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ABSTRACT

The conventional wisdom is (i) that fiscal austerity was the main culprit for the recessions experienced by many countries, especially in Europe, since 2010 and (ii) that this round of fiscal consolidation was much more costly than past ones. The contribution of this paper is a clarification of the first point and, if not a clear rejection, at least it raises doubts on the second. In order to obtain these results we construct a new detailed "narrative" data set which documents the actual size and composition of the fiscal plans implemented by several countries in the period 2009-2013. Out of sample simulations, that project output growth conditional only upon the fiscal plans implemented since 2009 do reasonably well in predicting the total output fluctuations of the countries in our sample over the years 2010-13 and are also capable of explaining some of the cross-country heterogeneity in this variable. Fiscal adjustments based upon cuts in spending appear to have been much less costly, in terms of output losses, than those based upon tax increases. The difference between the two types of adjustment is very large. Our results, however, are mute on the question whether the countries we have studied did the right thing implementing fiscal austerity at the time they did, that is 2009-13. Finally we examine whether this round of fiscal adjustments, which occurred after a financial and banking crisis, has had different effects on the economy compared to earlier fiscal consolidations carried out in "normal" times. When we test this hypothesis we do not reject the null, although in some cases failure to reject is marginal. In other words, we don't find sufficient evidence to claim that the recent rounds of fiscal adjustment, when compared with those occurred before the crisis, have been especially costly for the economy.

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1 Introduction

The deficit reduction policies (often referred to as fiscal "austerity") followed by several OECD countries in 2009-13 were designed to offset the expansionary increase in government spending sparked in previous years by the subprime lending crisis. They were certainly not adopted because the economy was weak and predicted to fall further: rather they were implemented while recessions were not quite over and a credit crunch was still getting in the way of the recovery. The aim of this paper is to provide an empirical measure of the effects of these deficit reduction policies on output growth. The Fall of 2014, when we write, is probably the earliest time when one can begin to assess the effects of these policies.

We analyse the main features of fiscal adjustment policies, starting from their composition: how they were divided between tax increases and spending cuts, and what has been their cost in terms of output losses. We also examine whether this round of fiscal adjustments, which occurred after a financial and banking crisis, has had different effects on the economy compared to earlier fiscal consolidations carried out in "normal" times. In addition, contrary to previous episodes of fiscal consolidation, this time many countries implemented deficit reduction policies all at the same time, possibly deepening their recessionary effects due to interdependence of their economies.

We proceed as follows. We start by documenting in detail "how" austerity has been implemented in each country. This is not an easy task: fiscal adjustment plans have often been complex, extending over several years, repeatedly modified in mid-course, sometimes even drastically because of political bickering. Then, we evaluate the effects of such policies on output growth. Since the fiscal corrections implemented in the years 2009-2013 (as most fiscal corrections) came, as we said, in the form of multi-year plans, rather than one year moves, we need a model capable of simulating the effects of plans rather than isolated shifts in fiscal variables. We estimate such a model with data running up to (but not including) the years 2009-13. Then we simulate the model out of sample (that is over the years 2009-13) feeding in the actual plans adopted in those five years. This strategy allows us to analyze not only the output effects of austerity as actually implemented, but also to ask what the effect on output growth would have been, had the same fiscal contractions been implemented in a different fashion, e.g. relying less on tax increases and more on spending cuts.

Our main finding is that fiscal adjustments based upon cuts in spend-

ing are much less costly, in terms of output losses, than those based upon tax increases. Our evidence indicates that the difference between the two types of adjustment is very large. Over our estimation period (1978-2007) the average tax-based adjustment plan with an initial size of one per cent of GDP results in a cumulative contraction in GDP of two per cent in the following three years. On the contrary, spending-based adjustments generate very small recessions with an impact on output growth not significantly different from zero. In this respect the recent episodes of austerity do not look different from previous ones. Out of sample simulations of our model, that project output growth conditional only upon the fiscal plans implemented since 2009, do reasonably well in predicting the total output fluctuations of the countries in our sample over the years 2010-13, and they are also capable of explaining some of the cross-country heterogeneity in this variable. The results are particularly strong for those countries in which the main shock in that period was indeed a fiscal policy one. For example, the tax-based adjustment implemented in Italy in 2010-13 is sufficient by itself to explain the recession experienced by the country over the period 2011-2012 (with negative GDP growth of around 2 per cent in each year).

When we test explicitly the hypothesis that recent fiscal adjustments had the same effect on output growth as past ones, we do not reject the null, although in some cases failure to reject is marginal. In other words, we don't find sufficient evidence to claim that the recent rounds of fiscal adjustment, when compared with those occurred before the crisis, have been especially costly for the economy. This evidence suggests that the fiscal multipliers estimated using data from the pre-crisis period give valuable information about the amount of output loss associated with the post-crisis fiscal consolidation measures. Blanchard and Leigh (2013) come to a different conclusion: they argue that the costs of fiscal adjustments have been higher in recent years than previously estimated and therefore expected. The difference between our results and theirs depends upon the fact that we construct forecast errors which are conditional only upon deficit-driven fiscal consolidations. Instead, the forecast errors constructed in Blanchard and Leigh are conditional upon a scenario for all the exogenous variables that enter the IMF forecasting model they use. To put it differently, if the current rounds of fiscal adjustments had been marginally more costly than before (but the evidence is murky on this point) this difference would be explained by concurrent variables, say the credit crunch, not by a change in fiscal multipliers between the years before and after the crisis.

It is important to note from the start that this paper has nothing to say about the optimality of the fiscal adjustments implemented over the years 2009-13. Our more limited goal is to show that there was significant heterogeneity in the effects of such policies depending on their composition, taxes *vs.* spending. Optimal policy can be discussed only within the framework of a structural model. The objective of our empirical paper is to highlight empirical evidence to be matched by structural models. The evidence we propose here can be used to select among different structural models: it cannot be used to discuss optimal policy.

This paper builds upon an earlier literature which had tried to assess the costs of fiscal adjustments using data up to 2007. That literature faced two key challenges. One was how to identify exogenous shifts in fiscal policy, namely shifts determined purely by the need to reduce excessive deficits and not as a response to the state of the economic cycle. The second challenge was to isolate the effect of fiscal policy from many other intervening factors such as devaluations, monetary policy, labor and product market reforms etc. This earlier literature, surveyed in Alesina and Ardagna (2010), used large changes in the cyclically-adjusted budget deficit as a measure of exogenous fiscal adjustments. Using various samples and various modelling choices, these papers consistently found that fiscal consolidations based on spending cuts had been much less costly than those based on tax increases. In fact, in some cases, spending cuts were even slightly expansionary, that is associated with almost immediate increases in growth, thus confirming much earlier findings by Giavazzi and Pagano (1990). Concerning the importance of accompanying policies, Alesina and Ardagna (2013) investigated to what extent such policies, in particular labor market reforms, have helped the success of some fiscal adjustments. While devaluations in some cases did help (see Ireland in 1988) they were not consistently the driving force of successful adjustments. Perotti (2013) also emphasizes how critical accompanying policies are, arguing that one should never study budget cuts in isolation from other policy changes.

Cyclically-adjusted budget numbers, however, are unable to filter out all fiscal policy actions correlated with the cycle: for instance, discretionary measures adopted in response to a recession are not filtered out of cyclically-adjusted numbers This methodology is thus suggestive, but imperfect. The limitations of studies that identify shifts in fiscal policy using cyclically-adjusted budget numbers have been overcome by the "narrative" method pioneered by Romer and Romer (2010). These authors use original sources (bud-

get documents, records of Congressional debates, etc.) to identify episodes of changes in US tax rates that were not dictated by the cycle, but were motivated either by the aim of improving "long run growth" or of reducing an inherited deficit. Applying this identification strategy, Romer and Romer (2010) estimate large tax multipliers: over the course of three years an increase in taxes equivalent to one percent of GDP lowers output by three percent.[1] Devries et al (2011) have used this methodology to construct a narrative time series of shifts in fiscal policy (in this case both taxes and spending) for 17 OECD countries since the early 1970s. The shifts in taxes and spending identified by these authors are solely motivated by the need to reduce an inherited deficit – a definition which fits precisely the fiscal consolidation episodes adopted in Europe since 2009-10. Guajardo et al (2014) have used these data to estimate fiscal multipliers and also find that tax-based adjustments were more costly, in terms of output losses, than expenditure-based ones, a result consistent with the earlier literature based upon cyclically adjusted deficits.

Alesina, Favero and Giavazzi (2014, AFG in what follows) use the fiscal consolidation episodes identified by Devries et al (2011), but propose a methodological innovation. They start from the observation that the shifts in taxes and spending that contribute to a fiscal adjustment almost never happen in isolation: they are typically part of a multiyear plan, in which some policies are announced well in advance, while other are implemented unexpectedly and, importantly, both tax hikes and spending cuts are used simultaneously. Also, as these plans unfold, they are often revised and these changes have to be taken into account as they constitute new information available to economic agents. AFG show that ignoring the connections between changes in taxes and expenditures, and between unanticipated and announced changes, might produce biased estimates of the effects of fiscal consolidations. Their results once again confirm a large difference between expenditure-based adjustments and tax-based ones. AFG also show that the shifts in monetary policy that accompany fiscal adjustments cannot explain the results – although this does not rule out the possibility that other contemporaneous economic reforms may make certain plans less costly than others.

The model estimated in AFG is the framework we use in this paper to

[1] The size of their multipliers has been subjected to many discussions. See in particular Favero and Giavazzi (2012) and the survey by Ramey (2011b).

estimate the effects fiscal consolidations on output growth over the years preceding 2009 (the model is actually estimated using data up to 2007). We then simulate the model out-of-sample (that is over the years 2009-13) feeding in the actual adjustments plans implemented by ten EU countries and by the US in those five years. Finally, we shall run counter-factual experiments asking what the effect on output growth would have been, had the same fiscal contraction been implemented in a different fashion, for instance with less tax hikes and more expenditure cuts.

The paper is organized as follows. In Section 2 we present an overview of fiscal austerity in Europe after the crisis. In Section 3 we describe the construction of our data and we illustrate the way in which we identify fiscal plans. We describe in detail one case (Portugal) to illustrate our methodology. Detailed information on the plans adopted by all other countries is available in a web appendix[2]. In Section 4 we present our model and our experiments. We first show the output effects of fiscal plans in the sample over which the model is estimated; we then show out-of-sample simulations, that is the results obtained feeding into the estimated model the actual adjustments implemented by each country in 2010-13; next we present the counterfactual experiment, and finally a discussion of robustness. Section 5 analyzes the question whether recent fiscal adjustments have been more costly than earlier ones. The last Section concludes.

2 Fiscal policy in the aftermath of the financial crisis

Many European economies did not enter the financial crisis with a clean fiscal slate. Before the crisis, debts and deficits were already high in several of them. One reason were the low interest rates of the first decade of the Euro, which had facilitated large debt build-ups in in the European periphery. The country with the largest debt was Italy, with a ratio to GDP of 1.06 in 2008; Greece had a ratio of 1. But even countries with apparently better fiscal positions (such as Spain and Ireland) still had budget deficits, notwithstanding an exceptional (and unsustainable) level of revenues accruing from a real estate bubble. However, concerns about fiscal sustainability were not limited to the European periphery. Many countries faced the challenge posed by the

[2] Available at http://igier-unibocconi.it/favero.

rapid aging of their populations: social expenditure had increased from an average of 18% of GDP in 1980 to 25% and 2009, with a rise of 5 percentage points of GDP in just the 10 years preceding 2009.[3] Moreover, total government spending, even if reduced at the end of the 90s to meet the Maastricht criteria, was still high in 2007 (43 percent in 2007 in the EU average). The average share of public spending over GDP had increased from 34% in 1970 to 43% in 2007 in the OECD economies.[4]

Government budgets, which were already structurally weak, worsened very significantly with the start of the financial crisis, in many cases because governments had to foot the bill of distressed financial institutions, Ireland being the most apparent example. The average deficit in the EU almost doubled between 2007 and 2008 reaching 6.4% of GDP in 2009 (See Table 1). In the United States the deficit increased from 2.7 to 13.3 percent of GDP.[5] As a consequence debt ratios jumped: from 66.5% of GDP in 2007 to a projected 109.2% in 2014 in the US; from 66.5% to 95.3% in the euro area (See Table 2). Besides automatic stabilizers, discretionary fiscal actions, aimed at slowing the rise in unemployment and protecting unemployed workers, played a crucial role, though to a different extent from country to country. The discretionary response was relatively small in Germany and Italy, while Spain, Portugal, the UK and France implemented a large increase of the cyclically adjusted deficit (See Table 1).[6]

[INSERT TABLES 1 and 2 HERE]

Large increases in budget deficits meant that many European countries, around 2009, entered the EU Excessive Deficit Procedure, that is their fiscal policies started being monitored by the European Commission.[7] After the start of the Greek crisis, in the spring of 2010, there were renewed anxieties about the unsustainability of public debt in some European countries and investors demanded higher interest rates on government bonds: yields spiked throughout the European periphery. At the same time, these pressures raised

[3] Data are from the OECD Social Expenditure Database.

[4] Data are from the OECD Economic Outlook.

[5] See IMF Fiscal Monitor 2013 and Table 1.

[6] See IMF Fiscal Implications of the Global Economic and Financial Crisis, June 2009, p. 12.

[7] The UK entered the Excessive Deficit Procedure in 2008. In 2009 the countries entering the procedure were: Spain, Greece, Ireland, France, Germany, Italy, Portugal, The Netherlands, Belgium and Austria. Denmark entered in 2010.

concerns in public opinions. The share of articles discussing fiscal consolidation was marginal during the first years of the financial crisis, but rapidly increased in 2010, typically reaching a peak around the end of 2011 (See Figure 1).[8]

[INSERT FIGURE 1 HERE]

Responding to these pressures, most European countries began fiscal consolidations, enacting, starting in 2010, multi-year deficit reduction programs, notwithstanding mediocre growth projections for the years to come.

Figure 2 shows how the fiscal policy of Euro Area economies changed overtime, in relation to the economic cycle. For every year we show the change in the cyclically-adjusted primary balance and the level of the output gap. The first and third quadrants represent instances of counter-cyclical fiscal policy where governments squeeze the public budget while the economy is overheating, and vice versa. On the contrary, the second and fourth quadrants include years in which fiscal policy was pro-cyclical. The majority of the countries in the sample adopted counter-cyclical fiscal policies at the beginning of the recession (2008-09) but turned pro-cyclical after 2009, namely fiscal consolidations started when recessions were not over yet.

[INSERT FIGURE 2 HERE]

The evidence in Figure 2 raises a natural question on the optimality of such counter-cyclical fiscal actions. As discussed in the introduction, our paper cannot answer this question. We cannot pass judgment on the pros and cons and on the timing of the fiscal adjustments. Our more limited aim is to investigate whether the effects of such adjustments were affected, and to what extent, by their composition (taxes *vs.* spending) and their persistence and predictability.

Together with these budgetary policies, structural reforms were also introduced in some countries. For instance, most of the countries in our sample implemented some labor and product market reforms (see OECD, 2014a).

[8] Data on the share of articles regarding the fiscal consolidation debate were gathered from Factiva from January 2006 to January 2014.

Spain introduced a very significant labor market reform (see OECD, 2014a); Italy, France and Spain implemented pension reforms in 2010 and 2011.[9]

Even though not driven by high borrowing costs, fiscal consolidation entered the policy agenda of some non-European economies as well. In the United States the fear for the sustainability of the public debt – and the downgrade of the US government bonds by S&P for the first time in history – was the main motivation behind the adoption of the measures included in the Budget Control Act approved in 2011 and the ensuing debate over the "Fiscal Cliff". In the web-appendix, we analyze these fiscal consolidation actions country by country. In the next section we show, using the example of Portugal, how we measure the fiscal plans adopted by each country, how we classify them as tax-based or expenditure-based and how we account for their changes over time.

Eventually, in 2013, the year our analysis stops, the intensity of the fiscal consolidation effort decreased almost everywhere in Europe – in part because some countries, such as Italy, Ireland and Portugal, were able to exit the Excessive Deficit Procedure, in part because Mario Draghi's famous words, "We will do whatever it takes", resulted in a significant reduction in borrowing costs and alleviated the risk of a debt crisis.

[9] In Italy the 2010 Budget Law raised the retirement age for old-age pensions for females working in the public sector starting from January 2012, introducing the same retirement age for men and women. In 2011 a new reform increased the old-age retirement age for women in the private sector from 60 to 62 years starting in 2012, with a gradual increase up to 66 years by 2018, whereas the male retirement age was increased to 66 years in 2012. Retirement ages and the seniority rules for early retirement were also indexed to life expectancy. On top of this, pension indexation was suspended for two years. Finally, the reform speeds up the transition from the defined benefit to the defined contribution schemes.In France various measures were taken with the 2010 Pension Reform to encourage the employment of older workers. The mandatory retirement age was raised from 65 to 70 years; a wider use of the pension premium was introduced and a greater flexibility for combining earned and pension income was guaranteed. Moreover, the extension of the contribution period as a function of rising life expectancy was approved, although indexation is not automatic.In Spain the pension reform is implemented in 2011 with the first measures entering in office in 2013. The Reform increased the retirement age from 65 to 67 years, while early retirement was delayed from 61 to 63 years. Moreover, the number of years required to reach the 100 percent of the reference wage increased from 35 to 37 years of contribution.

3 Fiscal consolidations in 2009-2013

3.1 Constructing and classifying fiscal plans

The fiscal consolidations implemented in 2009-2013 were multi-year fiscal plans. We measure and classify these plans extending the database running from 1976 to 2007 that was constructed by AFG for 17 OECD countries. The plans in AFG were in turn constructed reclassifying the annual shifts in fiscal policy – not driven by an output stabilization motive – identified by Devries et al (2011), whose assumptions we discussed in the introduction. Since the Devries et al (2011) data stop in 2007, we follow their methodology to identify the exogenous shifts in fiscal policy occurred after 2009, and then use them to build fiscal plans following the methodology of AFG.

Fiscal plans are combinations of unexpected and announced fiscal corrections. When a Parliament votes a deficit reduction policy at time t and implements it in the same year, we call it unexpected: e^u.[10] The latter represents a reduction of the deficit over GDP ratio. This reduction may come from a reduction in spending over GDP ratio (denoted by g) or an increase in the tax revenues over GDP ratio (denoted by τ). When a correction is voted by Parliament in year t but is implemented in year $t+k$ (where k is the anticipation horizon), it is called announced, with horizon k: $e^a_{t,k}$. As time goes by, and a correction announced in year t for year $t+k$, $e^a_{t,k}$, comes closer to the date of implementation, its horizon is correspondingly reduced: $e^a_{t+1,k-1}$. The shift in the index of the announced adjustment continues until the adjustment is actually implemented in year $t+k$. In that year it is labelled $e^a_{t+k,0}$. All the deficit reduction polices, both announced and implemented, are divided in tax increases and spending cuts, both measured as fraction of GDP. After plans have been constructed we distinguish between Tax-Based (TB) and Expenditure-Based (EB) plans. We label a fiscal adjustment respectively as TB and EB if the sum of the unexpected plus the announced tax (expenditure) changes (measured as percent of the GDP of the year the plan is introduced) is larger than the sum of the unexpected plus the announced expenditure (tax) changes. Note that since plans sometime change in mid-course – due to political bickering or because a government falls and is followed by a new one – a plan which started, say, as EB may

[10] In principle even a policy announced and implemented immediately might have been expected, but without an official announcement it is virtually impossible to measure the degree of surprise of a new policy, as disused in more detail in AFG.

turn into a TB one, or the other way around. In Section 4.4.3 we explore a different way of classifying fiscal adjustments abandoning the TB and EB dummy definitions and exploiting separately the magnitude of revenue and expenditure changes. Our empirical results are robust to this reclassification.

The countries which we consider are Austria, Belgium, Denmark, France, Germany, Great Britain, Ireland, Italy, Portugal, Spain and the United States.[11]

We now show how, using this framework, we have constructed fiscal consolidation plans over the years 2009-2013 for each country in our sample. We start, in Table 3, providing some descriptive statistics.

[INSERT TABLE 3]

3.2 Fiscal consolidation plans after the financial crisis

The countries in our sample can be divided into three groups. The first includes the countries in the core of the Euro area that on average experienced less serious financial trouble; the second includes countries in the periphery; the third group includes three countries outside EMU, which we use as examples of advanced economies with flexible exchange rates.

To identify exogenous shifts in fiscal policy we used the Stability and Convergence Reports of the European Commission, national budget reports, central bank reports, and Congressional Budget Office documents and Economic Reports of the President for the US. The detailed motivations for the deficit-driven fiscal consolidation plans from 2009 to 2013 and a description of how we retrieved the data are available in the web-appendix. Section 3.3 discusses the differences between our narrative shocks and the cyclically adjusted measures, and compares our data to other narrative measures.

We illustrate our methodology with the example of Portugal. In the web-appendix we show how the same procedure was applied to all other countries in our sample.

[11] Greece and Cyprus have been excluded because the data required to include these countries in the panel used to estimate the model were not available – and if they were, as could be the case of Greece, such data have since been extensively revised.

Portugal: Stabilization plan in 2010-13												
time	$\tau^u_{i,t}$	$\tau^a_{i,t,0}$	$\tau^a_{i,t,1}$	$\tau^a_{i,t,2}$	$\tau^a_{i,t,3}$	$g^u_{i,t}$	$g^a_{i,t,0}$	$g^a_{i,t,1}$	$g^a_{i,t,2}$	$g^a_{i,t,3}$	TB	EB
2010	0.6	0	1.4	0	0	0.5	0	1.4	0	0	1	0
2011	0.5	1.4	1.1	0.4	0	0.6	1.4	2.9	1.4	0	0	1
2012	0.4	1.1	2.1	0	0	0.8	2.9	0.8	0	0	0	1
2013	0.4	2.1	−0.4	0	0	0.1	0.8	0	0	0	1	0

Portugal started a very aggressive fiscal consolidation plan in 2010, under financial pressure on government bonds and liquidity concerns. Between 2010 and 2013 the measures adopted amounted, on average, to 4 percentage points of GDP per year for four consecutive years: this can be seen in the table above summing the terms e^u and $e^a_{(t+k,0)}$ thus computing the direct impact on the budget of each year of the measures adopted. In 2010 the budget deficit was reduced by 1.16% of GDP, of which 0.63 percent of revenues increase (τ^u_{2010} in the table above) and 0.53 of spending cuts (g^u_{2010}). Expenditure cuts involved wage restraints for civil servants, some cuts to social benefits and reductions to the operating expenditure of ministries. Revenue increases included an increase in the VAT rate and an increase in personal and corporate income taxes. The same 2010 Budget also introduced new expenditure cuts amounting to 1.41 percent of GDP and new tax increases of 1.43 percent to be implemented in 2011 (they are respectively $\tau^a_{2010,1}$ and $g^a_{2010,1}$). These announcements anticipated a further tightening of the 2010 expenditure measures and limitations to benefits and allowances related to the personal income tax. The first row of the above table illustrates the way in which we use this narrative record to construct the 2010 fiscal plan.

The sovereign debt crisis began in Portugal in November 2010, when the yield on the country's 10-year government bonds reached 7 percent. In April 2011, Prime Minister José Sócrates, who had resigned and was heading a transition government, announced that the country would request financial assistance. In May 2011 when the interest rates on debt had reached 10%, Eurozone leaders approved a € 78 billion bailout package for Portugal. As part of the deal, the country agreed to cut its budget deficit from 9.8 percent of GDP in 2010 to 5.9 percent in 2011, 4.5 percent in 2012 and 3 percent in 2013.

Note, in our table, that in 2011 a more comprehensive and longer adjustment program was designed as a condition for economic and financial assistance. The 0.6 percent of GDP of unexpected expenditure cuts focused

on public sector wages and public investments. The 0.5 percent of GDP of unexpected tax consolidation mainly involved a personal income tax surcharge on workers' $13th$ salary. The fiscal consolidation plan included more spending-based measures to be implemented by 2013. However, in both 2012 and 2013, the plan was modified with unexpected changes in the anticipated components of previously approved budgets.

The last two columns of the table show that this classification strategy leads to label the Portuguese plan in 2010 and 2013 as tax-based, and in 2011 and 2012 as expenditure-based. It is not uncommon for a plan to change its nature over time. In the case of Portugal, the change from EB to TB in 2013 was mostly due to the cancellation of some announced expenditure cuts (mostly reductions in public sector wages) by the Constitutional Court in June 2012. In order not to miss the deficit targets, the Portuguese government compensated these vanished expenditure cuts with new tax measures involving a revision of the personal income tax structure resulting in a reduction in the number of brackets, combined with 4 percent general surcharge of taxable income and a 2.5 percent solidarity tax on the highest tax bracket. This is clearly visible in the change from $\tau^a_{2011,2} = 0.4$ to $\tau^a_{2011,1} = 2.1$ and from $g^a_{2011,2} = 1.4$ to $g^a_{2011,1} = 0.8$ that in turn causes the plan to be predominantly tax-based in 2013.

In 2013, the government implemented a debt recovery scheme for overdue tax and social security contributions, to be implemented before the end of the year and coded as an unexpected 0.4 shift. Given the one-off nature of this scheme, we code its reversal in the following year as a negative announcement: $\tau^a_{2013,1} = -0.4$. Moreover, even though in April 2013 a further Constitutional Court decision ruled out cuts worth 0.8 percent of GDP, these were totally compensated by the frontloading of 0.8 percent of GDP from the expenditure review program.

In the web-appendix we go over each country's experience as we did here for Portugal and we illustrate the methodology and the sources we used to construct our fiscal plans.

Before moving to our results a few observations are in order.

- The size of the fiscal adjustments in many countries was large, especially in Spain, Ireland and Italy, in addition to Portugal as we have seen. In other countries, like Great Britain or Belgium, it was more moderate. In others (Germany and the US) it was relatively small. Ireland hit a 30% deficit over GDP ratio in 2010 as a result of the bail

out of banks, but even leaving this episode aside, the Irish adjustment was very large.

- Even in those countries with large adjustments (say Spain and Portugal) the size of them was not unprecedented in recent history. As shown in Table 3, column 3, the average consolidation impact is 3.4% of GDP per year in Portugal, a size that has been observed on several occasions in our estimation sample, e.g. Italy 1992, Denmark 1983, Sweden 1995, Ireland 1982.

- In certain countries (Ireland and Spain for instance) banking crises were the main determinants of the fiscal imbalances. In others (Portugal or Italy for instance) deficits and accumulated debts were the main drivers. In either case however the key exogeneity assumption regarding the cycle is preserved.

- The composition of adjustments between spending cuts and tax hikes varied across countries. For instance in the case of Italy the adjustments were all tax-based (at least until 2013). In the case of Ireland and Great Britain they were mostly spending-based. Spain was somewhere in between, although but more on spending than on taxes.

- The plans are generally a combination of expected and unexpected fiscal changes. Only in the case of Ireland there were no announcements of future policies during the adjustments.

- Many plans were revised in mid-course several times, as a result of political bickering. In Italy for example three different governments were in office between 2009 and 2013, including a "technical" one appointed with the specific task of improving the fiscal stance of the country at a moment when it was on the verge of fiscally imploding.

- In Italy, Spain and France pension reforms were implemented with potential savings accruing in future years. Probably the sharpest one, in terms of expected fiscal savings, was implemented in Italy.

- Spain introduced a reform to liberalize the labor market. Hardly any other structural reforms were implemented in any other country, at least until 2013 included.

- In the US the discretionary fiscal measures were implemented as a result of the extremely hot debate over the so-called "fiscal cliff". Despite the rhetoric in the debate, in the end the discretionary actions taken were very small.

3.3 Comparison with cyclically adjusted measures and other narrative data

We conclude this section comparing our narrative measure of fiscal policy with the cyclically-adjusted measures employed in some part of the literature. In Figure 3 we plot our measure against *(i)* the change in the cyclically-adjusted structural balance and *(ii)* the change in the primary balance for each country in our sample, as constructed by the IMF. The trend in the IMF structural measure is similar to ours and obviously less volatile than the uncorrected change in primary balance. Notice that in 2009 our measure is almost always equal to zero given that no exogenous consolidation policies were implemented. The discretionary policies implemented in 2008-09 were part of fiscal stimulus plans intended to recover from the crisis and thus must be considered endogenous. Hence, contrary to our measure, the change in the cyclically-adjusted structural deficit in 2009 is negative for almost every country. This raises a major concern about the use of changes in the cyclically-adjusted structural balance for the identification of exogenous shifts in fiscal policies. Note in particular that the smallest differences between our data and the structural cyclically-adjusted primary balance appear in countries which did not implement significant fiscal stimuli in response to the crisis, like Germany and Italy.

For the years after 2009-10 the trend in the IMF cyclically-adjusted structural measure is very similar to our narrative data. However, it almost always lies below our narrative changes. This is due to several factors. First, implemented consolidation measures were sometimes mitigated by discretionary anti-cyclical measures (which we exclude from our analysis because endogenous). Second, our data refer to ex-ante predictions of policy impacts, while the IMF measures refer to ex-post deficit outcomes.

[INSERT FIGURE 3 HERE]

Other narrative measures

Dell'Erba et al (2013) and Ağca and Igan (2013) have also constructed narrative data for the countries in our sample for the years 2010 and 2011. Dell'Erba et al (2013) base their construction on the estimates provided by the 2011 OECD publication *"Restoring Public Finances"*. Ağca and Igan (2013) complement the Dell'Erba et al (2013) using IMF Article IV Staff Reports, OECD Country Reports and national budgets. Both these works, however, do not take into account the multi-year feature of fiscal plans and thus do not collect data about announcements. Moreover, they only cover the years 2010 and 2011 when fiscal consolidations were not as relevant as in 2012 and 2013. Indeed, only a few countries started fiscal adjustments in 2010, while all countries in our sample implemented fiscal actions in 2012 and 2013. Furthermore, the average size of fiscal consolidations in 2012-13 is around 2%, against 1.3% for 2010-11. Our narrative episodes for 2010 and 2011 do not differ significantly from their estimates.

4 The output effects of fiscal consolidations

The analysis of the output effects of economic policy requires – for the correct estimation of the relevant parameters – identifying policy shifts that are exogenous with respect to output fluctuations. In the context of fiscal policy the concepts of exogeneity and identification are further illustrated in section 4.1 and discussed in the Appendix. As we already mentioned, for the sample used to estimate our model (1978-07) we identify fiscal stabilizations designed to offset changes in government spending implemented in the past. Such stabilizations are not motivated by contemporaneous cyclical fluctuations and are therefore likely to be exogenous with respect to output growth. In practice we use the "narrative" data collected by Devries et al (2011) and revised in AFG. By construction these fiscal adjustments are predictable by previous fiscal expansions. There is also evidence that fiscal adjustments identified with the narrative method are predictable from their own past (see the Appendix). We interpret this evidence as a consequence of the fact that fiscal policy is conducted through multi-year plans. In this section we show how plans and their output effect can be correctly estimated and simulated. Predictability and exogeneity are not the same concept as we discuss in section 4.1.

When fiscal policy is conducted in country i through multi-year plans, narrative exogenous fiscal adjustments in each year, $f_{i.t}$, include three com-

ponents: unexpected adjustments (announced upon implementation at time t) e^u_{it}, past announced adjustments (implemented at time t but announced in previous years) $e^a_{it,0}$ and future announced corrections (considering, for simplicity, the case in which the horizon of the plan is only one year, these corrections are announced at time t for implementation at time $t+1$) $e^a_{it,1}$.

$$f_{i.t} = e^u_{it} + e^a_{it,0} + e^a_{it,1}$$

where the letter e represents the sum of the two components of a fiscal adjustment: tax increases and spending cuts.

A fiscal plan is specified by making explicit the relation between announcements and the other two components of a plan. In particular, we consider

$$e^a_{it,1} = \varphi_{1i}\ e^u_{it} + v_{1,it}$$
$$e^a_{i,t+1,0} = e^a_{it,1}$$

The first is a behavioral relation that captures the style with which fiscal policy is implemented. More permanent plans will feature significantly positive φ_{1i} , while a temporary plan (to be reversed, at least partially in the future) will feature a significantly negative φ_{1i}.

The second relationship simply states that the announced correction implemented at time t is equal to what was announced in the previous period with a fiscal foresight of one period. Note that this does not imply that all announced corrections are implemented but it does imply that deviations of implemented corrections from those announced are always considered as surprises by all agents.

In the next section we shall illustrate how we deal with plans in a model designed to measure their effect on output, and how we use the estimated model to perform out-of-sample simulations. Before doing this, however, we briefly discuss how plans are identified.

4.1 The identification of exogenous fiscal plans

Exogeneity of the shifts in fiscal policy for the estimation of their output effect means that they should not be correlated with news on output growth, i.e with the cycle. The traditional steps to identify such exogenous shifts involved first the estimation of a joint dynamic model for the structure of the

economy and the variables controlled by the policy-makers (typically a VAR). The residuals in the estimated equation for the policy variables approximate deviations of policy from a rule. Such deviations, however, do not yet measure exogenous shifts in policy because a part of them could represent a reaction to contemporaneous information on the state of economy. In order to recover structural shocks from VAR innovations some restrictions are required. In the case of monetary policy identification can be achieved exploiting the fact that central banks take their policy decisions at regular intervals (e.g. there are eight FOMC meetings every year) and there is consensus on the fact that it takes at least one period between two meetings before the economy reacts to such decisions. This triangular structure – innovations in the monetary policy variable reflect both monetary policy and macroeconomic shocks, but macroeconomic variables are not contemporaneously affected by monetary policy shocks – is sufficient for identification.

Fiscal policy is different, in the sense that it is conducted through rare decisions and, as discussed above, is typically implemented through multi-year plans. Such plans generate "fiscal foresight": agents learn in advance future announced measures. The consequence is that the number of shocks to be mapped out of the VAR innovations is too high to achieve identification: technically the Moving Average representation of the VAR becomes non-invertible.

As a consequence of this specific feature of fiscal policy, after initial efforts at adapting the identification scheme used for monetary policy, attempts at mapping VAR innovations into fiscal shocks have become less successful and an alternative strategy has emerged, which is based on a non-econometric ("narrative") identification of the shifts in fiscal variables. These are then plugged directly into an econometric specification capable of delivering the impulse response functions that describe the output effect of fiscal adjustments. In this "narrative" (Romer and Romer 2010) identification strategy legislated tax and expenditure changes are classified into endogenous (induced by short-run countercyclical concerns) and exogenous (responses to an inherited budget deficit, or to concerns about long-run economic growth or politically motivated). In this paper we concentrate on fiscal measures designed to deal with inherited budget deficits, therefore we concentrate on the effect of a subset of all exogenous adjustments.

Starting from narratively-identified shifts in fiscal variables we build fiscal plans recognizing that such plans generate inter-temporal and intra-temporal correlations among changes in spending and revenues. The inter-temporal

correlation is the one between the announced (future) and the unanticipated (current) components of a plan – what we shall call the "style" of a plan. The intra-temporal correlation is that between the changes in revenues and spending that determines the composition of a plan. As argued by Ramey (2011a, b) distinguishing between announced and unanticipated shifts in fiscal variables, and allowing them to have different effects on output, is crucial for evaluating fiscal multipliers. This approach, first introduced in AFG, is an advance on the literature which so far had studied (see e.g. Mertens and Ravn 2011) the different effects of anticipated and unanticipated shifts in fiscal variables assuming that they are orthogonal.

As discussed above, a fiscal plan is specified by making explicit the relation between the unpredictable component of the plan and the other two components. In particular, with reference to a specific country i, we consider:

$$e^a_{it,1} = \varphi_{1i}\ e^u_{it} + v_{1,it}$$
$$e^a_{i,t+1,0} = e^a_{it,1}$$

The first equation is a behavioral relation that captures the style with which fiscal policy is implemented. Countries that typically implement "permanent" plans will feature a positive φ_{1i} , while temporary plans (in which a country announces that an initial fiscal action will be reversed, at least partially, in the future) will feature a negative φ_{1i} .

Our approach thus constructs the output response to a fiscal plan by allowing for a different effect between unanticipated and anticipated corrections, and by recognizing their interdependence within plans. Note that the very nature of a plan makes shifts in fiscal variables predictable. Finally within this framework we also allow for the infra-temporal correlations of plans, that is for heterogeneous effects of Tax-Based and Expenditure-Based fiscal adjustments.

The fiscal plans studied in this paper are constructed expanding the data put together, using the narrative method, by Devries et al (2011). These authors, however, differ from us in that they opt for aggregation, summing up anticipated and unanticipated components. Jordà and Taylor (2013) have observed that such aggregated shifts in fiscal variables (hereafter referred to as *IMF shocks*) are not exogenous, and therefore are not valid instruments because they can be predicted using their own past (strongly), past values of output growth (very weakly) and past values of debt dynamics (weakly). We show in the Appendix that while aggregation undoubtedly generates

predictability, predictability is different form exogeneity. We also argue that the restriction that the effect on output of anticipated and unanticipated corrections is the same is very strong, and that our proposed method, based on the simulation of plans in which the correlation between anticipated and anticipated corrections is measured and exploited in the constructions of the relevant impulse response functions, is more flexible.

4.2 The data

4.2.1 The pre-2009 data used in estimation

The AFG panel on which we run the 'within sample' estimation includes 14 countries: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Ireland, Italy, Japan, Portugal, Spain, the United Kingdom, and the United States.[12] The frequency of the data is annual and the sample runs from 1978 to 2007.

In the Devries et al (2011) data, tax increases are measured as the expected revenue effect of each change in the tax code as a percent of GDP of the year the announcements made, whether it is implemented immediately or announced for a later period. Spending cuts are measured as changes in expenditure relative to the level that was expected absent the policy shift, not relative to the previous year. This means that a spending cut for year $t+1$ does not necessarily imply a reduction in government spending relative to year t, but only relative to what would have happened in year $t+1$ absent any policy changes.[13] Announcements are assumed to be fully credible. A few measures that were announced but for which *"the historical record shows that they were not implemented at all"* are dropped from the Devries et al (2011) database. There are only five instances in our sample in which this happened – that is individual announcements were not recorded because never implemented – one each in Japan, Italy, Germany, the UK and the Netherlands (a case which is irrelevant for us since, as we discuss below, we drop this country). In these cases we have not questioned the Devries et al (2011) data call. All other announcements are assumed to be credible and thus recorded.

[12] Finland, Sweden and the Netherlands were dropped in the estimation in AFG. Euro Area countries such as Greece and Cyprus were also excluded for lack of (reliable) data. See that paper for more details.

[13] The US "Sequester" of March 2013 is one example.

4.2.2 The data after 2009 used in 'out-of-sample' simulations

In order to simulate the effects of the fiscal consolidations implemented after the strat of the financial crisis we extended the Devries et al (2011) panel following exactly the same methodology they employed. As discussed above in Section 3, our new data cover 11 countries in the period 2009-2013. The countries are: Austria, Belgium, Denmark, Germany, France, Ireland, Italy, Portugal, Spain, United Kingdom, and United States. The total number of years during which, in the various countries there has been an episode of fiscal consolidation is 42 (see Table 3).

4.3 The estimated model

In order to measure the output effect of fiscal consolidation plans, we estimate a multivariate system in which the output growth of each country is projected on the three (exogenous) components of a fiscal plan. This reduced form specification is a truncated moving average representation for output growth where the only innovations included are the fiscal ones. Of course we are omitting many other structural shocks relevant to explain output growth. But under our identifying assumption, all omitted structural shocks are orthogonal to those that we include in the regression.[14]

The estimated system (i denotes the country) is the following:

[14] This assumption could be tested by adding to the model some variables as proxies for the introduction of accompanying reforms potentially related to the narrative episodes. By doing so we could check whether such reforms, rather than the character of the fiscal plans, are what drives our estimates. AFG provide such a robustness check for labor market reforms.

$$\Delta y_{i,t} = \alpha + B_1(L)e^u_{i,t} * TB_{i,t} + B_2(L)e^a_{i,t,0} * TB_{i,t} + \quad (1)$$
$$C_1(L)e^u_{i,t} * EB_{i,t} + C_2(L)e^a_{i,t,0} * EB_{i,t} +$$
$$+ \sum_{j=1}^{3} \gamma_j e^a_{i,t,j} * TB_{i,t} + \sum_{j=1}^{3} \delta_j e^a_{i,t,j} * EB_{i,t} + \lambda_i + \chi_t + \mu_{i,t}$$

$$e^a_{i,t,j} = \varphi_{i,j}\ e^u_{i,t} + v_{i,t,j} \qquad j = 1, 2, 3$$
$$e^a_{i,t,0} = e^a_{i,t-1,1}$$
$$e^a_{i,t,j} = e^a_{i,t-1,j+1} + \left(e^a_{i,t,j} - e^a_{i,t-1,j+1}\right) \qquad j > 1$$

Per capita GDP growth in each country $\Delta y_{i,t}$, is affected by three different deficit reduction actions (as a percentage of GDP):

- approved and implemented in year t (unanticipated, e^u_t);
- shifts that had been announced in the past, but come into effect at time t ($e^a_{t,0}$);
- announced at time t that will be implemented in the future. We call these "anticipated" shifts in fiscal variables and consider a three-year horizon ($e^a_{t,j}$). Three years is the average horizon of the fiscal plans in our sample.

$B(L)$ and $C(L)$ polynomials are truncated after 3 years: they represent the coefficients of the associated lagged variables from time t to $t-3$.[15] The model is estimated by Seemingly Unrelated Regressions (SUR) imposing cross-country restrictions on the coefficients in B, C and on the $\gamma's$ and $\delta's$. We also include year and country fixed-effects. We gain in efficiency on the estimates of B, C and on the $\gamma's$ and $\delta's$ by pooling together the data from several countries.[16] We allow for the possibility of within country

[15] This truncation does not generate any omitted variable distortion under the assumption that fiscal shocks do not affect output for more than 3 years ahead. Indeed, since the shocks at t-4 are correlated with those at t-3 and t-2 by construction, the omitted variable bias is eliminated by assuming that they do not influence our dependent variable.

[16] The specification generalizes the MA representation estimated by Romer and Romer (2010) allowing different coefficients on the unanticipated adjustments (announced at time

heterogeneity in the response of output growth to tax-based and spending-based adjustments interacting overall fiscal shocks with TB and EB dummies.

Once the model is estimated we simulate the effect of an unanticipated shift in fiscal variables preserving the inter-temporal dimension of country-specific fiscal plans. That is, when we simulate the effects on output growth of an unanticipated shift, say in taxes, we recognize that a country's typical fiscal plan accompanies unanticipated shifts in taxes with the announcement of future shifts in taxes and/or spending. We build such "artificial" announcements adding to the estimated model the following country-specific additional equations:

$$e^a_{i,t,j} = \varphi_{i,j}\ e^u_{i,t} + v_{i,t,j} \qquad j = 1, 2, 3$$

Where i refers to the country, t is the period and j=1,2,3 is the horizon (limited to 3 years) of fiscal announcements. Allowing the $\varphi' s$ to differ across countries (i.e. allowing for countries to implement fiscal plans that are on average different from one country to another) we introduce an additional source of heterogeneity: "between" countries heterogeneity which relates to the "style" of fiscal plans, meaning the correlation between their unexpected and announced components. The estimation of a country's style allows us to distinguish between countries that pursue consistent stabilization efforts over time, countries with one-year horizon plans and finally countries in which the $\varphi'_{ij} s$ are negative, i.e. where announcements tend to overturn the effects of unanticipated shifts in policy.

In the specification illustrated above we interact overall fiscal shocks with the TB and EB dummies, rather than introducing τ_t and g_t separately. We do so because this version of the model is more suitable for simulating average plans and for interpreting their results. The reason is that it avoids the

t and implemented at time t), on the anticipated correction currently implemented (announced before time t, and implemented at time t), and on the future corrections (announced at time t, to be implemented in the future). The possibility of different effects of announced, anticipated and unanticipated corrections is well grounded in the theoretical literature and has already been introduced in empirical work (Mertens and Ravn 2011, Perotti 2013). Our MA representation is augmented by a number of auxiliary equations that capture the nature of the plan via the correlation between the unanticipated and announced components of fiscal plans. As discussed in the text, to save on degrees of freedom we take into account the intra-temporal correlations between the revenue side and the expenditure side of the adjustment interacting the total adjustment in the primary surplus with TB or EB dummies.

problem of estimating the contemporaneous correlation between taxes and spending measures. In other words, the introduction of τ_t and g_t directly into the specification would require the estimation of a very large number of $\varphi_{i,j}$ parameters. This drawback does not apply to TB and EB corrections, since by construction TB is equal to zero when EB is equal to one and thus no interaction between these corrections need to be estimated. On the other hand, the model with the TB and EB dummies may be sensitive to the categorization of plans into EB and TB, especially when the share of spending and taxes over the total consolidation is around 50%. Reassuringly, the vast majority of the plans in our estimation and simulation samples are far from a fifty-fifty split. In the estimation sample the share of spending cuts in the average EB plan (in which the average total annual adjustment is 1.36 of GDP) is 84 per cent, while in the case of TB plans (in which the average total annual adjustment is 0.89 of GDP) such a share is 76 per cent. In the simulation sample there are only 2 cases (over 42) where the share of spending is between 49% and 51% of the total consolidation, and 8 cases where the share is between 45% and 55%. In any event, in section 4.4.3 below we present estimates of the model in which we introduce τ_t and g_t separately. The results obtained introducing τ_t and g_t separately are qualitatively very similar to the ones obtained with the benchmark model.

To sum up, the model can serve two different purposes. First, as in AFG, we can estimate within-sample the output effect of the average consolidation plans occurred during the estimation period. In other words, we compute impulse responses of output with respect to plans, in order to measure their effects. These impulse responses are computed as the difference between the simulated output growth conditional on the average EB and TB plan, and the simulated output growth when no fiscal stabilization is implemented. Second, once the model is estimated, we can run out-of-sample simulations of specific adjustment plans feeding directly into the model the announced and realized components of a given plan – rather than using the estimated $\varphi_{i,j}$ to simulate the average within-sample plan. This second exercise produces projections of output growth conditional on the specific fiscal plan studied.

Our specification uses a parsimonious representation to simulate the output effect of fiscal plans. The same problem has been addressed using a different methodology (the Local Projections Method) in Jordà and Taylor (2013) and Jordà (2005). We illustrate and evaluate these two alternative approaches in the Appendix. The main difference between the two is that Jordà and Taylor deal econometrically with the different degree of predictability of

plans collapsed into exogenous single-period corrections, while our method preserves the inter-temporal, multi-period aspect of fiscal adjustments and trace the effect on output of fiscal stabilizations that, despite being predictable, are exogenous with respect to the cycle.

4.4 Results

We organize the presentation of our empirical results in two sub-sections. First, we describe the estimation and impulse response function corresponding to the average plan implemented during 1978-2007. We then concentrate on the main contribution of the paper: the out-of-sample simulations of the output effect of the consolidation plans adopted after the crisis.

4.4.1 Output effects of fiscal plans: pre-crisis (in-sample results)

Estimated coefficients for our model over the period 1976-2007 are reported in Table 4. Note the negative sign on all significant TB (tax based) adjustments implying that tax hikes have a negative and significant effect on output. The positive and in some cases statistically significant coefficients on the EB (expenditure based) adjustments mean that spending cuts are correlated with an increase in output (only one of the EB coefficients is negative and then only marginally significant: the effect of the implementation today of a spending cut announced in the past).

We summarize the results reporting, in Figure 4, the response of output to a one percent unexpected fiscal consolidation shock. We consider the effects of EB and TB adjustments separately (in blue and red, respectively). When simulating an unexpected shock, we accompany it with "artificial" announcements of future policy shifts constructed using the estimated style of each country's plans (the $\varphi'_{ij}s$). Different styles depend on the typical persistence of a shock, i.e. on the correlation between unexpected and anticipated shifts in fiscal variables within the average plan. For instance, in the case of Ireland, fiscal plans are typically purely unexpected and contain no announcements of future actions, while Italian plans are often reversed after one year.[17]

[INSERT TABLES 4, 5 AND FIGURE 4 HERE]

[17] Details about each country's style of fiscal adjustment are provided in Table 5.

The results clearly show that fiscal consolidations implemented mainly by raising taxes entail large output costs.[18] AFG show that the component of GDP which explains a large part of the difference between EB and TB adjustments is private investment.[19] In the next sub-section we explore whether this feature of fiscal adjustments extends to the more recent period, i.e. to the adjustments implemented over 2009-2013.

4.4.2 Output effects of fiscal austerity in 2010-13

Effects of the plans adopted in 2009-13

The recent years offer an interesting opportunity to evaluate the predictions of our empirical model. There has been variability across countries and across time in output growth during this period among the 11 countries in our sample. It is thus interesting to compare the model projection of output growth – conditional upon fiscal adjustment plans – with its observed path.

There are two questions we can attempt to answer: *i*) how much of the recent recessions can be attributed to fiscal austerity; and *ii*) how much of the heterogeneity in the severity of the crisis across countries can be explained by the different styles of fiscal corrections. The reader should remember, however, that the tool we are using is not a forecasting model. Our model projects output growth conditional on fiscal shocks only, overlooking all other structural factors that have affected output growth in 2009-10. Overlooking such factors does not affect the validity of our estimates (as omitted variables are orthogonal to those included in the specification) but it certainly affects the ability of our model to track the observed output growth.

We compute out-of sample simulations by feeding directly into our estimated model the actual plans adopted over the period 2009-2013. We assess the effects of a fiscal consolidation comparing the simulated path of output growth, with the observed one. In Section 5.1 we shall discuss whether such an out-of-sample simulation is valid testing for a regime change between in sample estimates (up to 2007) and out-of-sample simulations (after 2009). The results are supportive of our counterfactual exercise.[20]

[18] The impulse response functions in Figure 4 show the cumulated effects on GDP per capita.

[19] AFG also find significant asymmetries in the responses of inflation and interest rates in the response to TB and EB plans. Differently, the responses of term spreads do not feature a significant asymmetry. This result is consistent with the evidence in Alesina and Ardagna (2010).

[20] AFG also find significant asymmetries in the responses of inflation and interest rates

The results of our simulations are presented in Figures 5, 6 and 7. On the left hand side of each figure we plot a histogram describing the size and composition of the fiscal adjustments happening in that year. Red columns represent years of tax-based consolidations, while spending-based years are colored in blue. In each histogram we report the yearly impact (unexpected plus announced for time t) and the future announced shifts in fiscal variables, measured as a fraction of GDP. The impact is represented by the full-colored columns, while announcements correspond to the cross-hatched columns of each figure. On the right hand side panels we report:

- the actual GDP growth (in black);[21]

- the simulated GDP growth conditional on the implemented fiscal plan (in green with 64% confidence intervals);

- what output growth would have been, according to the model, had the plan been totally expenditure-based (blue line with squared symbols);

- what output growth would have been, according to the model, had the plan been totally tax-based (red line with circles).

In countries like Germany, Spain or the US, where the plans actually implemented were almost totally expenditure-based, the green and blue lines virtually coincide.

Our model matches the realized growth paths quite well, especially for those countries, such as Italy, where fiscal shocks were the main determinants of GDP growth. However, several caveats are in order.

First, as we already repeated a number of times, our model projects GDP growth only conditional upon fiscal consolidations. Therefore, we should expect a closer fit between actual and projected GDP growth in years during which there were no other significant shocks (e.g. economic, political, etc.). The evidence from 2012 and 2013 illustrates this point, as these years are more distant from the financial and economic shocks of 2008 and 2009. There are also a few specific non-financial shocks that could explain why predictions do not match actual growth. The most relevant ones occurred in Portugal in 2010 and in Germany in the years closer to the crisis. For Portugal our predicted growth rate for 2010 is considerably lower than realized growth. One possible reason is stated in the EU *"Council Recommendation (with a*

in the response to TB and EB plans. Differently, the responses of term spreads do not feature a significant asymmetry. This result is consistent with the evidence in Alesina and Ardagna (2010).

[21] In the case of Ireland we also ran simulations for GNP, instead of GDP, and the results (available upon request) are essentially unchanged.

view to bringing an end to the situation of an excessive government deficit in Portugal)" (p. 5), which claims that in 2010 "positive growth of 1.4% was largely due to exceptional factors that boosted exports and private consumption". In Germany, our projected growth rate is almost flat, which is distant from the growth rates realized right after the crisis. The IMF claimed that *"the [German] uptick started in the second quarter of 2009, led by exports and aided by policy support and restocking of inventories"*.[22] Not surprisingly, the model cannot account for export-led growth. In general, given the features of our model, it is reasonable to expect a better fit in countries subject to impressive amounts of fiscal adjustment because these shocks were more likely to dominate other shocks.

Second, note that in some countries like Ireland, Spain and the US, the model projections and the actual growth rate are set at different levels, especially when the fiscal adjustments are small. These are the countries where the average GDP growth before the crisis was significantly different (higher) from the one after the crisis. Remember that the model is estimated including a country fixed-effect, which is the average GDP per capita growth over the years 1978-2007 (net of fiscal shocks) and represents a counterfactual growth in absence of fiscal shocks. Since the model simulations assume that fiscal policy affects GDP only relatively to the level of the fixed-effect, this may lead to an overestimation of growth, especially when the fiscal adjustment is small, and for countries that in the post crisis years could not catch up with their per-capita growth rates in the 80s and 90s.

Conversely, as shown in Table 6, the projected growth for Ireland, Italy, Portugal and Spain show that the different nature of the fiscal adjustments contributes significantly in explaining growth differentials among these countries.

[INSERT TABLE 6]

The results confirm that EB adjustments have been much less costly than TB ones. Compare for example Ireland and Italy. The former had a draconian adjustment on the expenditure side and a small recession in 2010-13 after the disastrous banking collapse of 2009. Italy had a smaller adjustment but virtually all on the revenue side, at least up to 2013. The

[22] "Germany: 2010 Article IV Consultation-Staff Report; Public Information Notice on the Executive Board Discussion; and Statement by the Executive Director for Germany", p. 4.

result (in Italy) was a deep recession which is still ongoing. Portugal and Spain also feature a good match between observed output growth and that projected on the basis of predominantly expenditure based fiscal adjustments. Note that in the case of Spain the burst of the housing bubble contributed to the recession and high unemployment above and beyond the effects of the fiscal adjustments. In fact, even though the Portuguese and Spanish governments implemented some of the largest consolidations of the whole sample, most of them were through spending cuts and the effect on GDP was low compared to the amount of deficit reduction implemented. The UK had a moderate EB adjustment and a small and short-lived recession. France had a moderate and mixed type of adjustment, and a moderate recession.

The size of the 64% confidence bounds on our out-of sample simulations differ across countries.[23] There are two reasons for this. First, the uncertainty of the fixed effect, which captures the equilibrium rate of output growth in the absence of shocks, differs significantly across countries. Second, some plans may include elements (for example two-year-ahead announcements) whose effects are less precisely estimated: this makes the uncertainty of the simulation dependent on the style of a plan. As a result in some cases, such as Italy, confidence intervals are relatively narrow; in other, such as Germany or Ireland, they are much larger. In the case of Italy the plans adopted over 2010-13 include components whose coefficients were precisely estimated. Moreover, Italy has a small standard error associated with its fixed-effect. The German plans of 2010-13, instead, typically contained components (for example two-year ahead announcements of a spending cut) not as precisely estimated and a high standard error on the fixed-effect. In the case of Ireland, the significant size of each adjustment exacerbates the large standard error on the coefficients on unexpected EB shocks. Moreover, Ireland displays the largest standard error on the fixed-effect among all countries in the sample.

Counterfactuals

Turning now to the counterfactual results (the red and blue lines respectively on the right-hand-side panels) notice that in countries like Spain, Italy, Ireland and Portugal, which implemented the largest fiscal consolidations (and where the model predictions best fit the actual growth), the nature

[23] Confidence bounds differ also compared to the impulse response functions presented in Section 4.4.1. The main reason is the inclusion of the country fixed-effects uncertainty in the out-of sample simulations. Secondly, impulse response analysis is based on the simulation of the average plan in which several adjustment plans are pooled together, while out of sample projections consider instead a specific plan.

of the fiscal plans plays a prominent role in determining the growth experience. For example, if Spain had implemented exactly the same adjustment but had chosen to mostly raise taxes, instead of cutting expenditures, its GDP growth would have been about 5 percent lower in 2013. On the other hand, had Italy chosen to mostly cut expenditures rather than raise taxes, its GDP growth would have been 2 percent higher in every single year since 2011, with a cumulative "additional" 6 percent points of growth.

Finally, notice that, as anticipated above, the model does not succeed in projecting growth in countries where the fiscal consolidation effort was small, since other shocks probably dominated. Hence in Germany or the US, given the small magnitude of the adjustments implemented, it does not make a big difference whether the plans were predominantly TB or EB.

[INSERT FIGURES 5, 6, 7 HERE]

4.4.3 Robustness of the EB and TB dummy definitions

In the specification used so far fiscal shocks where interacted with the TB and EB dummies. As discussed above this specification may be sensitive to the categorization of plans into EB and TB. As a robustness check we run our model with a different specification in which we introduce τ_t and g_t separately. That is we do not "label" fiscal adjustments as TB and EB but we simply use in the regressions the actual announced and unexpected tax hikes and spending cuts. We discussed above the pros and cons and this approach relative to our previous specification based upon a classification of plans in EB and TB. One advantage of this approach is to avoid potential mis-specifications in cases where the allocation of spending cuts and tax increases is close to fifty-fifty – a case, as we discussed above, that almost never happens in our samples. This alternative specification is

$$\begin{aligned}\Delta y_{i,t} = \alpha + B_1(L)\tau^u_{i,t} + B_2(L)\tau^a_{i,t,0} + \\ C_1(L)g^u_{i,t} + C_2(L)g^a_{i,t,0} + \\ + \sum_{j=1}^{3}\gamma_j\tau^a_{i,t,j} + \sum_{j=1}^{3}\delta_j g^a_{i,t,j} + \lambda_i + \chi_t + \mu_{i,t}\end{aligned} \tag{2}$$

The estimated coefficients are shown in Table 7 and are qualitatively very similar to the ones obtained with the benchmark model. The coefficients on

taxes, when significant, are all negative, the coefficient on spending, when significant (which happens only marginally for one of them) are positive. Note however that inferring the response of output growth to taxes and expenditure from these coefficients only is warranted in the case tax and expenditure adjustments are orthogonal to each other, a condition that it not usually satisfied. Figures 8, 9 and 10 reproduce, using the new specification, the results shown in Figures 5, 6 and 7. The new results are consistent with those obtained using the EB/TB dummies. For some countries, such as Spain and Portugal, the model above delivers projections closer to realized GDP growth than those in our baseline specification.

[INSERT TABLE 7 HERE]
[INSERT FIGURES 8, 9, 10 HERE]

5 Were the recent fiscal adjustments especially costly?

The recent episodes of austerity happened under special conditions. They followed the Great Recession (in fact they started during its tail end) and the financial crisis, which led to credit crunches. In most cases market conditions forced European countries to start deficit reduction polices when the recession was not yet over and financial markets were still experiencing a credit crunch. In addition, many countries implemented fiscal contractions at the same time. All of these factors might suggest that the recent fiscal consolidations might have been more costly than those of previous decades.[24] Blanchard and Leigh (2013) argue that this was indeed the case. We investigate their finding that, in the recent round of fiscal adjustments, fiscal multipliers were larger than anticipated and we find that the evidence in favor of a change in fiscal multipliers is very weak.

In addressing this question it is important to distinguish between two possibilities. One is that fiscal multipliers were larger in these recent rounds of fiscal adjustments than estimated using pre-crisis data: this is the question asked by Blanchard and Leigh (2013). The other is that fiscal multipliers were not different but additional shocks (like credit crunches for instance)

[24] All of these factors were outlined (among others) by Christiano, Eichenbaum and Rebelo (2011), Eggertsson and Krugman (2012), Auerbach and Gorodnichenko (2012), OECD (2014b).

created deep recessions regardless of the size of fiscal multipliers. Within the framework of this paper we can only investigate the first of these questions.

We begin by testing whether our model implies a regime change between in-sample estimates (up to 2007) and out-of-sample simulations, after 2009.

5.1 Testing for a Regime Change

5.1.1 Test on joint equality of coefficients

We first test for the joint stability of our parameter estimates between the two samples 1981-2007 and 2008-2013. In order to run the test we interact each of the 20 coefficients measuring the output effects of shifts in fiscal variables with a time dummy taking the value of 1 after 2008.[25] The joint significance of each of these stability parameters is evaluated using the Wald test.

The hypothesis of structural stability is not rejected with $alpha = 0.01$ but rejected with $alpha = 0.05$. Hence we are at the margin of structural instability. However, the Wald test for the joint significance of so many parameters could be driven by transitory movement in just a single parameter. This is indeed the case since when we drop the coefficient for $e^a_{t-3,0}$ from the test we do not reject stability even with $alpha = 0.1$. As a consequence, we consider the estimates obtained using pre-crisis data to give valuable information about the amount of output loss due to the post-crisis fiscal consolidation measures. An additional caveat is that we are looking at a structural break rather close to the end of the sample, thus with very few observations after the break, which makes the test less precise.

5.1.2 Changing the estimation sample

To further support this point, we next provide a visual comparison (with confidence intervals) between the simulations produced using parameters estimated in the two samples: 1980-2007 and 1980-2013.

To do this, we re-estimate our model over the extended sample (1979-2013) and we then use the new estimated coefficients to simulate GDP growth inputting post-crisis shocks. Figure 11 plots the predicted growth rates using the new estimates (orange) against those computed in the previous section (Figures 5, 6 and 7) (green). The new projections track actual GDP growth

[25] Our test can be thought of as a version of the Chow Test that allows for the presence of country fixed effects in the panel data.

closer, as expected, but they do not differ significantly from those based on within-sample estimation.

[INSERT FIGURE 11 HERE]

5.2 Did Fiscal Multipliers Change After the Crisis?

Blanchard and Leigh (2013, hereafter BL) address the stability of fiscal multipliers using a different approach. They investigate the relation between the IMF growth forecast errors and the total amount of fiscal consolidations expected to be implemented in 2011, based on IMF forecasts. In practice, they run an OLS regression on a cross-section of 27 advanced economies employing a cyclically adjusted measure of changes in the structural budget balance. They find that *"stronger planned fiscal consolidation has been associated with lower growth than expected, with the relation being particularly strong, both statistically and economically, early in the crisis"*. Their results suggest that for every additional percentage point of GDP of fiscal consolidation, GDP was about 1 percent lower than forecasted. They interpret the result as implying that fiscal multipliers in 2011 were higher than those predicted by forecasters.[26]

In order to assess this evidence it is important to realize that the forecast errors constructed in BL are conditional upon a scenario for *all* the exogenous variables that enter the IMF forecasting model. Their forecast errors could therefore reflect surprises in such scenario and in the response of all endogenous variables to such surprises. Our approach instead delivers a projection of GDP growth conditional *only on the fiscal adjustment*. As a consequence, a regression of the residuals of our model – produced by projecting GDP growth only on the announced fiscal adjustment – run on the fiscal adjustment itself, can provide more direct evidence on the potential structural instability of fiscal multipliers.

To illustrate this point, we run the following regression

$$\Delta y_{it+i} - E\left[\Delta y_{it+i} | e_{it}, TB_t, EB_t\right] = \alpha + \beta e_{it} + \varepsilon_{it}$$

[26] BL investigate the robustness of their results replacing IMF forecasts with those of other forecasters: the EC, the OECD, and the EIU. They find that their results are robust. These alternative forecast, however, suffer of the same weakness we have pointed out for IMF forecasts.

The dependent variable is the discrepancy between the actual growth rate and the growth rate projected by our model, and e_{it} is the narrative measure of the deficit-driven fiscal consolidation actions (unexpected and announced). The model projections allow for a different impact on growth of TB and EB plans, therefore the nature of the plan is an important element of the conditioning information set.

If fiscal multipliers are stable, the estimated coefficient linking the real growth projection error and our narrative measure of fiscal episodes (β) should be centered on zero.

Notice the difference with the BL specification. In the BL specification the forecast error is the difference between realized growth and growth as predicted by the IMF forecasting model thus is conditional on all the exogenous variables forming the scenario of such model, not only fiscal variables, moreover no difference between TB and EB plans is allowed in this specification.

We first estimate the model using OLS and restricting the sample to the cumulated forecast errors in 2010-2011, in order to exactly replicate BL. Results are reported in Table 8. The estimate of β (0.243) is small, not significantly different from zero, and about one third of the value estimated in BL. Extending the estimation period to include the observations in 2010-13 the magnitude of the estimated coefficient does not change but is now significant at the 1% level (column 2). In other words, for each additional percentage point of fiscal consolidation after the financial crisis, GDP turned out to be 0.4 percent lower than accounted by our model, a value only marginally significant. However, introducing country-fixed effects the coefficient becomes again insignificant while not changing in magnitude (column 3). Results are robust to the inclusion of the sum of fiscal announcements in the specification (column 4). Summing up, our results suggest, differently from BL, that probably only minor or no changes in the fiscal multiplier have occurred after the crisis.

[INSERT TABLE 8]

The difference of our results with respect to the ones in BL might be due to many factors. First, as we said, our structural break test uses a model conditional only on fiscal policy with heterogeneous effect of EB and TB plans, and not conditional on the whole information set of IMF forecasters. Second, if the composition of the fiscal adjustments post 2010 differed from

the average composition in the past, this could explain why models that impose identical effects of TB and EB adjustments, such as the IMF forecasts, find a break in the estimated multiplier.[27] Finally, there are fewer countries in our sample, compared to that of BL.

6 Conclusions

The conventional wisdom is *(i)* that fiscal austerity was the main culprit for the recessions experienced by many countries, especially in Europe and *(ii)* that this round of fiscal consolidation was much more costly than the past ones. The contribution of this paper is a clarification of the first point and, if not a clear rejection, at least it raises doubts on the second.

On the first point our main finding is that, as in the past, in the recent episodes there has been a very big difference between tax-based and expenditure-based fiscal adjustments. The former have indeed been very costly in terms of output losses. The latter much less so. These results are very similar to those obtained by many authors who have studied the effects of fiscal adjustments preceding the period 2010-2013. Comparing our results on these recent adjustments and the ones obtained using pre-crisis data – that is up to 2007 – we did not find strong evidence against the hypothesis that fiscal multipliers –large tax multipliers and very small spending multipliers – were stable across the two sub-samples.

Our results, however, are mute on the question whether the countries we have studied did the right thing implementing fiscal austerity at the time they did, that is 2009-13. Consolidations, as illustrated in Figure 2 at the beginning of the paper, all happened at the trough of a recession, which normally is not a good time to adopt fiscal restraint. However the surge in interest rates on public debt on the European periphery might have fueled dangerous debt crisis. In some countries, such as Spain, Ireland and Portugal,

[27] To investigate whether their baseline results are driven primarily by spending cuts or by revenue increases, BL split their measure of fiscal consolidation — the change in the cyclically-adjusted fiscal balance — into the change in government spending and revenue and estimate the model separating between the change in spending and the change in revenue. They find that overall fiscal multipliers were, on average, underestimated for both sides of the fiscal balance, with a slightly larger degree of underestimation associated with changes in government spending. Once again, however, it is impossible to separate, within this framework, between overall forecast errors and forecast errors signaling a change in fiscal multipliers.

fiscal consolidations have been accompanied, at least in 2012-13, by other (non fiscal) shocks to the economy that have depressed output growth, raising the question of whether the intensity of the fiscal contraction was *optimal*. This is an important question, but one that, within the framework adopted in this paper, we cannot answer. We would need a structural model capable of tracking the effect of several shocks.

In order to obtain these results we constructed a detailed 'narrative" data set which documents the actual size and composition of the fiscal plans of several countries in the period 2009-2013. The plans are composed of preannounced and unexpected policy changes often with many revisions in mid-course, which incidentally added much uncertainty in expectations, an uncertainty which may have had negative effects on investments. Thus, an additional contribution of this paper is a clarification of these complex dynamic evolutions and the construction of a new narrative data set on recent fiscal adjustments. We have then estimated the output effects of these fiscal plans simulating out-of-sample a model that allows for anticipated and unanticipated shifts in fiscal variables, as well as for differences in the response of output to tax and spending changes.

Two criticisms could be raised to our analysis. First, our out-of-sample simulations are constructed under the assumption that fiscal multipliers did not change during the financial crisis, when monetary policy hit the zero lower bound. When we test explicitly the hypothesis that recent fiscal adjustments had the same effect on output growth as past ones, we find it hard to reject the null, although in some cases failure to reject is marginal. This result appears inconsistent with some recent empirical findings (discussed in the paper) where the costs of fiscal adjustments are found to be higher in recent years. One reason for this difference is the assumption – made in most studies of fiscal multipliers, but relaxed in this paper – that tax and spending multipliers are identical, and thus that one can estimate the output effects of "a fiscal consolidation". If, as the data strongly suggest, fiscal multipliers depend on the composition of a fiscal correction, imposing that the effects of tax-based and spending-based consolidations are identical will result in distorted estimates of the multiplier. Such distortion will depend on the composition of the average fiscal adjustment which occurred over the estimation sample. If the composition of the fiscal adjustments post-2007 differed from the average composition in the past, this could explain why models that impose identical effects of tax-based and spending-based consolidations find a break in the estimated multiplier.

The second, and in this case warranted, criticism is our failure to consider accompanying policies and to ask whether countries that accompanied fiscal austerity with structural reforms experienced better output growth than countries which did not. As noted in the introduction, and as documented in Alesina and Ardagna (2010, 2013) and Perotti (2013), multi-year fiscal adjustments rarely occur in isolation. They are often accompanied by other policies (a devaluation, a labor market reform or a pension reform) and their effects will vary depending on these policies. These policy packages have in the past delivered cases of "expansionary fiscal consolidations" in which countries have managed to avoid any recessionary cost of fiscal contractions. In the current rounds of adjustments, except for the few pension reforms which we documented (with benefits accruing with several years of delay) and of the Spanish labor market reform, the fiscal corrections of 2010-13 were mostly implemented in a rush under market pressure and governments rarely had the time to design and get Parliaments to approve significant reforms. For instance, only in 2014 did Italy implement a major labor market reform in the context of a pro-growth medium term package. More research is warranted on this point.

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8 APPENDIX: Plans and the Measurement of their Effects of Output

The fiscal plans studied in the paper are constructed expanding the data put together, using the narrative method, by Devries et al (2011). Jordà and Taylor (2013) have argued that the episodes of fiscal consolidation identified by Devries et al (hereafter referred to as 'IMF corrections') are not exogenous, and thus are not valid instruments because they can be predicted using their own past (strongly), past values of output growth (very weakly) and past values of debt dynamics (weakly). Some discussion of this point is in order. Consider our description of fiscal adjustment plans

$$f_{(i,t)}=e^u_{it}+e^a_{it,0}+e^a_{it,1}$$
$$e^a_{it,1}=\varphi_{1i}\ e^u_{it}+v_{1,i,t}$$
$$e^a_{it,0}=e^a_{it,1}$$

$f_{i,t}$, the narrative exogenous fiscal adjustment in each year, includes three components: the unexpected adjustments (announced upon implementation at time t), the past announced adjustments (implemented at time t but announced in the previous years) and the future announced corrections (considering, for simplicity, the case in which the horizon of the plan is only one year these corrections are announced at time t for implementation at time $t+1$).

The IMF corrections are defined as follows: $e^{IMF}_{i,t}=e^u_{it}+e^a_{it,0}$. Based on this definition, the fact that $e^{IMF}_{i,t}$ are correlated across time is not surprising. In fact, if fiscal policy is implemented through plans, $e^{IMF}_{i,t}$are correlated by construction.

$$Cov(e^{IMF}_{i,t}, e^{IMF}_{i,t-1}) = Cov(e^u_{it}+e^a_{it,0}, e^u_{it-1}+e^a_{it-1,0}) = \varphi_{1,i}Var(e^u_{it-1})$$

When plans are considered, initial shocks are given to e^u_{it} rather than to $e^{IMF}_{i,t}$, and e^u_{it}, differently from $e^{IMF}_{i,t}$, are not predictable from their own past.

Given an initial shock to e^u_{it}, the effects of a fiscal plan are simulated by using a moving average representation of output growth that projects it on each of the three types of fiscal action, supplemented by the set of equations describing the country-specific style of the plan

$$\begin{aligned}\Delta y_{i,t} = \alpha + B_1(L)e^u_{i,t} * TB_{i,t} + B_2(L)e^a_{i,t,0} * TB_{i,t} + \\ C_1(L)e^u_{i,t} * EB_{i,t} + C_2(L)e^a_{i,t,0} * EB_{i,t} + \\ + \sum_{j=1}^{3}\gamma_j e^a_{i,t,j} * TB_{i,t} + \sum_{j=1}^{3}\delta_j e^a_{i,t,j} * EB_{i,t} + \lambda_i + \chi_t + \mu_{i,t}\end{aligned} \tag{3}$$

$$\begin{aligned}e^a_{i,t,j} &= \varphi_{i,j}\ e^u_{i,t} + v_{i,t,j} \qquad j = 1,2,3 \\ e^a_{i,t,0} &= e^a_{i,t-1,1} \\ e^a_{i,t,j} &= e^a_{i,t-1,j+1} + \left(e^a_{i,t,j} - e^a_{i,t-1,j+1}\right) \qquad j \geqslant 1\end{aligned}$$

Importantly, e^u_{it} are not predictable by their past and are not correlated with the cycle. But since e^u_{it} are identified via the narrative method – selecting fiscal adjustments designed to offset the expansionary changes in government spending occurred in the past – they are predictable by past changes in government debt.

Exogeneity, however, is different form predictability. Consider, for the sake of illustration, this simple representation

$$\begin{aligned}\Delta y_{i,t} &= \alpha + \beta e^u_{i,t} + \mu_{1,t} \\ e^u_{i,t} &= \rho e^u_{i,t-1} + \mu_{2,t} \\ \begin{bmatrix} \mu_{1,t} \\ \mu_{2,t} \end{bmatrix} &= \left[\begin{pmatrix} 0 \\ 0 \end{pmatrix} \begin{matrix} \sigma_{1,1} & \sigma_{1,2} \\ \sigma_{1,2} & \sigma_{2,2} \end{matrix} \right]\end{aligned}$$

The condition required for e^u_{it} to be weakly exogenous for the estimation of β is $\sigma_{1,2} = 0$, which is independent of $\rho = 0$: when $\sigma_{1,2} = 0$ and ρ is different from zero e^u_{it} is predictable but exogenous for the estimation of β.

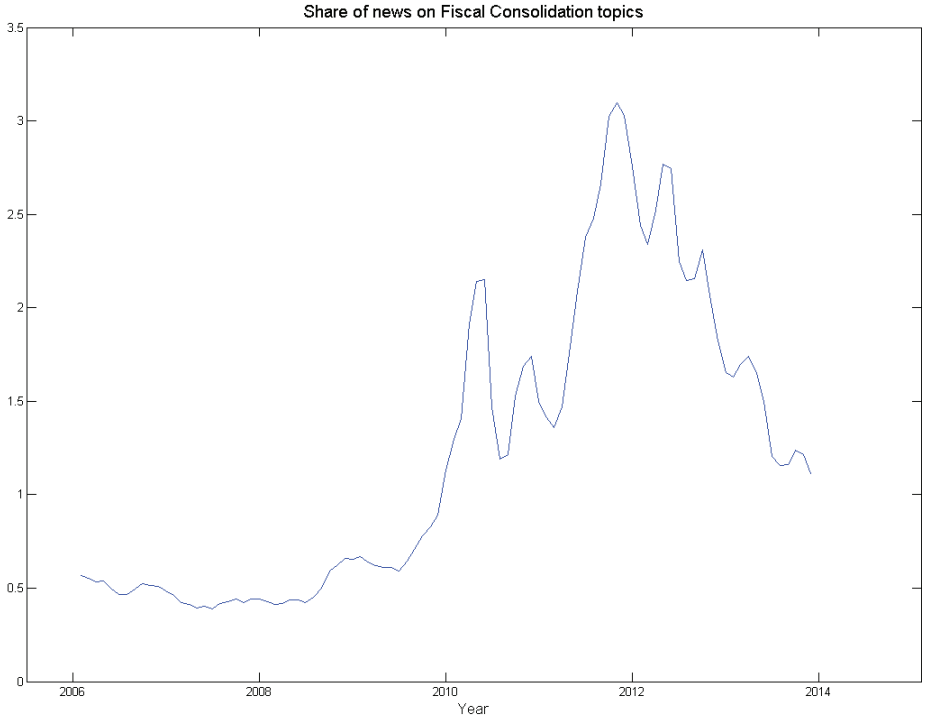
To sum up, our methodology is based on a truncated MA representation where plans take care of most of the predictability of the IMF corrections. Some predictability is present in our corrections – because the consolidation episodes selected are those designed to offset an expansionary increase in government spending happened in the past – but this predictability does not affect the consistency of our estimates of the output effect of fiscal adjustment plans.

Jordà and Taylor (2013), choose a different route to address the predictability of the $e^{IMF}_{i,t}$ corrections, by taking the following three steps

- redefine $e_{i,t}^{IMF}$ innovations as a 0/1 dummy variable;
- estimate a propensity score deriving the probability with which a correction is expected by regressing it on its own past and predictors;
- use the propensity score to derive an Average Treatment Effect based on Inverse Probability Weighting.

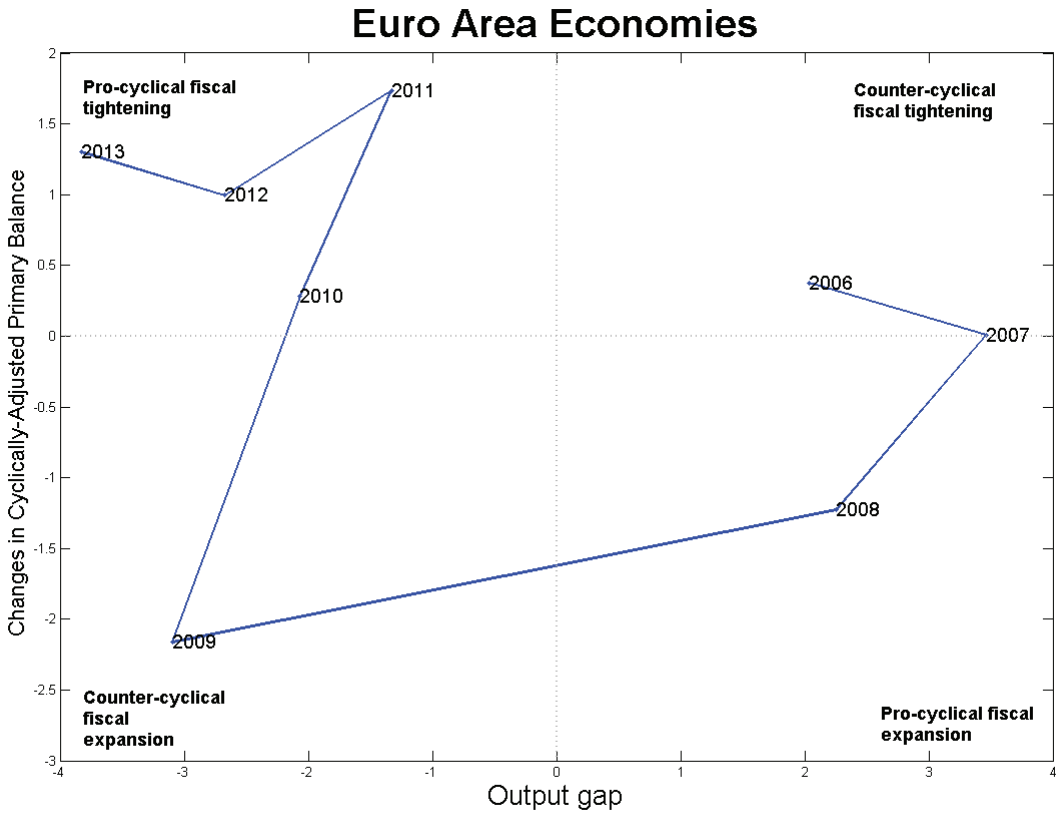
This method has the advantage of taking the simulation of the output effect of fiscal adjustments closer to a quasi-natural experiment. This result, however, comes at some cost. First, replacing $e_{i,t}^{IMF}$ innovations with a 0/1 dummy disregards relevant information on the intensity of the adjustment. Second, the links between the announced and anticipated part of a stabilization plan are lost. Third, the presence of the forward looking component – which is omitted from the specification – might introduce a bias in the local-projections-computed impulse responses whenever there is a systematic relation between the forward looking component and the unexpected component of the adjustment. Fourth, the heterogeneity of fiscal plans across countries is lost when they are assimilated to the same common treatment administered to many "patients".

Figure 1: Fiscal Policy in Media



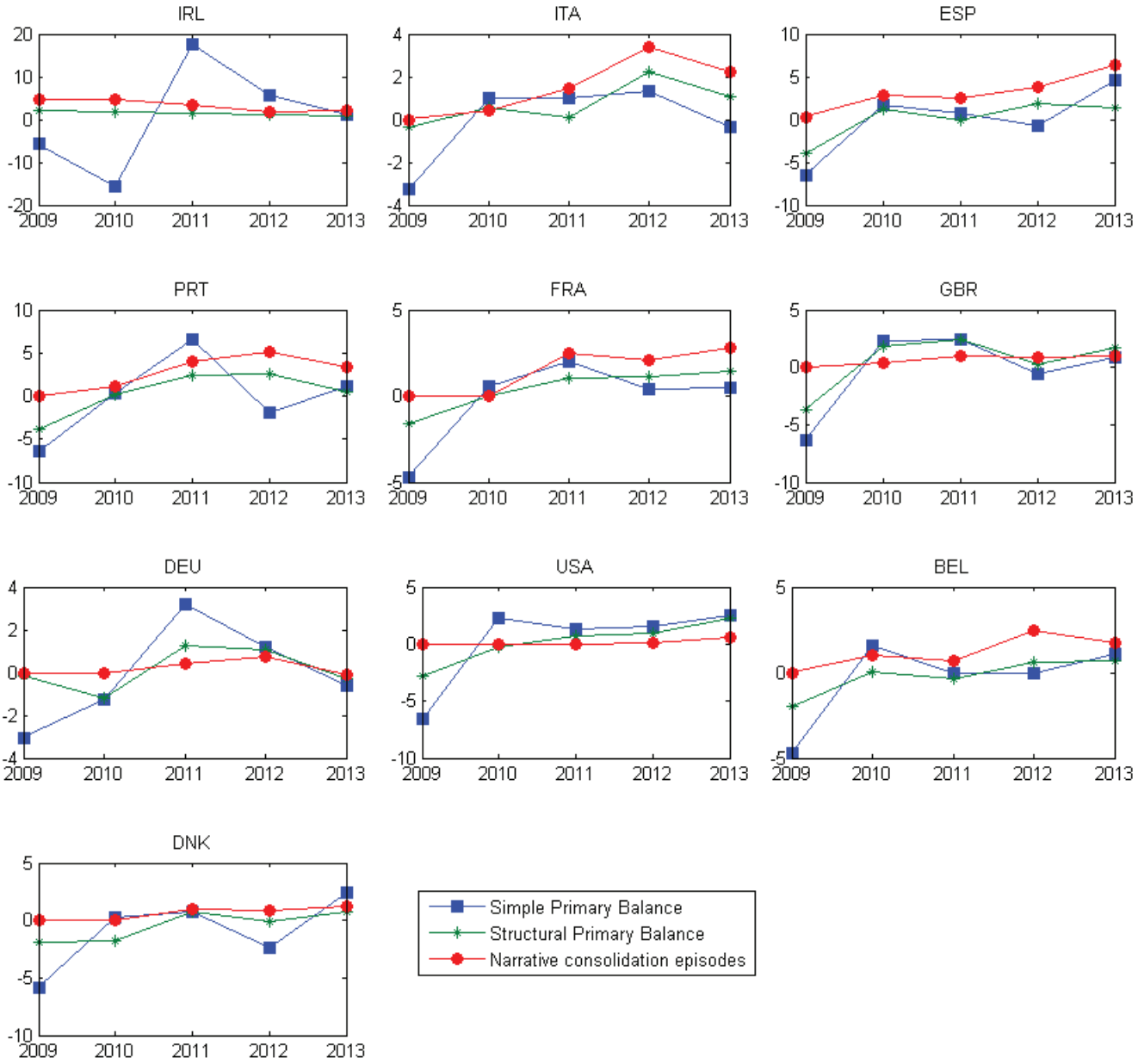
The extent to which fiscal policy was debated in media is measured through the share of articles concerning fiscal policy over the total number of published articles. Data are monthly and the plotted series is a 5-year centered moving average of the measure in our sample. Numbers along vertical axis are the percentage over total articles published. Using the archive Factiva we searched for keywords connected to fiscal policy and debt: "austerity", "fiscal consolidation", "fiscal compact", "Maastricht", "excessive deficit procedure", "public debt", "fiscal policy", "budget deficit" and "debt crisis". We collect monthly data for the countries in our sample from January 2006 to January 2014. We normalize the absolute number of articles dividing by the total number of published articles, measured by searching the most common word for each country (e.g. "the" for English-speaking countries). We select the first five national newspapers for circulation in every country excluding sport newspapers, free newspapers and tabloids.

Figure 2: Extent of Pro-cyclical polices in Advanced Economies during and after the financial crisis



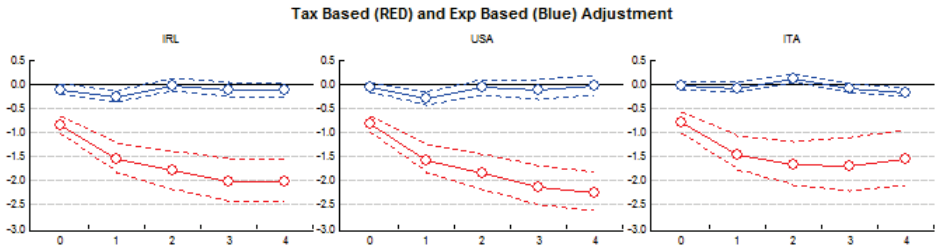
We plot the change in the cyclically adjusted primary balance against the output gap registered in the same year. A negative (positive) change in the primary balance means that the cyclically adjusted deficit is increasing (decreasing). As a consequence, years of countercyclical fiscal policy are those in the first and third quadrants, while years of procyclical policies lie in the second and fourth quadrants. Source: OECD Forecasting, Analysis and Modeling Environment.

Figure 3: Comparison between Simple Primary Balance, Structural Primary Balance and Narrative Changes in fiscal policy



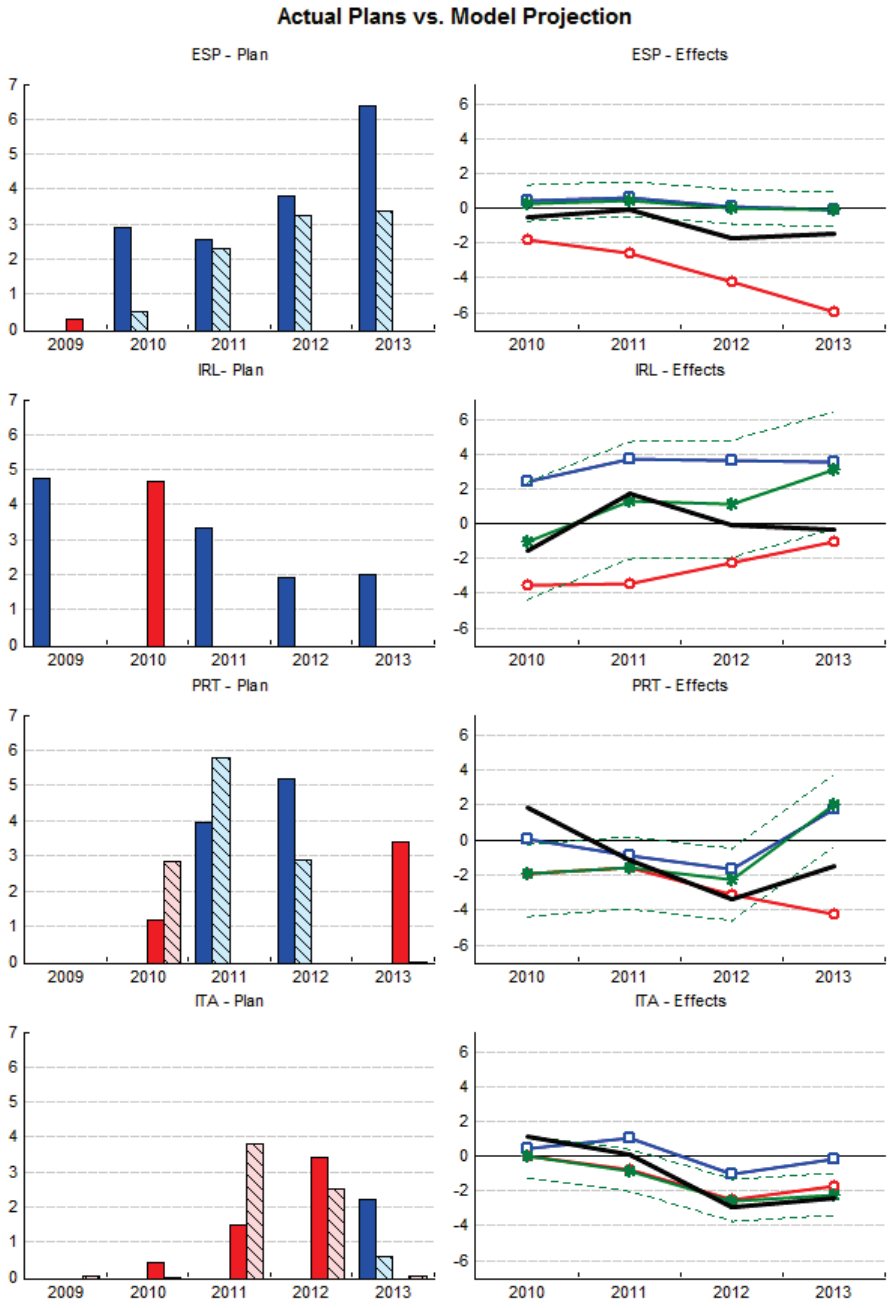
Sources: data on simple primary balance and structural primary balance are taken from IMF World Economic Outlook Database, October 2013; narrative consolidation episodes are our extension of Devries et al. (2011) data.

Figure 4: Fiscal Consolidation Examples



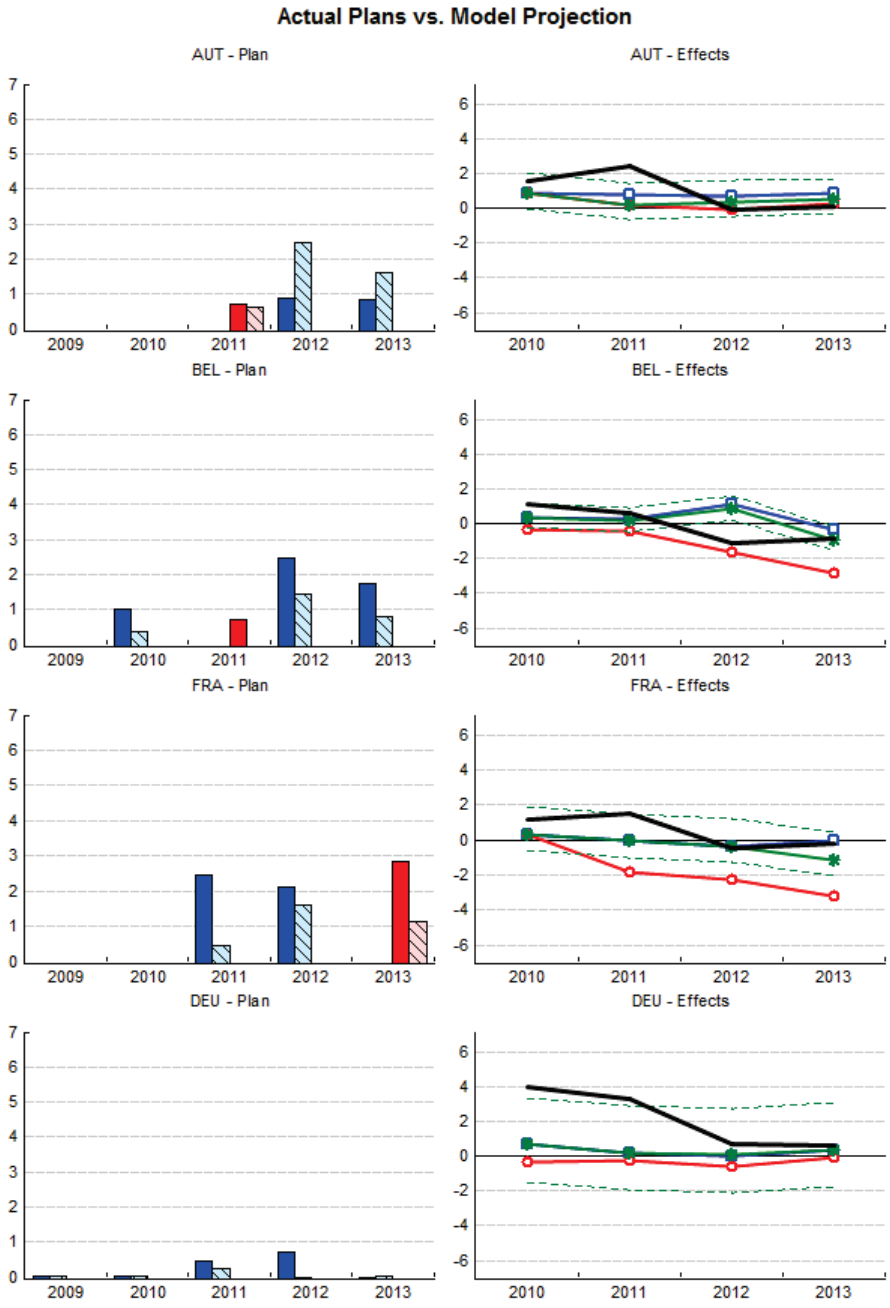
Impulse responses for tax-based (red) and spending-based consolidations (blue). Numbers along the vertical axis report the cumulative effect on GDP per capita in percentage points.

Figure 5: Benchmark and Counterfactual Simulation



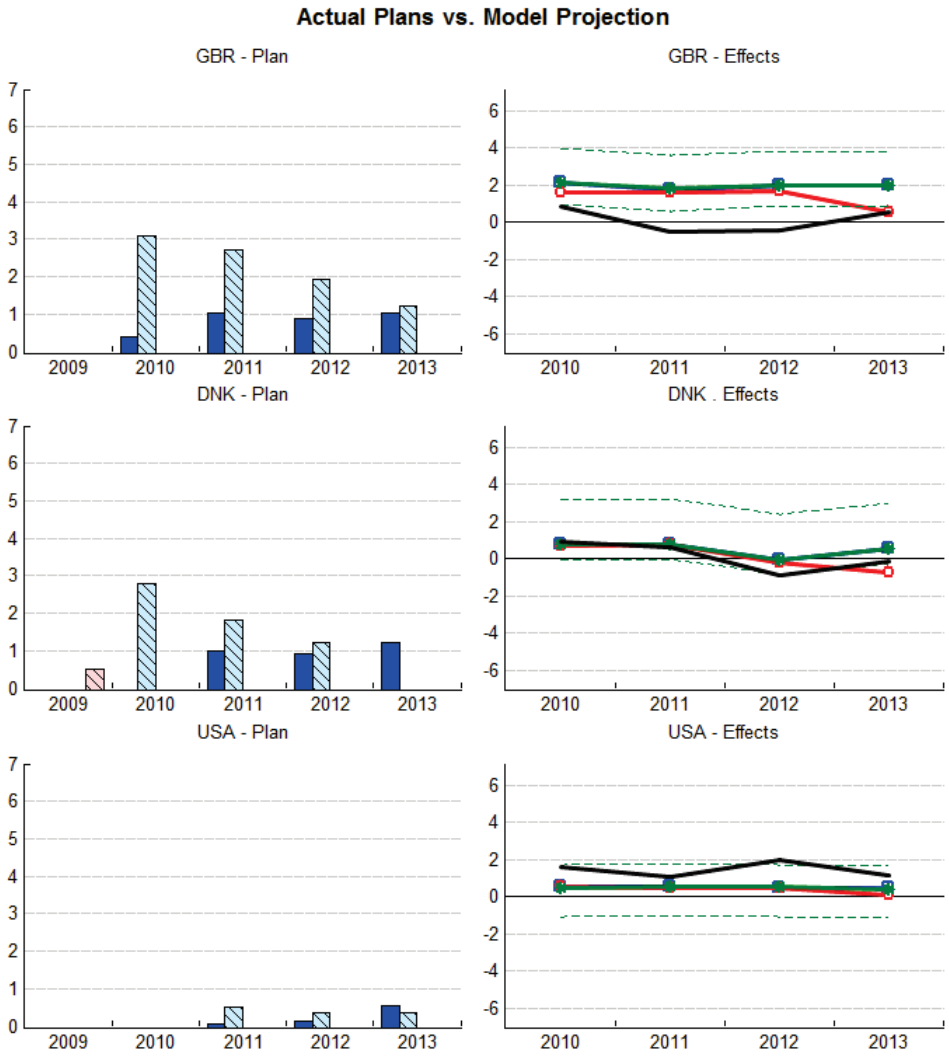
Histograms on the left hand side of the graph represent the planned fiscal consolidations in every year. Red columns represent years of tax-based consolidations, while spending-based ones are colored in blue. In each histogram we report, the yearly impact $(e_t^u + e_{t.0}^a)$ and all the future announced shifts in fiscal variables, measured as a fraction of GDP. The impact is represented by the full-colored columns, while the announcements correspond to the cross-hatched columns of each figure. On the right hand side panels we report the corresponding simulated GDP growth (in green with 64% confidence bounds) against the actual one (in black). Counterfactual GDP growth paths for totally tax and spending-based plans are respectively in red and blue.

Figure 6: Benchmark and Counterfactual Simulation



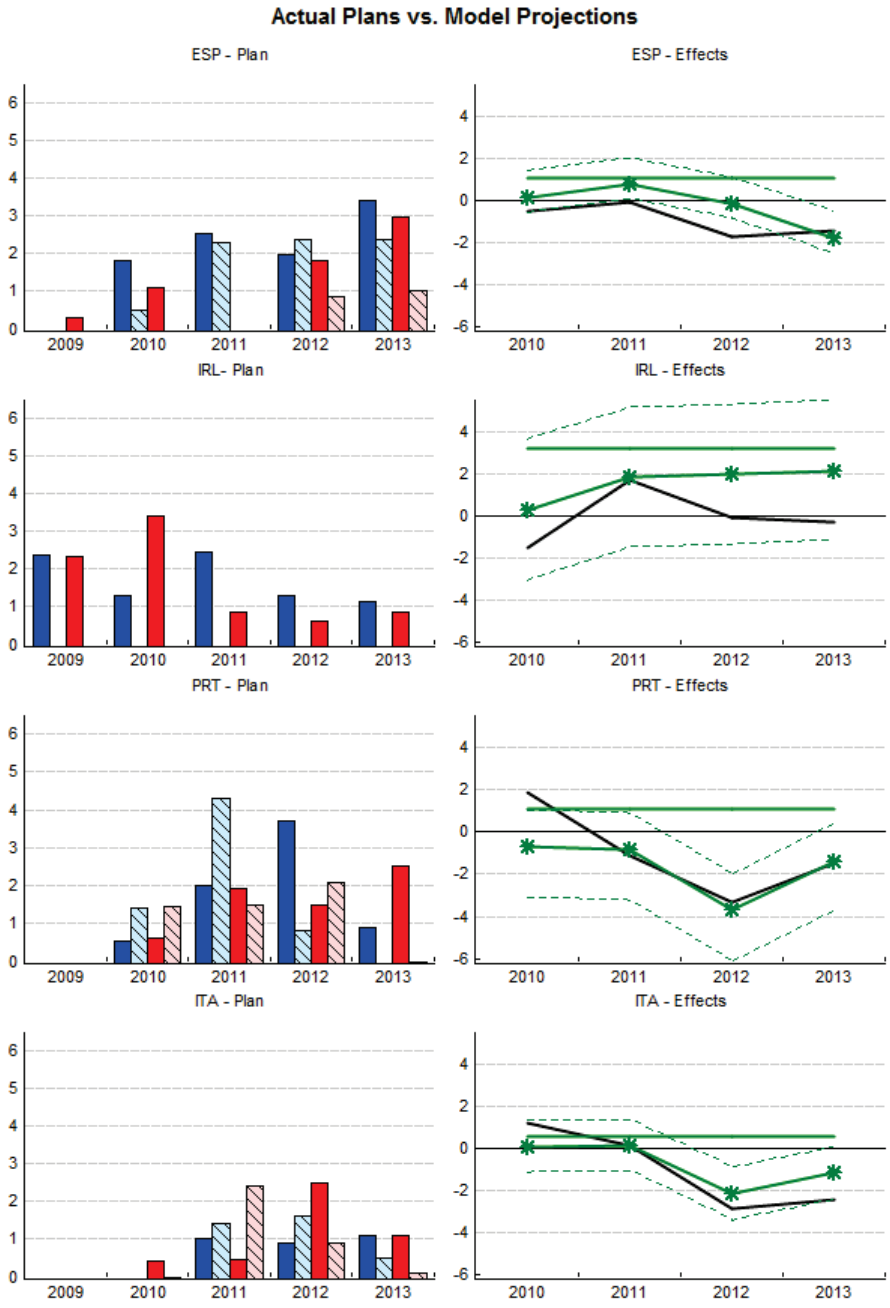
Histograms on the left hand side of the graph represent the planned fiscal consolidations in every year. Red columns represent years of tax-based consolidations, while spending-based ones are colored in blue. In each histogram we report, the yearly impact $(e_t^u + e_{t.0}^a)$ and all the future announced shifts in fiscal variables, measured as a fraction of GDP. The impact is represented by the full-colored columns, while the announcements correspond to the cross-hatched columns of each figure. On the right hand side panels we report the corresponding simulated GDP growth (in green with 64% confidence bounds) against the actual one (in black). Counterfactual GDP growth paths for totally tax and spending-based plans are respectively in red and blue.

Figure 7: Benchmark and Counterfactual Simulation



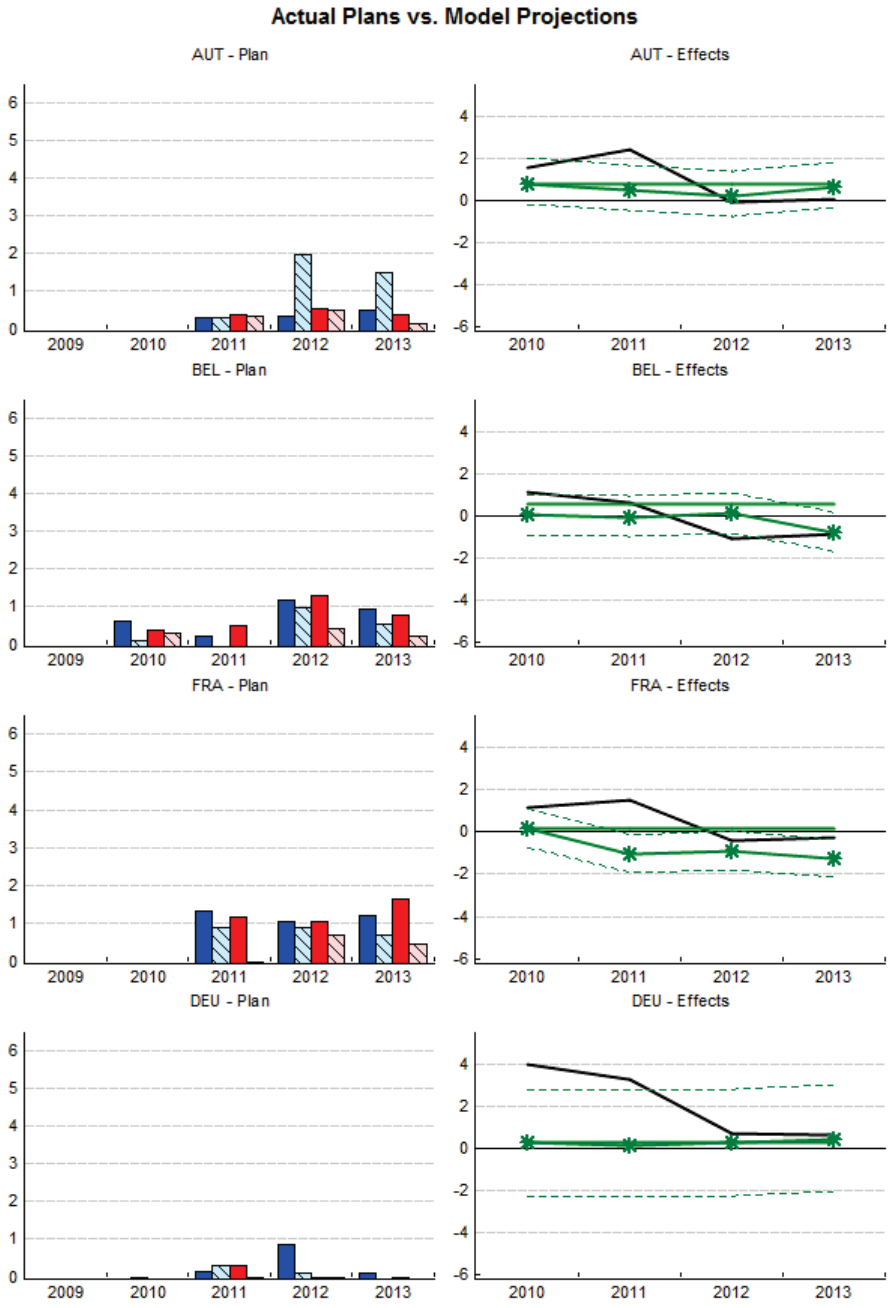
Histograms on the left hand side of the graph represent the planned fiscal consolidations in every year. Red columns represent years of tax-based consolidations, while spending-based ones are colored in blue. In each histogram we report, the yearly impact $(e_t^u + e_{t.0}^a)$ and all the future announced shifts in fiscal variables, measured as a fraction of GDP. The impact is represented by the full-colored columns, while the announcements correspond to the cross-hatched columns of each figure. On the right hand side panels we report the corresponding simulated GDP growth (in green with 64% confidence bounds) against the actual one (in black). Counterfactual GDP growth paths for totally tax and spending-based plans are respectively in red and blue.

Figure 8: Model Simulation after direct estimation of τ and g, separately



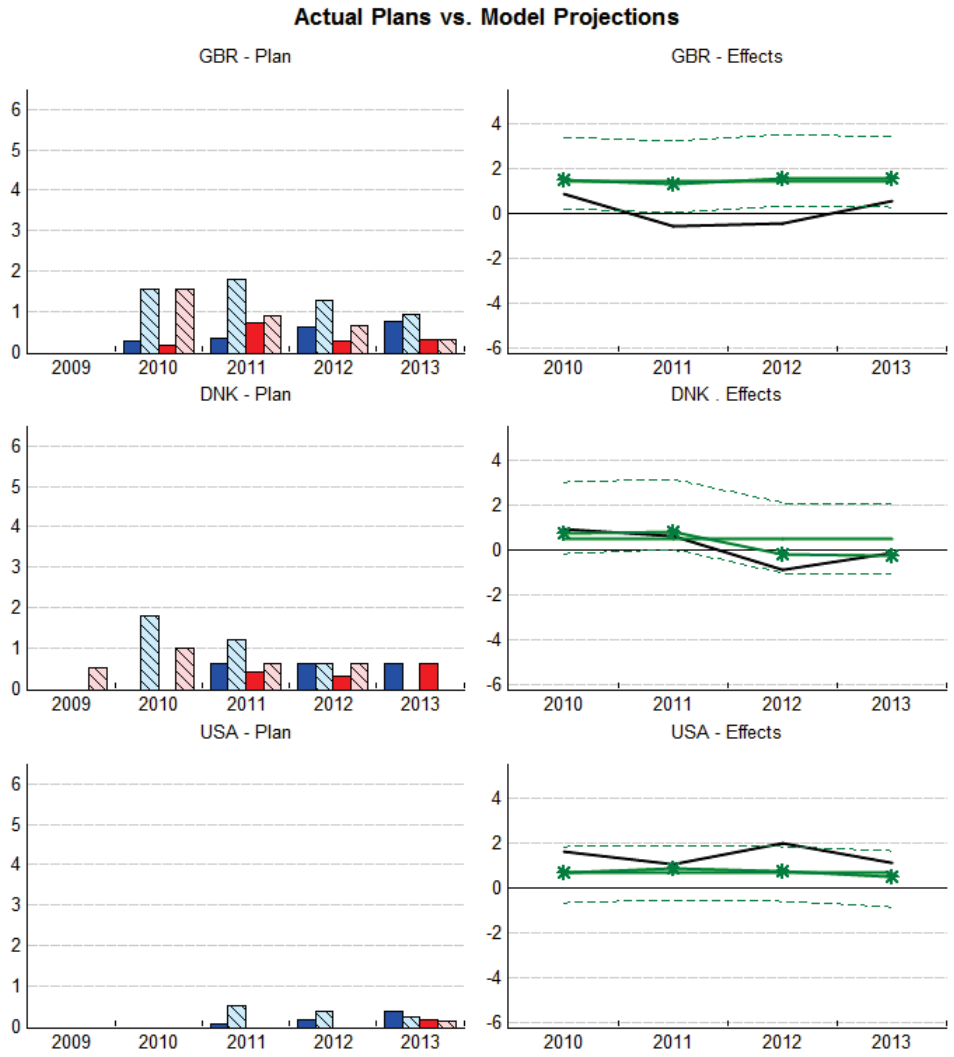
Histograms on the left hand side of the graph represent the total impact of fiscal consolidations in every year. Blue columns represent spending measures, while tax measures are in red. In each histogram we report, the yearly impact $(e_t^u + e_{t.0}^a)$ and all the future announced shifts in fiscal variables, measured as a fraction of GDP. The impact is represented by the full-colored columns, while the announcements correspond to the cross-hatched columns of each figure. The right hand side of the graph plots the simulated growth (green) against the actual growth (black). The model used to simulate plans employs spending and tax shocks separately. No tax and spending-based dummies are included.

Figure 9: Model Simulation after direct estimation of τ and g



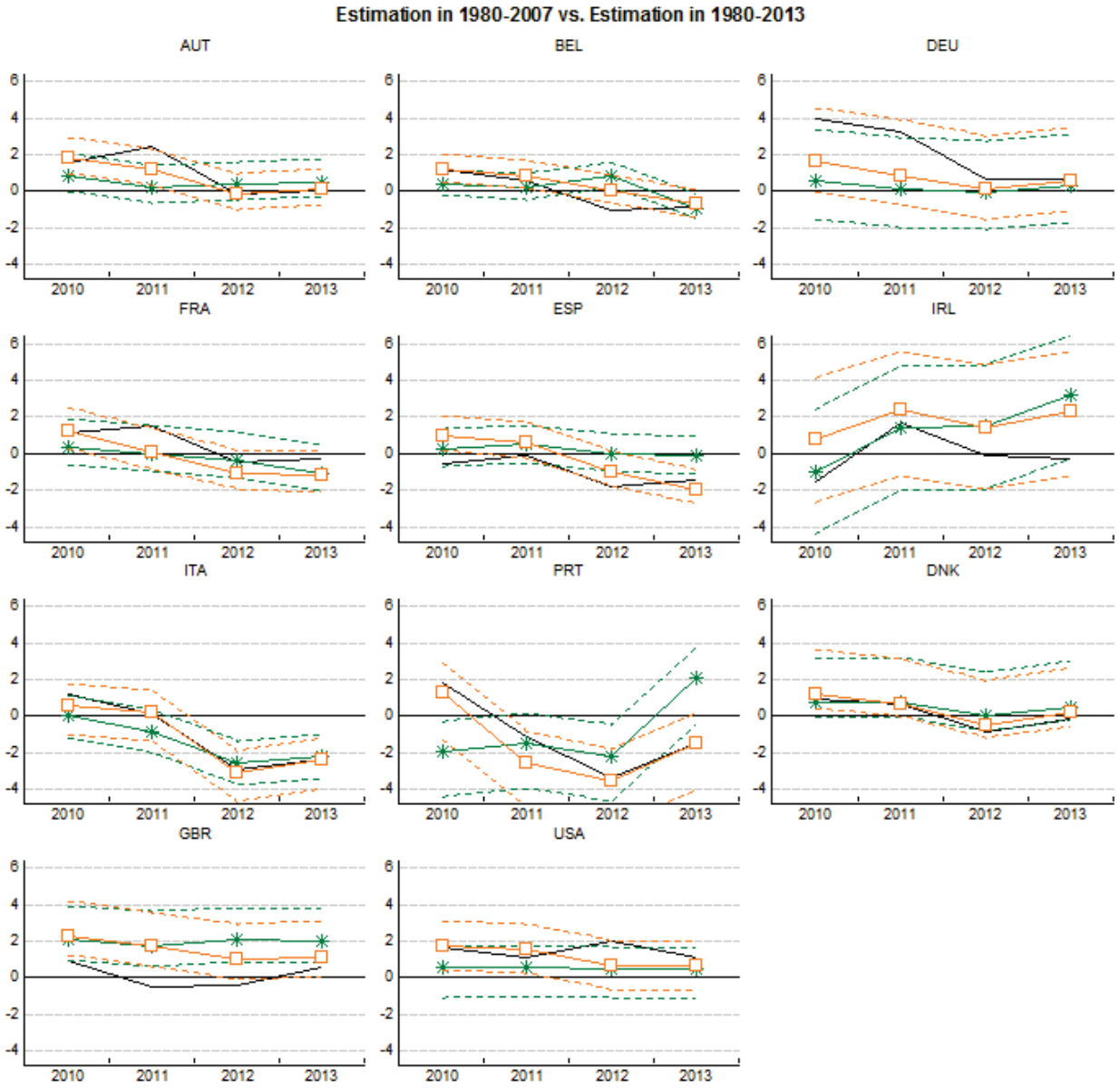
Histograms on the left hand side of the graph represent the total impact of fiscal consolidations in every year. Blue columns represent spending measures, while tax measures are in red. In each histogram we report, the yearly impact ($e_t^u + e_{t.0}^a$) and all the future announced shifts in fiscal variables, measured as a fraction of GDP. The impact is represented by the full-colored columns, while the announcements correspond to the cross-hatched columns of each figure. The right hand side of the graph plots the simulated growth (green) against the actual growth (black). The model used to simulate plans employs spending and tax shocks separately. No tax and spending-based dummies are included.

Figure 10: Model Simulation after direct estimation of t and g



Histograms on the left hand side of the graph represent the total impact of fiscal consolidations in every year. Blue columns represent spending measures, while tax measures are in red. In each histogram we report, the yearly impact $(e_t^u + e_{t.0}^a)$ and all the future announced shifts in fiscal variables, measured as a fraction of GDP. The impact is represented by the full-colored columns, while the announcements correspond to the cross-hatched columns of each figure. The right hand side of the graph plots the simulated growth (green) against the actual growth (black). The model used to simulate plans employs spending and tax shocks separately. No tax and spending-based dummies are included.

Figure 11: Pseudo-out-of-sample simulation



The figure plots the predicted growth rates using the estimates on the sample 1980-2013 (orange) against those computed in the sample 1980-2007 (green).

Table 1: Public Balance

							Projections		Change
	2007	2008	2009	2010	2011	2012	2013	2014	2010-14
Overall balance (% GDP)									
World		-2.2	-7.4	-6.0	-4.5	-4.3	-3.5	-3.0	2.4
Adv. economies	-1.1	-3.5	-9.0	-7.8	-6.6	-5.9	-4.7	-3.8	3.1
EM economies	1.2	0.0	-4.6	-3.1	-1.7	-2.1	-2.2	-2.2	0.9
US	-2.7	-6.7	-13.3	-11.1	-10.0	-8.5	-6.5	-5.4	4.6
Euro area	-1.3	-2.1	-6.4	-6.2	-4.1	-3.6	-2.9	-2.6	3.3
France	-2.8	-3.3	-7.6	-7.1	-5.2	-4.6	-3.7	-3.5	3.4
Germany	0.2	-0.1	-3.1	-4.1	-0.8	0.2	-0.3	-0.1	3.8
Ireland	0.1	-7.4	-13.9	-30.9	-13.4	-7.7	-7.5	-4.5	23.3
Italy	-1.6	-2.7	-5.4	-4.3	-3.7	-3.0	-2.6	-2.3	1.8
Portugal	-3.2	-3.7	-10.2	-9.8	-4.4	-4.9	-5.5	-4.0	4.4
Spain	1.9	-4.5	-11.2	-9.7	-9.4	-10.3	-6.6	-6.9	3.1
UK	-2.9	-5.1	-11.4	-10.1	-7.9	-8.3	-7.0	-6.4	3.1
Cyclically adjusted balance (% GDP)									
Adv. economies	-2.2	-3.7	-6.2	-6.3	-5.5	-4.7	-3.6	-2.9	2.8
EM economies		-1.7	-3.7	-2.8	-1.9	-2.1	-2.0	-2.0	0.8
US	-2.8	-5.1	-8.1	-8.5	-7.7	-6.4	-4.6	-3.9	3.9
Euro area	-2.4	-3.1	-4.6	-4.8	-3.4	-2.4	-1.3	-1.3	3.5
France	-3.0	-3.1	-5.1	-5.1	-3.9	-3.1	-1.9	-1.8	3.2
Germany	-1.1	-1.3	-1.2	-3.5	-1.0	0.1	0.0	0.1	3.5
Ireland	-8.6	-11.9	-10.3	-8.7	-7.0	-6.0	-5.5	-3.7	3.3
Italy	-3.5	-3.6	-3.4	-3.4	-2.8	-1.2	-0.2	-0.2	3.2
Portugal	-4.2	-4.3	-9.4	-9.7	-3.6	-3.0	-3.0	-2.0	6.7
Spain	-1.1	-5.6	-10.2	-8.3	-7.6	-5.1	-4.2	-5.1	4.1
UK	-5.2	-7.3	-9.7	-8.6	-6.5	-5.4	-4.3	-3.4	4.3

Source: IMF World Economic Outlook, April 2013 and IMF Fiscal Monitor, October 2013.
Advanced economies are G20 countries, while EM economies are the G20 countries among the emerging ones.

Table 2: Gross Government Debt

							Projections		Change
	2007	2008	2009	2010	2011	2012	2013	2014	2010-13
Gross debt (Percent of GDP)									
World		65.7	75.8	79.5	79.7	81.1	79.3	78.6	-0.1
Advanced economies	76.4	81.3	94.9	101.5	105.5	110.2	109.3	109.5	7.8
Emerging market economies	34.5	33.5	36.0	40.3	36.7	35.2	34.3	33.6	-6.1
United States	66.5	75.5	89.1	98.2	102.5	106.5	108.1	109.2	9.9
Euro area	66.5	70.3	80.0	85.6	88.1	92.9	95.0	95.3	9.4
France	64.2	68.2	79.2	82.3	86.0	90.3	92.7	94.0	10.4
Germany	65.4	66.8	74.5	82.5	80.5	82.0	80.4	78.3	-2.1
Ireland	25	44.5	64.9	92.2	106.5	117.1	122.0	120.2	29.8
Italy	103.3	106.1	116.4	119.3	120.8	127.0	130.6	130.8	11.3
Portugal	68.3	71.6	83.1	93.2	108.0	123.0	122.3	123.7	29.1
Spain	36.3	40.2	53.9	61.3	69.1	84.1	91.8	97.6	30.5
United Kingdom	43.7	52.2	68.1	79.4	85.4	90.3	93.6	97.1	14.2

Source: IMF World Economic Outlook, April 2013 and IMF Fiscal Monitor, October 2013.
Advanced economies are G20 countries, while EM economies are the G20 countries among the emerging ones.

Table 3: Descriptive Table of Fiscal Plans

Country	**Cumulated Fiscal Consolidation 2009-2013**	**Average Consolidation Impact**	**Share of Announced Consolidation**	**Number of EB Years**	**Number of TB Years**	**Share of EB Events, Weighted for Size of Consolidation**
IRL	16.67	3.33	0%	4	1	72%
ESP	15.915	3.18	26%	4	1	98%
PRT	13.7	3.43	71%	2	2	67%
ITA	7.49	1.87	47%	1	3	29%
FRA	7.435	2.48	26%	2	1	53%
BEL	5.92	1.48	17%	3	1	88%
GBR	3.334	0.83	89%	4	0	100%
DNK	3.2	0.64	91%	4	0	100%
AUT	2.43	0.81	50%	2	1	72%
DEU	1.05	0.35	0%	3	0	100%
USA	0.71	0.24	37%	3	0	100%

The column "Average Consolidation Impact" displays the average impact computed only over the total number of episodes in each country between 2009 and 2013. The last columns weights each EB event employing the size of the consolidation. The total number of events is 42 and only 10 of them are TB.

Table 4: Estimation Result of within Sample Estimation (1980-2007)

	Coefficient	Std. Error	t-Statistic	Prob.
$e^u_{i,t} * TB_{i,t}$	-0.879723***	0.114489	-7.683905	0
$e^u_{i,t} * EB_{i,t}$	-0.115265	0.075279	-1.531166	0.1268
$e^a_{i,t} * TB_{i,t}$	-0.484525*	0.285855	-1.695002	0.0911
$e^a_{i,t} * EB_{i,t}$	-0.344987*	0.179673	-1.920084	0.0558
$e^u_{i,t-1} * TB_{i,t-1}$	-0.623768***	0.116860	-5.337734	0
$e^u_{i,t-1} * EB_{i,t-1}$	-0.117574	0.079345	-1.481801	0.1394
$e^a_{i,t-1} * TB_{i,t-1}$	-0.174587	0.298896	-0.584108	0.5596
$e^a_{i,t-1} * EB_{i,t-1}$	0.306099*	0.169529	1.805586	0.0720
$e^u_{i,t-2} * TB_{i,t-2}$	-0.118379	0.118397	-0.999852	0.3182
$e^u_{i,t-2} * EB_{i,t-2}$	0.209932**	0.083388	2.517537	0.0123
$e^a_{i,t-2} * TB_{i,t-2}$	0.082704	0.357215	0.231525	0.8171
$e^a_{i,t-2} * EB_{i,t-2}$	0.505489***	0.172553	2.929471	0.0036
$e^u_{i,t-3} * TB_{i,t-3}$	-0.348970***	0.122697	-2.844161	0.0048
$e^u_{i,t-3} * EB_{i,t-3}$	0.017926	0.078940	0.227081	0.8205
$e^a_{i,t-3} * TB_{i,t-3}$	0.118452	0.339582	0.348817	0.7275
$e^a_{i,t-3} * EB_{i,t-3}$	0.256666	0.170707	1.503546	0.1337
$e^a_{i,t,1} * TB_{i,t}$	-0.206790	0.263327	-0.785297	0.4329
$e^a_{i,t,1} * EB_{i,t}$	-0.125764	0.174064	-0.722519	0.4705
$e^a_{i,t,2} * TB_{i,t}$	0.576258	0.844609	0.682277	0.4956
$e^a_{i,t,2} * EB_{i,t}$	0.552432	0.848592	0.650998	0.5155

Table 5: Styles of plans as in AFG (within-sample estimation)

	AU	OE	BG	CA	DK	DEU	FR
$\varphi_{1,i}$	0.85 (0.12)	0.31 (0.06)	0.04 (0.09)	0.99 (0.19)	0.14 (0.07)	0.12 (0.12)	0.18 (0.08)
$\varphi_{2,i}$	−0.14 (0.08)	0	0	0.59 (0.097)	0	−0.096 (0.08)	−0.02 (0.04)
$\varphi_{3,i}$	−0.02 (0.01)	0	0	0.022 (0.04)	0	0.03 (0.01)	−0.03 (0.03)

	IR	IT	JP	NL	PT	SP	UK	US
$\varphi_{1,i}$	0	−0.22 (0.04)	0.27 (0.03)	−0.09 (0.02)	0.07 (0.14)	0.06 (0.06)	0.34 (0.02)	0.07 (0.23)
$\varphi_{2,i}$	0	0	−0.0005 (0.003)	0	0	0	0.04 (0.02)	0.07 (0.16)
$\varphi_{3,i}$	0	0	0	0	0	0	0	−0.1 (0.12)

Coefficients above are estimated through the following equations:

$$e^a_{i,t,1} = \varphi_{1,i} e^u_{i,t} + v_{1,i,t}$$
$$e^a_{i,t,2} = \varphi_{2,i} e^u_{i,t} + v_{2,i,t}$$
$$e^a_{i,t,3} = \varphi_{3,i} e^u_{i,t} + v_{3,i,t}$$

Table 6: Fiscal Adjustments and GDP growth in Southern Europe

	IR		IT		SP		PT	
	Actual	Projected	Actual	Projected	Actual	Projected	Actual	Projected
2010	-1.5	-1.04 (-4.38, 2.37)	1.17	0.01 (-1.25, 1.15)	-0.51	0.28 (-0.73, 1.3)	1.87	-1.97 (-4.43, -0.28)
2011	1.71	1.20 (-2.07, 4.68)	0.14	-0.84 (-2.07, 0.34)	-0.06	0.49 (-0.51, 1.52)	-1.1	-1.6 (-4.01, 0.12)
2012	-0.06	1.40 (-1.97, 4.77)	-2.9	-2.53 (-3.79, -1.38)	-1.74	0.04 (-0.96, 1.06)	-3.35	-2.23 (-4.67, -0.53)
2013	-0.29	3.06 (-0.3, 6.45)	-2.41	-2.19 (-3.45, -1.04)	-1.44	-0.14 (-1.13, 0.89)	-1.45	2.05 (-0.38, 3.75)

In brackets, 95% confidence bounds for projected GDP growth.

Table 7: Direct Estimation of of t and g within Sample (1980-2007)

	Coefficient	Standard Error	T-statistics	
τ^u_t	-0.648793***	0.153449	-4.228065	0
$\tau^a_{t,0}$	-1.021318***	0.248409	-4.111446	0.0001
τ^u_{t-1}	-0.436015***	0.147131	-2.963445	0.0033
$\tau^a_{t-1,0}$	-0.094866	0.250728	-0.378363	0.7054
τ^u_{t-2}	-0.120252	0.155715	-0.772256	0.4406
$\tau^a_{t-2,0}$	0.099802	0.257854	0.387051	0.6990
τ^u_{t-3}	-0.352745**	0.157988	-2.232727	0.0263
$\tau^a_{t-3,0}$	0.354216	0.231010	1.533334	0.1262
$\tau^a_{t,t+1}$	-1.104238***	0.249919	-4.418380	0
$\tau^a_{t,t+2}$	1.053898	0.912886	1.154468	0.2492
g^u_t	-0.087041	0.141932	-0.613258	0.5402
$g^a_{t,0}$	-0.293784	0.373823	-0.785892	0.4325
g^u_{t-1}	-0.027610	0.140893	-0.195964	0.8448
$g^a_{t-1,0}$	0.153334	0.387605	0.395594	0.6927
g^u_{t-2}	0.297646**	0.140203	2.122964	0.0346
$g^a_{t-2,0}$	0.047956	0.400446	0.119758	0.9048
g^u_{t-3}	0.037966	0.136347	0.278456	0.7808
$g^a_{t-3,0}$	-0.150175	0.368451	-0.407585	0.6839
$g^a_{t,t+1}$	0.506932	0.389358	1.301969	0.1939
$g^a_{t,t+2}$	0.337680	1.180079	0.286150	0.7750

Table 8: Check on multiplier stability after the Financial Crisis

	(1)	(2)	(3)	(4)
VARIABLES	BL-style	Pooled	FE	FE
$e_{i,t}$	-0.243	-0.400***	-0.392	-0.472
	(0.277)	(0.122)	(0.297)	(0.374)
Constant	2.095	0.632	0.620	0.441
	(1.258)	(0.466)	(0.491)	(0.379)
$\sum_j e^a_{i,t,j}$				0.254
				(0.286)
Observations	11	44	44	44
R-squared	0.051	0.153	0.093	0.139

The first column shows the OLS results for 2010-11. Column 2 extends the sample to the period 2010-13 and employs an OLS. In column 3 and 4 we include country fixed-effects. Robust standard errors in parentheses.