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

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Abstract

This paper investigates the short-run effects of fiscal consolidation measures on economic activity in the euro area during the Euro Crisis. Building on a review of the literature on the growth impact of fiscal consolidations, it presents new econometric estimates on the link between cumulative GDP growth and fiscal austerity measures during 2011-2013. The empirical results lend support to a Keynesian explanation, 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 fiscal multipliers that were, on average, higher than 1, pointing to strong contractionary effects. The negative cumulative growth effects of fiscal consolidation in the euro area are sizeable; estimates in the existing literature are in the range of 3.2% to 12.0% of GDP during 2011-2013, where the lower bound has to be considered as a very conservative estimate. Against the background of the macroeconomic and institutional circumstances that prevailed in the euro area over the time period studied, the cause of the euro area's double dip recession is fiscal consolidation.

1 Introduction

Since 2010/2011, fiscal consolidation has been a central feature of crisis management in the euro area. What were the short-run effects of fiscal consolidation measures - cuts in government spending and/or tax increases, motivated by the policymakers' desire to cut the fiscal deficit - on economic activity in the euro area, with particular focus on the years 2011-2013? This research question is at the heart of this paper.

Based on a review and discussion of the theoretical and empirical literature on the effects of fiscal consolidations, this paper presents new econometric estimates on the link between cumulative real GDP growth and fiscal consolidation measures in the euro area during the Euro Crisis. The research goal is to contribute to explaining

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the role of fiscal policy in the euro area's double dip recession - which started after the third quarter of 2011 - and its growth performance in 2012 and 2013 (CEPR (2014)). The paper provides 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. The econometric results are related to estimates from the existing literature on the size of output losses from fiscal consolidation in the euro area.

The empirical part of the paper is based on looking at various data sources on the intensity of fiscal consolidation measures: We use both changes in the structural budget balance - which Blanchard and Leigh (2013), among others, have done before - and the narrative record from budgets and policy documents in the spirit of Romer and Romer (2010) in order to identify fiscal consolidation measures. 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, which means that the depth of the economic crisis in the euro area's economies was closely associated with the harshness of fiscal consolidation. This econometric finding is consistent with a review of the fiscal multiplier literature, which emphasizes key conditions for "higher-than-normal" fiscal multipliers, which were fulfilled in large parts of the euro area over the time period studied. Second, reasonable estimates from the literature on the cumulative GDP losses from fiscal austerity in the euro area during 2011-2013 are in the range of 3.2% to 12.0% of GDP, where the lower bound of this range should be considered a very conservative estimate. Under the macroeconomic and institutional circumstances that prevailed in the euro area over the time period studied, fiscal consolidation is the cause of the double dip recession that started after the third quarter of 2011.

The remainder of this paper is structured as follows: Section 2 reviews the literature on fiscal multipliers. Section 3 presents the econometric analysis on the link between cumulative GDP growth and fiscal austerity measures in the euro area during 2011-2013. Section 4 relates the econometric findings from the empirical section to existing estimates from the literature on the size of GDP losses from fiscal consolidation in the euro area. Section 5 summarizes and concludes.

2 Which factors determine the size of fiscal multipliers?

The fiscal multiplier is typically defined as describing the ratio of the change in GDP (in constant prices) to an exogenous change in the fiscal balance. The higher the multiplier, the costlier the fiscal adjustment will be in terms of output losses.

Several survey studies point out that multiplier values reported in the literature vary substantially (e.g. Hemming *et al.* (2002); Fatas and Mihov (2009); Gechert and Rannenberg (2014)). Fiscal consolidation multipliers range from 'expansionary fiscal contraction' in some neoclassical models - i.e. negative fiscal multipliers: a fiscal consolidation leads to an expansion of output, even in the short-term) to 'self-defeating fiscal austerity' in Keynesian models (i.e. fiscal multipliers markedly higher than one: a fiscal consolidation has strong contractionary effects on economic activity).

The literature suggests that numerous factors might affect the size of fiscal multipliers: monetary policy accomodation, the composition of fiscal consolidation

(spending-based vs. tax-based) and the initial level of public indebtedness, the exchange-rate regime, the openness of the economy, the international business environment etc. (e.g. Barrell *et al.* (2012); Ilzetzki *et al.* (2013)).

Gechert and Rannenberg (2014) conduct a meta-regression analysis of 98 empirical studies in order to study whether fiscal multipliers are regime-dependent. They find that fiscal multipliers increase by 0.6 to 0.8 units during an economic downturn. Furthermore, they report that spending multipliers are markedly higher than tax multipliers, especially during recessions; all expenditure categories other than increases in unspecified government spending are found to have cumulative multipliers that robustly exceed 1 in the downturn regime. However, 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 fiscal multipliers are substantially higher when economic resources are underutilized (e.g. Batini *et al.* (2012); DeLong and Summers (2012); Qazizada and Stockhammer (2014)).

The case of severe restrictions in conventional monetary policy effectiveness due to the zero lower bound of nominal interest rates has gained relevance since the outbreak of the financial crisis in 2008. New-Keynesian modelers argue that fiscal multipliers are substiantially higher than 1 if central banks cannot cut interest rates further in order to stimulate the economy due to the ZLB. In their New-Keynesian DSGE model, Christiano *et al.* (2011) show that real interest rates rise when nominal interest rates are stuck at zero, which then leads to a deflationary spiral. An increase in government spending drives down the real interest rate and causes a large increase in output, because fiscal multipliers are higher than in "normal times". Hall (2009) finds that, in an economy with a fiscal multiplier below 1 in normal times, the multiplier can rise to 1.7 when the ZLB binds.

Another essential research strand in the multiplier literature investigates how certain characteristics of severe financial crises and their aftermaths might influence fiscal policy effectiveness. For example, Corsetti *et al.* (2012) find that fiscal multipliers are significantly above 2 during times of financial crisis. In a New-Keynesian model of debt-driven slumps, where agents in the private sector are forced into rapid deleveraging, Eggertsson and Krugman (2012) show that the result is a Keynesian-type multiplier in excess of 1. And Koo (2013) argues that fiscal multipliers are markedly higher than 1 as long as the private sector is collectively minimizing debt after an asset bubble has burst, because the deleveraging acts as a drag on aggregate demand.

The literature review provided above has implications for the research question on the effects of fiscal consolidation measures on real GDP in the euro area, because conditions for higher-than-normal multipliers were fulfilled in large parts of 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 zero lower bound on nominal interest rates (e.g. Coeure (2012)). In large parts of the euro area, the private sector was in the process of deleveraging (see Koo (2015), p. 219ff.), and therefore not in a position to borrow - even at very low interest rates -, which impaired the effectiveness of monetary policy measures. 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 (e.g. DeGrauwe (2012)). Therefore, currency devaluations were not available to stressed countries in order to increase price competitiveness vis-a-vis main euro trading partners and stimulate the econ-

omy via an increase in exports. Also, the initial position of euro area economies in 2010/2011 was one characterized by considerable economic slack. The IMF estimated in real-time that all euro area countries but Malta had negative output gaps over the years 2010-2012, if only to varying degrees (InternationalMonetaryFund (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. Against the background of the institutional and macroeconomic circumstances in the euro area, we therefore expect the empirical relationship between cumulative real GDP growth (dependent variable) and fiscal consolidation measures (independent variable) to be strongly negative.

3 Econometric analysis

To investigate whether GDP growth has been systematically related to fiscal consolidation measures in the euro area, 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 fiscal policy during this time period.

The baseline equation estimated is:

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

where $Y_{i,2011:2013}$ denotes cumulative (year-over-year) growth of real GDP (Y) in economy i during the time period 2011-2013, $\Delta F_{i,2011:2013}$ denotes the exogenous change in the fiscal variable of interest in economy i during the time period 2011-2013, and $\epsilon_{i,2011:2013}$ is the error term. Our hypothesis, based on the literature review in the previous section, is that fiscal consolidations and real GDP growth will be negatively correlated; and strongly so, if the main conditions for higher-than-normal fiscal multipliers (considerable slack in the economy and constraints of monetary policy) are fulfilled.

How do we measure $\Delta F_{i,2011:2013}$? First, we will look at cyclically-adjusted fiscal data, by using the change in the structural budget balance (which is measured in percent of potential output). Positive values of $\Delta F_{i,2011:2013}$ indicate fiscal consolidation, while negative values are interpreted as discretionary fiscal stimulus. Structural budget balance data were obtained from the European Commission's Spring Forecast in May 2015 (EuropeanCommission (2015)) and the IMF's World Economic Outlook in April 2015 (InternationalMonetaryFund (2015)), respectively. The European Commission estimates the structural budget balance as the headline budget balance, corrected for the cyclical component (by accounting for the effects of the business cycle on revenues and expenditures), temporary and one-off effects (Mourre *et al.* (2014)).[1] Data for real GDP is also obtained from EuropeanCommission (2015) and InternationalMonetaryFund (2015). We will provide estimates on the relationship between cumulative GDP growth and fiscal consolidations based on IMF and European Commission data sources, respectively.

Critics might object that measuring fiscal consolidation in terms of changes in the structural budget balance is not ideal. Cyclical adjustments of fiscal variables will always be prone to revisions, because of the problems related to estimating the budget balance at which the output gap would be zero (e.g. Tereanu *et al.*

[1] See Fedelino *et al.* (2009) on how the IMF computes cyclically-adjusted fiscal balances.

(2014)). It is quite likely that for at least some of the countries in our country sample, the change in the structural balance does partially reflect developments that cannot be explained by a desire of policymakers to cut the fiscal deficit (e.g. Carnot and de Castro (2015)). That is why we will, secondly, back up our findings from looking at the empirical evidence based on structural budget balance data by also investigating data obtained by the narrative approach in the spirit of Romer and Romer (2010) and DeVries *et al.* (2011). We use the data assembled by Gainsbury *et al.* (2012) and OECD (2012), where we find consolidation numbers based on the narrative record, which was obtained from budget documents and policy papers, in order to identify size and timing of fiscal consolidation measures. This will enable us to judge whether the empirical findings are consistent over different sources of data.

Our baseline regression results focus on the euro area.[2] However, we also look at the empirical evidence for other country groups in order to investigate possible differences in the relationship between real GDP growth and the fiscal policy stance across different institutional regimes.

3.1 Baseline results

	β	T-value β	α	Number of countries	R^2
Structural budget balance data					
International Monetary Fund data	-1.854	-5.683***	7.327	18	0.586
European Commission data	-2.075	-5.075***	7.470	18	0.557
Narrative approach data					
OECD (2012)	-1.906	-2.927**	6.735	15	0.604
Gainsbury *et al.* (2012)	-1.647	-6.353***	3.733	6	0.833

Table 1: OLS baseline results for the euro area

Data: IMF (World Economic Outlook, April 2015), European Commission (AMECO, May 5th 2015), OECD (2012), Gainsbury *et al.* (2012); author's calculations.

Dependent variable: cumulative real GDP growth 2011-2013*

T-values are heteroskedasticity-robust (White)

$\Delta F_{i,2011:2013}$ is measured as the percentage point change in the structural budget balance (in % of potential GDP). OECD (2012) reported fiscal consolidation numbers in % of nominal GDP and Gainsbury *et al.* (2012) in % of GDP per head.

***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Structural budget balance data for Cyprus and Estonia was not available in InternationalMonetaryFund (2015). Missing values were filled with structural budget balance data from the AMECO data base (May 5th 2015).

Note that for the specification using data by Gainsbury *et al.* (2012) we only had fiscal consolidation data for the year 2011. Following DeGrauwe and Ji (2013), we use the growth in real GDP over 2011-2012 as the dependent variable, which we regress on the narrative-based variable obtained from Gainsbury *et al.* (2012).

Table 1 reports the baseline results from Ordinary Least Squares estimation (OLS). Using changes in the structural budget balance as estimated in InternationalMonetaryFund (2015) in order to identify fiscal consolidations, we find a strong

[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.

negative correlation between cumulative real GDP growth and fiscal consolidation measures:[3] The β coefficient is -1.85, implying that an increase of 1 percentage point in fiscal consolidation during 2011-13 was associated with a decline in real GDP during 2011-13 of about 1.85 percentage points. Figure 1 illustrates the statistically significant relationship with a scatterplot.[4] 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 EuropeanCommission (2015) are similar;[5] the β coefficient of -2.08 is even slightly larger.

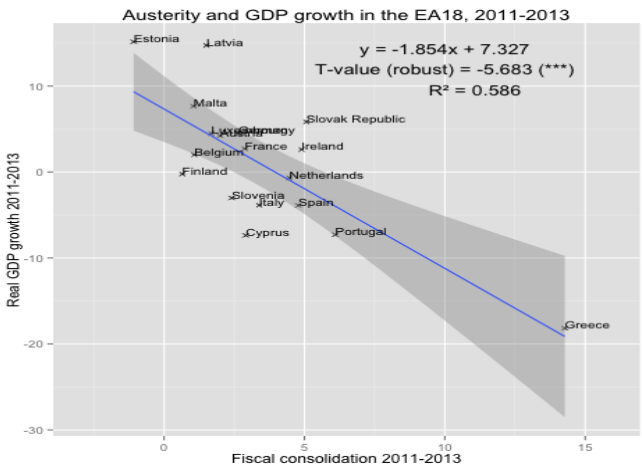

Figure 1: Data: IMF (World Economic Outlook, April 2015); author's calculations. Fiscal consolidation is measured as the change in the structural budget balance (which the IMF measures annually in % of potential GDP) during 2011-2013

Using data on the intensity of fiscal consolidation which was obtained from policy documents and budgets, 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)[6] deliver a β coefficient of fiscal consolidation of -1.91. Using consolidation data from Gainsbury *et al.* (2012), 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]InternationalMonetaryFund (2015) did not provide structural budget balance data for Cyprus and Estonia. Missing values were filled with structural budget balance data from the AMECO data base (May 5th 2015). This allowed us to estimate the baseline regression equation for the whole EA18 country group.

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

[5]Structural budget balance and real GDP data from EuropeanCommission (2015) was available for all EA18 countries.

[6]In the OECD (2012) specification, data for 15 euro area countries was available: the EA18 country group excluding data for Cyprus, Latvia and Malta.

Critics might argue that the link between fiscal austerity measures and GDP growth is not robust. First, we do not control for additional variables which might influence both the intensity of fiscal consolidation and economic activity, which would cause our OLS estimate to be biased. Second, there is concern that such cross-sectional pictures could be dominated by outlier observations. In order to respond to such criticisms in advance, we proceed with several robustness checks.

3.2 Robustness checks

Our first step of the robustness analysis is to investigate the role of outlier observations. Since critics might object that the baseline results could be driven by data for Greece, which implemented by far the most intense fiscal austerity measures of all countries, we exclude Greece from our sample. Using data from InternationalMonetaryFund (2015) for our calculations, the R^2 declines from 0.59 to 0.35 and the β coefficient is now statistically significant at the 5% level (see Table 2).[7] 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 more formally by applying three accepted estimation strategies designed to resist the influence of potential outliers. First, we reestimate the baseline specification using robust regression, which downweights 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; therefore, the robust regression procedure is a check of whether outliers are influencing the baseline OLS results (see Blanchard and Leigh (2013), p. 9).[8] The robust regression estimate of β (-1.84) is very similar to the OLS estimate (-1.85).

The second variation in the estimation tequnique is implemented via quantile regression, which is again supposed to make the estimates less affected by the role of outlier observations.[9] The quantile regression estimate of β (-1.80) is again very similar to our OLS estimate. The third variation in the estimation tequnique 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 EA18). 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.[10]

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 2 reports regression results not only for the EA18, but also for the EU27,[11] a group of advanced economies (including European and

[7] Including Greece, the coefficient was significant at the 1% level.

[8] The robust regression procedure was implemented in R via the rlm function from the 'MASS' package.

[9] Quantile regression minimizes 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). Quantile regression was implemented in R via the rq function in the 'quantreg' package. Standard errors were calculated based on the summary.rq function.

[10] Results of the exact same robustness checks, based on OLS estimates from EuropeanCommission (2015) 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.

[11] The EU27 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, Slovak Republic, Slovenia, Spain, Sweden, United King-

	β	T-value β	α	Number of countries	R^2
EA18 (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
EU27 (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***	7.666	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	-0.859	-1.702*	12.161	35	0.077

Table 2: Regression results: Data source InternationalMonetaryFund (2015)

Data on fiscal consolidation and real GDP growth: InternationalMonetaryFund (2015); author's calculations.

Dependent variable: cumulative real GDP growth 2011-2013

T-values are heteroskedasticity-robust (White). $\Delta F_{i,2011:2013}$ is measured as the change in the structural budget balance in % of potential GDP.

***, **, * 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 the AMECO data base (May 5th 2015).

The country sample in the specification "OLS advanced European" is the EU27 excluding Romania, Hungary, Bulgaria and Poland. In the "Liquidity trap" specification, we excluded Australia, Iceland, Israel, Korea, New Zealand, Norway and Taiwan - those countries comprise the "no liquidity trap" country group.

non-European economies)[12] and emerging market economies.[13]

For many of these additional economies, the conditions for higher-than-normal multipliers discussed while reviewing the fiscal multiplier literature (such as the ZLB constraint and slack in the economy) are less relevant, which leads us to expect a smaller absolute value of β for the EA27, the advanced economies sample and the emerging markets country group - compared to the EA18, respectively. This is what

dom.

[12]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, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Taiwan, United Kingdom, United States.

[13]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.

we find: The β coefficient of fiscal consolidation is strongly negative and statistically significant in the EA18, EU27 and advanced economies specification, respectively; however, β is markedly larger for the EA18 (-1.9) than in the EU27 (-1.5) and advanced economies country group (-1.6). Furthermore, statistical significance for the EU27 has declined; the quantile regression and Cook's distance estimate point to the role of outliers influencing the EU27 OLS estimates. It is also notable that excluding Greece from the OLS estimation has more impact on the results for the EU27 and advanced economies group than on the EA18. 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.[14] In this specification of 29 advanced economies, the estimate of β is -1.594 and strongly significant; in the - admittedly small - group of 7 no-liquidity-trap advanced economies, however, β is -0.279 and lacks significance.

When we repeat the analysis for the group of 35 emerging market economies for which the IMF provided structural budget balance data, we do find a smaller 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 higher-than-normal fiscal multipliers, which were less important in emerging market economies during 2011–2013 than in the euro area and other parts of the global economy. It might be explained 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 percent or less during 2011-13.[15] In stark contrast, 24 of the EU27 countries did face such a liquidity trap situation at some point over the same time period.[16]

Additionally, Table 3 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 eurozone countries[17] and 31 advanced economies.[18] We find for both country groups that the absolute size of the β coefficient of fiscal consolidation is much smaller than during 2011-2013; it also lacks statistical significance in all of the pre-crisis specifications, which is in line with our expectation that conditions for higher-than-normal fiscal multipliers mattered during 2011-2013.

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

[14] The term liquidity trap describes a situation characterized by the central bank's inability to use interest rate cuts in order to induce investors to lend out their money. Consistent with Blanchard and Leigh (2013), we define our set of liquidity trap economies that as those economies for which the central bank's main nominal policy interest rate reached 1 percent or less during 2011 - 13.

[15] Bulgaria is the only notable exception.

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

[17] The 15 euro area countries group in Table 3 consists of Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Slovak Republic, Slovenia, Spain.

[18] The 31 advanced economies from the country group in Table 3 consists of: Australia, Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong SAR, Iceland, Ireland, Israel, Italy, Japan, Korea, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Taiwan, United Kingdom, United States.

	β	T-value β	α	Number of countries	R^2
EA15 2005-2007					
OLS	-1.245	-1.670	11.624	15	0.289
EA15 2002-2004					
OLS	-0.183	-0.205	7.257	15	0.008
Advanced economies 2005-2007					
OLS	-0.275	-0.352	13.563	31	0.009
Advanced economies 2002-2004					
OLS	0.308	0.829	9.626	31	0.016

Table 3: Pre-crisis years: Data source InternationalMonetaryFund (2015)

Data on fiscal consolidation and real GDP growth: InternationalMonetaryFund (2015); author's calculations.

T-values are heteroskedasticity-robust (White). $\Delta F_{i,2011:2013}$ is measured as the change in the structural budget balance in % of potential GDP.

***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

evolution of real GDP growth. The omission of such potentially relevant control variables could bias the analysis towards overestimating the size of the β coefficient. First, critics might point to the literature on the relationship of sovereign debt and economic growth, arguing that it is no surprise that economic growth turned out to be so weak in large parts of Europe, given that government debt levels were so high to start with (in countries like Greece and Italy markedly above the 90%-of-GDP-threshould emphasized in Reinhart and Rogoff (2010)).[19] For example, it has been argued 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 account for this kind of argument, it is relevant to consider the role of sovereign debt problems in the euro area. This approach is necessary in order to test whether our baseline OLS results are picking up the effects of sovereign debt problems rather than the effects of fiscal consolidation measures. As can be seen from Table 4, the econometric 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.

Second, it has 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 said to have contributed to the weak growth performance during the Euro Crisis, after capital inflows to deficit countries had abruptly stopped (e.g. EuropeanCommission (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

[19] See Herndon *et al.* (2014) for a critique of the main 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).

(2007) stock of net foreign liabilities (in % of nominal GDP).[20]

Finally, we econometrically control for the role of household debt. We do so because there are concerns that large household debt overhangs have negative effects on GDP growth (e.g. Mian *et al.* (2013)). We do so by reestimating the econometric baseline equation while controlling for the precrisis (2007) level of the household debt-to-disposable-income ratio.[21] We again find that our estimate of the fiscal consolidation coefficient remains largely unchanged.

We conclude 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.[22]

	β	T-value β	γ	T-value γ	Number of countries	R^2
InternationalMonetaryFund (2015)						
Initial debt-to-GDP ratio	-1.441	-3.813***	-0.059	-1.434	18	0.622
Initial structural 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
Pre-crisis current account balance	-1.988	-6.033***	-0.191	-0.923	18	0.626
Pre-crisis stock 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

Table 4: Robustness checks for the euro area: Additional control variables

Data on fiscal consolidation and GDP growth: InternationalMonetaryFund (2015)

Dependent variable: cumulative real GDP growth 2011-2013

$\Delta F_{i,2011:2013}$ is measured as the change in the structural budget balance in % of potential GDP.

T-values are heteroskedasticity-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.

4 How large were the cumulative output losses from fiscal austerity in 2011-2013?

EuropeanCommission (2012b) provides estimates on the impact of fiscal consolidation measures on economic activity in the euro area, where GDP losses are estimated as the deviation from a baseline scenario without fiscal consolidation. According to

[20] Data for stock of net foreign liabilities is from the updated and extended version of the dataset constructed by Lane and Milesi-Ferretti (2007)

[21] 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.

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

the numbers used in the Commission's simulations, total fiscal adjustment amounted to about 4% of GDP from 2011 to 2013 (see EuropeanCommission (2012b), p. 45.) Using simulations with its work-horse DSGE model QUEST (e.g. Roeger and in 't Veld (2010)), 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).

Rannenberg *et al.* (2015) criticize that the assessment of the effects of fiscal consolidation on economic activity in the euro area in EuropeanCommission (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 existence of non-Ricardian households. 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, implying that fiscal consolidation caused cumulative output losses of about 12% of GDP.

Table 5 lists estimates of the impact of fiscal consolidation on euro area GDP from four additional papers. in 't Veld (2013), who also uses the European Commission's QUEST model, finds that fiscal consolidation caused a cumulative loss in euro area output of 3.2% from 2011 to 2013. 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 report that the cumulative output loss from fiscal adjustment was 4.0%, stressing that fiscal multipliers in 2011-2013 were higher than in "normal times" due to substantial slack in European economies, heightened liquidity constraints because of the financial crisis and the ZLB constraint of monetary policy. 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.

	2011	2012	2013	cumulative
EuropeanCommission (2012b), p. 45		0.3	0.5	0.5
Holland and Portes (2012), p. F8	1.5	3.1	4.0	4.0
in 't Veld (2013), p. 10	0.7	2.0	3.2	3.2
Rannenberg *et al.* (2015), p. 21				12.0
Gechert *et al.* (2015), p. 6	4.3	6.4	7.7	7.7

Table 5: GDP losses from fiscal consolidation 2011-2013

After taking out the most extreme result at the lower bound (0.5% of GDP, reported in EuropeanCommission (2012b)), we may ask: Is it plausible that the negative growth effects are actually to be found in the range of results reported in literature? In order to judge this, we perform some back-of-the-envelope calculations. The European Commission estimates that fiscal consolidation in the euro area cumulated to 4.0% of GDP between 2011 and 2013, also pointing out that austerity measures were primarily focused on cuts in government spending (see European-

Commission (2012b), p. 45). As Truger (2013) argues amongst other authors, it is quite conservative to assume a cumulative multiplier of 1.0, given the existing literature on the size of fiscal multipliers. A multiplier of 1.0 would mean that fiscal consolidation in the euro area lead to a GDP loss of 4.0%, compared to the unknown baseline without fiscal austerity measures. Assuming a cumulative multiplier of 1.5, the output loss from fiscal adjustment increases to 6% of GDP; and a multiplier of 2 leads to a loss in real GDP that amounts to 8%. It is notable that these simple back-of-the-envelope calculations are in the same ballpark as the estimates reported in the simulation studies.

What can we conclude from this? After the drop in real GDP by 4.5% in 2009 - which was associated with the economic downturn triggered by the financial crisis -, economic activity began to recover in 2010 (+2%). However, as the double-dip recession started after the third quarter of 2011, annual GDP growth in 2011 (+1.6%) was already lower than in 2010. In 2012 and 2013, the euro area economy contracted by 0.8% and 0.3%, respectively.[23] If we look at the estimated losses from fiscal consolidation, it can be seen that the negative growth effects of fiscal consolidation in the euro area are so large that they are sufficient to explain the double dip recession of 2011 and the subsequent weak growth performance in 2012 and 2013. Fiscal consolidation placed sharp contractionary pressure on the euro area economy. It is therefore reasonable to state that - against the background of the institutional and macroeconomic circumstances - the cause of the second euro area recession, which started after the third quarter of 2011, is fiscal austerity.[24]

5 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: 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 lends support to a Keynesian explanation; it is in line with previous studies from the relevant empirical literature, which report that fiscal adjustments are typically contractionary, and strongly so during difficult economic times (Batini *et al.* (2012); Jorda and Taylor (2013); deCos and Moral-Benito (2013); Yang *et al.* (2013); Guajardo *et al.* (2014)). 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 "higher-than-normal" multipliers - related to considerable economic slack and constraints in monetary policy effectiveness - are met.

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 macroeconomic circumstances in the euro area were very unfavorable over the time period studied. The deflationary effects of fiscal

[23] Data: Eurostat (download on September 14th 2015)

[24] A macroeconomy is obviously influenced by all kinds of factors, of which fiscal policy is but one. These other factors ought not to be neglected. However, the analysis presented in this study suggests that fiscal policy is essential for explaining the double dip recession.

consolidation measures aggravated the macroeconomic troubles on the demand side and triggered a debt-deflationary spiral, characterized by very low inflation, rising real debt burdens and further increases in public debt-to-GDP ratios - especially in the euro area's periphery countries -, which means that front-loading fiscal austerity in the euro area turned out to be counterproductive (e.g. Mastromatteo and Rossi (2015)).

Against the background of the macroeconomic and institutional environment in the euro area, and considering that fiscal austerity was mainly based on government spending cuts with higher multiplier effects than tax increases, fiscal cutbacks in the euro area's economies predictably proved highly contractionary. We arrive at this conclusion by grounding our interpretation of the econometric evidence on the association between fiscal consolidation measures and cumulative real GDP growth in the euro area in basic theoretical arguments from the fiscal multiplier literature.

6 List of references

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