wiiw

Working Paper 130

OCTOBER 2016

# Did Fiscal Consolidation Cause the Double-Dip Recession in the Euro Area?

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The Institute for New Economic Thinking supported this work under Grant INO1500015.

# Abstract

This paper analyses the short-run effects of fiscal consolidation measures on economic activity in the euro area during the euro crisis. It presents new econometric estimates on the link between cumulative GDP growth and fiscal austerity measures during 2011-2013. The main empirical finding is that the depth of the economic crisis in the euro area's economies is closely related to the harshness of fiscal austerity. Cumulative multiplier estimates are found to vary in a range from 1.4 to 2.1, depending on the data source used to identify the intensity of fiscal consolidation. Given these multiplier values, a reasonable approximation of the size of the output losses due to fiscal austerity in the euro area during 2011-2013 is in the range of 5.5% to 8.4% of GDP. Against the background of the prevailing macroeconomic and institutional circumstances, fiscal consolidation is argued to be the cause of the double-dip recession.



Keywords: fiscal policy, fiscal multiplier, fiscal consolidation, austerity, growth, eurozone

JEL classification: E61, E62, E63

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# 1. Introduction

Since 2010/2011, fiscal consolidation has been a central feature of crisis management in the euro area. Fiscal consolidation measures are defined as cuts in government spending and/or tax increases, motivated by the policy-makers' desire to cut the fiscal deficit. What was the short-run impact of fiscal austerity on economic activity in the euro area? This paper analyses the 'short-run' growth effects of fiscal consolidation measures in the sense that it provides estimates on cumulative multipliers for the three-year period 2011-2013, while it does not estimate the long-run (hysteresis) effects of the austerity policies under study. The research goal of this paper is to contribute to explaining the role of fiscal policy in the euro area's double-dip recession, which started after the third quarter of 2011 and developed into a prolonged recession in 2012 and 2013 (CEPR, 2015).

The main contributions of the analysis are as follows. First, we present new econometric estimates on the link between cumulative real GDP growth and fiscal consolidation measures in the euro area. The econometric baseline results are used to obtain estimates on the size of cumulative GDP losses in the euro area during 2011-2013, which are then related to already existing estimates. Second, the paper focuses on the time period of the double-dip recession (2011-2013), which has so far received little attention in the macro econometric literature. Third, this paper looks at a variety of data sources to measure fiscal consolidation. Specifically, we use changes in the structural budget balance, an approach that Blanchard and Leigh (2013) have proposed in a seminal paper; but we also consider the 'narrative record' from budgets and policy documents in the spirit of Romer and Romer (2010) to identify size and timing of fiscal consolidation measures. This multi-data-sources-approach offers the advantage of allowing for an evaluation of whether the econometric results on the effects of fiscal austerity are consistent across different approaches to identifying fiscal consolidation. The fourth contribution of this paper is to provide an integrated discussion on the role of the institutional and macroeconomic circumstances in the euro area with regard to the determinants of the size of fiscal multipliers.

What are the main findings? First, the empirical evidence points to a strong negative correlation between cumulative GDP growth and fiscal consolidation measures in the euro area's economies during 2011-2013. The depth of the economic crisis was closely associated with the harshness of fiscal consolidation. Cumulative multiplier estimates range from 1.4 to 2.1, depending on the data source used to measure the extent of fiscal austerity. This econometric finding is consistent with reviewing the fiscal multiplier literature, emphasising key conditions for fiscal multipliers higher than 1.0 that were fulfilled in large parts of the euro area. Second, using the econometric results as an approximation for the size of fiscal multipliers during 2011-2013 leads to a range of cumulative output losses due to fiscal austerity from about 5.5% to 8.4% of GDP. Under the macroeconomic and institutional circumstances prevailing in the euro area over the time period studied, fiscal consolidation is the cause of the double-dip recession.

The remainder of this paper is structured as follows: Section 2 reviews the literature on fiscal multipliers. Section 3 describes the econometric strategy for analysing the link between cumulative GDP growth and fiscal consolidation measures. Section 4 presents the baseline econometric results and relates them to existing estimates from the literature on the size of GDP losses from fiscal consolidation in the euro area. Section 5 provides several robustness checks, as we account for the role of outliers, vary the country group and control for additional variables. Section 6 summarises and concludes.

# 2. Which factors determine the size of fiscal multipliers?

The fiscal multiplier is typically defined as the ratio of a change in real GDP to an exogenous change in the fiscal balance (e.g. Batini et al., 2014). Several studies demonstrate that multiplier values reported in the literature vary substantially (e.g. Hemming, 2002; Fatas and Mihov, 2009; Gechert and Rannenberg, 2014; Alesina et al., 2015). The literature suggests that numerous factors affect the size of multipliers: monetary policy accommodation, the composition of fiscal consolidation (spending-based vs. tax-based), the initial level of public indebtedness, the exchange-rate regime, the openness of the economy, spillover effects with other economies, and the international business environment (e.g. Ramey, 2011; Arestis, 2012; Barrell et al., 2012; Ilzetzki et al., 2013). Gechert and Rannenberg (2014) conduct a meta-regression analysis of 98 empirical studies to study whether fiscal multipliers vary with the business cycle. They find that multipliers increase by 0.6 to 0.8 units during an economic downturn and report that spending multipliers are markedly higher than tax multipliers, especially during recessions. During 'normal' economic times and during booms, fiscal multipliers are not only lower than in downturns; they also vary less across different fiscal instruments. Several multiplier studies from recent years report that multipliers are substantially higher when economic resources are underutilised (e.g. DeLong and Summers, 2012; Charles et al., 2015; Fazzari et al., 2015; Qazizada and Stockhammer, 2015; Jorda and Taylor, 2016).

## 2.1. MULTIPLIERS IN CRISIS TIMES

In what follows, we focus on the literature on the size of multipliers in crisis times. The case of severe restrictions in conventional monetary policy effectiveness due to the zero lower bound of nominal interest rates (ZLB) has gained relevance since the outbreak of the financial crisis in 2008. This is especially the case in the mainstream New-Keynesian literature, where it is argued that fiscal multipliers are substantially higher than 1.0 if central banks are constrained by the ZLB in their ability to stimulate the economy with interest rate cuts (e.g. Christiano et al., 2011; Woodford, 2011).

Another research strand in the multiplier literature investigates how characteristics of financial crises and their aftermaths might influence fiscal policy effectiveness. For example, Corsetti et al. (2012) report that fiscal multipliers are significantly above 2.0 during times of financial crisis. Eggertsson and Krugman (2012) show that in a New-Keynesian model of debt-driven slumps, where agents in the private sector are forced into rapid deleveraging, the result is a multiplier in excess of 1. Koo (2013) argues that fiscal multipliers are markedly higher than 1.0 as long as the private sector is collectively minimising debt after an asset price bubble has burst, because the deleveraging acts as a drag on aggregate demand.

The arguments presented above have implications for the research question on the effects of fiscal consolidation measures on output, because conditions for multipliers in excess of 1.0 were actually fulfilled in the euro area during 2011-2013. The ECB was severely constrained in its ability to stimulate the economy by cutting interest rates because of the ZLB (e.g. Coeure, 2012). In large parts of the European Monetary Union, the private sector was in the process of deleveraging (see Koo, 2015:

pp. 219-229), and therefore not in a position to borrow – even at very low interest rates –, which impaired the effectiveness of monetary policy. Furthermore, the monetary union is a fixed exchange-rate regime, in which individual member countries do not have control over the currency in which they issue debt (De Grauwe, 2012). Therefore, currency devaluations were not available to stressed countries in order to increase price competitiveness vis-a-vis main trading partners and stimulate the economy via an increase in exports. Also, the initial position of euro area economies in 2010/2011 was characterised by significant economic slack. The IMF estimated in real-time that all euro area countries but Malta had negative output gaps (to varying degrees) over the years 2010-2012 (IMF, 2011). Negative output gaps are widely accepted as a standard indication that there are demand-side problems and that in principle it would be possible to increase production and to decrease unemployment by demand-side measures without creating any inflationary pressures. However, such standard output gap measures tend to severely underestimate the extent of resource underutilisation during a recession (e.g. Klär, 2013; Palumbo, 2015). This underscores the point that the business cycle positions of euro area economies were completely incompatible with the expectation that fiscal consolidation measures would have a positive impact on growth and employment, based on the flawed idea of 'expansionary fiscal contractions' put forward by Alberto Alesina and others (Dellepiane-Avellaneda, 2015).

## 2.2. ESTIMATES ON THE SIZE OF GDP LOSSES DUE TO FISCAL CONSOLIDATION IN THE EURO AREA

How does the existing literature estimate the size of GDP losses due to fiscal consolidation in the euro area during 2011-2013? In the context of this question, it has to be recognised that a comparison of existing studies is complicated by the fact that not all of the relevant papers cover estimates for the whole period 2011-2013. Furthermore, they do not all use the same data on the intensity of fiscal consolidation measures. In order to improve comparability of the studies, Table 1 – which summarises the most relevant existing estimates on the size of GDP losses in the euro area – also depicts the size of cumulative multipliers.

**Table 1 / Estimates of cumulative losses from fiscal consolidation in the euro area during 2011-2013 (in % of GDP)**

| | *2011* | *2012* | ***2013*** | ***Cumulative Multiplier*** |
|---|---|---|---|---|
| European Commission (2012b), pp. 45-46 | --- | 0.3 / 0.9 | **0.5 / 1.6** | **0.3 / 0.8** |
| Rannenberg et al. (2015), p. 21 | --- | --- | **5.2** | **1.3** |
| In't Veld (2013), p. 10* | 0.7 | 2.0 | **3.2** | **2.1**** |
| Holland and Portes (2012), p. F8 | 0.5 / 1.5 | 1.0 / 3.1 | **1.7 / 4.0** | **0.4 / 0.9**** |
| Gechert et al. (2015), p. 6 | 4.3 | 6.4 | **7.7** | **1.9**** |

Own illustration, based on the sources cited in the table.
*Results refer to the core euro area excluding Germany.
**The multiplier estimate was not presented explicitly in the respective paper; it was, therefore, calculated implicitly from the estimated GDP loss due to fiscal austerity and the fiscal impulse data used in the study.

The European Commission (2012b) assesses the impact of fiscal consolidation as the deviation from a baseline scenario without fiscal consolidation. Using simulations with its DSGE model QUEST, it is estimated that the short-run multiplier of fiscal consolidation is low (around 0.25). Assuming that fiscal plans are fully credible and that monetary policy helps to cushion the contractive effects of fiscal adjustment, the negative impact of fiscal adjustment in 2012 and 2013 is estimated to be very limited (cumulatively 0.5% of GDP over 2012-2013; see Table 1). However, the study argues that the effects of

fiscal consolidation depend on the reception of fiscal measures in the private sector and on monetary policy accommodation (European Commission, 2012b: pp. 46-47). In particular, this means that when both a binding ZLB and the possibility that private sector agents doubt whether the government is credibly committed to implementing fiscal consolidation measures is introduced into the model, multipliers and GDP losses are markedly higher, as the cumulative multiplier during 2012-2013 increases from 0.25 to 0.8 and the cumulative GDP loss surges from 0.5% to 1.6%.

Rannenberg et al. (2015) point out that the assessment of the effects of fiscal consolidation on economic activity in the euro area in European Commission (2012b) does not adequately take into account the restrictions imposed on monetary policy by the ZLB, the tightening of liquidity constraints for households as a result of the financial crisis, and that it has not properly allowed for the possibility that households do not anticipate that cuts in government spending imply higher future private consumption because of lower future tax burdens. They employ two DSGE models – one is the New Area Wide Model from the ECB, the other the European Commission's QUEST III model – for their simulations, in which they constrain the response of monetary policy, account for liquidity constraints of households and introduce a financial accelerator. They find that in the presence of both the financial accelerator and an increased share of liquidity constrained households, the cumulative multiplier over the 2011-2013 period equals 1.3. If one considers that the cumulative fiscal consolidation restriction for the euro area during 2011-2013 is 4.0% of GDP (see Rannenberg et al., 2015: p. 8), a multiplier of 1.3 implies that fiscal consolidation caused cumulative output losses of about 5.2% of GDP.

In't Veld (2013), who also uses the European Commission's QUEST model, finds that the negative growth effects of fiscal consolidation can be markedly larger when all countries consolidate simultaneously. For the core euro area excluding Germany, he reports a cumulative GDP loss of 3.2% from 2011 to 2013. Furthermore, In't Veld (2013) emphasises that output reductions due to fiscal austerity vary significantly across euro area countries. For Greece and Portugal, he finds cumulative losses due to austerity that amount to 8.0% and 6.9% of GDP, respectively. In comparison, the 3.9% loss estimated for Germany is also substantial, but certainly markedly smaller (see In't Veld, 2013: pp. 10-11).

Holland and Portes (2012) use the National Institute Global Econometric Model (NiGEM), a large scale macroeconometric model, to assess the economic impact of fiscal consolidation plans for the period 2011/13. They calculate output losses for two major scenarios. In the first scenario, they assume that interest rates are flexible and not bound at zero, and that liquidity constraints in the private sector are not higher than the long-run average. This scenario yields a cumulative GDP loss due to fiscal consolidation of 1.7% of GDP. In scenario 2, however, they 'allow for an impaired interest rate channel and heightened liquidity constraints – assumptions we consider more realistic under current conditions' (Holland and Portes, 2012: p. F8), which yields a markedly larger GDP loss of 4%. Gechert et al. (2015) build on the meta-regression analysis by Gechert and Rannenberg (2014) and find that the fiscal consolidation in the euro area reduced GDP by 4.3% relative to a baseline scenario without fiscal adjustment in 2011, with the deviation from the baseline increasing to 7.7% in 2013.

The next section will present the econometric strategy of this paper. Based on the literature review on the size of fiscal multipliers, the main hypothesis is that fiscal consolidation measures and cumulative real GDP growth will be negatively associated; and strongly so when main conditions for multipliers higher than 1.0 are fulfilled.

# 3. Econometric strategy

To investigate whether GDP growth in the euro area has been systematically related to the extent of fiscal consolidation, we use the following econometric approach. We regress the cumulative growth in real GDP during 2011-2013 on a fiscal variable that is supposed to capture exogenous changes in the fiscal balance.

The baseline equation estimated is:

$$\Delta Y_{i,2011:2013} = \alpha + \beta \Delta F_{i,2011:2013} + \epsilon_{i,2011:2013}$$

where $\Delta Y_{i,2011:2013}$ denotes cumulative growth of real GDP (*Y*) in economy *i* during the time period 2011-2013, $\Delta F_{i,2011:2013}$ captures the exogenous change in the fiscal balance in economy *i* during the time period 2011-2013, and $\epsilon_{i,2011:2013}$ is the error term.

How do we measure $\Delta F_{i,2011:2013}$ ? This question is highly important because of an endogeneity problem. Ups and downs in economic activity cause changes in the fiscal balance that are the result of automatic stabilisers; e.g. a downswing in economic growth will lead to a fall in tax revenues and an increase in unemployment-related government spending – without any actual change in fiscal policy. Such a development would both affect the explanatory variable $\Delta F_{i,2011:2013}$ and the error term in the same direction. In practice, 'using the change in the overall fiscal balance to measure changes in fiscal policy would bias estimates towards finding expansionary effects of fiscal consolidation on economic activity' (Guajardo et al., 2011: p. 6), because the fiscal balance improves (worsens) due to the effects of automatic stabilisers that are triggered by an improvement (deterioration) in economic activity.

In the macro econometric literature, one finds two major approaches that try to overcome this endogeneity problem.[1] The first can be called the 'conventional approach' (e.g. Yang et al., 2015), which looks at changes in cyclically-adjusted fiscal data. The basic idea is to correct the headline fiscal balance for the effects of the business cycle on government revenues and expenditures. The IMF and the European Commission do so by estimating the fiscal balance at which the output gap – the difference between actual and potential output – would be zero. After correcting for the cyclical component of the fiscal balance, they also account for so-called budgetary one-off effects, e.g. costs related to bailing-out financial institutions, which yields the structural budget balance (Fedelino et al., 2009; Mourre et al., 2014). The intensity of fiscal consolidation can then be calculated by looking at changes in the structural budget balance – a strategy proposed by Blanchard and Leigh (2013).

A typical criticism in the literature is that changes in the structural budget balance might not only reflect the policy-makers' desire to cut the fiscal deficit, which is due to problems related to estimating the fiscal balance at which the output gap would be zero (e.g. Carnot and de Castro, 2015). Therefore, the contribution of this paper is to look at other data sources as well, as we also follow the second major strategy in the macro econometric literature for overcoming the endogeneity problem, which is called the

[1] Other approaches exist, but are not discussed here; see, e.g. Blanchard and Perotti (2002).

'narrative approach'. Inspired by Romer and Romer (2010), 'narrative' data sources identify size and timing of fiscal policy measures from budgets, budget documents and policy papers by accounting for the policy-makers' motivations for implementing the respective measures.

Taking a variety of data sources into account in order to identify the intensity of fiscal consolidation is an important contribution to the existing literature, because we can check whether the econometric findings for the euro area are robust to using different identification strategies. Table 2 lists the data sources used in this paper. It depicts details on the relevant time period for which data was available during 2011-2013 and shows the number of euro area countries for which data could be included. Regarding the 'conventional approach', we obtain data from European Commission (2015) and IMF (2015), respectively. Data from the 'narrative approach' is based on European Commission (2015), OECD (2012) and Gainsbury et al. (2011), respectively. From the six different data sources depicted in Table 2, we obtain cross-sectional data on variations in the intensity of fiscal consolidation that can be accessed in the appendix.

**Table 2 / Data sources used to identify fiscal consolidation measures in the euro area (2011-2013)**

| | Data | Time period | EA countries |
|---|---|---|---|
| *'Conventional approach'* | | | |
| IMF (2015) | Structural budget balance in % of potential output | 2011-2013 | 16 |
| European Commission (2015) | Structural budget balance in % of potential output | 2011-2013 | 18 |
| European Commission (2015) | Primary structural budget balance in % of potential output | 2011-2013 | 18 |
| *'Narrative approach'* | | | |
| European Commission (2015) | Discretionary fiscal measures in % of nominal GDP | 2011-2013 | 18 |
| OECD (2012) | Fiscal consolidation measures in % of nominal GDP | 2011-2013 | 15 |
| Gainsbury et al. (2011) | Fiscal consolidation measures in % of GDP per head | 2011 | 6 |

Own illustration, based on the sources cited in the table.

# 4. Baseline results and discussion

The baseline OLS regressions used in this paper to obtain multiplier estimates build upon the seminal contributions by Blanchard and Leigh (2013) and De Grauwe and Ji (2013). The strength of the OLS approach chosen is that it delivers estimates for the size of multipliers that are more straightforward and easier to interpret than the results from more sophisticated econometric strategies in the recent multiplier literature (e.g. Qazizada and Stockhammer, 2015; Yang et al., 2015; Jorda and Taylor, 2016), but nonetheless robust, as will be demonstrated by the robustness checks in section 5.

There are three major reasons for focusing on the period 2011-2013. First, this paper is especially interested in analysing the effects of fiscal consolidation measures when it comes to explaining the euro area's double-dip recession (CEPR, 2015), which other authors in the macroeconometric literature have so far been unable to study in sufficient depth. Second, although some countries – such as Ireland and Latvia – had started to implement consolidation measures before the year 2011, the simultaneous turn to fiscal austerity in large parts of the euro area was most pronounced during 2011-2013 (e.g. European Commission, 2012b). Therefore, the time period chosen provides an ideal possibility to exploit the variation in the intensity of fiscal consolidation across the euro area's economies to obtain econometric estimates on the size of fiscal multipliers. The third and more technical reason is data availability. 'Conventional approach data' on fiscal consolidation measures for the years 2009-2013 is only available from the IMF (2015), and 'narrative approach data' for this longer time period is not available at all from the data sources depicted in Table 2. Hence, we would not be able to use multiple data sources to identify the intensity of fiscal consolidation measures if we were to focus on the period 2009-2013. Using more than one data source is, however, central to the empirical approach of this paper.

The presentation of the baseline results in this section focuses on the euro area.[2] However, robustness checks in the next section will also look at the empirical evidence for other country groups in order to investigate whether the experiences of euro area countries were similar to those of non-euro area countries.

It might be argued that cross-sectional evidence on the link between fiscal consolidation measures and GDP growth strongly depends on the role of outliers. That is why the robustness checks in Section 5 will show that the results are not unduly influenced by outlier observations. Another objection might be that additional variables affect both the intensity of fiscal austerity and real GDP growth. The subsequent robustness analysis will, however, demonstrate that the β coefficient of fiscal consolidation is not unduly affected when we control for additional variables that might have both influenced real GDP growth and fiscal consolidation over the time period studied.

Table 3 reports the baseline results from Ordinary Least Squares estimation (OLS). Using changes in the structural budget balance as estimated in IMF (2015) in order to identify fiscal consolidations, we find a strong negative correlation between cumulative real GDP growth and fiscal consolidation measures.

[2] The EA-18 country group includes Belgium, Germany, Estonia, Ireland, Greece, Spain, France, Italy, Cyprus, Latvia, Luxembourg, Malta, Netherlands, Austria, Portugal, Slovenia, Slovakia, Finland.

The β coefficient is -1.85, implying that an increase of 1 percentage point in fiscal consolidation during 2011-13 was associated with a cumulative decline in real GDP during 2011-13 of about 1.85 percentage points. Figure 1 illustrates the statistically significant relationship with a scatterplot for each of the six data sources depicted in Table 3.[3] Plotting the data suggests that those euro area countries that implemented more intense fiscal consolidations suffered more pronounced declines in real GDP from 2011 to 2013; vice versa, countries which did not adjust (that much), performed markedly better in terms of real GDP. The estimation results based on data from European Commission (2015) are similar when we identify fiscal consolidation measures by changes in the structural budget balance (β coefficient -2.08) and by changes in the primary structural budget balance (which excludes interest payments; β coefficient -2.09), respectively.

**Table 3 / OLS baseline results for the euro area**

| | *β* | t-value *β* | *α* | Number of countries | $R^2$ |
|---|---|---|---|---|---|
| ***'Conventional approach' data*** | | | | | |
| Structural budget balance / IMF | -1.854 | -5.683*** | 7.327 | 18 | 0.586 |
| Structural budget balance / EC | -2.075 | -5.075*** | 7.470 | 18 | 0.557 |
| Primary structural budget balance / EC | -2.089 | -3.626*** | 7.936 | 18 | 0.573 |
| ***'Narrative approach data'*** | | | | | |
| European Commission (2015) | -1.382 | -5.183*** | 8.007 | 18 | 0.756 |
| OECD (2012) | -1.906 | -2.927** | 6.735 | 15 | 0.604 |
| Gainsbury et al. (2011) | -1.647 | -6.353*** | 3.733 | 6 | 0.833 |

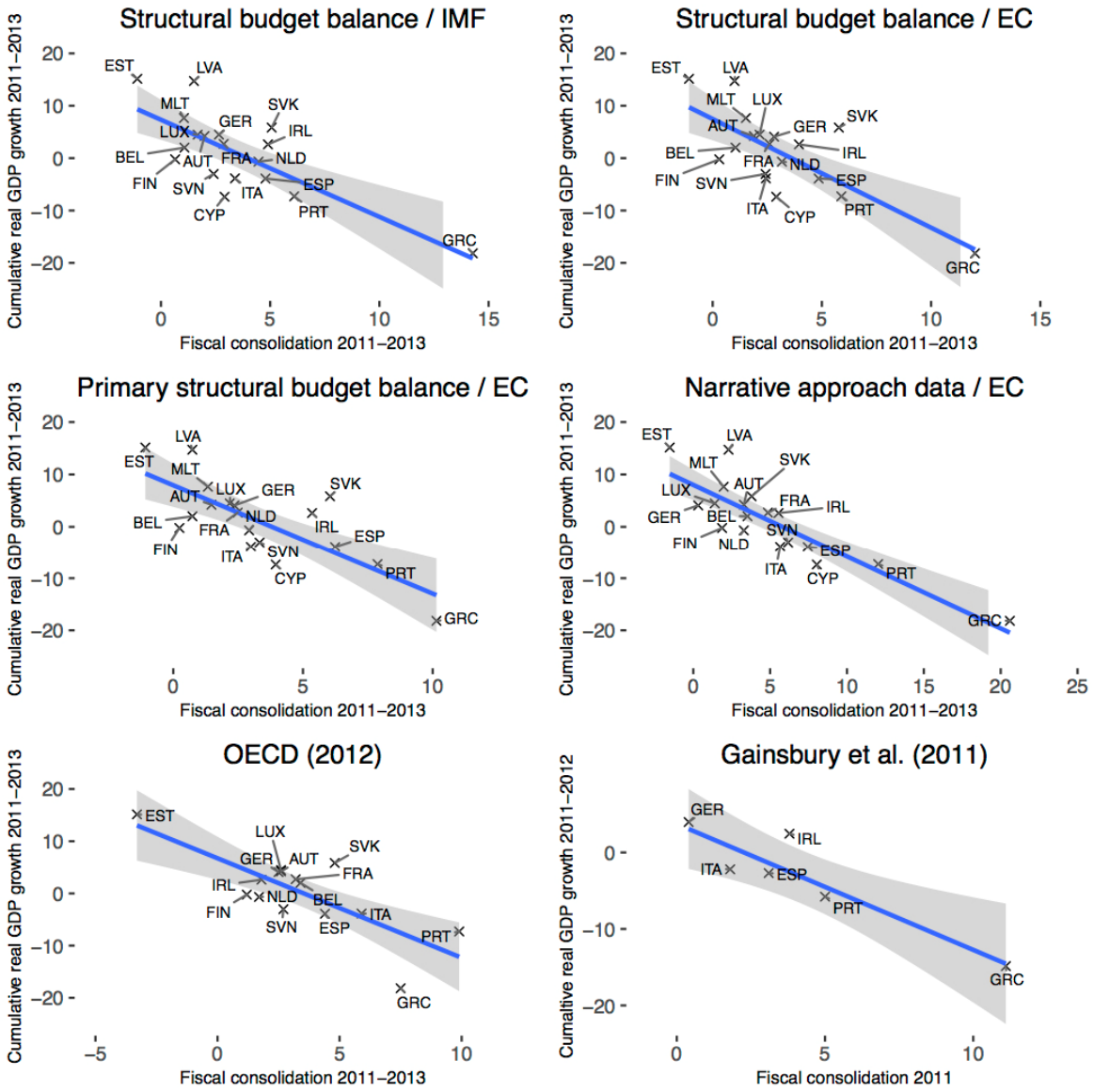
Author's calculations, based on the data sources mentioned in the table.
Dependent variable: cumulative real GDP growth 2011-2013.
Note that for the specification using data by Gainsbury et al. (2011) we only had fiscal consolidation data for the year 2011. Following De Grauwe and Ji (2013), we use the cumulative growth in real GDP over 2011-2012 as the dependent variable, which we regress on the narrative-based variable obtained from Gainsbury et al. (2011).
T-values are heteroscedasticity-robust (White).
***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.
Structural budget balance data for Cyprus and Estonia was not available in IMF (2015). Missing values were filled with structural budget balance data from European Commission (2015).

Using data on the intensity of fiscal consolidation that was obtained from budgets and other relevant documents ('narrative approach'), we again find a negative, statistically significant relationship between the cumulative growth in real GDP and fiscal consolidation measures during 2011-2013. OLS estimates based on fiscal consolidation numbers reported in OECD (2012)[4] deliver a β coefficient of -1.91. Looking at data on discretionary fiscal measures from European Commission (2015), we find that a 1 percentage point increase in fiscal consolidation was associated with a cumulative decline in real GDP by 1.38 percentage points. Obtaining consolidation data from Gainsbury et al. (2011), we once more find a statistically significant negative association between real GDP growth and austerity measures in the euro area countries under study (β coefficient of -1.65).

[3] Throughout the study, statistical inference is reported based on heteroscedasticity-robust standard errors.

[4] In the OECD (2012) specification, data for 15 euro area countries was available: the EA-18 country group excluding data for Cyprus, Latvia and Malta.

**Figure 1 / Plotting cumulative real GDP growth against fiscal consolidation measures**

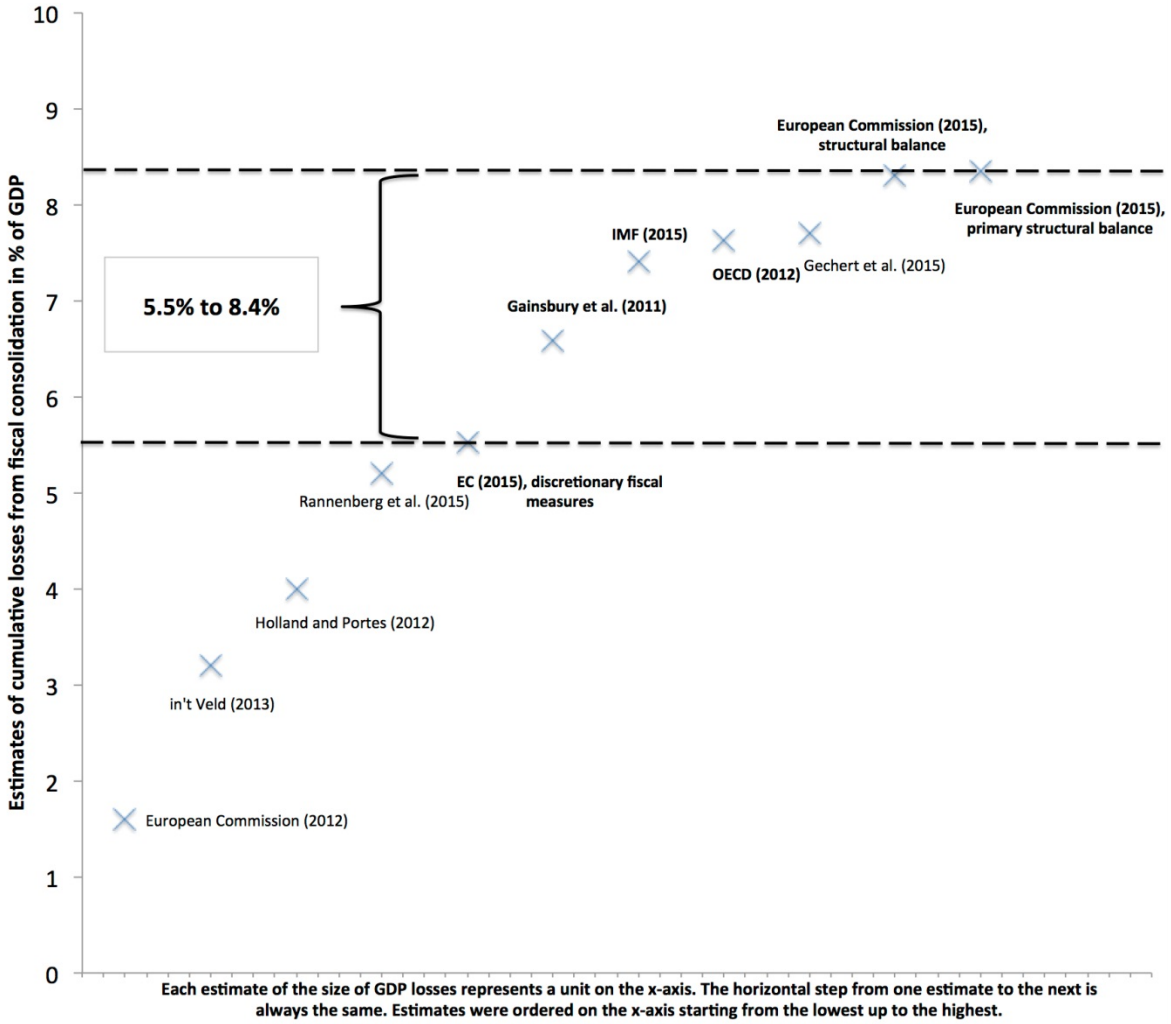



Own illustration. For more details on the econometric results see Table 3; for more information regarding the data sources see Table 2.

The natural interpretation of these econometric findings is that they provide evidence for multipliers that were, on average, substantially higher than 1.0. In section 2, we have already discussed estimates on the size of cumulative output losses in the euro area during 2011-2013 (see Table 1). How can we use our econometric baseline results in order to contribute to the existing literature? The European Commission estimates that fiscal consolidation in the euro area cumulated to 4.0% of GDP between 2011 and 2013 (see European Commission, 2012b: pp. 45-46). Looking at the β coefficients from Table 3 as an approximation of the size of cumulative multipliers in the euro area leads to a range of cumulative output losses due to fiscal consolidation from about 5.5% to 8.4% of GDP during 2011-2013 – in comparison to the unknown baseline scenario without fiscal austerity measures (see Figure 2). The advantages of these calculations are that they require fewer assumptions and that they are way simpler

than building a large macroeconomic model, as Rannenberg et al. (2015) and other researchers have done. But still, these simple calculations can be used as a reasonable approximation of the size of GDP losses in the euro area, which are due to fiscal austerity. As Figure 2 illustrates graphically, the 5.5% to 8.4% numbers are in the upper part of the range of estimates from the existing literature. Using the multiplier based on primary structural budget balance data from the European Commission (2015) yields a GDP loss caused by fiscal consolidation of about 8.4% of euro area GDP, which constitutes the upper limit of the range of estimates.

**Figure 2 / Mapping the size of cumulative GDP losses due to fiscal consolidation in the euro area (2011-2013)**




Own illustration. Bold labelling indicates that the estimates are based on the author's own calculations. The other estimates were obtained from the existing literature. See Table 2 for details on the data sources used to identify fiscal consolidation measures. See Table 1 for a table summary of the estimates from the existing literature.

# 5. Robustness checks

In this section, we perform several tests to assess the robustness of the baseline results reported in the previous section.

## 5.1. THE ROLE OF OUTLIERS

Our first step of the robustness analysis is to analyse the role of outliers. Since critics might object that the baseline results are driven by data for Greece, which implemented the most intense fiscal austerity measures of all countries, we exclude Greece from our sample. Using data from IMF (2015), the $R^2$ declines from 0.59 to 0.35 and the β coefficient is now statistically significant at the 5% level (see Table 4). The size of the β coefficient is even larger (-2.05 compared to -1.85). We then test the sensitivity of the baseline results to outliers formally by applying three accepted estimation strategies designed to resist the influence of outliers. First, we reestimate the baseline specification using robust regression, which downweighs observations with larger absolute residuals by making use of iterative weighted least squares. Robust regression is less fragile to the influence of outlier observations than OLS; the procedure is a check of whether outliers are influencing the baseline OLS results (see Blanchard and Leigh, 2013: p. 9). The robust regression estimate of β (-1.84) is very similar to the OLS estimate (-1.85).

The second variation in the estimation technique is implemented via quantile regression, which is also supposed to make the estimates less affected by the role of outlier observations.[5] The quantile regression estimate of β (-1.80) is again very similar to our OLS estimate. The third variation in the estimation technique was introduced as follows. We investigate the role of outlier observations by using Cook's distance method; the approach was to discard observations with Cook's distance greater than 4/N, where N is the sample size (18 countries in case of the EA-18). In our euro area sample, Cook's distance is smaller than 4/N for all euro area countries; therefore, our Cook's distance estimates are identical to the OLS estimates.[6]

## 5.2. VARIATIONS IN THE COUNTRY GROUP

The second step of our robustness checks is to vary the country group in order to shed light on whether the experiences of euro area countries are similar to those of non-euro area countries. Table 4 reports

[5] Quantile regression minimises the sum of the absolute residuals about the median, rather than the sum of the squares of the residuals about the mean as in OLS (see Blanchard and Leigh (2013), p. 10).

[6] Results of the exact same robustness checks, based on OLS estimates from European Commission (2015) 'conventional approach' data, support the finding that the robust regression, quantile regression and Cook's distance estimates of β are very similar to the OLS estimate, and that they are all statistically significant. Results are available on request from the author.

regression results not only for the EA-18, but also for the EU-27,[7] a group of advanced economies (including European and non-European economies)[8] and emerging market economies.[9]

**Table 4 / Robustness checks: the role of outliers and variations in the country group**

| | $\beta$ | t-value $\beta$ | $\alpha$ | Number of countries | $R^2$ |
|---|---|---|---|---|---|
| **EA-18 (OLS)** | -1.854 | -5.683*** | 7.327 | 18 | 0.586 |
| OLS excl. Greece | -2.049 | -2.495** | 7.803 | 17 | 0.351 |
| Robust regression | -1.835 | -5.667*** | 7.098 | 18 | 0.585 |
| Quantile regression | -1.799 | -2.627** | 7.506 | 18 | 0.583 |
| Cook's distance | -1.854 | -5.683*** | 7.327 | 18 | 0.586 |
| **EU-27 (OLS)** | -1.549 | -3.100*** | 7.184 | 27 | 0.404 |
| OLS excl. Greece | -1.133 | -1.649 | 6.156 | 26 | 0.134 |
| Advanced European | -1.620 | -4.300*** | 6.834 | 23 | 0.454 |
| Robust regression | -1.531 | -2.986*** | 6.989 | 27 | 0.403 |
| Quantile regression | -1.826 | -2.026* | 7.897 | 27 | 0.390 |
| Cook's distance | -1.133 | -1.649 | 6.156 | 26 | 0.134 |
| **Advanced Economies (OLS)** | -1.590 | -4.727*** | 7.718 | 36 | 0.452 |
| OLS excl. Greece | -1.326 | -3.088*** | 7.270 | 35 | 0.228 |
| Liquidity trap | -1.594 | -5.002*** | 7.075 | 29 | 0.469 |
| No liquidity trap | -0.279 | -0.438 | 8.291 | 7 | 0.044 |
| Robust regression | -1.588 | -4.720*** | 7.666 | 36 | 0.452 |
| Quantile regression | -1.831 | -3.374*** | 7.973 | 36 | 0.439 |
| Cook's distance | -1.326 | -3.088*** | 7.270 | 35 | 0.228 |
| **Emerging Market Economies (OLS)** | -0.807 | -1.309 | 12.393 | 35 | 0.063 |
| Robust regression | -0.662 | -0.950 | 12.077 | 35 | 0.060 |
| Quantile regression | -1.355 | -1.515 | 11.192 | 35 | 0.001 |
| Cook's distance | -1.174 | -2.018* | 12.848 | 34 | 0.115 |

Data on fiscal consolidation and real GDP: IMF (2015); author's calculations. Dependent variable: cumulative real GDP growth 2011-2013. T-values are heteroscedasticity-robust (White). Fiscal consolidation is measured as the change in the structural budget balance. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.
Structural budget balance data for Cyprus and Estonia was not available. Missing values were filled with structural budget balance data from European Commission (2015).
The country sample in the specification 'Advanced European' is the EU-27 excluding Romania, Hungary, Bulgaria and Poland.
In the 'Liquidity trap' specification, we excluded Australia, Iceland, Israel, Korea, New Zealand, Norway and Taiwan; these countries comprise the 'no liquidity trap' country group.

For many of these additional economies, the conditions for multipliers in excess of 1.0 discussed while reviewing the fiscal multiplier literature (such as the ZLB constraint and slack in the economy) are arguably less relevant than in the euro area, which leads us to expect a smaller absolute value of β for the EU-27, the advanced economies sample and the emerging markets country group – compared to the EA-18, respectively. We find that the β coefficient of fiscal consolidation is strongly negative and

[7] The EU-27 consists of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

[8] The advanced country group consists of 36 countries: Australia, Austria, Belgium, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong SAR, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, Taiwan, United Kingdom, United States.

[9] This emerging markets group consists of 35 countries: Argentina, Bosnia, Brazil, Bulgaria, Chile, Colombia, Croatia, Dominican Republic, Ecuador, Egypt, Georgia, Guyana, Hungary, India, Indonesia, Jordan, Lebanon, Malaysia, Mauritius, Mexico, Morocco, Panama, Paraguay, Peru, Phillipines, Poland, Romania, Russia, Serbia, South Africa, Thailand, Turkey, Ukraine, Uruguay.

statistically significant in the EA-18, EU-27 and advanced economies specification, respectively; however, β is markedly more negative for the EA-18 (-1.9) than in the EU-27 (-1.5) and advanced economies country group (-1.6). Furthermore, statistical significance for the EU-27 has declined; the quantile regression and Cook's distance estimate point to the role of outliers influencing the EU-27 OLS estimates. It is also notable that excluding Greece from the OLS estimation has more impact on the results for the EU-27 and advanced economies group than on the EA-18. In the advanced economies specification, we also test for the possible role of constraints in monetary policy. We do so by estimating a separate specification in which we only include economies that were, arguably, in a liquidity trap during this period.[10] In this specification of 29 advanced economies, the estimate of β is -1.59 and strongly significant; in the – admittedly small – group of 7 no-liquidity-trap advanced economies, however, β is -0.28 and lacks significance.

When we repeat the analysis for the group of 35 emerging market economies for which the IMF (2015) provided structural budget balance data, we find a β coefficient of -0.8. The fiscal consolidation coefficient in the emerging markets specification lacks significance, which also does not change when we perform robustness checks by implementing more robust estimation procedures. This finding points to the importance of accounting for the conditions of fiscal multipliers higher than 1.0, which were less important in emerging market economies during 2011-2013 than in the euro area and other parts of the global economy. Differences in the size of the fiscal multiplier across country groups might be explainable – to a non-negligible extent – by differences in the monetary policy regime. For virtually none of the emerging market economies in our sample, the central bank's main nominal policy interest rate reached 1 per cent or less during 2011-2013.[11] In stark contrast, 24 of the EU-27 countries did face such a liquidity trap situation at some point over the same time period.[12]

**Table 5 / Robustness check regarding pre-crisis years**

| | *β* | t-value *β* | *α* | Number of countries | $R^2$ |
|---|---|---|---|---|---|
| EA-15 2005-2007 | -1.245 | -1.670 | 11.624 | 15 | 0.289 |
| EA-15 2002-2004 | -0.183 | -0.205 | 7.257 | 15 | 0.008 |
| Advanced economies 2005-2007 | -0.275 | -0.352 | 13.563 | 31 | 0.009 |
| Advanced economies 2002-2004 | 0.308 | 0.829 | 9.626 | 31 | 0.016 |

Data on fiscal consolidation and real GDP growth: IMF (2015); author's calculations.
T-values are heteroscedasticity-robust (White). The fiscal variable is measured as the change in the structural budget balance. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Additionally, Table 5 reports evidence on the link between cumulative real GDP growth and fiscal consolidation measures before the financial crisis for comparable 3-year periods (2005-2007 and 2002-2004) in a sample of 15 euro area countries[13] and 31 advanced economies.[14] We find for both

[10] The term liquidity trap describes a situation characterised by the central bank's inability to use interest rate cuts in order to induce investors to lend money. Consistent with Blanchard and Leigh (2013), we define our set of liquidity trap economies as those economies for which the central bank's main nominal policy interest rate reached 1 per cent or less during 2011-2013.

[11] Bulgaria is the only notable exception.

[12] The three exceptions are: Hungary, Poland and Romania.

[13] The 15 euro area countries group in Table 4 consists of Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia, Spain.

[14] The 31 advanced economies from the country group in Table 4 consists of: Australia, Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong SAR, Iceland, Ireland, Israel, Italy, Japan, Korea, Lithuania,

country groups that the β coefficient of fiscal consolidation is much less negative than during 2011-2013; it also lacks statistical significance in all of the pre-crisis specifications, which is in line with our hypothesis that conditions for fiscal multipliers higher than 1.0 mattered during 2011-2013.

## 5.3. INCLUDING ADDITIONAL CONTROL VARIABLES

The next step of the robustness checks is to introduce additional control variables, which could potentially both explain the intensity of fiscal consolidation and the evolution of real GDP. The omission of such potentially relevant control variables could bias the analysis towards overestimating the size of the negative β coefficient. When it comes to including additional controls, we estimate the following equation:

$$\Delta Y_{i,2011:2013} = \alpha + \beta \Delta F_{i,2011:2013} + \gamma X_{i,t} + \epsilon_{i,2011:2013}$$

where $\Delta Y_{i,2011:2013}$ and $\Delta F_{i,2011:2013}$ are defined as in the specification introduced in section 3, and $X_{i,t}$ represents additional control variables in economy *i* at time *t*, where *t* refers either to the initial year 2010 before the time period 2011-2013 or to the pre-crisis year 2007 – depending on the respective additional control variable, which will be described below in more detail. Additional controls are introduced into the robustness check specifications one at a time.

Which additional variables does this paper control for, and what are the reasons for including them? First, economists who are suspicious of multipliers higher than 1.0 – as estimated by this paper in section 4 – might argue that it is no surprise that economic growth turned out to be so weak in large parts of the euro area, given that government debt levels were high to start with in 2010. Although Herndon et al. (2014) have conclusively demonstrated the flaws and untenable nature of the infamous Reinhart and Rogoff (2010) finding that 'across both advanced countries and emerging markets, high debt/GDP levels (90 percent and above) are associated with notably lower growth outcomes' (Reinhart and Rogoff, 2010: p. 22), it might still be claimed that '[t]he circumstances which help to reduce the short-term costs [of fiscal consolidations] include when [...] the fiscal starting position is particularly precarious and thus confidence in the sustainability of public finances is rather low' (ECB, 2010: p. 84). In order to anticipate the argument that the baseline OLS results from section 4 are picking up the effects of public debt problems rather than the effects of fiscal consolidation measures, the robustness checks consider the role of the initial sovereign debt situation in the euro area in 2010. As can be seen from Table 6, the baseline results are robust to controlling for the initial (end-2010) government-debt-to-GDP ratio, for the initial (end-2010) fiscal-balance-to-GDP ratio, and for the initial (end-2010) structural-budget-balance-to-potential-output ratio. The β coefficient of fiscal consolidation stays strongly negative and statistically significant at the 1% level. This suggests that the initial level of public debt does not unduly affect the multiplier estimates for the euro area found in this paper.

We also control for the sovereign credit default swap (CDS) spread in the first quarter of 2011, as it can be argued that CDS spreads take potential future debt problems as perceived by financial market actors into account.[15] Again, the baseline results do not change much. We then control for the initial bank CDS

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Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, Taiwan, United Kingdom, United States.

[15] Data refers to average 5-year sovereign CDS spreads; it was obtained from the companion data set to Blanchard and Leigh (2013).

spread in the first quarter of 2011 in order to check whether the OLS results are picking up the effects of stress in the financial sector.[16] It has also been argued that the build-up of current account imbalances before the crisis has negatively impacted on the economic performance in countries that accumulated considerable current account deficits. Sustained losses in competitiveness and the associated build-up of indebtedness are claimed to have contributed to the weak growth performance during the Euro Crisis, after capital inflows to deficit countries had abruptly stopped (e.g. European Commission, 2012a). To investigate the role of external imbalances, which might have triggered both fiscal consolidation and headwinds to economic growth, we control for the pre-crisis (2007) current-account-deficit-to-GDP ratio and again find that the link between GDP growth and fiscal consolidation is robust. Results are also similar when we control for the pre-crisis (2007) stock of net foreign liabilities.[17]

**Table 6 / Robustness checks: additional control variables**

| | $\beta$ | t-value $\beta$ | $\gamma$ | t-value $\gamma$ | Number of countries | $R^2$ |
|---|---|---|---|---|---|---|
| Initial debt-to-GDP ratio | -1.441 | -3.813*** | -0.059 | -1.434 | 18 | 0.622 |
| Initial structural budget balance | -1.684 | -3.110*** | 0.203 | 0.285 | 18 | 0.588 |
| Initial fiscal balance | -2.028 | -3.087*** | -0.183 | -1.799* | 18 | 0.607 |
| Sovereign CDS spread | -2.067 | -2.156** | 0.004 | 0.282 | 17 | 0.585 |
| Bank CDS spread | -1.921 | -1.979* | 0.004 | 0.227 | 10 | 0.861 |
| Pre-crisis current account balance | -1.988 | -6.033*** | -0.191 | -0.923 | 18 | 0.626 |
| Pre-crisis stock of net foreign liabilities | -2.057 | -4.724*** | -0.027 | -0.853 | 18 | 0.613 |
| Pre-crisis household debt-to-income | -1.561 | -4.851*** | 0.023 | 1.365 | 12 | 0.799 |

Data on fiscal consolidation and GDP growth: IMF (2015). Dependent variable: cumulative real GDP growth 2011-2013. The fiscal variable is measured as the change in the structural budget balance. γ refers to the coefficient of the control variable. T-values are heteroscedasticity-robust (White).
***, **, and * denotes statistical significance at the 1%, 5%, and 10% level, respectively. Constant term included in specification, but the estimate is not reported. The additional controls appear in the specifications one at a time.

Finally, we control for the role of household debt. We do so because there are legitimate concerns that large household debt overhangs during a crisis have negative effects on GDP growth (e.g. Keen, 2013; Koo, 2013; Mian et al., 2013), which could also have impacted on the relationship between fiscal consolidation measures and economic performance. Therefore, we re-estimate the baseline equation while controlling for the pre-crisis (2007) level of the household debt-to-disposable-income ratio.[18] We again find that our estimate of the fiscal consolidation coefficient remains largely unchanged.

In a nutshell, the robustness analysis suggests that the β coefficient of fiscal consolidation is neither unduly affected by the role of outliers nor by additional variables that might have both influenced cumulative real GDP growth and fiscal consolidation intensity over the time period studied.[19] What's more, results from variations in the country group support the hypothesis that conditions for multipliers higher than 1.0 in the euro area's economies mattered. Hence, the robustness checks support the finding that multipliers in the euro area were, on average, substantially higher than 1.0 during 2011-2013.

16 Data refers to average 5-year bank CDS spreads; it was, again, obtained from Blanchard and Leigh (2013).

17 Data for stock of net foreign liabilities (in % of nominal GDP) is from the updated and extended version of the dataset constructed by Lane and Milesi-Ferretti (2007).

18 Data on household debt-to-disposable-income ratios is from the OECD (Household accounts, downloaded on May 17th 2015). Due to data constraints, we could only include 12 euro area countries: Belgium, Germany, Ireland, Greece, Spain, France, Italy, Netherlands, Austria, Portugal, Slovenia, Finland.

19 Results for the same robustness checks in terms of including addition control variables, but based on data from European Commission (2015), support this finding. Results are available on request from the author.

# 6. Conclusions

This paper has investigated the short-run effects of fiscal consolidation measures on economic activity in the euro area, with particular focus on the years 2011-2013. The econometric evidence on the link between cumulative real GDP growth and fiscal consolidation measures points to a strong negative association, as the depth of the economic crisis over 2011-2013 in the euro area's economies is closely related to the harshness of fiscal austerity. This finding is in line with previous studies from the recent empirical literature which report that fiscal adjustments are typically contractionary, and strongly so in a slump (Batini et al., 2012; Zezza, 2012; De Cos and Moral-Benito, 2013; Guajardo et al., 2014; Qazizada and Stockhammer, 2015; Yang et al., 2015; Jorda and Taylor, 2016; Stockhammer et al., 2016). The evidence we find also supports our hypothesis that one has to expect highly contractionary effects of fiscal consolidation on GDP growth when major conditions for multipliers higher than 1.0 – related to considerable economic slack and constraints in monetary policy effectiveness – are met.

Cumulative multiplier estimates for the euro area during 2011-2013 are found to vary in a range from 1.4 to 2.1, depending on which data source one uses to measure the extent of fiscal austerity. Based on these multiplier values, the paper calculates that an approximation of the size of output losses from fiscal consolidation in the euro area over the time period studied is in the range of 5.5% to 8.4% of GDP. It is therefore reasonable to state that – against the background of the prevailing institutional and macroeconomic circumstances – the cause of the double-dip recession in the euro area, which started after the third quarter of 2011, is fiscal austerity.

Critics might argue that some GDP loss from fiscal austerity was inevitable in the euro area, as fiscal deficits in stressed euro area countries had to be reduced. However, this argument downplays the importance of the austerity measures' timing and speed, which were crucial because circumstances in the euro area were very unfavourable over the time period studied, considering that the economic recovery was everything but complete and that policy options for offsetting the contractionary effects of fiscal austerity were severely constrained. Fiscal consolidation measures aggravated macroeconomic troubles via the demand side and triggered a debt-deflationary spiral, characterised by very low inflation, rising real debt burdens and further increases in public debt-to-GDP ratios (e.g. Mastromatteo and Rossi, 2015) – especially in the euro area's periphery countries. Front-loading fiscal austerity in the euro area has proven to be self-defeating.

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# Appendix

**Table A 1 / Data on the intensity of fiscal consolidation measures in the euro area's economies (2011-2013)**

| SOURCE | IMF (2015) | Commission (2015) | Commission (2015) | Commission (2015) | OECD (2012) | Gainsbury et al. (2011)* |
|---|---|---|---|---|---|---|
| ***DATA*** | ***SBC*** | ***SBC*** | ***PSBC*** | ***DFM*** | ***FCM1*** | ***FCM2*** |
| *Country* | | | | | | |
| *Austria* | 1.995 | 1.885 | 1.471 | 3.293 | 2.6 | |
| *Belgium* | 1.074 | 1.046 | 0.739 | 3.528 | 3.4 | |
| *Cyprus* | 2.911 | 2.911 | 3.949 | 8.037 | | |
| *Estonia* | -1.084 | -1.084 | -1.078 | -1.534 | -3.3 | |
| *Finland* | 0.649 | 0.302 | 0.237 | 1.874 | 1.2 | |
| *France* | 2.872 | 2.603 | 2.483 | 4.854 | 3.2 | |
| *Germany* | 2.652 | 2.810 | 2.357 | 0.321 | 2.5 | 0.4 |
| *Greece* | 14.274 | 12.008 | 10.145 | 20.597 | 7.5 | 11.1 |
| *Ireland* | 4.897 | 3.949 | 5.351 | 5.547 | 1.8 | 3.8 |
| *Italy* | 3.387 | 2.436 | 2.992 | 5.651 | 5.9 | 1.8 |
| *Latvia* | 1.508 | 1.000 | 0.735 | 2.293 | | |
| *Luxembourg* | 1.68 | 2.148 | 2.176 | 1.398 | 2.6 | |
| *Malta* | 1.05 | 1.521 | 1.335 | 1.979 | | |
| *Netherlands* | 4.464 | 3.168 | 2.924 | 3.289 | 1.7 | |
| *Portugal* | 6.098 | 5.891 | 7.873 | 12.029 | 9.9 | 5.0 |
| *Slovakia* | 5.067 | 5.776 | 6.043 | 3.794 | 4.8 | |
| *Slovenia* | 2.41 | 2.420 | 3.326 | 6.170 | 2.7 | |
| *Spain* | 4.784 | 4.851 | 6.237 | 7.450 | 4.4 | 3.1 |

Note: More details on the data sources can be obtained in table form from table 2 in the paper. SBC, structural budget balance (in % of potential output), change 2011-2013. PSBC, primary structural budget balance (in % of potential output), change 2011-2013. DFM, discretionary fiscal measures 2011-2013 (in % of nominal GDP). FCM1, fiscal consolidation measures 2011-2013 (in % of nominal GDP). FCM2, fiscal consolidation measures 2011 (in % of GDP per head). Regarding the calculated changes in structural budget balance data, a positive sign is interpreted as fiscal tightening and a negative sign signals fiscal loosening.
*Note that the Gainsbury et al. (2011) data is not for 2011-2013, but for 2011 only.

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Wien 6, Rahlgasse 3

ZVR-Zahl: 329995655

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Offenlegung nach § 25 Mediengesetz: Medieninhaber (Verleger): Verein "Wiener Institut für Internationale Wirtschaftsvergleiche", A 1060 Wien, Rahlgasse 3. Vereinszweck: Analyse der wirtschaftlichen Entwicklung der zentral- und osteuropäischen Länder sowie anderer Transformationswirtschaften sowohl mittels empirischer als auch theoretischer Studien und ihre Veröffentlichung; Erbringung von Beratungsleistungen für Regierungs- und Verwaltungsstellen, Firmen und Institutionen.

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