EUROPEAN CENTRAL BANK

EUROSYSTEM

WORKING PAPER SERIES

NO 1697 / JULY 2014

THE GROWTH IMPACT OF DISCRETIONARY FISCAL POLICY MEASURES

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In 2014 all ECB publications feature a motif taken from the €20 banknote.

Acknowledgements
We are grateful to the ESCB's Working Group on Public Finance (WGPF) for authorising the use of data from the 'disaggregated approach' for this study. These data are confidential, and therefore they are not reported herein. The opinions expressed herein are those of the authors and do not necessarily reflect those of the European Central Bank or the Eurosystem. The views expressed herein are those of the authors and should not be attributed to the IMF, its Executive Board, or its management.

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ISSN	1725-2806 (online)
ISBN	978-92-899-1105-4 (online)
EU Catalogue No	QB-AR-14-071-EN-N (online)

ABSTRACT

This paper looks at the impact of discretionary fiscal policy on economic growth for a sample of 18 EU countries over the period 1998-2011. The main novelty of this paper is the use, on the revenue side, of a dataset of fiscal measures based on the yield of actual legislative and budgetary measures, rather than approximations, such as changes in cyclically-adjusted variables. Using static and dynamic panel data techniques, we find that fiscal consolidation can be a drag on economic growth in the short-term, although some specific budget categories are not found to be statistically significant. In general, the results also indicate that expenditure-based adjustment tends to be less harmful than revenue-based adjustment. Among expenditure cuts, reductions in government investment and consumption are found to be growth reducing. Among revenues, indirect tax increases are found to have a particularly strong negative impact. Dynamic specifications suggest that consolidation reduces growth mainly in the year of fiscal adjustment, while future growth rates are affected only through the usual time persistence. Non-linear specifications indicate that spreading out consolidation reduces the negative impact on growth, but only very slightly and in the absence of financial market pressures and/or fiscal sustainability considerations. Additionally, front-loading fiscal consolidation appears to be less detrimental for growth when it is based on expenditure cuts rather than tax increases

Key words: Fiscal multipliers, fiscal policy and growth, panel data.

JEL: H20, H30, H50, C33.

Non-technical Summary

This paper provides some empirical evidence on the impact of discretionary fiscal policy on economic growth for a panel of 18 EU countries during the period 1998-2011. Fiscal consolidation has been one of the main themes in the economic policy debate in Europe since the onset of the financial and sovereign debt crises. This has rekindled interest in the impact of consolidation on economic growth, and in particular on the costs and benefits of consolidation, its composition and the optimal timing.

A key issue, when looking at the growth impact of discretionary fiscal policy, is the definition of a reliable measure of discretionary government action. Typically, most of the existing papers use changes in fiscal deficits, usually adjusted for effects of the cycle and interest payments, as a measure of discretionary fiscal policy actions. However, there are many reasons to doubt the accuracy of such measures, which are often computed using simple statistical adjustment methods based on times series, which do not accurately reveal the underlying policy choices. Another approach, recently adopted in some papers, is to use public information about the motivations behind fiscal policy measures and their budgetary impact. However, this type of information may often lack accuracy and the stated political motivations may not be credible.

This study uses a different approach from other studies to approximate the amount of discretionary fiscal policy measures adopted by governments. On the revenue side, it uses information contained in a unique data set collecting the estimated yield of all legislative and budgetary fiscal policy changes adopted by each national government. This dataset has been developed within the European System of Central Banks (ESCB) in the context of the disaggregated approach (Kremer, 2006). The use of this dataset in the empirical literature was pioneered by Agnello and Cimadomo (2012). On the expenditure side, the paper defines a measure of discretionary spending as the gap between actual primary spending (net of social payments) and its trend defined as the previous year's spending uprated for inflation.

The main finding of this study is that fiscal consolidation can be a drag on economic growth in the short-term. This finding is in line with the most recent literature, though some papers, especially earlier ones, have reported positive effects on growth even in the short run. However, when looking at the impact of more disaggregated budgetary categories, we find that some of them are not statistically significant. For example, cuts in subsidies appear to have no negative growth impact. The results also indicate that expenditure-based adjustment tends to be less harmful than revenue-based adjustment. This is in line with the literature and expectations, but

some other findings are surprising, such as a more negative impact from indirect rather than direct tax increases. This is, however, entirely driven by effects occurring when GDP growth is lower than its potential rate, suggesting that taxing consumption is harmful only during recessions.

The paper also looks at dynamic specifications, i.e. how the effect on growth evolves over time. It finds that whenever there is a negative growth impact, it appears to occur mostly in the year of fiscal policy action, with only very limited knock-on effects on later years. Further work using non-linear specifications suggests that spreading out consolidation reduces the negative impact on growth, but only very slightly. Additionally, front-loading of fiscal consolidation appears to be less detrimental for growth when it is based on expenditure cuts rather than tax increases. It is important to note, however, that our analysis abstracts from the role of financial market pressures and/or fiscal sustainability considerations, which often support the case for front loading fiscal consolidation.

The main policy implication of this research is that, while fiscal consolidation is likely to hurt growth in the short run, the impact can be minimised by choosing a growth-friendly composition of the adjustment.

1. Introduction

This paper presents an empirical investigation of the growth impact of fiscal policy using a panel of 18 European countries over the period 1998-2011. Although this is not a new question, it seems to us there is still a gap in the literature. In particular, most of the existing papers use changes in the cyclically-adjusted primary balance as a proxy for discretionary fiscal policy actions. One drawback of this measure, however, is that it is usually computed using simple statistical adjustment methods based on times series, which do not reveal the underlying policy choices. To overcome this difficulty, we use a new measure of discretionary changes in fiscal policy. In particular, on the revenue side, we use direct estimates of the yields of all legislative and budgetary fiscal policy changes, which are obtained from a unique data set developed within the European System of Central Banks (ESCB), the use of which was pioneered by Agnello and Cimadomo (2012). In this data set the estimated yields of legislative changes have been vetted by ESCB experts. On the expenditure side, the paper defines a measure of discretionary spending as the gap between actual primary spending (net of social payments) and its trend defined as the previous year's spending uprated by inflation.

We look at the growth effect of actual measures, controlling for time and year effects and taking into account dynamic effects. We find that fiscal consolidation can be a drag on economic growth in the short-term, although some specific budgetary categories are not found to be statistically significant. Among expenditure measures, reductions in government investment and consumption are found to be growth reducing and among revenue measures, indirect tax increases are found to have a particularly strong impact. Dynamic specifications suggest that most of the effect occurs in the current year, with growth reductions in later years only due to persistence over time, i.e. a significant lagged dependent variable. Non-linear specifications indicate that spreading out consolidation may reduce the negative impact on growth only slightly. Additionally, front-loading fiscal consolidation appears to be less detrimental for growth when it is based on expenditure cuts rather than tax increases. However, it should be noted that this analysis abstracts from the role of financial market pressures and/or fiscal sustainability considerations, which often support the case for a front loading of fiscal consolidation.

The rest of the paper is structured as follows. Section 2 covers the related literature on fiscal consolidation and growth. Section 3 discusses the data and the empirical strategy used in this paper, and spells out the advantages compared to other datasets as well as the costs and benefits

of our panel data specification compared to other approaches. Section 4 describes the empirical results and Section 5 concludes.

2. Related literature

A rather general consensus has emerged in the empirical literature about the fact that in the short term fiscal consolidation can be a drag on economic growth. This effect would work mainly via lower aggregate demand, although under full Ricardian equivalence an increase in private demand following fiscal consolidation, may mitigate, or even fully offset, these contractionary effects. An accommodating monetary policy, may also work in the direction of fully counteracting the contractionary effects of fiscal policy, though this option is not available in all monetary frameworks, and certainly not in a currency union with centralised monetary policy. Finally, a credible fiscal consolidation plan may be expansionary in the short term if it gives rise to confidence effects and especially if the initial policy is unsustainable. Confidence effects may work both via positive effects on private demand and via lower risk premiums on public debt, which reduce real interest rates thus crowding in private investments.

Given these various counter-acting effects, it is not surprising that the part of the literature that has attempted estimating fiscal multipliers (i.e. the reaction of output to fiscal measures) has yielded a wide range of results. A study by Riera-Crichton et al. (2012) summarises the findings and notes that estimates of multipliers range from -2.5 to 4.0 in the theoretical literature, and from -2.3 to 3.6 in the empirical literature.

Papers that stress the positive impact of consolidation include Giudice et al. (2007) who look at large consolidations in the EU, and find that confidence effects occur quite frequently – in up to half of all consolidation episodes. They also find that consolidation was more likely to be expansionary if based on spending cuts rather than revenue increases. Similar results are found in Alesina and Ardagna (2013) who find that expansionary fiscal consolidations are possible, if consolidation is combined with structural reforms, thus giving a clear sense of regime change. Giavazzi and Pagano (1990) and Perotti (2011) look at the consolidation episodes of Denmark and Ireland in the 1980s, and the channels via which they produced expansionary effects. An important finding of their analysis, among others, is that the composition of budget consolidation was a key element for the success of consolidation as lower spending created room for lower labour taxes. This helped competitiveness and the wage moderation policy.

Some recent research, however, has questioned this result. Guajardo et al. (2011), for example, find little support for the expansionary consolidation hypothesis. Using a new dataset on fiscal consolidations developed by Devries et al. (2011), the authors find that a 1% of GDP fiscal consolidation reduces private consumption by 0.75% in two years and real GDP by 0.62%.[4] Estimation results are based on a dynamic panel model of real economic activity (i.e. real private consumption and real GDP) on its two lags and on two lags of the action-based fiscal consolidations using the OLS methodology. Ilzetzki and Vegh (2008) use more traditional measures of fiscal policy action, but address the endogeneity through econometric means, and also finds that cutting spending is recessionary. Alesina et al. (2012), however, who use the same data set, but look at fiscal consolidation plans over various years, find that expenditure-based adjustments are not recessionary.

Recently there has also been a discussion on whether consolidation may not only reduce growth, but even have such a strong detrimental impact that it would increase rather than reduce fiscal deficits. Apart from an arugment by Easterly et al. (2008), which is more relevant for developing countries, there are recent theoretical papers by Denes et al. (2012) and DeLong and Summers (2012), which show that such an effect could occur if the interest rate were close to zero. These findings are therefore not applicable to peripheral European countries, which face funding difficulties and rising interest costs.

3. Data and measurement strategy

3.1 A measure of discretionary fiscal policy action

A key issue in any empirical study on the economic effects of fiscal consolidations is to have a reliable measure of discretionary fiscal policy actions which is not related to underlying macroeconomic developments. Most of the existing studies on the topic use the change in the cyclically-adjusted primary budget balance (CAPB)[5] as a measure of discretionary changes in the fiscal policy stance.[6] One drawback of this measure, however, is that the cyclical adjustment methodology may be affected by severe limitations. First, estimates of potential GDP become

[4] The authors show how the expansionary consolidation hypothesis is confirmed when using the cyclically adjusted primary balance (CAPB) as a measure of discretionary fiscal policy. They argue, however, that this is due to the fact that cyclically adjusted data may suffer from reverse causality and bias the analysis towards support the expansionary consolidation hypothesis.

[5] The CAPB is equal to the budget balance net of interest payments and the effects of the economic cycle.

[6] To ensure that changes in the CAPB capture discretionary changes in fiscal policy these studies focus on changes in the CAPB which are sufficiently large and above a certain threshold typically set at 1.5 or 2.0 p.p. of (potential or trend) GDP.

erratic in presence of extreme fluctuations in economic activity. Second, elasticities are likely to change in deep recessions, e.g. corporate income tax revenues will behave nonlinearly and collapse rather than fall in line with GDP or profits. Also mandatory spending on social insurance and social welfare payments may rise by more than is common when the unemployment rate jumps up. Finally, the cyclical adjustment methodology fails to account for a missing link between the budget balances and the economic cycle, namely the role of asset prices on revenues (Morris and Schuknecht, 2007).

Recently, Romer and Romer (2010) have adopted a more narrative method to identify legislative tax changes in the US over the period 1945-2007. The authors rely on historical information about the size, timing and motivation of the fiscal policy actions of the government and assess the impact of such changes on real output and find that tax increases have a contractionary effect in the short and medium term (i.e. three years). In a similar vein, Devries et al. (2011) have constructed an action-based dataset of fiscal consolidations for a sample of 17 OECD countries over 1979-2009. This dataset is based on information from contemporaneous budget documents and budget speeches in order to identify the size, the timing of discretionary changes in taxes and government spending motivated by the aim to reduce the budget deficit and not in response to prospective macroeconomic conditions. This approach allows to separate legislated fiscal policy measures into those that are motivated by the aim to improve fiscal sustainability from those taken in response to expected macroeconomic developments.

Still, this action-based measure also has its drawbacks. First, it is questionable that motivations as described in public documents are true. Sometimes they may also be hard to distinguish. During a boom, for example, a consolidation achieves both deficit reduction and provides the desired reduction in aggregate demand, and can be sold on whichever argument seems politically more promising. Second, it is not entirely clear why motivations should matter. Any fiscal policy choice that affects revenue policy or spending will have an impact on aggregate demand. Finally, the costing of the measures, if taken from government documents, may be biased, if not checked by an independent third party.

Compared to the existing literature on the growth impact of discretionary fiscal policies, this paper uses, on the revenue side, a different measure of discretionary fiscal policy actions. Instead of approximating measures indirectly from changes in fiscal variables, on the revenue side we use a direct estimate which sums up the yield of individual measures on tax and social security contributions which have been legislated or likely to be legislated by national parliaments. This

is because, the benchmark path followed by revenue items in the absence of discretionary measures can be easily identified on the basis of assumptions about economic growth and developments in the tax bases. We consider total measures, irrespective of their official or underlying motivation. Clearly, this approach is not perfect either, as it depends on the accurate direct quantification of measures, which can also be difficult, but at least these estimates are not contaminated by cyclical or other non-policy-related changes to fiscal variables. On the expenditure side, the amount of discretionary fiscal measures is defined as the gap between actual spending and an expenditure benchmark (i.e. the no-policy-change scenario) which we define as the previous year's government primary spending (net of social spending) uprated by inflation. The reason for using a different approach on the spending side, compared to the revenue side, is that a direct estimation of the yield of expenditure measures is generally not feasible since classification of a given measure as expansionary or contractionary depends on the definition of a benchmark and this is typically not possible in the case of most spending items, especially those which do not depend on entitlements written in legislation (e.g. intermediate consumption, investments).

It could be argued that the amount of measures taken are nevertheless endogenous, because policy makers react to the economic environment and in particular the business cycle when setting their tax and spending policies – which is the motivation behind the action-based datasets that attempt to focus on consolidations that are not motivated by macroeconomic management. However, these policy reactions should not be overestimated. After all, different governments react very differently in response to the same economic challenge, depending on their ideological and cultural background. Hence, when faced with an economic slump, some governments will take fiscal stimulus measures, while others will try to take consolidation measures to contain the increase in the fiscal deficit. This strategy may even be changed mid-way, for example, if elections take place. Still, we address any such remaining endogeneity by econometric means (GMM).

3.2 Discretionary revenue measures

As discussed above, our discretionary revenue measure is based on information from a dataset developed by the ESCB in the context of the disaggregated approach (Kremer 2006).

This approach consists of an integrated framework which distinguishes the various factors affecting the evolution of public finances and allows isolating the policy effects. On the revenue side, the data provide a breakdown of revenues (net of cyclical effects and temporary factors)

into direct taxes payable by corporations, direct taxes payable by households, indirect taxes and social security contributions. The disaggregated approach decomposes the change in each category of revenues into: i) *legislative changes*, reflecting the budgetary impact of revenue measures which have been passed by national parliaments or that have been specified in sufficient detail and are likely to be passed; ii) *fiscal drag*, which reflects the tendency for tax receipts to grow at a faster (slower) pace than the tax base. This is typically due to the progressive or regressive nature of a particular tax; iii) *decoupling* of the tax base from GDP, which reflects differences in the trend (volume) growth rate of the macroeconomic base variable and the trend growth rate of real GDP and iv) a *residual* component which captures developments that are not explained by the model (due for example to errors in the model specification). In the context of the disaggregated approach, the legislative changes correspond to the discretionary revenue changes which we use in this paper. The costing contained in these data has been evaluated by fiscal experts from National Central Banks, and may therefore differ from official government estimates. The use of these data in academic research was pioneered by Agnello and Cimadomo (2012) in a study that explores how discretionary fiscal policies on the revenue side of the government budget have reacted to economic fluctuations in European Union countries.

The information on legislated revenue changes available from the ESCB disaggregated approach described above has been used to construct a dataset for 18 EU countries over the period 1998-2011. Following Agnello and Cimadomo (2012), the table below presents the correlation matrix of changes of total taxes and social security contributions and the driving factors as identified in the context of the disaggregated approach, focusing on observations averaged over all countries and time period considered. As can be seen from the table, the residual component explains a significant part of the change in cyclically adjusted revenues, followed by legislative changes. This confirms the suspicion that changes in tax revenues or revenue-ratios are strongly affected by unexplained effects, which include estimation errors, for example because non-linearities of the tax system are not taken into account. In an approach based on cyclically-adjusted primary balances, these would probably show up as measures.

Table 1: Correlation matrix of changes in overall taxes and social contributions, and the four sub-components computed according to the ESCB's disaggregated approach

	Total revenues	Fiscal drag	Decoupling	Legislative changes	Residual
Total revenues	1				
Fiscal drag	0.10	1			
Decoupling	0.16	0.23	1		
Legislative changes	0.28	-0.03	-0.05	1	
Residual	0.40	-0.17	-0.58	-0.43	1

Notes: Variables refer to overall taxes and social security contributions, net of temporary measures. Total revenues refer to changes in cyclically-adjusted revenues, net of temporary measures. Values reported are the simple average of single countries' variance-covariance matrix, for the panel EU-18 over the period 1998-2011. Source: authors' calculations

3.3 Spending measures

When turning to the spending side, it should be remembered that there is a huge difference between revenues and expenditures. While revenues fluctuate even in the absence of measures, spending—apart from mandatory items, especially on social payments—is determined in the annual budget and any change in budget appropriations is therefore generally a policy measure. We use European Commission data[7] on government expenditures to define spending measures consistently across all countries as deviations of actual spending from a no-policy-change scenario.[8] We define the no-policy-change scenario as the previous year's government spending uprated by inflation. Since we are interested in changes in government spending that are discretionary, we focus on primary spending net of social payments, as these are typically the items most affected by cyclical developments. The budgetary impact of the financial support to the banking sector (via higher capital transfers), is also excluded from the expenditure aggregate. This is to avoid that our measure of discretionary spending is biased by these one-off factors whose budgetary impact can be extremely sizeable in some cases, but which are not expected to have the same direct impact on the economy as other discretionary measures. Our estimate of discretionary spending measures is therefore given by the following formula:

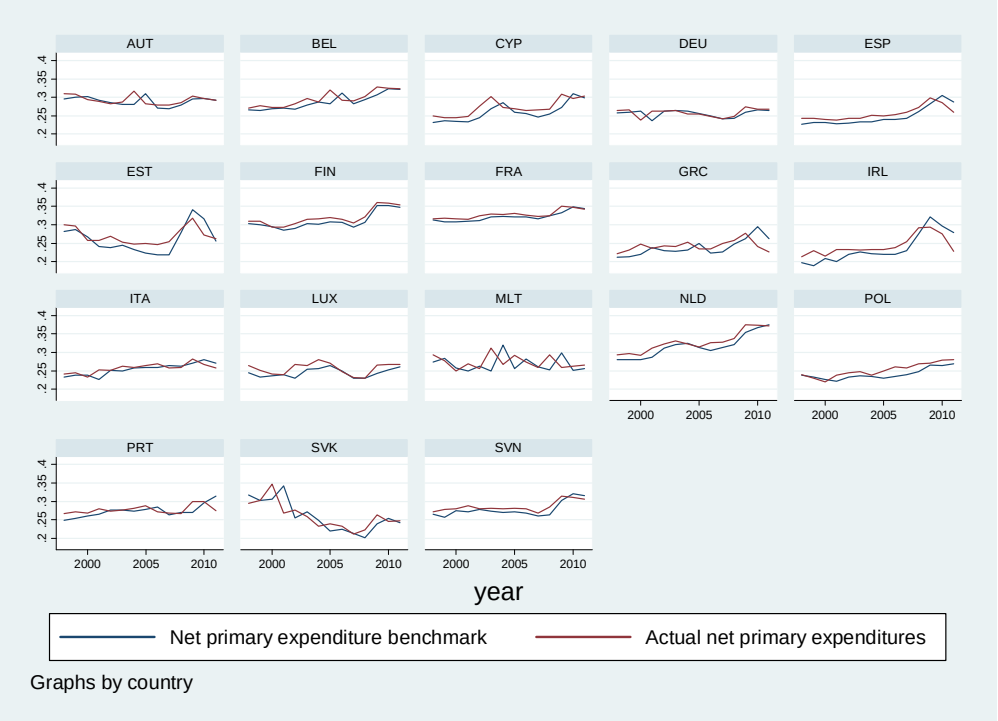
$$dpns_{i,t} = pns_{i,t} - pns_{i,t-1}(1+\pi_{i,t}) \quad (1)$$

[7] Annual macro-economic database of the European Commission (AMECO), downloaded in March 2012,

[8] While the data set from the disaggregated approach also includes some estimates of spending measures, this is based on a number of arbitrary assumptions (see also Kremer et al., 2006), which are unlikely to be applied consistently across countries.

where *dpns* is the discretionary amount of primary spending net of social payments and capital transfers to the banking sector (henceforth *d*iscretionary *p*rimary *n*et *s*pending or *dpns*) of country *i* at time *t*. *dpns* is calculated as the difference between the level of primary net spending of country *i* at time *t* and its level under the no-policy change scenario which is given by the level of primary net spending at t-1 uprated by the HICP inflation rate of country *i* at time *t* (π). A negative value would therefore indicate a restrictive policy, i.e. expenditures that have been cut compared to the no policy change scenario. Figure 1, shows for all countries in our sample the trend of the two expenditure variables in the right hand side of formula (1) as share of GDP for the period 1998-2011.

Figure 1: Net primary expenditure benchmark versus actual net primary expenditures, (share of GDP, 1998-2011)



Source: Authors' calculation based on European Commission data.

As can be seen from the figure, countries in the sample display different patterns although in most cases net primary expenditures peaked after the 2007-08 recession, when fiscal stimuli packages in the context of the European Economic Recovery Plan were introduced in some countries, and started to decline afterwards.

3.4 Total measures

Based on the above, our measure of the discretionary fiscal policy (*dfp*) measures as share of GDP is computed as:

$$dfp_{i,t} = leg_{i,t} - dpns_{i,t} \qquad (2)$$

where both the legislative changes (*leg*) and the discretionary net primary spending are expressed as share of GDP.[9] Given the limitation of our data on revenue measures, the resulting database covers 18 countries over 1998-2011. The data are annual, in line with the annual budgets used in all countries.

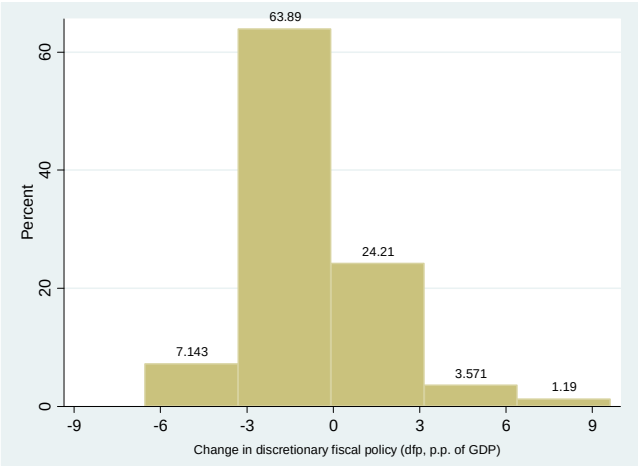
Table 2 displays key summary statistics for our measure of discretionary fiscal policy changes and changes in expenditures, and Figure 2 displays the distribution of the *dfp* variable.

Table 2: Summary Statistics of discretionary fiscal policy changes

Variable	Obs	Mean	Std. Dev.	Min	Max
dfp	252	-0.74	2.11	-6.53	9.09
dfp>0	70	1.66	2.06	0.01	9.09
dfp<0	182	-1.66	1.21	-6.53	-0.03
dnps	252	0.69	1.65	-7.30	6.19
dnps>0	192	1.35	0.96	0.02	6.19
dnps<0	60	-1.43	1.61	-7.30	0.00

Source: Authors' calculations

Figure 2: Distribution of discretionary fiscal policy changes (% of GDP)



Source: Authors' calculations

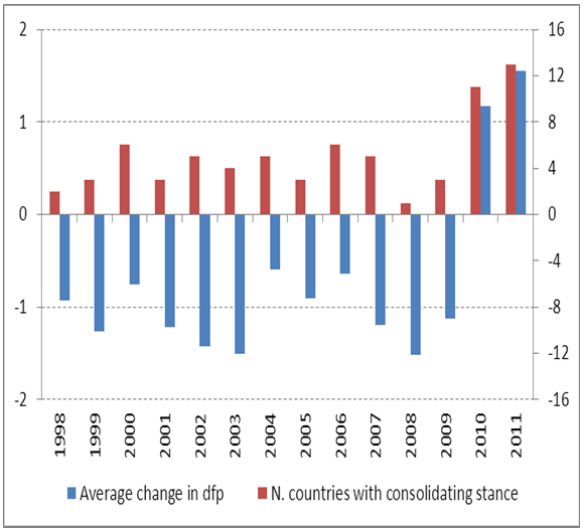
Over the period 1998-2011 and for the countries in our sample, fiscal consolidations (i.e. those for which *dfp*>0) represent less than one third of the total episodes, and this holds in particular for discretionary changes in expenditures (i.e. *dnps*<0). The average size of fiscal consolidations in the sample is close to about 1.7% of GDP, though for the sample under consideration the

[9] The legislated revenue measures are already expressed as the budgetary impact on the change of the underlying budgetary item in the respective year.

fiscal stance, based on our measure of discretionary fiscal policy changes, was on average slightly expansionary.

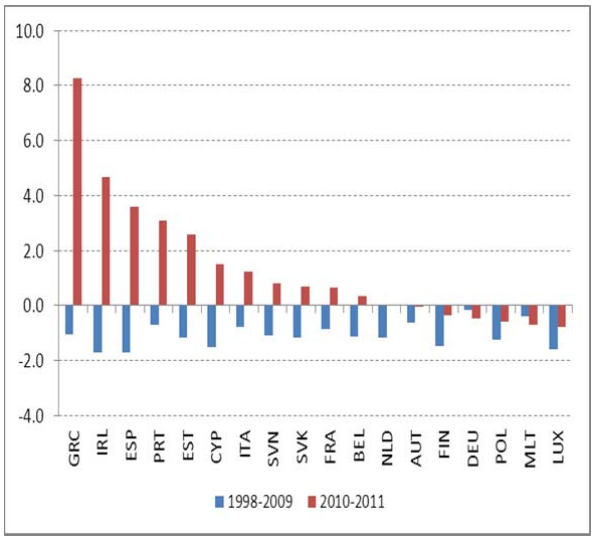
Figures 3 and 4 show the average size of discretionary changes in fiscal policy (i.e. *dfp*) across time and by countries. Figure 3 shows that the fiscal policy stance was on average expansionary for most of the years covered by our sample. A clear change in trend occurred since 2010 along with a sharp increase in the number of countries that shifted to a consolidating policy stance. Looking at individual countries, Figure 4 shows that for the period 1998-2009 all the countries in our sample had a relatively expansionary fiscal stance and that the intensification of the sovereign debt crisis in 2010 led to a sharp increase in the consolidation efforts of most countries, particularly in those that have recently entered a financial assistance programme or that have been under intense market pressure.

Figure 3: Average annual change in discretionary fiscal policy (% GDP, cross country average) and number of consolidating countries



Source: authors' calculations

Figure 4: Average change in discretionary fiscal policy by country (%GDP, 1998-2011)



Source: authors' calculations
Note: countries are sorted according to the size of change in discretionary fiscal policy over 2010-11

4. Empirical strategy and results

4.1 Empirical approach

As our estimates of fiscal measures represent exogenous policy choices taken by governments, one approach is to use simple regression techniques to investigate the impact of fiscal measures on economic growth. This basic approach can be justified by noting that unlike measures based on fiscal deficits, growth does not have an economic impact on our measure of fiscal adjustment. However, our measure could still be subject to political endogeneity, if governments take action based on expected growth outturns. In section 4.3 we will also consider treating the fiscal adjustment measure as an endogenous variable.

Our basic approach is simply a regression of real economic growth rate (g) on its own lag, our measure of discretionary fiscal policy (dfp)[10] and a set of control variables (X):

$$g_{i,t} = \alpha_0 + \beta_1 g_{i,t-1} + \beta_2' dfp_{i,t} + \beta_3' X_{i,t} + f_i + y_t + \varepsilon_{i,t}$$

The measure of discretionary changes in fiscal policy could be an aggregate estimate or a vector of various components. The coefficient is then a measure of the fiscal multiplier, or respectively, of the various revenue and spending multipliers. As we have panel data and strong reasons to believe that there are differences across countries and time, which are not independent of the other variables, we also include fixed country (f) and year (y) effects.

4.2 Static regressions

Even though there are good reasons to assume that fiscal consolidations have dynamic effects, we start with a simple static regression. This serves as benchmark for later dynamic specifications and avoids some of the endogeneity issues encountered there.

We start with the simplest possible specification by regressing real growth on our estimate of total consolidation measures in the first regression of Table 3. This shows a strongly significant negative coefficient, which is robust to the addition of country and year fixed effects in regression (2). Regression (3) splits measures into revenue and expenditure components, in line with the literature suggesting that growth impacts of these are likely to differ. Indeed, we find that revenue measures are associated with a greater reduction in growth, but the coefficient (in absolute terms) is not statistically different from the one on expenditure measures. Regression

[10] As defined above, the measure is defined as a share of current GDP. As a robustness check, we also ran regressions on measures as a share of the previous year's GDP and obtained the same results.

(4) goes a step further in splitting revenues into indirect and direct taxes (including social security contributions) and expenditure into investment and current spending. On the spending side we find that cuts in investment are associated with lower growth, while the coefficient on current spending is much smaller and statistically less significant. More surprising is the finding on the revenue side, which shows a much stronger and more significant impact for indirect taxes, even though much of the literature suggests that they should be relatively less detrimental for growth.[11] The same results are obtained if only revenues or only expenditures are split into two categories (not shown). Finally, we split revenues and spending into even more categories. We find that on the revenue side, indirect taxes remain with a strong negative impact, while the three components of direct taxes all remain insignificant. On the spending side, apart from investment, we also find a significant coefficient on consumption, while measures relating to subsidies or the compensation of employees are unrelated to economic growth.

[11] See for example Johansson et al. (2008).

Table 3: The impact of fiscal adjustment on real growth

	(1) OLS	(2) WG	(3) WG	(4) WG	(5) WG
Total measures	-0.404***	-0.427***			
	(0.127)	(0.130)			
Revenue			-0.521*		
			(0.249)		
Indirect taxes				-1.394**	-1.649*
				(0.548)	(0.856)
Direct taxes				-0.251	
				(0.170)	
by household					0.369
					(0.357)
by enterprises					-0.117
					(0.286)
social security					-1.320
					(0.870)
Expenditure			0.391***		
			(0.105)		
Investment				1.141***	1.028***
				(0.238)	(0.200)
Current spending				0.280***	
				(0.070)	
Consumption					0.895**
					(0.324)
Subsidies					0.414
					(0.397)
Comp. of employees					0.281
					(0.494)
Observations	252	252	252	252	252
R2	0.0695	0.657	0.657	0.696	0.715
Adj. R2	0.0658	0.636	0.636	0.674	0.689
Countries		18	18	18	18

Dependent variable: real growth
Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.
All within-groups estimates (WG) include country and year effects.

4.3 Dynamic analysis

As there could be a difference between the short and medium-term effects of fiscal consolidation, the analysis should be based on a dynamic specification. We therefore add a lagged dependent variable, as well as lags of all explanatory variables to the regressions. Ideally we would like to add even more lags, but we are limited by the size of our dataset.

As is well known (Nickell, 1981), adding lagged dependent variables in panel regressions leads to biased regression results. In particular, the coefficient on the lagged dependent variable is biased upward if an OLS regression is used, and downward in the case of within-group

regressions. This bias, however, disappears the more time periods are added. In our case, with 14 time periods, the bias is unlikely to be substantial so we can arguably proceed with normal within-group techniques. Moreover, Judson and Owen (1999) have shown that biases to other coefficients are typically very small. Still, we also report a few specifications estimated with the system-GMM estimator suggested by Blundell and Bond (1998). This is the estimator of choice for panel data with endogenous variables when there are a large number of groups. As our data set contains only 18 countries, we report results, but need to bear in mind that the method is only asymptotically valid.

Table 4 presents the results as obtained with traditional within-groups estimators. The regressions mirror those of Table 3, except that they include lags of all variables. We find that the lagged dependent variable is statistically significant in all regressions, supporting the choice of a dynamic specification. The other variables are found to be significant only contemporaneously and in exactly the same cases as in the static framework (with the unique exception of the compensation of employees). This suggests that consolidation measures have a medium-term impact through the lagged dependent variable, but no additional impact in the following year.

Table 4: The dynamic impact of fiscal adjustment on real growth

	(1)	(2)	(3)	(4)
Real growth$_{t-1}$	0.297***	0.307***	0.308***	0.274***
	(0.082)	(0.079)	(0.063)	(0.054)
Total measures	-0.322**			
	(0.126)			
Total measures$_{t-1}$	0.001			
	(0.098)			
Revenue		-0.536*		
		(0.289)		
Revenue$_{t-1}$		0.168		
		(0.168)		
Indirect taxes			-1.711**	-1.905**
			(0.733)	(0.757)
Indirect taxes$_{t-1}$			-0.277	0.340
			(0.367)	(0.435)
Direct taxes			-0.195	
			(0.151)	
Direct taxes$_{t-1}$			0.195	
			(0.184)	
by household				0.296
				(0.263)
by household$_{t-1}$				0.036
				(0.184)
by enterprises				-0.427
				(0.254)
by enterprises$_{t-1}$				0.347
				(0.380)
social security				-0.943
				(0.796)
social security$_{t-1}$				0.264
				(0.390)
Expenditure		0.263**		
		(0.095)		
Expenditure$_{t-1}$		0.021		
		(0.102)		
Investment			1.060***	0.834***
			(0.201)	(0.151)
Investment$_{t-1}$			-0.082	0.028
			(0.422)	(0.241)
Current spending			0.076	
			(0.138)	
Current spending$_{t-1}$			-0.166	
			(0.139)	
Consumption				1.004***
				(0.290)
Consumption$_{t-1}$				0.283
				(0.387)
Subsidies				0.447
				(0.448)
Subsidies$_{t-1}$				-0.887
				(0.833)
Comp. of employees				-0.102
				(0.296)
Comp. of employees$_{t-1}$				0.642**
				(0.278)
Observations	234	234	234	234
Countries	18	18	18	18
R2	0.681	0.685	0.727	0.753
Adj. R2	0.659	0.660	0.700	0.717

Dependent variable: real growth
Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All regressions include country and year effects.

Table 5 re-estimates some of the regressions of Table 4 using System-GMM methods. As the GMM method is valid only asymptotically as the number of groups goes to infinity, and as its differencing and instrumenting costs observations, we need to keep the number of variables small. We therefore drop the lagged explanatory variables (other than the lagged dependent variable), which all proved insignificant above. A general finding of these regressions is that the coefficient of the lagged dependent variable increases compared to the within-group estimator, which is in line with the expected bias. The bias does not appear to be large though.

The first three regressions allow only for the endogeneity of the lagged dependent variable and otherwise mirror those of Table 3. The results are generally similar to the within-groups results, except that the coefficient on total spending turns insignificant. In the more disaggregated regression, the coefficient on investment, remains strongly significant, however. The standard specifications tests are passed for the first two regressions. For the third regression, however, the Hansen/Sargan test yields a p-value of 100%, which is typically an indication of too many instruments having weakened the test. We therefore do not report result for the regressions with more explanatory variables, as these would suffer even more from this problem.

In regressions 4 and 5, we additionally allow the discretionary fiscal policy measures to be endogenous reflecting political endogeneity as discussed above. Regression (4), which uses total measures, yields results that are very similar to those obtained with within-groups regressions. This suggests that our general treatment of fiscal adjustment measures as exogenous has led to a very small bias if any. Regression (5), which allows for separate effects for revenue and spending measures, also yields numerically similar coefficients to the corresponding within-group regression, but the coefficient on revenue measures turns insignificant. The Sargan/Hansen test, however, yields again a p-value that is very close to 100%, indicating possible problems as in regression (3). Overall then, we consider these findings as supportive of our general approach.

Table 5: The dynamic impact of fiscal adjustment on real growth, System GMM estimates

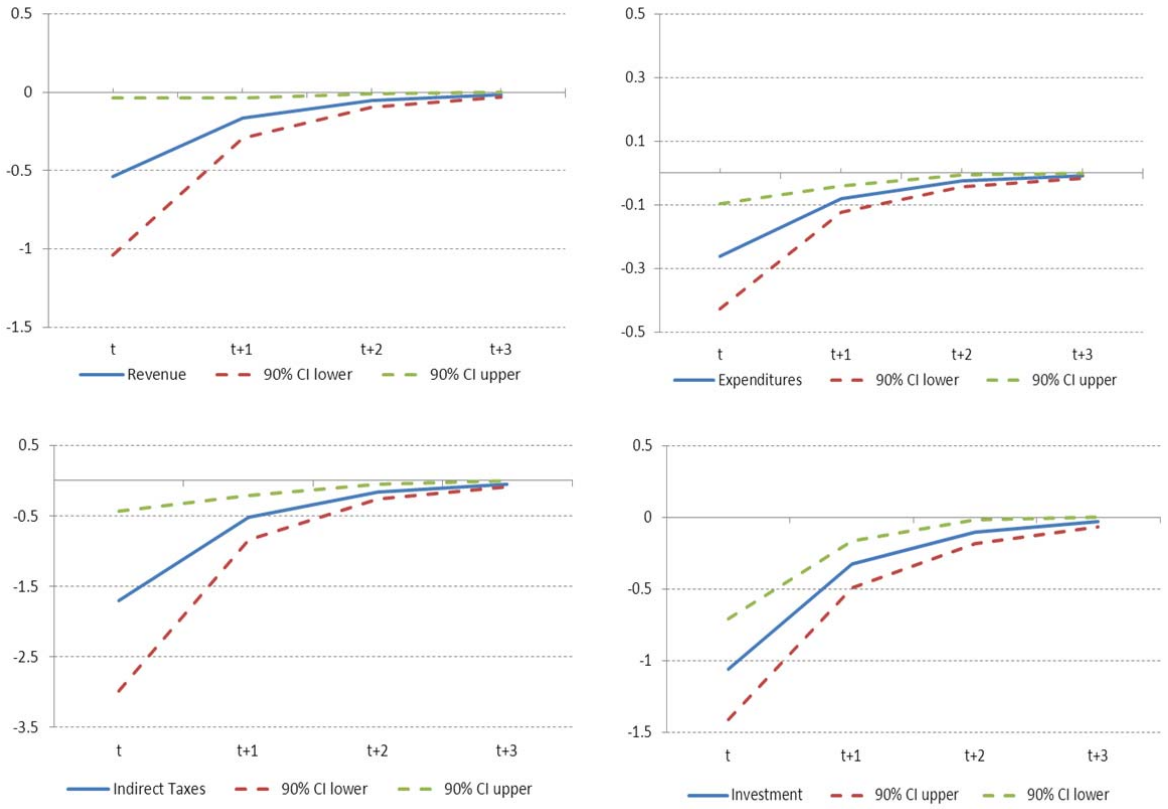
	(1)	(2)	(3)	(4)	(5)
Real growth$_{t-1}$	0.412*	0.396*	0.381**	0.370**	0.346**
	(0.221)	(0.216)	(0.190)	(0.186)	(0.174)
Total measures	-0.187*			-0.312**	
	(0.099)			(0.156)	
Revenue		-0.412**			-0.615
		(0.164)			(0.384)
Indirect taxes			-1.151***		
			(0.420)		
Direct taxes			-0.128		
			(0.110)		
Expenditure		0.130			0.248**
		(0.101)			(0.111)
Investment			0.884***		
			(0.255)		
Current spending			0.097		
			(0.101)		
Observations	252	252	252	252	252
Countries	18	18	18	18	18
AR1 p	0.0240	0.0218	0.0200	0.0207	0.0134
AR2 p	0.644	0.450	0.135	0.765	0.498
Hansen p	0.380	0.377	1	0.317	0.981
Endogenous variabls	g_{t-1}	g_{t-1}	g_{t-1}	g_{t-1}, dfp_t	g_{t-1}, $dnps_t$, $dleg_t$
Instruments	g_{t-2}	g_{t-2}	g_{t-2}	g_{t-2}, dfp_{t-1}	g_{t-2}, $dnps_{t-1}$, $dleg_{t-1}$

Dependent variable: real growth
Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All regressions include country and year effects. Estimated using system-GMM with a collapsed instrument set and the h(2) option of the command xtabond2.

To gain further insights about the medium term implications of the estimated impact of discretionary changes in fiscal policy on the real GDP growth rate, we present a simple impulse response function obtained on the basis of the coefficient estimates of Table 4. In particular, as we are interested in assessing the effect of an increase in taxes and a reduction in expenditures and their subcomponents, on the real GDP growth, we use the coefficient estimates of models (2) and (3) of Table 4 to calculate the effect on the real GDP growth rate of a 1% change in the corresponding fiscal variables on impact and over the next three years. As can be seen from the figures, the negative effect on impact varies between revenues and expenditures, and in the case of indirect taxes and investments, the effect is larger than in aggregate. Over the medium term

and across both categories of fiscal variables, the impact on real GDP growth fades progressively away converging towards zero after three years.

Figure 5: Impact on real GDP growth of a 1% of GDP change in fiscal variables



Source: Authors' elaboration. Confidence intervals are calculated on the basis of the delta method (see nlcom command in STATA 11)

4.4 Non-linear effects

4.4.1 Results by economic cycle

Fiscal multipliers could be different in recessions from what they are in booms, because there would be less crowding when supply constraints are not binding. Auerbach and Gorodnichenko (2012) for example find that spending multipliers are significantly higher in recessions. To

address this possibility in our data, we produce a dummy variable indicating whether the real growth rate exceeds the potential growth rate, and interact this with the variables of interest.[12]

Table 6: The impact of fiscal adjustment on growth, depending on cyclical position

	(1)	(2)	(3)
Real growth$_{t-1}$	0.292***	0.281***	0.254**
	(0.090)	(0.095)	(0.095)
Total measures,	-0.272**		
g > potential	(0.119)		
Total measures	-0.348*		
g < potential	(0.178)		
Revenue,		-0.002	
g > potential		(0.160)	
Revenue,		-0.620	
g < potential		(0.363)	
Indirect taxes,			-0.413
g > potential			(0.452)
Indirect taxes,			-1.710**
g < potential			(0.796)
Direct taxes,			-0.024
g > potential			(0.158)
Direct taxes,			-0.174
g < potential			(0.111)
Expenditure,		0.350*	
g > potential		(0.175)	
Expenditure,		0.242*	
g < potential		(0.131)	
Investment,			0.997***
g > potential			(0.158)
Investment,			0.970
g < potential			(0.604)
Current spending,			0.238*
g > potential			(0.136)
Current spending,			0.155
g < potential			(0.150)
Observations	252	252	252
Countries	18	18	18
R2	0.686	0.692	0.725
Adj. R2	0.664	0.668	0.699

Dependent variable: real growth
Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All regressions include country and year effects.

[12] An alternative would be to define a dummy indicating whether there is a positive output gap. However, this is more likely to be prone to error, given the difficulty in defining output gaps, and the frequent revisions to output gap series. Results are very similar, however.

Table 6 shows the results with variables interacted with our dummy, so that both the impact on growth in times of growth exceeding the potential rate and in times of undershooting it is shown. The first regression shows that the negative impact of fiscal consolidation measures is stronger in times of weak growth, although the difference between both coefficients is not significant. Regression (2) splits revenue and spending measures. On the revenue side, in times of weak growth, the coefficient is almost significant (p=10.5), while in boom times it is not. Spending measures, however, are significant at any time. In regression (3), we see further that among revenue measures, it is particularly indirect taxes that turn significant when growth is low. This may explain the broader puzzle that our data have shown a strong impact from indirect taxes, even though they are usually found to be the least detrimental for growth. In deep recessions, where output is largely demand driven, an indirect tax increase may be particularly harmful, even though it is not so in equilibrium. On the spending side, we find that coefficients do not differ much depending on the cycle. When growth is weak, however, the standard error increases so as to render the coefficient insignificant. This could be explained by the various counteracting effects in times of weak growth: on one hand multipliers are likely to be large, but on the other hand any additional spending is more likely to threaten debt sustainability than when growth is strong.

4.4.2 Results with non-linear consolidation impact

It is possible that very large discretionary fiscal policy measures could have a disproportional effect on growth. An extremely tight consolidation, for example, could be more than twice as harmful for growth as one of half the size. Or a particularly large stimulus package could face diminishing marginal returns, because of capacity constraints or because its reversal is more obvious to economic agents. In this section we therefore allow for nonlinear effects, by adding squared measures to the regression specification.

Table 7: A non-linear impact on economic growth

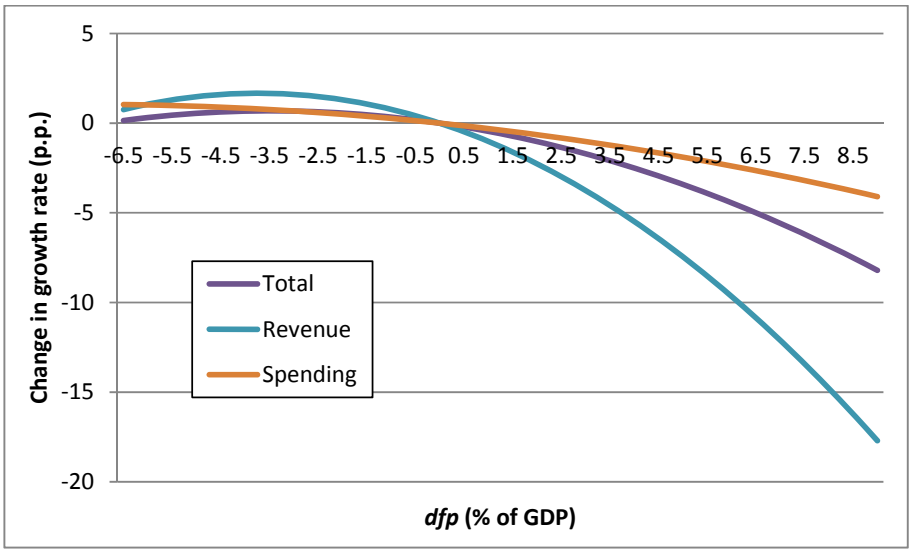
	(1)	(2)
Real growth$_{t-1}$	0.250**	0.275**
	(0.090)	(0.106)
Total measures	-0.297***	
	(0.099)	
Total measures^2	-0.043**	
	(0.017)	
Revenue		-0.647**
		(0.283)
Revenue^2		-0.087
		(0.056)
Expenditure		0.206**
		(0.091)
Expenditure^2		-0.014
		(0.030)
Observations	252	252
Countries	18	18
R2	0.699	0.696
Adj. R2	0.679	0.673

Dependent variable: real growth
Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All regressions include country and year effects.

Table 7 shows the results. The results confirm a nonlinear relationship, with the coefficient on the squared term always negative, but only significant in the first regression, which considers total measures. To facilitate the interpretation of these coefficients, Figure 6 shows a chart of the estimated relationship over the range of discretionary fiscal policies included in our sample. The result is in line with the hypothesis above, that very strong consolidations are disproportionally growth reducing while the additional growth benefits of excessive stimulus is declining. Moreover, when looking separately at revenue and spending measures, the additional drag caused by particularly large revenue measures is very high, while strong spending cuts imply a low cost in terms of lost growth. This in turn would suggest that from the viewpoint of reducing the overall impact on growth fiscal consolidation should be spread out. However, this analysis abstracts from other constraints, such as financial market pressures, or fiscal sustainability considerations, which often support a front-loading of consolidation as a necessary step to restore fiscal sustainability and regain financial market confidence. When front-loaded

consolidation is required, though, the findings of this paper suggest that it should be predominantly spending based.

Figure 6: The impact of discretionary fiscal policy measures on growth.



4.5 Further results

4.5.1 Comparisons with other measures of fiscal consolidation

Much of the early studies have used the change in the CAPB as a measure of discretionary fiscal policy changes. As mentioned above, this approach is questionable, given the imperfections of the cyclical adjustment and the resulting endogeneity. Still, we wanted to see whether the results in our sample would actually be different when using that measure. Hence we reran the basic static and dynamic regressions, replacing our measure of total fiscal measures by the change in the CAPB. We consistently found this measure to be insignificant in explaining economic growth, confirming the suspicion that the use of this measure as a quick alternative to gathering data on actual consolidation measures is not without consequences.

We also wanted to compare our results to those obtained using the Devries et al. (2011) data set. The comparison proved, however, impossible to make. First, the sample size was reduced by the smaller number of countries available for both data sets. Second, the matched dataset had very few (25) consolidation episodes, because the data cover only instances of fiscal consolidation (i.e. measures reducing the budget deficit).

4.5.2 Additional control variables

While country and year effects already control for many unobserved variables, we also report some further results with additional controls. To this purpose we re-estimate the four specifications reported in Table 4 (excluding the insignificant lagged variables on the fiscal measures) with additional controls such as the short-term interest rate and the general government gross debt. For ease of comparison, Table 8 reports the baseline results along with those including the controls.[13] Overall the significance as well as the size of the coefficients capturing the impact of discretionary fiscal policy on growth remains unaltered. The short term interest rate has a negative and significant impact on real GDP growth across all specifications. The lagged dependent variable loses significance in all specifications, whereas our measure of discretionary fiscal policy remains broadly unchanged. The inclusion of the gross debt to GDP ratio does not alter our baseline results. Its coefficient remains insignificant in the first two specifications, and it turns weakly significant in the third and fourth specification. The sign of the coefficient is in line with the results of the existing empirical studies on the growth impact of debt namely that a higher debt to GDP ratio leads to lower growth (Checherita-Westphal and Rother, 2012).

[13] We do not show results including as a control the current account balance, because this never turned significant and did not affect the other coefficients.

Table 8: Additional control variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Measure of discretionary fiscal policy	**Total**			**Revenues and Expenditures**			**Direct, Indirect Taxes, Current and Investment Spending**			**Further subcomponents of revenues and expenditures**		
Real growth$_{t-1}$	0.291***	0.199	0.274***	0.294***	0.203	0.277***	0.265**	0.188	0.253***	0.258**	0.177	0.244***
	(0.092)	(0.122)	(0.082)	(0.094)	(0.126)	(0.084)	(0.095)	(0.120)	(0.084)	(0.092)	(0.119)	(0.083)
Total measures	-0.321**	-0.277*	-0.291**									
	(0.124)	(0.147)	(0.120)									
Revenue				-0.444*	-0.450	-0.423*						
				(0.231)	(0.273)	(0.209)						
Indirect taxes							-1.302**	-1.381**	-1.240**	-1.698**	-1.811**	-1.675**
							(0.568)	(0.613)	(0.550)	(0.785)	(0.791)	(0.767)
Direct taxes							-0.194	-0.206	-0.192			
							(0.142)	(0.163)	(0.131)			
by household										0.337	0.369	0.366
										(0.281)	(0.265)	(0.295)
by enterprises										-0.311	-0.353	-0.316
										(0.248)	(0.296)	(0.243)
social security										-1.081	-1.099	-1.149
										(0.725)	(0.720)	(0.767)
Expenditure				0.273**	0.209*	0.238**						
				(0.097)	(0.111)	(0.102)						
Investment							0.950***	0.821***	0.911***	0.842***	0.696***	0.800***
							(0.180)	(0.181)	(0.191)	(0.150)	(0.161)	(0.159)
Current spending							0.184**	0.139	0.161*			
							(0.083)	(0.087)	(0.090)			
Consumption										0.744**	0.786*	0.699**
										(0.305)	(0.377)	(0.303)
Subsidies										0.136	-0.194	0.124
										(0.326)	(0.325)	(0.322)
Comp. of employees										0.022	-0.039	-0.071
										(0.382)	(0.443)	(0.351)
Additional controls												
Short-term interest rate		-0.271**			-0.273**			-0.233*			-0.251*	
		(0.103)			(0.102)			(0.113)			(0.121)	
Gross government debt			-0.029			-0.030			-0.022*			-0.026**
			(0.018)			(0.018)			(0.012)			(0.010)
Observations	252	236	252	252	236	252	252	236	252	252	236	252
Countries	18	17	18	18	17	18	18	17	18	18	17	18
R2	0.685	0.700	0.691	0.687	0.702	0.693	0.719	0.734	0.723	0.736	0.756	0.740
Adj. R2	0.665	0.678	0.670	0.665	0.679	0.670	0.698	0.711	0.700	0.711	0.730	0.714

Dependent variable: real growth
Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All regressions include country and year effects.

5. Conclusion

This paper has considered the growth impact of fiscal consolidation measures using a new dataset, based on actual estimates of consolidation measures. The main finding is that fiscal consolidation can be a drag on economic growth in the short-term, although it depends on the fiscal consolidation measure chosen. This finding is in line with some, but not all of the literature, some of which found positive effects, even in the short run. Some of the detailed findings are surprising, such as a more negative impact from indirect rather than direct tax increases, but this is entirely driven by effects occurring when growth is lower than the potential rate, suggesting that raising consumption taxes is harmful only during recession. In any case, many findings are in line with previous work, such as the greater impact of revenue rather than spending measures. In dynamic specifications we found not much evidence of additional effects in years following consolidations, except through the persistence of the growth performance. Our

results from nonlinear specifications suggest that, in the absence of financial market pressure and/or sustainability considerations, the negative short-term impact of fiscal consolidation on growth is minimised by spreading out the adjustment rather than front-loading, but that front-loading may be less detrimental for growth when based on expenditure cuts.

Further research in this area would be useful. An obvious extension would be the calculation of equivalent measures for a larger dataset, which would allow us to estimate the dynamic specifications more robustly, and would allow us to consider longer time horizons.

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