257510	-0.148714	-0.264400	17.73234	0.929968	0.985823
	(0.05893)	(0.05938)	(0.07668)	(3.85499)	(0.20876)	(0.21165)
	[4.36968]	[-2.50448]	[-3.44790]	[4.59983]	[4.45465]	[4.65774]
D_GDP(-1)	0.374026	0.325817	0.413640	-9.195147	-0.243469	-0.005958
	(0.11032)	(0.11116)	(0.14355)	(7.21642)	(0.39080)	(0.39621)
	[3.39046]	[2.93117]	[2.88149]	[-1.27420]	[-0.62300]	[-0.01504]
D_TAXES(-1)	-0.014575	-0.062070	0.087208	7.209353	0.138497	-0.245841
	(0.07705)	(0.07763)	(0.10026)	(5.04001)	(0.27294)	(0.27671)
	[-0.18917]	[-0.79953]	[0.86985]	[1.43042]	[0.50743]	[-0.88843]
REAL_INT_RATE(-1)	-0.000125	0.000867	0.000846	0.571415	0.007310	0.002428
	(0.00102)	(0.00103)	(0.00133)	(0.06670)	(0.00361)	(0.00366)
	[-0.12287]	[0.84354]	[0.63780]	[8.56708]	[2.02386]	[0.66295]
D_DEBTNR(-1)	0.033594	0.003972	0.040676	-0.583054	0.212581	0.017263
	(0.01645)	(0.01658)	(0.02141)	(1.07622)	(0.05828)	(0.05909)
	[2.04196]	[0.23958]	[1.90003]	[-0.54176]	[3.64749]	[0.29215]
D_DEBT_R(-1)	-0.045985	-0.001863	0.036724	1.596711	0.145645	0.252147
	(0.01715)	(0.01728)	(0.02232)	(1.12191)	(0.06076)	(0.06160)
	[-2.68125]	[-0.10778]	[1.64553]	[1.42320]	[2.39721]	[4.09350]
C	0.014588	0.010805	0.021486	0.230276	-0.003613	0.020285
	(0.00516)	(0.00520)	(0.00672)	(0.33775)	(0.01829)	(0.01854)
	[2.82540]	[2.07684]	[3.19803]	[0.68179]	[-0.19753]	[1.09391]
R-squared	0.297019	0.090401	0.134835	0.319718	0.195826	0.194098
Adj. R-squared	0.275823	0.062975	0.108749	0.299207	0.171579	0.169800
Sum sq. resids	0.202558	0.205651	0.342983	866.7759	2.541955	2.612808
S.E. equation	0.031904	0.032147	0.041515	2.087021	0.113021	0.114585
F-statistic	14.01336	3.296270	5.168970	15.58761	8.076458	7.988051
Log likelihood	420.9330	419.3723	366.6877	-440.3025	160.3778	157.5461
Akaike AIC	-4.018767	-4.003614	-3.492114	4.342743	-1.489105	-1.461613
Schwarz SC	-3.905684	-3.890531	-3.379031	4.455826	-1.376021	-1.348529
Mean dependent	0.025014	0.008718	0.026203	2.554643	0.081808	0.071742
S.D. dependent	0.037491	0.033210	0.043975	2.493055	0.124174	0.125758

Determinant resid covariance (dof adj...	2.31E-13
Determinant resid covariance	1.88E-13
Log likelihood	1264.527
Akaike information criterion	-11.86919
Schwarz criterion	-11.19069

Note: *EViews9* output.

A.36. Stability check for the regression containing internal and external debt, new ordering (section 4.6.2.)

Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_TAX...
Exogenous variables: C
Lag specification: 1 1
Date: 08/26/18 Time: 15:22

Root	Modulus
0.625861	0.625861
0.220922 - 0.283809i	0.359658
0.220922 + 0.283809i	0.359658
0.228397 - 0.151784i	0.274233
0.228397 + 0.151784i	0.274233
0.182179	0.182179

No root lies outside the unit circle.
VAR satisfies the stability condition.

Note: *EViews9* output.

A.37. Estimation output of the regression containing debt issued in national and foreign currency, new ordering (section 4.6.2.)

Vector Autoregression Estimates
Date: 08/26/18 Time: 15:22
Sample: 1995 2016 IF DUMMY_YGAP=1
Included observations: 219
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_TAXES	REAL_INT_...	D_DEBTFC	D_DEBTNC
D_SPEND(-1)	0.231626	-0.140580	-0.307384	15.96527	-0.338211	0.784940
	(0.06098)	(0.05819)	(0.07574)	(4.29284)	(1.32729)	(0.22792)
	[3.79835]	[-2.41597]	[-4.05849]	[3.71904]	[-0.25481]	[3.44392]
D_GDP(-1)	0.386247	0.353231	0.295584	-15.88136	0.613786	0.779181
	(0.10643)	(0.10156)	(0.13219)	(7.49234)	(2.31653)	(0.39779)
	[3.62912]	[3.47820]	[2.23610]	[-2.11968]	[0.26496]	[1.95876]
D_TAXES(-1)	0.011176	-0.104960	0.135900	9.023209	1.372512	-0.601946
	(0.07575)	(0.07228)	(0.09408)	(5.33234)	(1.64869)	(0.28311)
	[0.14755]	[-1.45217]	[1.44454]	[1.69217]	[0.83249]	[-2.12618]
REAL_INT_RATE(-1)	-0.000841	-8.52E-05	-0.000627	0.692223	0.022634	0.006163
	(0.00093)	(0.00089)	(0.00115)	(0.06537)	(0.02021)	(0.00347)
	[-0.90574]	[-0.09614]	[-0.54327]	[10.5892]	[1.11985]	[1.77581]
D_DEBTFC(-1)	-0.001278	-0.008687	-0.012788	0.403948	0.072465	-0.004496
	(0.00321)	(0.00306)	(0.00399)	(0.22598)	(0.06987)	(0.01200)
	[-0.39827]	[-2.83618]	[-3.20755]	[1.78753]	[1.03714]	[-0.37477]
D_DEBTNC(-1)	-0.002294	0.018358	0.035901	0.115977	0.232639	0.273537
	(0.01696)	(0.01618)	(0.02106)	(1.19364)	(0.36906)	(0.06337)
	[-0.13528]	[1.13466]	[1.70473]	[0.09716]	[0.63036]	[4.31622]
C	0.015865	0.012007	0.030086	0.225985	-0.066796	0.018201
	(0.00506)	(0.00483)	(0.00629)	(0.35638)	(0.11019)	(0.01892)
	[3.13387]	[2.48566]	[4.78500]	[0.63411]	[-0.60620]	[0.96190]
R-squared	0.306111	0.116096	0.168454	0.417737	0.021327	0.173798
Adj. R-squared	0.286473	0.091080	0.144919	0.401258	-0.006371	0.150415
Sum sq. resids	0.250763	0.228321	0.386825	1242.711	118.7985	3.503061
S.E. equation	0.034393	0.032817	0.042716	2.421125	0.748579	0.128545
F-statistic	15.58742	4.640845	7.157787	25.34948	0.769968	7.432650
Log likelihood	430.8213	441.0877	383.3571	-500.8372	-243.7727	142.0825
Akaike AIC	-3.870514	-3.964271	-3.437051	4.637783	2.290161	-1.233630
Schwarz SC	-3.762187	-3.855945	-3.328724	4.746109	2.398488	-1.125304
Mean dependent	0.023236	0.007144	0.024946	2.978602	0.050531	0.074287
S.D. dependent	0.040715	0.034422	0.046194	3.128941	0.746205	0.139461

Determinant resid covariance (dof adj...	2.44E-11
Determinant resid covariance	2.01E-11
Log likelihood	832.6567
Akaike information criterion	-7.220610
Schwarz criterion	-6.570651

Note: *EViews9* output.

A.38. Stability check for the regression containing internal and external debt, new ordering (section 4.6.2.)

Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_TAX...
Exogenous variables: C
Lag specification: 1 1
Date: 08/26/18 Time: 15:23

Root	Modulus
0.675448	0.675448
0.188218 - 0.329643i	0.379593
0.188218 + 0.329643i	0.379593
0.304370 - 0.059331i	0.310099
0.304370 + 0.059331i	0.310099
0.098356	0.098356

No root lies outside the unit circle.
VAR satisfies the stability condition.

Note: *EViews9* output.

A.39. Estimation output of the regression containing short-term and long-term debt, new ordering (section 4.6.2.)

Vector Autoregression Estimates
Date: 08/26/18 Time: 15:24
Sample: 1995 2016 IF DUMMY_YGAP=1
Included observations: 239
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_TAXES	REAL_INT_...	D_LTDEBT	D_STDEBT
D_SPEND(-1)	0.208021	-0.110236	-0.218370	16.24630	0.773756	3.396516
	(0.06229)	(0.05708)	(0.07479)	(4.74505)	(0.13254)	(0.94282)
	[3.33957]	[-1.93122]	[-2.91991]	[3.42384]	[5.83776]	[3.60249]
D_GDP(-1)	0.504161	0.468230	0.556021	-30.67179	-0.337962	0.504247
	(0.10848)	(0.09941)	(0.13024)	(8.26354)	(0.23083)	(1.64194)
	[4.64760]	[4.71022]	[4.26915]	[-3.71170]	[-1.46415]	[0.30711]
D_TAXES(-1)	-0.062833	-0.162956	-0.035344	20.26684	0.075469	-2.202885
	(0.07879)	(0.07221)	(0.09460)	(6.00226)	(0.16766)	(1.19263)
	[-0.79744]	[-2.25685]	[-0.37361]	[3.37653]	[0.45013]	[-1.84708]
REAL_INT_RATE(-1)	6.89E-05	0.000114	0.000181	0.611167	0.001791	0.016714
	(0.00091)	(0.00083)	(0.00109)	(0.06910)	(0.00193)	(0.01373)
	[0.07597]	[0.13694]	[0.16578]	[8.84432]	[0.92774]	[1.21729]
D_LTDEBT(-1)	-0.006765	-0.006035	0.037090	1.762259	0.355148	-0.623765
	(0.02162)	(0.01982)	(0.02596)	(1.64724)	(0.04601)	(0.32730)
	[-0.31284]	[-0.30456]	[1.42864]	[1.06983]	[7.71856]	[-1.90579]
D_STDEBT(-1)	-0.005268	-0.011567	-0.017358	0.933280	0.046644	-0.179803
	(0.00408)	(0.00374)	(0.00490)	(0.31086)	(0.00868)	(0.06177)
	[-1.29104]	[-3.09320]	[-3.54290]	[3.00227]	[5.37172]	[-2.91102]
C	0.017022	0.014627	0.028547	-0.054829	0.015623	-0.013671
	(0.00532)	(0.00487)	(0.00639)	(0.40515)	(0.01132)	(0.08050)
	[3.20046]	[3.00102]	[4.47056]	[-0.13533]	[1.38043]	[-0.16982]
R-squared	0.262955	0.164948	0.197593	0.361939	0.409346	0.084108
Adj. R-squared	0.243893	0.143352	0.176841	0.345437	0.394071	0.060422
Sum sq. resids	0.300768	0.252574	0.433560	1745.352	1.361814	68.90698
S.E. equation	0.036006	0.032995	0.043230	2.742821	0.076615	0.544989
F-statistic	13.79505	7.637862	9.521678	21.93358	26.79751	3.550852
Log likelihood	458.8803	479.7492	415.1801	-576.7220	278.4074	-190.5034
Akaike AIC	-3.781425	-3.956061	-3.415733	4.884703	-2.271191	1.652748
Schwarz SC	-3.679604	-3.854239	-3.313912	4.986524	-2.169370	1.754570
Mean dependent	0.024149	0.008160	0.026194	2.804171	0.084057	0.019919
S.D. dependent	0.041408	0.035649	0.047647	3.390173	0.098425	0.562239

Determinant resid covariance (dof adj...	5.64E-12
Determinant resid covariance	4.72E-12
Log likelihood	1081.757
Akaike information criterion	-8.700898
Schwarz criterion	-8.089972

Note: *EViews9* output.

A.40. Stability check for the regression containing short-term and long-term debt, new ordering (section 4.6.2.)

Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_TAX...
Exogenous variables: C
Lag specification: 1 1
Date: 08/26/18 Time: 15:24

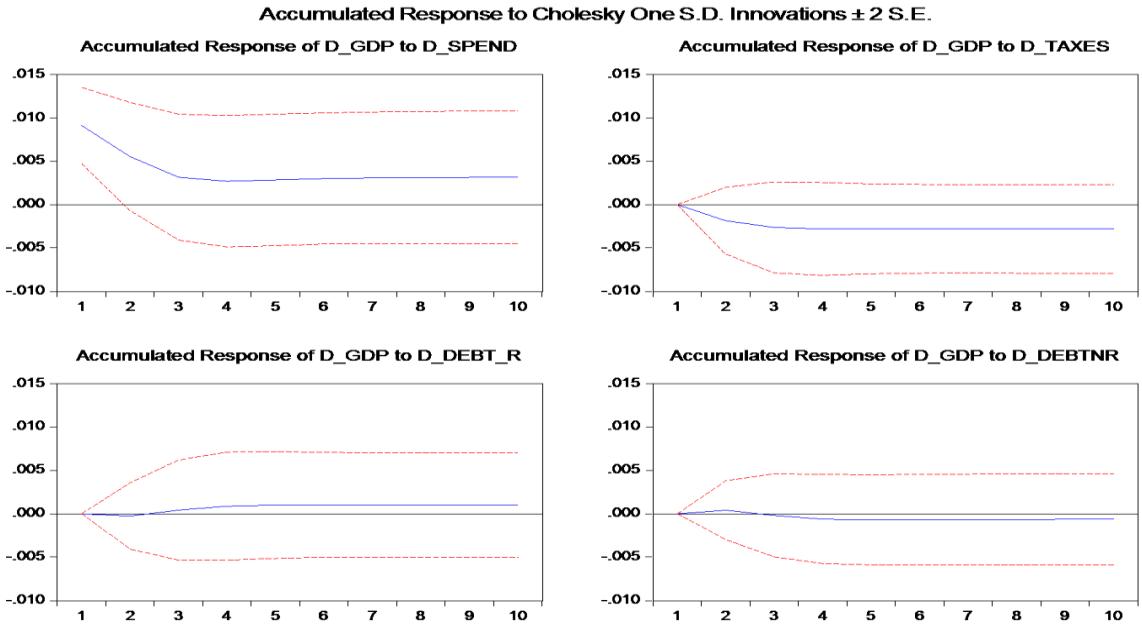
Root	Modulus
0.641864	0.641864
0.298572 - 0.168046i	0.342615
0.298572 + 0.168046i	0.342615
0.213904 - 0.266154i	0.341457
0.213904 + 0.266154i	0.341457
-0.239397	0.239397

No root lies outside the unit circle.
VAR satisfies the stability condition.

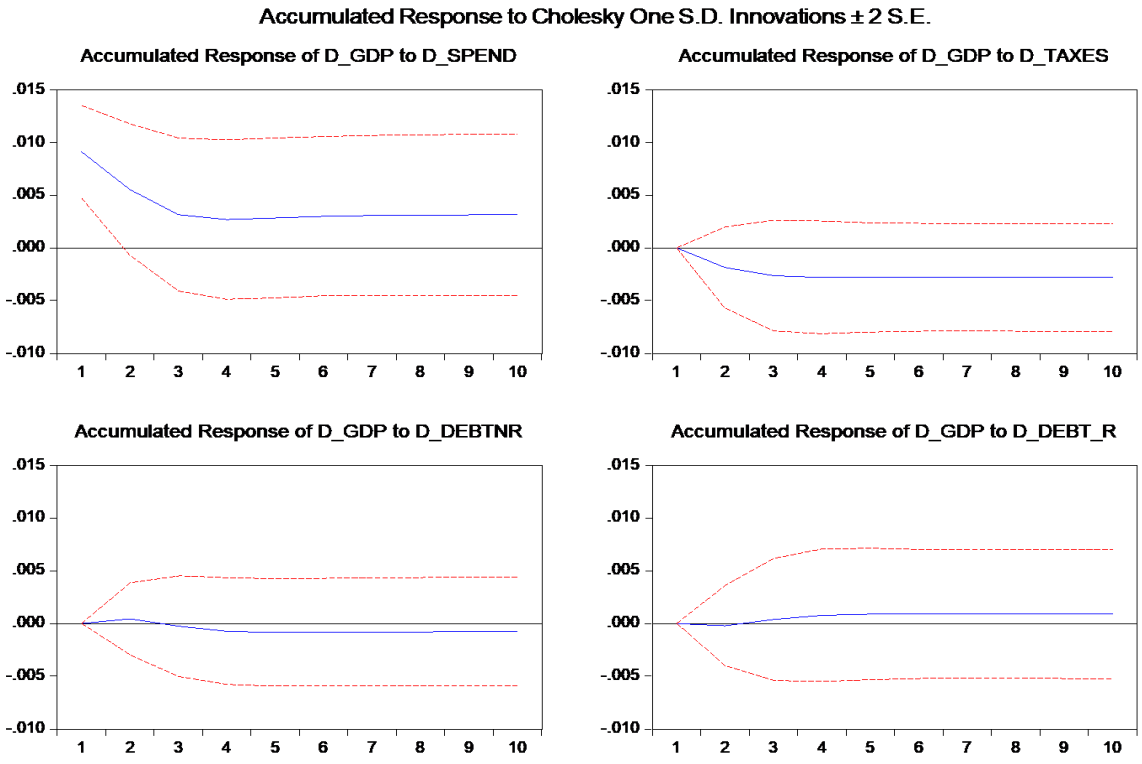
Note: *EViews9* output.

A.41. Accumulated responses (effects on GDP) for the regression containing internal and external debt, recession periods – robustness check (section 4.6.2.)

First ordering



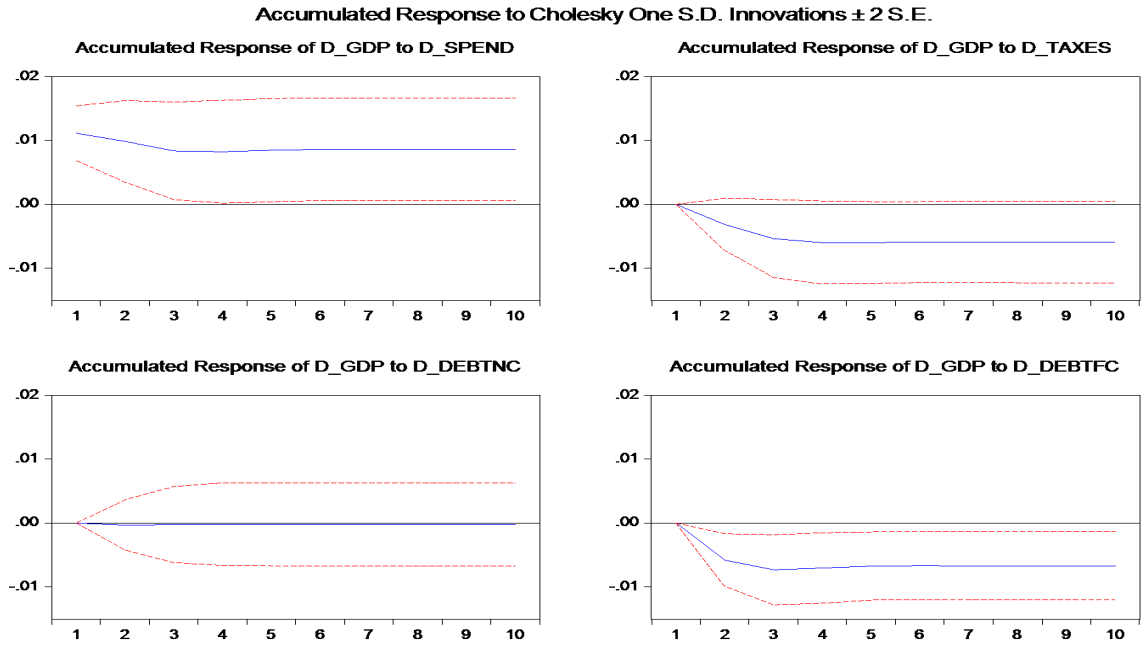
New ordering



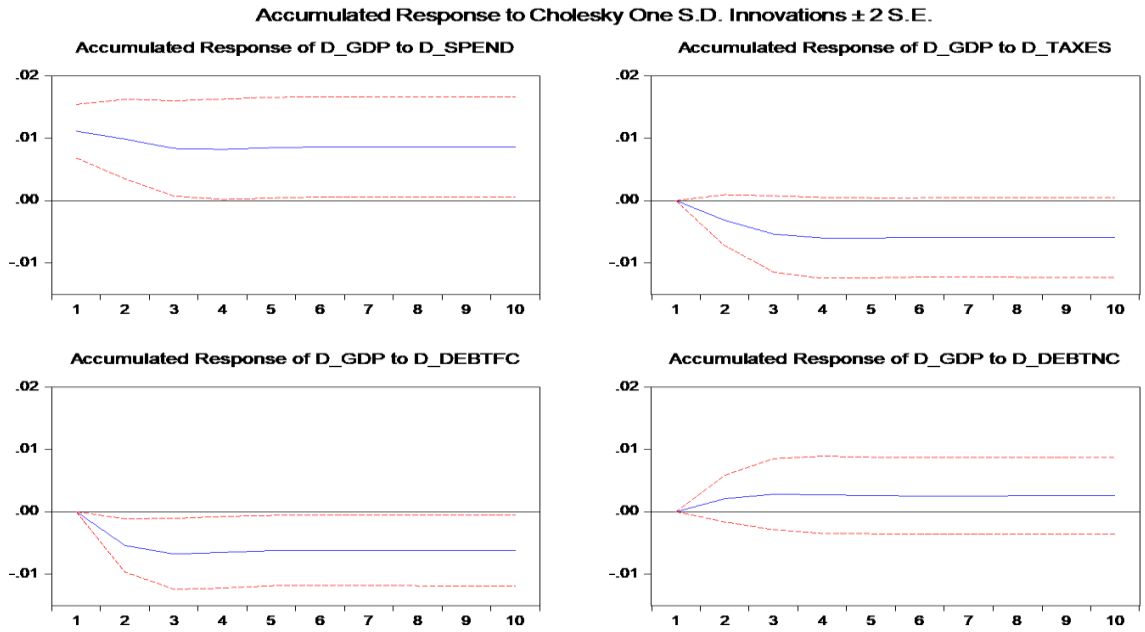
Note: *EViews9* output.

A.42. Accumulated responses (effects on GDP) for the regression containing debt issued in national and foreign currency, recession periods – robustness check (section 4.6.2.)

First ordering



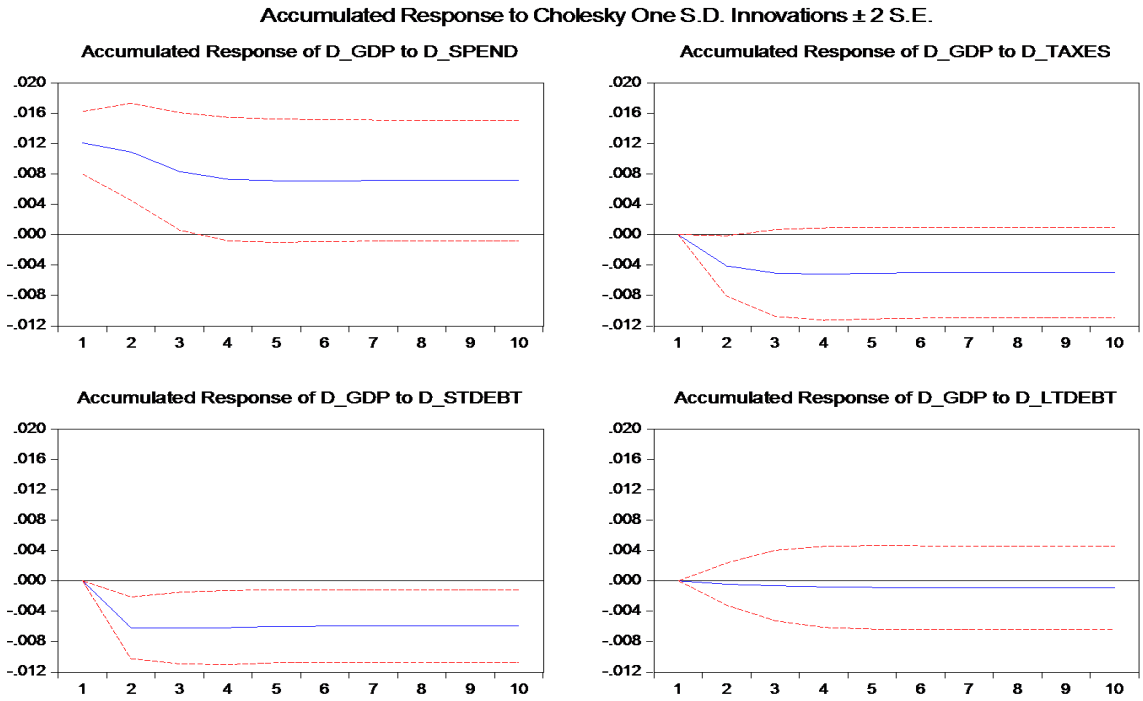
New ordering



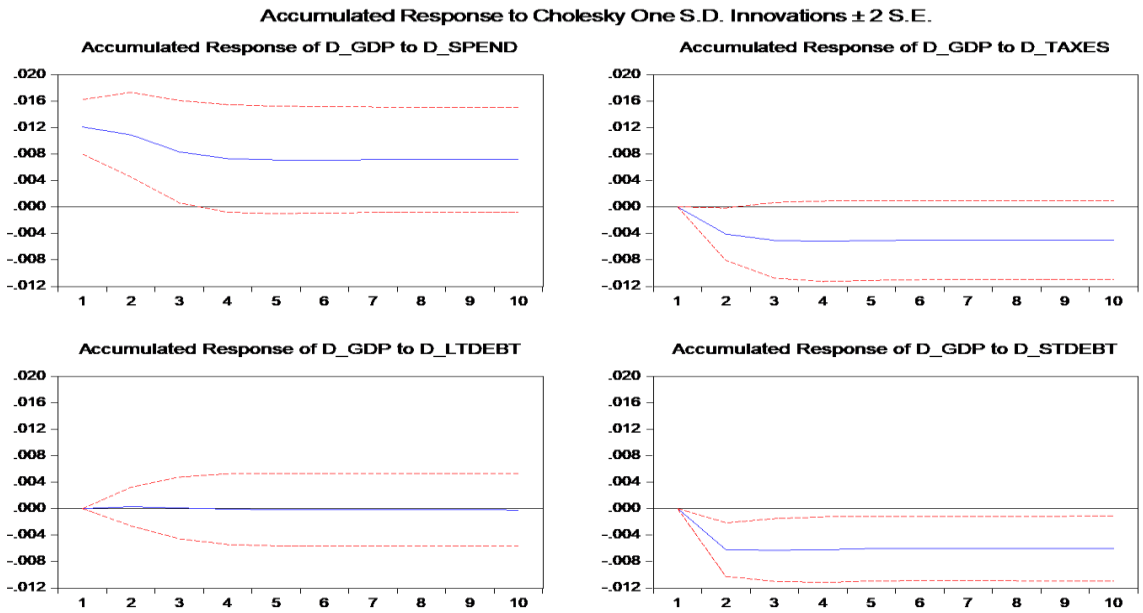
Note: *EViews9* output.

A.43. Accumulated responses (effects on GDP) for the regression containing short-term and long-term debt, recession periods – robustness check (section 4.6.2)

First ordering



New ordering



Note: *EViews9* output.

A.44. Estimation output of the core regression containing DUMMY_DEBT, recession periods – robustness check (section 4.6.4.)

Vector Autoregression Estimates
Date: 08/26/18 Time: 20:47
Sample: 1995 2016 IF DUMMY_YGAP=1
Included observations: 246
Standard errors in ( ) & t-statistics in [ ]

	D_SPEND	D_GDP	D_TAXES	REAL_INT_...	D_DEBT
D_SPEND(-1)	0.141936	-0.194187	-0.363290	22.10000	0.997571
	(0.06120)	(0.05694)	(0.07848)	(4.73841)	(0.13994)
	[2.31934]	[-3.41066]	[-4.62928]	[4.66401]	[7.12861]
D_GDP(-1)	0.412307	0.380512	0.395396	-21.66021	-0.075390
	(0.10357)	(0.09636)	(0.13282)	(8.01958)	(0.23684)
	[3.98083]	[3.94881]	[2.97697]	[-2.70091]	[-0.31831]
D_TAXES(-1)	-0.029299	-0.138871	0.053940	15.89548	-0.216575
	(0.07310)	(0.06801)	(0.09373)	(5.65972)	(0.16715)
	[-0.40083]	[-2.04204]	[0.57545]	[2.80853]	[-1.29571]
REAL_INT_RATE(-1)	-0.000399	-0.000279	-0.000315	0.644466	0.004446
	(0.00088)	(0.00082)	(0.00112)	(0.06788)	(0.00200)
	[-0.45486]	[-0.34150]	[-0.28054]	[9.49436]	[2.21790]
D_DEBT(-1)	-0.045642	-0.056734	-0.052850	6.602072	0.282575
	(0.02141)	(0.01992)	(0.02745)	(1.65771)	(0.04896)
	[-2.13187]	[-2.84831]	[-1.92499]	[3.98265]	[5.77192]
C	0.031412	0.029749	0.049586	-1.066462	0.010616
	(0.00644)	(0.00599)	(0.00826)	(0.49850)	(0.01472)
	[4.87913]	[4.96663]	[6.00600]	[-2.13935]	[0.72108]
DUMMY_DEBT	-0.016528	-0.015236	-0.019137	0.857738	0.002789
	(0.00493)	(0.00458)	(0.00632)	(0.38156)	(0.01127)
	[-3.35402]	[-3.32323]	[-3.02826]	[2.24795]	[0.24746]
R-squared	0.312760	0.181330	0.191105	0.387531	0.327197
Adj. R-squared	0.295507	0.160778	0.170798	0.372156	0.310307
Sum sq. resids	0.292832	0.253471	0.481549	1755.605	1.531224
S.E. equation	0.035003	0.032566	0.044887	2.710282	0.080042
F-statistic	18.12794	8.822819	9.410788	25.20401	19.37175
Log likelihood	479.1603	496.9153	417.9789	-590.7830	275.6906
Akaike AIC	-3.838702	-3.983052	-3.341292	4.860025	-2.184477
Schwarz SC	-3.738957	-3.883306	-3.241547	4.959770	-2.084731
Mean dependent	0.023531	0.007782	0.025112	2.879061	0.079286
S.D. dependent	0.041703	0.035549	0.049294	3.420491	0.096381

Determinant resid covariance (dof adj...	2.08E-11
Determinant resid covariance	1.80E-11
Log likelihood	1298.029
Akaike information criterion	-10.26852
Schwarz criterion	-9.769799

Note: *EViews9* output.

A.45. Stability check for the core regression containing DUMMY_DEBT, recession periods – robustness check (section 4.6.4.)

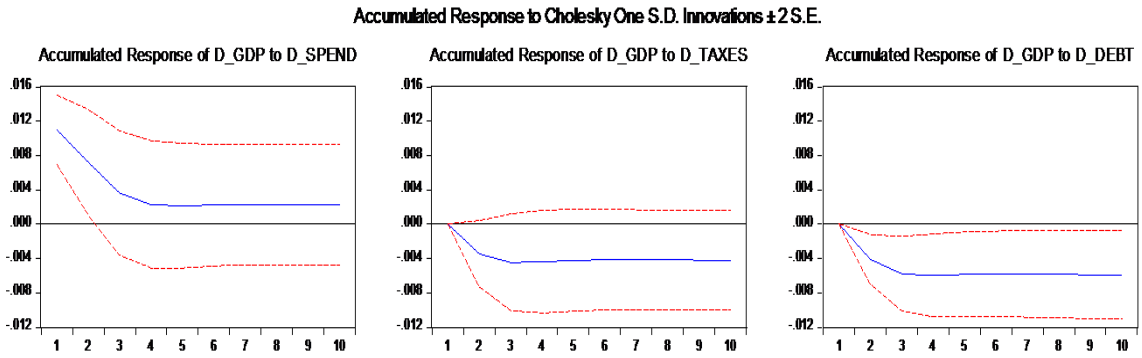
Roots of Characteristic Polynomial
Endogenous variables: D_SPEND D_GDP D_TAX...
Exogenous variables: C DUMMY_DEBT
Lag specification: 1 1
Date: 08/26/18 Time: 20:48

Root	Modulus
0.656215	0.656215
0.268105 - 0.295283i	0.398838
0.268105 + 0.295283i	0.398838
0.155503 - 0.158870i	0.222308
0.155503 + 0.158870i	0.222308

No root lies outside the unit circle.
VAR satisfies the stability condition.

Note: *EViews9* output.

A.46. Accumulated responses (effects on GDP) for the core regression, for different debt levels, recession periods – robustness check (section 4.6.4.)



Note: *EViews9* output.

A.47. Fiscal multipliers considering shocks in spending, taxes, and debt, for different debt levels, within recession periods – robustness check (section 4.6.4.)

Period	Public spending		Taxes		Debt	
	Core	***Dummy_debt***	**Core**	***Dummy_debt***	**Core**	***Dummy_debt***
1	0,721	0,663	0,000	0,000	0,000	0,000
2	0,618	0,436	-0,382	-0,347	-0,072	-0,093
3	0,452	0,217	-0,512	-0,446	-0,107	-0,132
4	0,371	0,137	-0,516	-0,440	-0,115	-0,136
5	0,348	0,127	-0,500	-0,423	-0,115	-0,134
6	0,346	0,134	-0,490	-0,417	-0,114	-0,132
7-	0,347	0,138	-0,487	-0,416	-0,114	-0,133
8	0,348	0,138	-0,487	-0,417	-0,114	-0,133
9	0,348	0,138	-0,487	-0,418	-0,114	-0,134
10	0,348	0,137	-0,488	-0,418	-0,115	-0,134

Note: Authors' calculations.