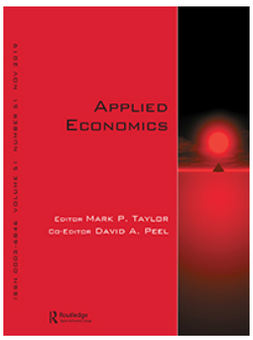

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Fiscal multipliers in the Eurozone: an SVAR analysis

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ABSTRACT

We compute the value of fiscal multipliers (for government primary expenditure, Income and wealth taxes and for Production and import taxes) in the Eurozone countries since the creation of the currency union (2000Q1-2016Q4), in order to understand how the values can vary according to the public debt level, the pace of economic growth, and the output gap. Imposing quarterly fiscal shocks, the results showed that government expenditure had a positive effect on output, with an annual accumulated multiplier of 0.44, whereas tax multipliers presented negative signs: the Income and wealth and the Production and import taxes stood at −0.11 and −0.55, respectively. Furthermore, the spending multiplier showed a higher value for countries with lower levels of public debt, during recessions, and in countries with negative output gaps. On the other hand, tax shocks seemed to be recessive in highly indebted countries and those facing positive output gaps.

KEYWORDS

Fiscal multiplier; structural VAR; fiscal policy

JEL CLASSIFICATION

B22; E62; H62; H63

I. Introduction

According to the definition given by Spilimbergo, Symansky, and Schindler (2009), fiscal multipliers (or Keynesian's multipliers) can be defined as being the ratio of a change in output to a unitary exogenous change in the fiscal balance, which could be driven by a change in government expenditure, or tax revenue. This concept assumes that, according to the Keynesian theory, an increase in fiscal balance stimulates the level of domestic consumption, as well as GDP and the State's revenue, generating a cyclical dynamic. In turn, given an improvement in the budget balance, a recessive impact on economic activity might be expected.

Batini, Callegari, and Melina (2012) and Brinca et al. (2016) explain that the last Great Recession brought the multipliers back into debate in the economic research literature, and consequently, the effectiveness of fiscal policy (and its variation, depending on the time and space factors). When the crisis emerged, many countries adopted expansionist fiscal measures to stimulate their economies, hoping to create an impact on demand and limit job losses (Born, Jüssen, and Müller 2013; Zubairy 2014). Nevertheless, the impact of the crisis on the multiplier's values seemed to be uncertain, especially on the relative stabilizing effects provided by the variation on government spending and tax cuts (Ilzetzki et al., 2013; Zubairy 2014; Spilimbergo, Symansky, and Schindler 2009). Firstly, the uncertainty and mistrust in the economy appear to have increased precautionary savings, thus reducing the marginal propensity to consume and consequently the size of multipliers. However, on the contrary, the deleveraging process increased the number of liquidity-constrained agents and the accommodative behave of monetary institutions (with the short rates being close to zero), which may have a positive impact on multipliers. Thus, in the absence of clear stabilizing effects, when the financial crises became a sovereign debt crisis, there was a shift from expansionary to austerity policies.

According to the traditional analysis based on the Mundell-Fleming model, the fiscal multiplier is predicted to be close to zero in economies with floating exchange rates (where government spending generates pressure on interest rates, diminishing net exports due to currency appreciation and the increase of demand for money – thus

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offsetting the government spending's expansionist effect), but is larger in economies which are part of a currency union. Furthermore, as the EMU countries were subject to large fiscal adjustments, the magnitude of the fiscal multipliers in the case of EMU countries deserves special attention (Born, Jüssen, and Müller 2013). Based on these reasons, the following research is focused on the Eurozone countries since the creation of the currency union.

We contribute to the existing literature with new estimates for fiscal multipliers and with a new insight into how these multipliers change according to different types of policies or country-specific factors in an economic and monetary union. The time span also covers the global financial and economic crisis, where fiscal multipliers changed in respective magnitudes. In addition, we build on a literature review of the transmission channels, determinants, and values of the multipliers (for different periods and samples), as well as its inherent theoretical perspectives. The EMU as whole has not been extensively explored in the literature, which is especially relevant, considering the recent episodes of fiscal consolidation.

This paper is organized as follows. Section 2 is literature review. Section 3 presents the methodology and data. Section 4 reports the empirical analysis and Section 5 concludes.

II. Literature

Theoretical perspectives

In Samuelson and Nordhaus (2001), fiscal policy is described as being a set of decisions or rules related to taxes, to government expenditure, and to decisions to allocate resources in both the public and private sector, in order to influence peoples' income and consumption, and also to provide incentives for economic decisions. However, the need for State intervention in the economic activity is not consensual, and it varies according to different economic perspectives.

From the Keynesian perspective, it is assumed that a certain proportion of economic resources is unemployed, and thus that a certain fraction of the population is liquidity-constrained or economically myopic. Accordingly, as agents are expected to have a higher propensity to consume, a change in their income or taxes should have a significant impact on aggregate demand, consequently leading to second round effects: the so-called Keynesian multipliers. As these policies stimulate both national consumption and income, hypothetically there is no effect on savings and on capital accumulation (Bernheim 1989). Following this perspective, the size of government spending should vary over the stages of the business cycle, being more needed and effective during recessions than expansions, thus enhancing the need for policy activism to stimulate output during a deep recession. (Auerbach and Gorodnichenko 2011).

The Neoclassical perspective assumes that economic agents plan their consumption over their life cycle, where fiscal deficits might change their projections and lead to shifting costs to future generations. As argued in Bernheim (1989), a positive consumption shock is expected to lead to a decrease in savings, a stimulus for interest rates, and consequently, to crowding out private initiatives.[1] Diamond (1965) defends that the effect of temporary deficits on the economic activity is expected to be small and perverse, thus changing agents' decisions. As households plan their consumption level for a long-term horizon, a marginal increment on their wealth level generates a limited impact on current consumption. If the fiscal stimulus is generated by a tax decrease, then the result is expected to be close to its counterfactual value, whereby a decrease in capital tax level would stimulate savings (due to a higher rate of return), and a decrease in labour income could induce an intertemporal substitution, leading to the same result (stimulates savings).

However, the Neoclassical economists appear to neglect the importance of fiscal policy in mitigating market failures and the business cycle. As argued in Lucas (1973), beforehand government policies just used to constitute market failures (such as unemployment), despite the effects of these troubles remaining fixed. In addition, the

[1]It should be noted that, as demonstrated in the Hicks-Hansen model (IS-LM), as expansionist fiscal policies increase the demand for money, a synchronization with monetary policymakers may be requested. If the money supply is flexible, then the maintenance of interest rates could avoid an offset of fiscal multipliers.

author is sceptical about the possibility of policy-makers applying contractionary measures to promote counter-cyclical policies in order to mitigate cyclical fluctuations. For otherwise, once the economy has close-to-full employment, real deficits would crowd out private expenditure and inflationary pressures would emerge (Bernheim 1989).

As argued by Blanchard and Perotti (2002), the neoclassical theory differs from the Keynesian one essentially with regard to government spending, as, on several occasions, private consumption and GDP increased simultaneously with a decrease in government spending (non-Keynesian effects of fiscal policy). Whilst in the neoclassical model, a shock in government spending can only result in an increase in private investment if the shock is sufficiently persistent and taxes are sufficiently non-distortionary (as investment could fall otherwise). On the contrary, in a Keynesian model, investment increases if the accelerator effect prevails, and it falls if the effect of a higher interest rate prevails.

Finally, the Ricardian theory defends the existence of an inter-generational altruistic transfer system, where the level of consumption is determined according to agents' resources and their descendants (dynastic resources function). This perspective predicts that fiscal deficits shift payments to future generations and that households increase their savings to match the present discounted value of future taxes and expenditures, thus avoiding any effect on their offspring. Therefore, a fiscal shock does not have any real effect on economic activity (Bernheim 1989).

Fiscal multipliers

Transmission channels

In Brinca et al. (2016), it is shown that one of the main transmission channels between fiscal policy and economic activity – which is an important determinant of the value of fiscal multipliers – is the level of liquidity-constrained agents in the economy. When the constraints are higher, the marginal propensity to consume increases, thus leading to an increase in the magnitude of the fiscal multiplier. In addition, high interest rates and an increase in the net present value of the fiscal shock can also be a liquidity factor, which results in a boost to the value of multipliers.

Regarding tax policy, Zubairy (2014) demonstrated that a decrease in labour taxes increases output, the number of hours worked, consumption, and investment level. Consumption also generates a positive wealth effect, whereby the intra-temporal substitution effect leads to a rise in consumption and employment, due to a higher return from labour. The investment level is expected to increase due to the increase in the rate of capital return and its effects on labour supply.

If capital taxes decrease, this would also result in more hours worked and a rise in wages. The after-tax return on capital might increase, thus leading to an increase in investment, and the intertemporal substitution would lead to a delay in consumption and to an increase in labour supply. The effect on consumption and labour on the equilibrium is not linear, as labour tax revenue would soon be increased to pay for the deficit incurred (Zubairy 2014).

According to Brinca et al. (2016), a more progressive tax system could reduce the multiplier by reducing restrictions on credit, although it could also increase the value of the multiplier through a lower holding of assets and its impact on interest rates (whereby less savings lead to higher interest rates). In addition, the results of these authors also showed that the impact of fiscal measures sharply increases in response to a decrease in the capital–output ratio. They defend that when the tax levels go up, the economy becomes poorer (with less capital), interest rate increase, and wage rates decrease.

On the expenditure side, the empirical evidence provided by Afonso and Sousa (2011) shows that a public spending shock tends to generate a small (positive) effect on GDP, a quick fall in stock prices, and an increase in debt-financing costs. Zubairy (2014) argues that, in the face of an increase in public spending, an increase in demand gives firms an incentive to reduce their markups in order to achieve a larger customer base. This shift in markups could increase labour demand, wages, and output. In turn, higher wages can lead households to substitute leisure for consumption, thus offsetting the negative impact on wealth. In addition, an increase in interest rates

would be the expected and intertemporal substitution effect (which would have a negative impact on consumption), although this would be small. However, in a situation where government spending is financed by lump-sum taxes, households would face a decrease in wealth, which would consequently generate an impact on consumption and on the number of hours worked.

As argued by Zubairy (2014), monetary policy is crucial to determine the movements of interest rates, which in turn plays a role in how the economy reacts to fiscal shocks. A higher nominal interest rate increases the spending and capital tax's multipliers, whereas the labour tax multiplier decreases. The first two multiplier's cases can be explained, as a higher value of nominal interest rate means that the monetary policy makers increased their real rates less rapidly, thus increasing the expansionary effects of fiscal measures. Although inflation has a limited effect on fiscal shocks, it has a larger (negative) effect on the labour tax multiplier. Labour tax cuts result in households increasing labour supply, which generates a fall in wages, and lower marginal costs result in a fall in inflation.

Determinants of fiscal multipliers

As defended by many authors (e.g. Zubairy 2014; Boussard, Castro, and Salto 2012), nonlinearity of multipliers facing different types of measures and conditions exist, according to their source of financing. According to Boussard, Castro, and Salto (2012), the main factors affecting the multipliers can be grouped as: i) factors that lead households to base their consumption level on their current income (financial frictions); ii) the nature of the fiscal shock (credibility and duration); iii) the composition of the fiscal shock; iv) the structural features of each economy; v) monetary policies, and; vi) the exchange rate regime and the openness of the economy.

When assessing the determinants of the value of fiscal multipliers, both for high-income and developing countries, Ilzetski, Mendoza, and Végh (2013) realized that the value depends on the level of development of each country, where developing countries tend to have higher multipliers than high-income ones, although these negative to start with, with a less persistent effect. Regarding debt level, the result showed that with a range of sovereign debts over 60% of GDP, the multipliers were not statistically different from zero, and thus the fiscal stimulus could have a negative impact on long-run output. Barrel, Holland, and Hurst (2012) found a 40–55% correlation (positive) between country size and the multipliers, whereby large economies are less open to imports than smaller economies, in spite of the bigger impact on interest rates.

According to the literature, the action of fiscal multipliers is greater if leakages are few (i.e. the stimulus generates less changes in savings or on spending on imports). In addition, with regard to liquidity constrains and wealth inequality, Spilimbergo, Symansky, and Schindler (2009) argued that multipliers are maximized in the following circumstances: if households demonstrate non-Ricardian behaviours; if the propensity to import is small (related to the dimension and openness of each economy); if the automatic stabilizers are small; and if the output gap is large. When unemployment is very low, the fiscal policy has limited overall effects.

With respect to the role of the level of openness, closed economies used to have long-run multipliers over the unity, whereas open economies can have negative multipliers in the short and long run. There are two reasons behind this phenomenon: i) a country with a low trade level could have high tariffs or barriers to trade, ii) the economy may be too large, despite a country's high level of trade (where its openness level is a relative indicator). Both factors can affect the magnitude of the multiplier independently (Ilzetski, Mendoza, and Végh 2013), as the shock tends to spread to other economies through the trade market, where the degree of dependence of consumption on current income, and the speed of response (labour market flexibility) are crucial factors (Barrel, Holland, and Hurst 2012). Nevertheless, with regard to the exchange rate regime, capital mobility can accommodate the exchange rate in order to maintain the rate in parity. In addition, an open economy has smaller spending multipliers than a tax-based one, as it is unable to adjust the exchange rate. Therefore, the higher the degree of openness of an economy, the lower the multiplier which is to be expected (Boussard, Castro, and Salto 2012).

Regarding the persistence of the measures, while temporary reductions in income taxes decrease the multiplier, mistrust about fiscal sustainability (with an impact on risk premium) can have a strong effect, as can the temporary measures put into place – which trigger intertemporal reallocation (e.g. a decrease in investment tax credits for firms). In addition, permanent measures generate higher multipliers than temporary ones when focused on income, while the reverse is true when the measures are focused on prices (Spilimbergo, Symansky, and Schindler 2009). Overall, permanent multipliers are smaller than temporary ones, as they have a higher impact on long-term rates, and consequently generate an increase in asset prices and investment (Barrel, Holland, and Hurst 2012).

Auerbach and Gorodnichenko (2011) point out the difference of the values between an expansion and a recession. The result predicts a larger multiplier in a recession (close to two) than in an expansion (close to zero). It could be argued that the value of the multiplier should be higher, as government spending is simultaneous with the economic recovery. In addition, the impact of government spending on total employment seems to be higher during recessions (particularly in private sector employment). However, the expenditure shock could stimulate inflation during expansions and generate deflationary responses during recessions. According to Batini, Callegari, and Melina (2012), for countries in a recession (and facing high-risk premium on debt), a smooth and gradual consolidation is preferred to an aggressive austerity, in order to avoid an excessive recessive impact on output (which does not compromise the debt ratio).

Measuring the rigidity of labour market (using an index of protection of labour relations and another one for labour market regulation), Auerbach and Gorodnichenko (2011) found that output responses during recessions increase when the rigidity in the labour market is higher, which is consistent with the view that labour rigidity enhances the effectiveness of fiscal policy during recessions.

Corroborating these perspectives, in a study on OECD countries, Riera-Crichton, Végh, and Vuletin (2015) argued that while in recession, the spending multiplier is 0.73, and that during expansions, the value stands at 0.09 (which is not significantly different from zero). Under countercyclical policies, this value is smaller during a boom, as the reduction in government spending is offset by increases in consumption and net exports, which, in turn, reduces inflationary pressures. On the other hand, during a recession, an increase would have a positive and statistically significant effect on output, as it would lead to an increase in consumption and investment, as net exports and inflation would tend to decrease (which is consistent with the Keynesian theory).

However, Riera-Crichton, Végh, and Vuletin (2015) also discovered that in many cases (44%) pro-cyclical policy measures (related to public expenditure) are observed, rather than countercyclical ones. As the economic response does not appear to be symmetric for both types of policies, the authors found evidence that during recessionary periods, the long-run fiscal multiplier can achieve the value of 2.3. By computing the value of multipliers depending on the phase of the business cycle and the type of policy adopted, the authors found the following situations can ocurr: i) when there is a decrease in government spending during an expansion – the multiplier assumes the value of zero at any horizon; ii) in the case of an increase in government spending during an expansion – the multiplier is 1.13 (1.25 after 2 years); iii) with a decrease in government spending during a recession the multiplier is 0.76, and; iv) an increase in government spending during a recession leads to the multiplier having the value of 0.68 (2.28 after 2 years).

The value of fiscal multipliers also depends on the relationship between the fiscal mechanism used and the reaction of the private sector. In this context, in the literature, there seems to exist a crowding-in/crowding-out pattern effect of government spending and taxation. Blanchard and Perotti (2002) argued that private consumption is crowded out by taxation, and crowded in by government spending, which is difficult to reconcile with a neoclassical model, and is consistent with a Keynesian model. On the contrary, private investment is crowd out by both government spending and taxation, which implies a strong negative effect on private investment of a fiscal

expansion, which is consistent with the neoclassical model. The root of this difference is based on the responses of investment to an increase in expenditure, which depends on the relative strength of the effects preceded by an increase in both output and interest rates, although in both theories increases in public spending and taxes have opposite effects on investment. In Boussard, Castro, and Salto (2012) it is argued that fiscal shocks lead to crowding-out effects (due to the interest rates) and to a fiscal multiplier greater than 1; however, if the stimulus is large enough, the multiplier can be close to 1, as the marginal product of capital and the investment compensate the decrease in consumption.

The choice between government spending or tax cuts was studied by Barrel, Holland, and Hurst (2012), who said that multipliers generated by income taxes and benefits adjustments are small, as they can be offset by a temporary change in savings rate. The opposite occurs with spending cuts, where an impact on unemployment and on goods and services bought could be expected. Furthermore, in Boussard, Castro, and Salto (2012), it is argued that short-term multipliers face expenditure shocks rather than tax shocks, and that because of this, there is a fundamental trade-off between short-run pain and long-term gain. This issue can be compounded by price rigidities, as firms can easily respond to shocks in aggregate demand by changing output, rather than by changing prices.

According to Ilzetski, Mendoza, and Végh (2013), countries under predetermined exchange rate regimes used to have long-run multipliers higher than 1 (note that under the currency union, if private demand rises together with public demand, then the multiplier exceeds the unity, assuming that net exports remain unchanged) (Born, Jüssen, and Müller 2013). Under a flexible exchange rate, the multipliers are close to zero. The differences between responses to fiscal shocks are related with the degree of monetary accommodation. These results are consistent with the Mundell-Fleming model, especially the results related to the efficacy of fiscal policy. In Zubairy (2014), it is argued that responses of monetary policymakers shift the output from the steady state, which is important when determining movements of interest rates and when limiting the impact of spending shocks.

With regards to the speed of action of monetary policy, Barrel, Holland, and Hurst (2012) studied the differences between the scenario where a monetary action takes place during the first year, and the scenario where the interest rate is fixed during the first year. A faster response would reduce the fiscal multipliers during the first three years, but raises the values during the subsequent ones. In addition, the authors realized that at zero lower bound, interest rates cannot fall, although output could fall by 0.1 p.p. more than during the counterfactual scenario.

The importance of the monetary policy reaction (by managing interest rates) is shown in Leeper, Traum, and Walker (2017), where the expected inflation in the Taylor Rule can explain about 10% of impact multipliers. The Keynesian liquidity trap can be crucial, as if nominal interest rates remain at zero lower bound, this should increase the spending multiplier to values well above that of unity. In addition, Minea and Mustea (2015) highlight the importance of a strong coordination regarding monetary policy to promote a higher cohesion, coordination, and consequently, a more effective fiscal policy (which is a reliable tool when facing an economic crisis).

Empirical studies on the Eurozone countries have shown that output positively responds to a positive shock in public spending. In Combes et al. (2014), both expenditure and tax multipliers seemed to be significantly different in those countries most affected by the Eurozone crisis (Greece, Italy, Portugal, and Spain), and these countries had a higher expenditure multiplier and a more Keynesian response to spending shocks.

Table 1 summarizes some of the values found in the literature for the fiscal multipliers.

III. Methodology and data

As argued by Blanchard and Perotti (2002), the VAR approach may be one of the best-suited methods for the study of fiscal policy (contrary to monetary policy), for two reasons. First, fiscal variables move for several reasons, including many exogenous (with respect to output) fiscal shocks. Second, decision and implementation lags in fiscal policy

Table 1. Multiplier values in the literature.

Article	Sample	Period	Method	Shock	Signal	Control Factor	Impact Multiplier	Cumulative Multiplier
Combes et al. (2016)	CEEC	1999–2013	PVMEC	Government Expenditure	+	:	0.09	0.21
					+	Low Income	0.11	0.22
					+	High Income	0.05	0.11
					+	Low Debt	0.1	0.28
					+	High Debt	0.06	0.1
					+	Low Openess	0.11	0.26
					+	High Openess	0.08	0.13
Combes et al. (2014)	Eurozone	1999–2012	PVAR	Government Expenditure	+	:	≈0	0.26
				Taxes	-	:	0.25	1.85
				Government Expenditure	+	Crisis	0.09	1.26
				Taxes	-	Crisis	0.28	1.55
Riera-Crichton, Vegh and Vuletin (2014)	OECD	1986–2008	LSDV (linear local projections)	Government Expenditure	:	:	0.31	0.40
					:	Expansion	0.09	0.09
					:	Recession	0.73	1.25
					:	Extreme Expansion	≈0	≈0
					:	Extreme Recession	1.25	2.08
					+	:	0.49	1.36
					-	:	≈0	≈0
					+	Expansion	1.13	1.25
					-	Expansion	≈0	≈0
					+	Recession	0.68	2.28
					-	Recession	0.76	0.79
Zubairy (2014)	USA	1958–2008	DSGE	Government Expenditure	+	:	1.12	0.85
				Labor Tax	-	:	0.13	0.34
				Capital Tax	-	:	0.33	0.36
Ilzetzki et al (2013)	20 High-income 24 Developing	1960–2007	SVAR	Government Consumption	+	High-Income	0.37	0.80
					+	Developing	−0.21	0.18
					+	Predetermined Exchange Rate	0.09	1.50
					+	Flexible Exhange Rate	−0.30	≈0
					+	Open Econ.	0.02	1.29
					+	Closed Econ.	−0.28	−0.75
					+	High Debt	≈0	−2.30
				Government Investment	+	High-Income	0.41	1.15
					+	Developing	0.57	0.75
Auerbach and Gorodnichenko 2011)	OECD	1985–2008	SVAR	Government Expenditure	+	:	:	0.31
			Direct Projections		+	:	:	0.46
			Direct Projections (FE)		+	Expansion	:	−0.20
			Direct Projections (FE)		+	Recession	:	0.46
Barrel, Holland, and Hurst (2012)	OECD	2010–2012	NiGEM	Government Consumption	-	Temporary Innovations	−0.63	:
				Indirect Taxes	+	Temporary Innovations	−0.09	:
				Direct Taxes	+	Temporary Innovations	−0.14	:
				Government Consumption	-	Permanent Consolidation	−0.58	:
				Indirect Taxes	+	Permanent Consolidation	−0.08	:
				Direct Taxes	+	Permanent Consolidation	−0.12	:
Born, Jüben and Müller (2013)	OECD	1985–2011	SVAR	Government Expenditure	+	Fixed Exchange Rate	1.25	1.00
					+	Floating Exchange Rate	0.45	0.55
Ilzetski, Mendoza, and Végh (2013)	20 High-income 24 Developing	1960–2007	SVAR	Government Consumption	+	High-Income	0.37	0.80
					+	Developing	−0.21	0.18
					+	Predetermined Exchange Rate	0.09	1.50
					+	Flexible Exhange Rate	−0.30	≈0
					+	Open Econ.	0.02	1.29
					+	Closed Econ.	−0.28	−0.75
					+	High Debt	≈0	−2.30
				Government Investment	+	High-Income	0.41	1.15
					+	Developing	0.57	0.75
Blanchard and Perotti (2002)	USA	1960–1997	SVAR	Government Expenditure	+	:	0.84	1.29
				Taxes	+	:	−0.69	−0.78

imply that, at a high enough frequency, there is a little or no discretionary response of fiscal policy to unexpected contemporaneous movements in economic activity. In a related study, Afonso, Agnello, and Furceri (2010) decomposed both government spending and government revenue into three components: responsiveness, persistence, and discretion, where discretion is not related to the business cycle and neither is it related to the autoregressive stickiness of the fiscal variables. Nevertheless, this approach does encompass the simultaneous response of all the variables in an SVAR set-up.

In order to assess the value of the multipliers from a shock in primary government expenditure and in tax revenue, we distinguished the taxes on Income and wealth and on Production and imports. All variables are presented in real terms, per capita, with logarithms and, with the exception of GDP, all the variables are presented with differences in respect to the unit root test. The estimation of the fiscal multiplier was based on the reduced-form VAR model, with four lags (which verifies the stability condition):

$$A(L)Y_t = u_t \tag{1}$$

Y_t denotes a vector containing the output and the fiscal variables, A(L) is an autoregressive lag polynomial, and u_t represents a correlated error term. Next, the structural uncorrelated shocks ε_t were computed.

In this way, an SVAR model was designed using a recursive identification based on the Cholesky decomposition of the variance-covariance matrix of the reduced-form VAR shocks. The ordering in the SVAR, from the most to the least exogenous, is the following: Taxes on Income and wealth – Taxes on Production and imports – Primary expenditure – GDP, as presented in Blanchard and Perotti (2002). In this case, taxes have a direct impact on output, although they might also have a role of financing government expenditure. In turn, government expenditure has a contemporaneous impact on output, but not on tax revenue. Following a Cholesky matrix, the first-ordered shock does not react contemporaneously to any shocks in the system; however, the second one only reacts to the first shock, and so on. Non-zero restrictions were then introduced in the matrix to represent the sensitivity of taxes to changes in GDP, including tax elasticities (with the values of 1.1 for income and wealth taxes, and 0.9 for production and imports).[2] As the primary expenditure elasticity is almost null,[3] its value was not considered (zero-restriction).

The four-variable VAR model equation has the following form:

$$\begin{bmatrix} 1 & 0 & 0 & 1.1 \\ \alpha_{pTiT} & 1 & 0 & 0.9 \\ \alpha_{giT} & \alpha_{gpT} & 1 & 0 \\ \alpha_{yiT} & \alpha_{ypT} & \alpha_{yg} & 1 \end{bmatrix} \begin{bmatrix} u_t^{iT} \\ u_t^{pT} \\ u_t^{g} \\ u_t^{y} \end{bmatrix} \tag{2}$$

where g denotes government expenditures, y the output, iT is the Income and wealth taxes revenue, and pT is the tax revenue from Production and imports.

The fiscal multiplier is then computed as an accumulated change in output to a quarterly variation in the fiscal variable,[4] by imposing a set of quarterly exogenous shocks (1 s.d. innovation) and by assessing the response of GDP, as we assume that the multiplier is linear (i.e. it is not sensitive to the magnitude of the shock). The multiplier is thus calculated by $\frac{\sum_0^{t+3} \Delta y_t}{\sum_0^t \Delta (iT/pT/g)_t}$.

IV. Estimation and results

We used different country sample settings in the estimations to assess the value of the fiscal multipliers, and also to understand how they may vary according to specific factors. For the baseline estimation for the period 2000Q1-2016Q4, the sample is composed of Eurozone countries (EA19) with a dummy variable to exclude the countries during the period when they did not belong to the EMU. In a second stage, a dummy for high levels of public debt is included, with a threshold of 60% of GDP, in order to split the countries between those with amounts under and above this value. The third stage focuses on growth in GDP, in order to perceive how the multipliers could vary, depending on

[2]Based on Mourre and Princen (2015) and Wolswijk (2007).
[3]See Prince, Dang, and Botev (2015).
[4]For example, if the quarterly shock is 0.1 and the annual response is 0.06, then this would be equivalent to a shock of 1%, with a response of 0.6% (a multiplier of 0.6).

whether the countries are in an expansion or a recession. For simplification, the annual growth rate (the sum of all the quarters of each year) was considered, and a recession was understood to be an annual decrease in GDP. Finally, in a last estimation, a dummy is added for the output gap (gap between the current GDP and the potential GDP – using annual data from AMECO), thus differentiating countries with an output under and above their potential GDP. Appendix A provides the description of the data used.

We use a default size of 95% for the confidence interval. The graphical representations of the impulse response functions are presented in Appendix B.

Baseline estimation

According to the baseline results (in Table 2), the value of the primary expenditure (accumulated) multiplier is 0.44 when facing a quarterly shock, in the EA19 between 2000 and 2016. In other words, by proportion, in response to a quarterly exogenous shock in primary expenditure (of +1%), GDP is expected to increase by 0.44% at the end of the first year (4 quarters). Moreover, the value is predicted to increase to 0.62 at the end of the second year.

A 1% increase in Income and wealth taxes' revenue is supposed to have a recessionary impact on GDP of 0.11%, achieving 0.58% over 8 quarters.

With regards to an increase in Production and imports taxes' revenue, the multiplier is expected to be −0.55; however, on the contrary, the remaining shocks slightly decrease at the end of the second year (−0.48).

As primary expenditure is higher at the end of the second year (showing a stronger impact on GDP), this appears to be an effective tool for dealing with the business cycle, which could be explained by the direct impact on demand generated by an expenditure shock, whereas a Production and imports tax shock would be accommodated by (lower than 1) price-demand elasticity.

It should be noted that, with the exception of Production and imports taxes, all the Impulse Reaction Functions (IRF) are significantly different from zero, with a confidence interval of 95%, which proves the robustness of the sign of the responses. In addition, the confidence interval is narrow enough during the first year to provide a strong clue of its magnitude. However, as the confidence interval becomes too broad during the following quarters, our analysis focuses on the annual multiplier.

Debt-dependent estimation

We have also accounted for the level of the debt ratio, with a dividing threshold of 60%. When observing the results (see Table 3), in the case of countries with high levels of public debt, the primary expenditure multiplier is 0.29, the Income and wealth taxes multiplier is −0.26, and the multiplier for Production and imports taxes is −0.75.

On the contrary, with countries with a public debt lower than 60% of GDP, primary expenditure seems to be greater than the unity at the end of the first year (1.09) and the tax multipliers seem to have positive signs. An Income and wealth taxes shock has a multiplier of 0.26, and Production and imports taxes have a value of 0.24. The confidence provided by a better fiscal performance and by a stronger redistribution could be the root of this expansionary result.

Table 2. Multiplier estimations for the baseline sample.

Fiscal Multipliers: +1 s.d. innovation shock			NOVO 4 lags
Variable	Characteristic	Period (quarters)	Multiplier
Primary Expenditure	:	4	0.44
Primary Expenditure	:	8	0.62
Income and Wealth Taxes	:	4	−0.11
Income and Wealth Taxes	:	8	−0.58
Production and Imports Taxes	:	4	−0.55
Production and Imports Taxes	:	8	−0.48

Table 3. Multiplier estimations of the debt-dependent sample.

Fiscal Multipliers: +1 s.d. innovation shock			NOVO 4 lags
Variable	Characteristic	Period (quarters)	Multiplier
Primary Expenditure	Debt > 60%	4	0.29
Primary Expenditure	Debt < 60%	4	1.09
Income and Wealth Taxes	Debt > 60%	4	−0.26
Income and Wealth Taxes	Debt < 60%	4	0.26
Production and Imports Taxes	Debt > 60%	4	−0.75
Production and Imports Taxes	Debt < 60%	4	0.29

Therefore, the expenditure multipliers seem to be higher in countries with lower levels of public debt – at least during the first year. This result corroborates with the figures presented by Combes et al. (2016) which reached the same conclusion for Central and Eastern European countries.

Although the effect on long-term interest rates (Spilimbergo, Symansky, and Schindler 2009) and the propensity to consume (Brinca et al. 2016) are predicted to be higher under a liquidity constraint scenario, the negative effects generated by an excessive accumulation of debt, seems to partially offset the fiscal stimulus, especially on the risk premium (Reinhart and Rogoff 2010).

Growth-dependent estimation

We then went on to consider the relevance of computing fiscal multipliers during recession periods. The results (see Table 4) show that the primary expenditure multiplier is higher during recessions than during expansions – achieving values above unity (1.51), which corroborates with some of the literature which points to a higher effectiveness of public expenditure during recessions (e.g. Auerbach and Gorodnichenko 2011; Combes et al. 2014). This could be understood to be due to a higher need for subsidies and transfers by agents who have a high propensity to consume. In addition, whereas during an expansion a hypothetical decrease in public expenditure is offset by the increase in consumption and net exports, during a recession, expenditure has a higher effect on output, thus increasing consumption and investment, whereas net exports tend to decrease (Riera-Crichton et al., 2015).

The Income and wealth multiplier also shows a higher (negative) value during recessions, with a stronger impact (−1.75) on consumption and investment decisions.

Contrary to the previous multipliers, the Production and imports multipliers seem to generate a higher effect on GDP during expansions. Whilst the multiplier has value greater than unity in expansions (−1.17), it has an almost null impact (positive) during recessions. A positive shock for this type of taxes can represent a disincentive for private consumption, which represents that a possible reason for this expansionary multiplier could be the macroeconomic effects provided by an external indebtedness deleveraging.

Nevertheless, supporting the Keynesian theory, the results (with the exception of Production and import taxes) show that the fiscal policy is more effective when applying countercyclical policies – i.e. by increasing expenditure and providing higher incomes during recessions, and by applying higher taxes during expansions (the recessive impact would be lower).

Nevertheless, it can be perceived in Table 4 that the impacts of quarterly expenditure shocks are substantially higher in less-indebted countries (at least during the first year) and during recessions. This finding may call for a special attention to the risks of fiscal consolidations strategies (restrictive, pro-cyclical policies) based on expenditure cuts (which is sometimes inherent for indebtedness processes) and also to the relevance of a controlled debt level, providing a fiscal space to apply counter-cyclical measures.

Output gap-dependent estimation

For further robustness, we considered the relevance of positive and negative output gaps. The results (in

Table 4. Multiplier estimations of the growth-dependent sample.

Fiscal Multipliers: +1 s.d. innovation shock			NOVO 4 lags
Variable	Characteristic	Period (quarters)	Multiplier
Primary Expenditure	Expansion	4	−0.17
Primary Expenditure	Recession	4	1.51
Income and Wealth Taxes	Expansion	4	−0.18
Income and Wealth Taxes	Recession	4	−1.75
Production and Imports Taxes	Expansion	4	−1.17
Production and Imports Taxes	Recession	4	0.07

Table 5. Multiplier estimations of the output gap dependent sample.

Fiscal Multipliers: +1 s.d. innovation shock			NOVO 4 lags
Variable	Characteristic	Period (quarters)	Multiplier
Primary Expenditure	OutputGap > 0%	4	0.07
Primary Expenditure	OutputGap < 0%	4	0.20
Income and Wealth Taxes	OutputGap > 0%	4	−0.52
Income and Wealth Taxes	OutputGap < 0%	4	0.00
Production and Imports Taxes	OutputGap > 0%	4	−0.44
Production and Imports Taxes	OutputGap < 0%	4	0.08

Table 5) show that in countries where outputs are above their potential GDP (i.e. when the output gap is positive), the primary expenditure multiplier is predicted to be very small (0.07). Regarding tax multipliers, the annual multipliers seem to be higher, where the multiplier of Income and wealth taxes is −0.52 and −0.44 for Production and imports taxes.

On the other hand, countries with negative output gaps seem to have lower multipliers. The primary expenditure multiplier was 0.20, with both taxes having multipliers close to zero (which is positive for indirect taxes).

The estimation shows that the fiscal policy produces better results during 'bad times', when there is a need for State intervention to apply counter-cyclical measures which are more effective.

Assessing the results of all the dependent estimations together, we can conclude that public spending is more effective during recessions/"bad times" and that financing public expenditure with indirect tax revenues (by making an effort to control the debt level) to apply counter-cyclical policies seems to be the optimal strategy.

V. Conclusions

According to the literature, the uncertainty and the non-linear responses of fiscal stimulus during the Great Recession brought the sign and magnitude of fiscal multipliers to the centre of the debate. Accordingly, this study aims to compute the value of fiscal multipliers, namely of government expenditure, Income and wealth, and Production and import taxes, in the Eurozone countries since the creation of the currency union. In addition, we also aimed to understand how these values vary according to the level of public debt, the pace of economic growth, and the output gap.

After discussing some contributions in the literature regarding fiscal multipliers and the underlying theories, we conclude that, according to our estimations, government expenditure had a positive effect on output during the period 2000–2016, with an annual accumulated multiplier of 0.44 (0.62 after two years). The tax multipliers presented negative signs, whereby the multipliers for Income and wealth and Production and import taxes, respectively, stood at −0.11 (−0.58) and −0.55 (−0.48).

Furthermore, for countries with high levels of public debt, the computed primary expenditure has a smaller multiplier (0.29 in our study). The Income and wealth tax multiplier is −0.26, and for the Production and imports taxes, it is −0.75. On the other hand, for countries with public debt under 60% of GDP, the annual expenditure multiplier seems to be above the unity (1.09) and the tax multipliers seem to have positive signs. The difference between multipliers depending on the debt level could be related to the negative effects provided by an excessive accumulation of debt, namely on risk premium.

In addition, the primary expenditure multiplier seems to be higher during recessions than during expansions, achieving values above unity in the first year (1.51, compared with the slightly recessive multiplier during expansions of −0.17). This result could support the Keynesian theory, which reflects the effectiveness of automatic stabilizers and supports that fiscal policy is expected to be more effective when applying countercyclical policies (which corroborates with Auerbach and Gorodnichenko 2011; Combes et al. 2014). Regarding tax multipliers, while Income and wealth taxes seem to be highly recessive during recessions (with just a small impact during expansions), Production and imports taxes are highly recessive during expansions (and slightly positive during recessions).

Lastly, countries with negative output gaps presented a higher primary expenditure multiplier of 0.20 (0.07 when the output gap is positive) and almost null tax multipliers (−0.52 and −0.44 for direct and indirect taxes, for positive output gaps, respectively).

During the recent economic crisis, several countries were subject to stringent fiscal consolidations, whereby spending cuts and tax increases were applied to highly indebted countries that faced recession. Following our results, we can conclude that this may not be the best strategy to boost economic growth, as the response is expected to be recessive under these conditions. Furthermore, we find that primary expenditure is more effective during recessions/"bad times", and that financing public spending with indirect taxes (in an effort to control the debt level) to apply counter-cyclical policies could be the optimal strategy.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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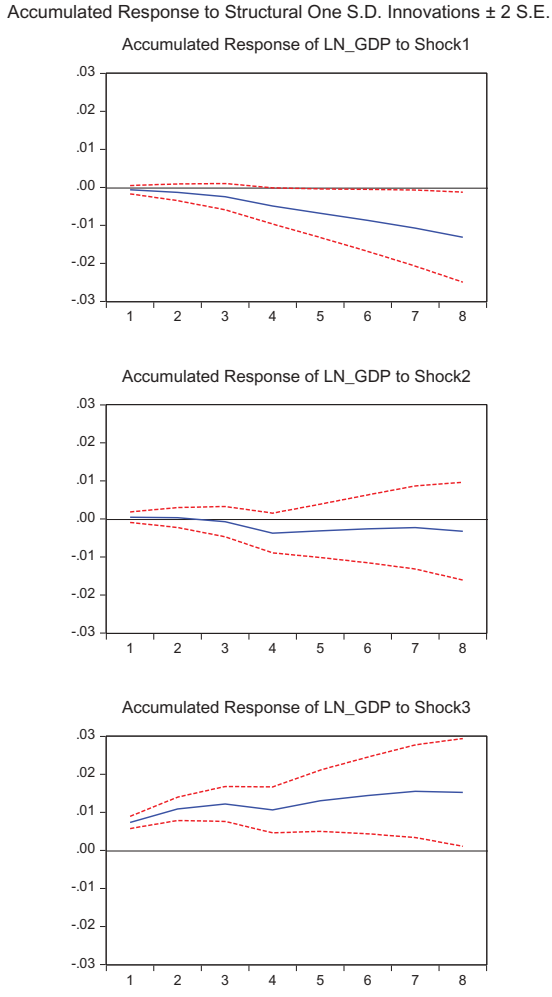
Appendix A. Descriptive statistics of variables

	Mean	Median	Maximum	Minimum	Std.Dev.	Kurtosis	Observ
GDP	25,869.9	23,243.3	83,312.8	3157.8	15,447.3	6.59	1292
Primary Expenditure	11,001.6	9281.2	34,560.6	694.6	6760.2	5.21	1256
Income and Wealth Taxes	3054.4	2285.1	12,497.1	155.4	2353.5	5.89	1256
Production and Imports Taxes	3276.3	2913.7	10,845.6	259.8	1917.7	6.58	1256
Debt	61.6	59.7	181.0	3.3	36.1	3.13	1289

Appendix B. Graphic representation of the estimations[5]

Baseline Estimation



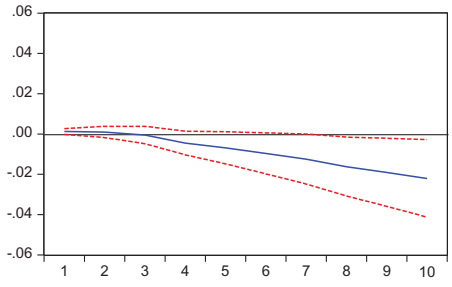
[5]Shock1: 1 S.D. innovation in the logarithm of Income and wealth taxes revenue (in differences);

Debt-Dependent Estimation

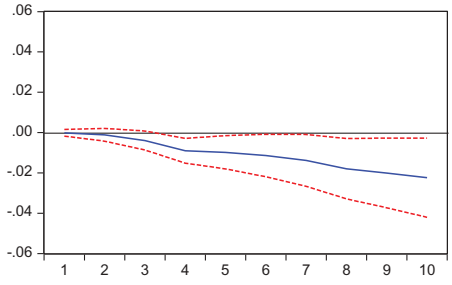
Public Debt > 60% of GDP

Accumulated Response to Structural One S.D. Innovations ± 2 S.E.

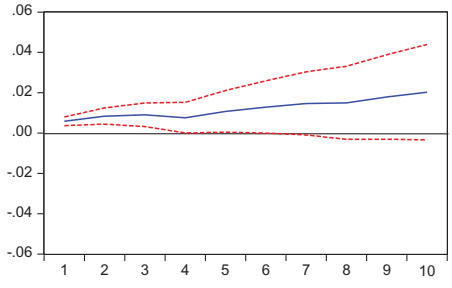
Accumulated Response of LN_GDP to Shock1



Accumulated Response of LN_GDP to Shock2



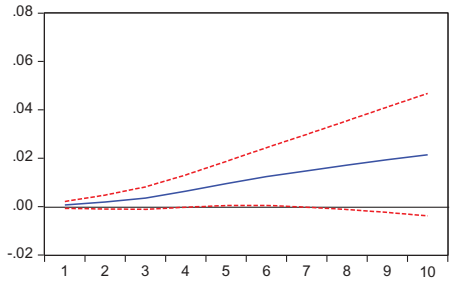
Accumulated Response of LN_GDP to Shock3



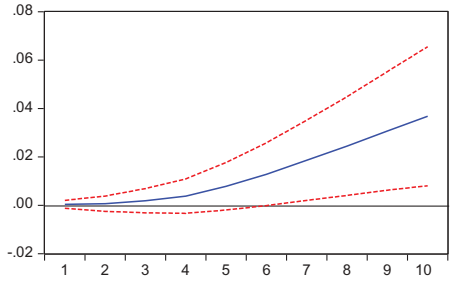
Public Debt < 60% of GDP

Accumulated Response to Structural One S.D. Innovations ± 2 S.E.

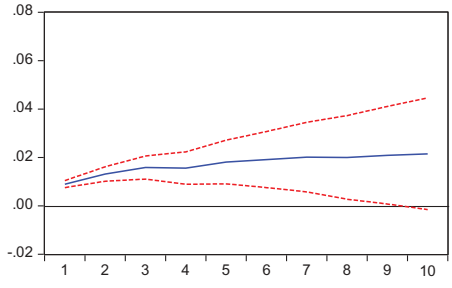
Accumulated Response of LN_GDP to Shock1



Accumulated Response of LN_GDP to Shock2



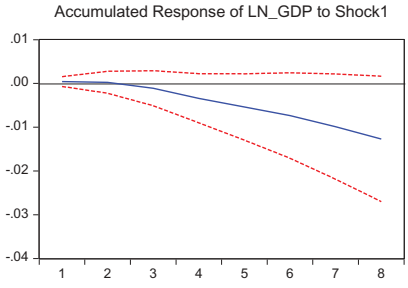
Accumulated Response of LN_GDP to Shock3

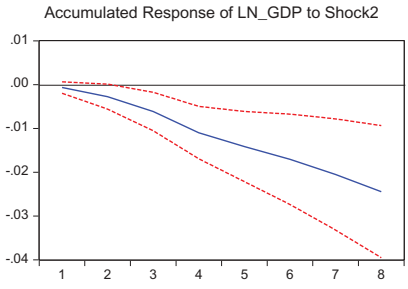


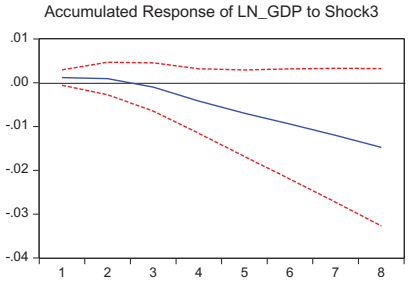
Growth-Dependent Estimation

GDP Growth > 0%

Accumulated Response to Structural One S.D. Innovations ± 2 S.E.

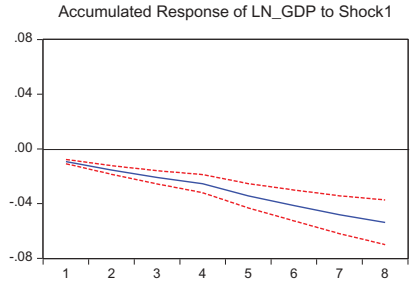


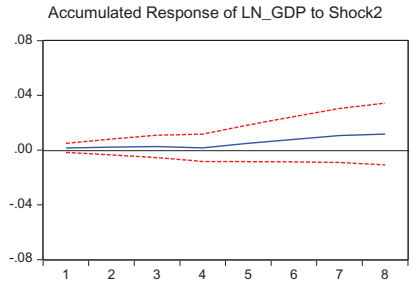


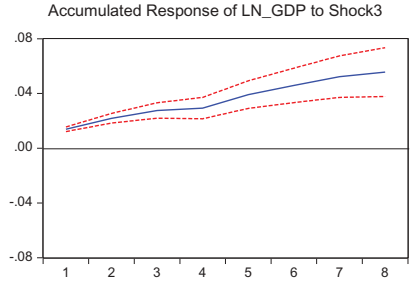


GDP Growth < 0%

Accumulated Response to Structural One S.D. Innovations ± 2 S.E.



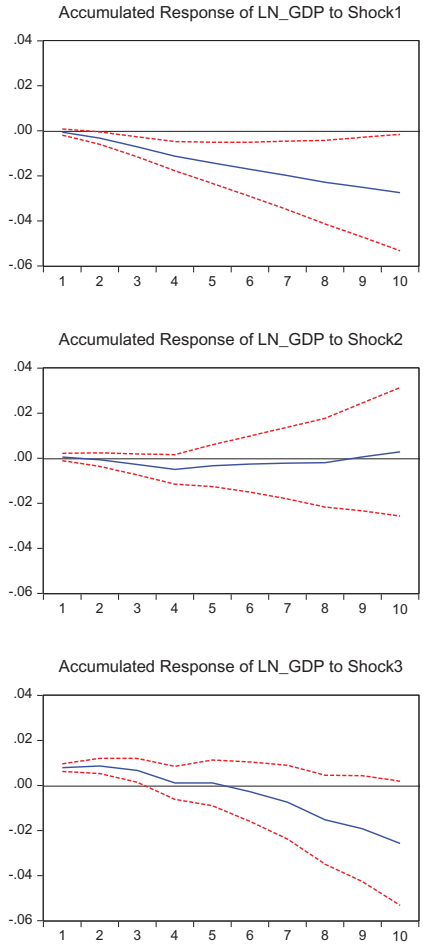




Output Gap-Dependent Estimation

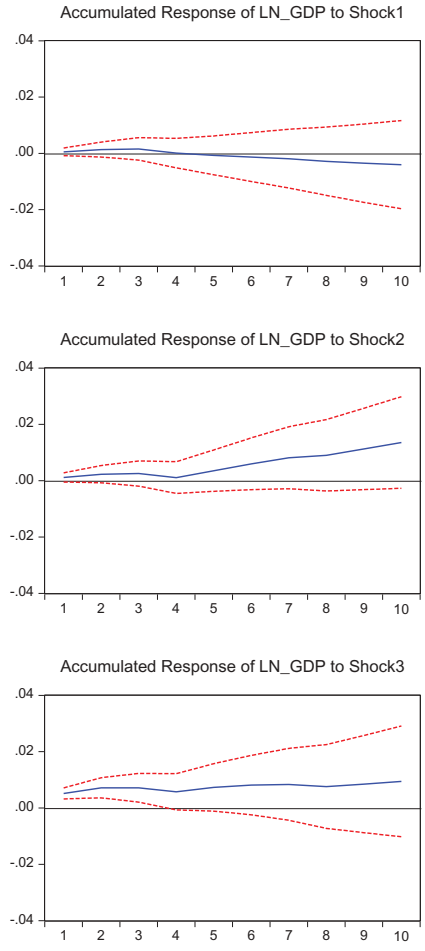
Output Gap > 0% Potential GDP

Accumulated Response to Structural One S.D. Innovations ± 2 S.E.



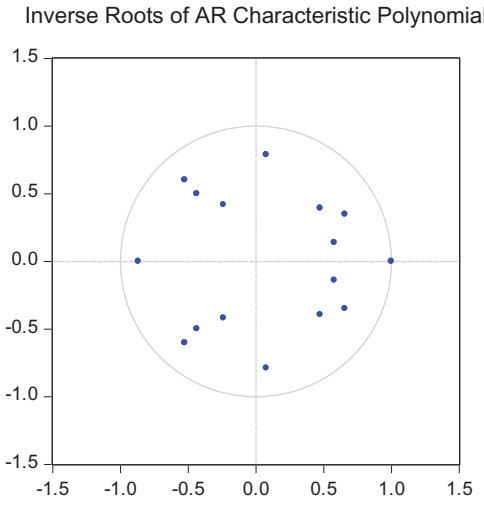
Output Gap > 0% Potential GDP

Accumulated Response to Structural One S.D. Innovations ± 2 S.E.

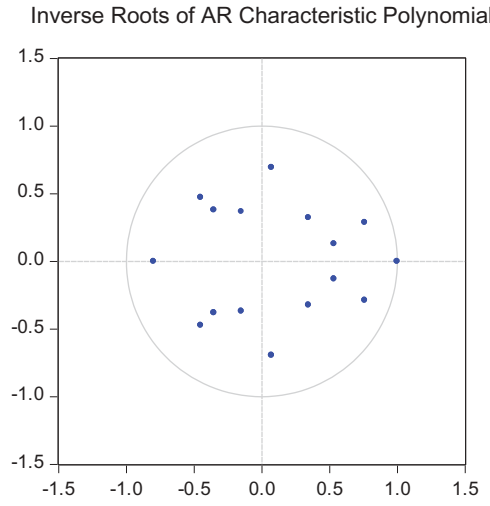


Appendix C. VAR stability condition check

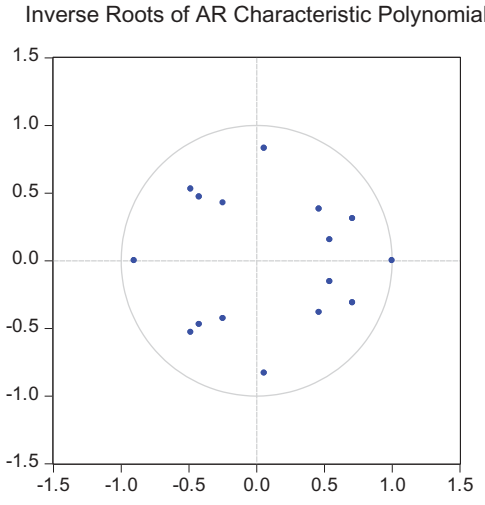
Roots of Characteristic Polynomial



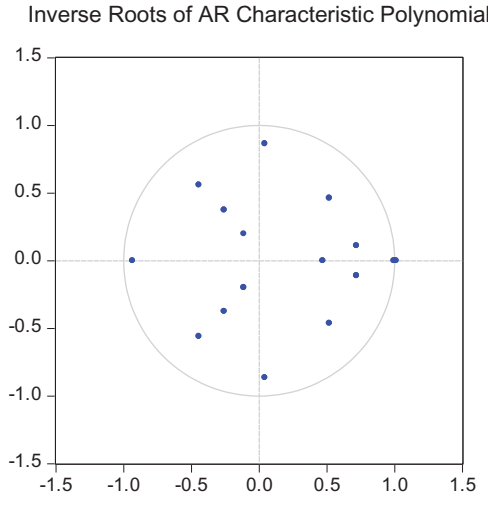
Baseline Estimation



Debt-Dependent Estimation (high)



Growth–Dependent Estimation (high)



Output Gap-Dependent Estimation (high)