FISCAL CONSOLIDATION AFTER THE GREAT RECESSION: THE ROLE OF COMPOSITION

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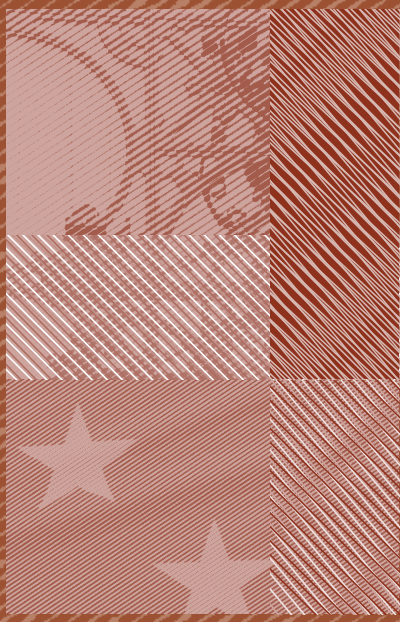

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BANCO DE ESPAÑA

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Abstract

We have examined the fiscal consolidation episodes in a group of OECD countries from 2009 to 2014. The range of the estimated short-term fiscal multiplier runs from 1.2% to 2% of GDP, larger than those obtained in more “normal times”, implying that the contractionary effect has been greater in depressed environments. Nevertheless, we have also found that revenue measures have a higher and more persistent real impact than expenditure measures, which is more consistent with the literature and suggests that expenditure cuts are less harmful for the economy than tax hikes.

Keywords: fiscal multipliers, fiscal policy, crisis management.

JEL Classification: E12, E62, E63, H12.

Resumen

Entre 2009 y 2014, los países de la OCDE han acometido un importante proceso de consolidación fiscal. En el presente trabajo examinamos el efecto de este proceso sobre la actividad económica. Los multiplicadores fiscales de corto plazo se estiman entre el 1,2 % y el 2 % del PIB, mayores que los obtenidos en «tiempos normales», lo que implica que el efecto contractivo ha sido mayor en un entorno de actividad económica más deprimida. No obstante, encontramos que las medidas de consolidación sobre los ingresos públicos tienen un efecto mayor y más persistente que las medidas sobre el gasto, un resultado coherente con la literatura que sugiere que la composición del ajuste es relevante para el cálculo del efecto de las medidas fiscales en la economía.

Palabras clave: multiplicadores fiscales, política fiscal, crisis económica.

Códigos JEL: E12, E62, E63, H12.

1 Introduction

In the wake of the global financial crisis, the fall in revenues, the fiscal stimulus and the realisation of contingent liabilities, mostly related to the support provided to the financial system, triggered a considerable increase in the public deficit in advanced economies, reaching 9% of GDP and a debt ratio over 90% in 2009. The long-term costs of high public debt are well known from the literature, explaining why so many countries subsequently committed to fiscal adjustment programs to ensure the sustainability of their public finances.

By 2015 the deficits have been reduced significantly, but public debt to GDP ratios in the advanced economies have still not stabilised and stand at levels not seen since the end of World War II. Nevertheless, the fiscal policy debate has focused on the short-term effects of fiscal consolidation and, consequently, on the appropriate speed of debt reduction and the composition between revenue and expenditure. This paper analyses the effects of fiscal consolidation for a group of OECD countries in the period 2009-2014 and compares it with previous consolidation periods.

There are several possible reasons why the current episode of large fiscal retrenchment is so very different from previous ones. Six years after the onset of the crisis, output gaps and cyclical unemployment still loom large in many advanced economies. Monetary policy is very expansionary, but given the zero lower bound of interest rates financial conditions remain tight. Moreover, a synchronised fiscal adjustment across several major economies may adversely impact the recovery. In fact Blanchard and Leigh (2013) have already shown that a negative relationship between fiscal consolidation forecasts and subsequent growth forecast errors has been responsible for a slower than expected recovery in a number of economies during the period 2010-2011.

Empirically, the problem is to correctly identify the effects of fiscal policy on output. When analysing cross-country evidence, a standard method has been to use the cyclically-adjusted primary balance (CAPB) to approximate discretionary changes in fiscal policy. From another standpoint, traditional VAR methods assume that fiscal changes are uncorrelated with other determinants of output. However, as pointed out by Romer and Romer (2010), these fiscal variables may include non-policy changes correlated with output. That is particularly relevant when using annual data, since agents may be responding to the fiscal change within the year and that correlation would bias the analysis against the contractionary effects of fiscal consolidation.

To address these identification problems the literature has used historical records – the narrative approach – to look for fiscal policy actions that are aimed at reducing the budget deficit rather than in response to current economic conditions. To that end we have constructed a dataset of government spending cuts and revenue increases from a broad set of policy documents for a group of advanced economies.

Alesina et al. (2015) analysed historical records up to 2007 to simulate multi-year fiscal plans in 2009-2013. In our case we have looked to the cost of fiscal consolidation for a wider set of advanced economies using a new dataset from the period 2009-2014. The collected measures are ex-post outcomes and we do not try to separate the expected from the unexpected component of the fiscal change. Against this background, we are able to

compare our data with the fiscal consolidation records in more "normal times" (1979-2009) previously studied in the literature (Guajardo et al., 2014).

In keeping with Keynesian models, most empirical results have shown a fall in output after a rise in taxes or a cut in government spending. That would be consistent with a short-term spending multiplier that lies between 0.6 and 1.8 (Ramey, 2011), although multi-country models give a multiplier of less than 1 independently of the fiscal instrument (Kilponen et al., 2015). But a line of the literature has highlighted the importance of composition between revenue and expenditure when studying consolidation efforts and the existence of non-Keynesian effects. Giavazzi and Pagano (1990) were the first to show that large expenditure-based fiscal adjustments could be expansionary. More recently, Alesina and Ardagna (2010) found that spending cuts were much more effective than tax increases on large fiscal consolidations, and that they were associated with economic expansion across a panel of OECD countries. Significant fiscal consolidation today (particularly if implemented with large expenditure cuts) may reduce the need for future fiscal action, raising the current confidence of households and firms. Thus when this expectation channel dominates the pure multiplier effect, consolidation will have a positive effect on output. Given the scale of the fiscal efforts across countries in the wake of the global crisis and the sizeable revenue increases, it is an open issue if there is any evidence of "expansionary fiscal contractions" when considering the most recent time period.

The next section of the paper describes some characteristics of the fiscal consolidation taking place after 2009, showing that the efforts have been higher than in previous episodes. We also present a test of exogeneity of fiscal actions compared with standard CAPB measures. Section 3 reports the main econometric results. We estimate the dynamic fiscal multiplier on output in a single equation specification and compare it with alternative VAR specifications. We also report the differences between revenue and expenditure, considering only large consolidations. The evidence points to higher fiscal multiplier effects after the financial crisis and to higher and more persistent impact of revenue-based rather than expenditure-based actions. The latter evidence goes in the same direction than the one reported by Alesina et al. (2015). Moreover, we found that revenue multipliers are larger while expenditure multipliers become non-significant when only large consolidations are considered.

Section 4 presents two relevant extensions. First, given the interdependence of monetary and fiscal policy, we analyse whether it has any significant influence on the estimated fiscal multipliers. Changes in policy interest rates are shaping the magnitude of the fiscal actions, especially when the most recent period, affected by the zero lower bound, is excluded. Second, we study if there are any specific fiscal effects for the euro area countries, since they have been subject to a common monetary policy and fiscal framework. The confidence channel in presence of a financial stress environment may explain the lower real effects of fiscal actions in the Euro Area. To conclude, Section 5 presents a summary of the main results together with some open issues for future research.

2 Characterising the fiscal consolidation after the financial crisis: 2009-2014

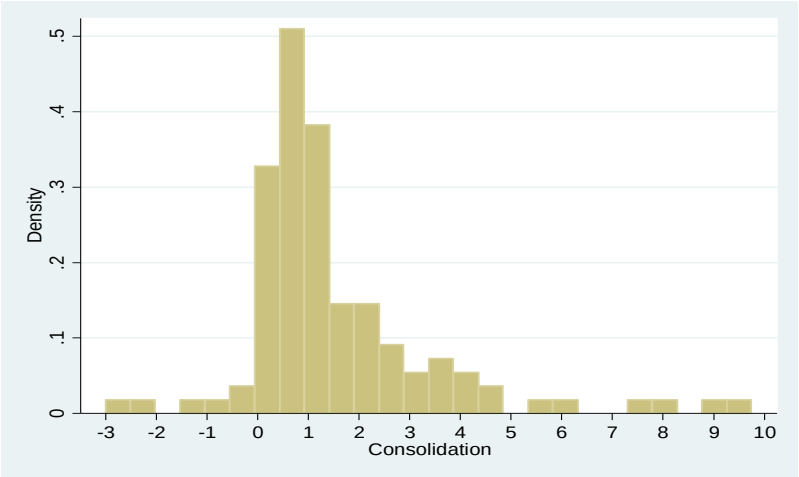
Over the last five years many advanced and emerging economies have been involved in a process of fiscal consolidation. The main objective was to reduce the fiscal deficit that increased significantly as a consequence of the 2008 financial crisis. For example, the average discretionary fiscal stimulus in the G-20 economies was around 2% of GDP in 2009 and 2010 and their average fiscal deficit reached 6.8% in 2010 (see IMF, 2010). In consequence at the Toronto Summit in 2009 they committed to fiscal plans that would halve deficits by 2013.

We follow the historical approach proposed by Romer and Romer (2010) to identify fiscal consolidations after the financial crisis.[1] The historical episode narrative aims to separate policy changes from those arising from non-policy developments. The set of documents reviewed for this purpose relies on Stability and Convergence Programmes submitted annually to the European Commission, national budgets, OECD Economic Surveys and IMF Staff Reports, as well as national sources such as the Congressional Budget Office (CBO) and several Memorandums of Understanding (MoUs). Where possible we have reviewed the measures announced, using the most up-to-date document available, and have checked those documents using the retrospective analysis included in the IMF's Article IV reviews and in the OECD's "Restoring Public Finances" documents. All the budgetary measures are fully credible and implemented in the year assigned by the official documents.

The sample includes the revenue-based and expenditure-based fiscal actions taken by 27 economies in the period 2009-2014 (see Appendix 1, Table A.1). These are 25 OECD countries plus Latvia and Lithuania which are now euro area countries. Thus, the majority are advanced countries, but there are also two emerging economies (Mexico and Turkey). In total we have identified 101 cases of action where these countries took some budgetary measures. During the period 2010-2014, more than 70% of the economies included in the sample were immersed in fiscal consolidation. The median of the adjustments is 1% of GDP and the average is 1.76% of GDP, with a standard deviation of 0.18 pp. The range runs from -3.0% to 9.75% of GDP (see Figure 1). The negative figures correspond to the expiration of temporary fiscal measures, for example Estonia in 2010 and 2011, and the figures over 9% of GDP correspond to Estonia and Latvia in 2009.

1. We identify fiscal policy changes using historical documents as in Devries et al. (2011).

Figure 1. Narrative episodes of fiscal consolidation 2009-2014: Size distribution



The current fiscal adjustment episodes are very different from the previous ones studied by Guajardo et al. (2014). During the period 1978-2009 the fiscal adjustments of 15 advanced economies averaged 0.99% with a standard deviation of 0.94. Thus, although the number of observations and of years in our sample is smaller, it contains more countries, the average size of fiscal consolidation is larger and it has lower variance. If we define large consolidations as consolidation efforts amounting to more than 1.5% of GDP, as in Alesina and Ardagna (2010), we find a total of 67 large fiscal consolidations.

Most observations in the sample are concentrated between 2011 and 2013 (see Figure 2). The 2009 data are driven by the Baltic economies that suffered a sudden stop and a credit crunch in 2008. In 2009 they started to consolidate very significantly (an average of 8%), in a year dominated by spending cuts (see Figure 3). In 2010 there was an increase in the number of countries tightening their budgets, including the euro area economies subject to market pressure. Finally, in 2014 the pace of fiscal consolidation abated, with fewer countries making consolidation efforts and expenditure cuts exceeding tax increases.

Figure 2. Narrative episodes of fiscal consolidation, 1978-2014

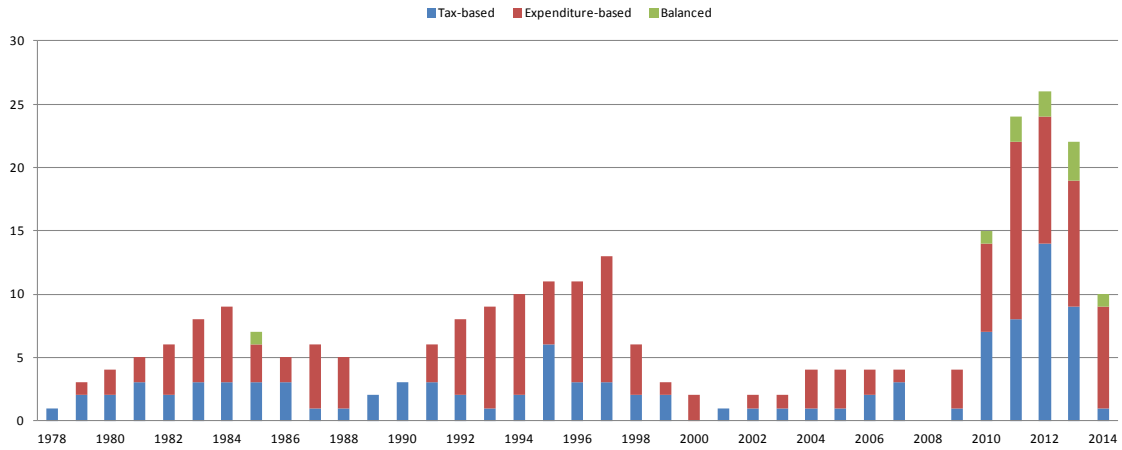
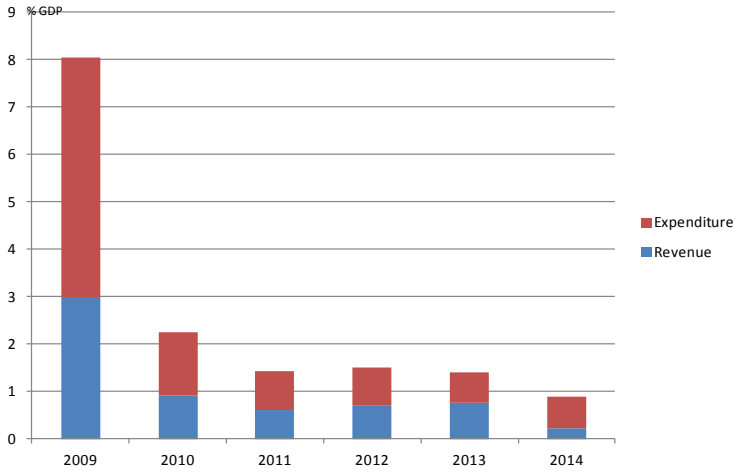


Figure 3. Average size of narrative fiscal consolidations



The composition of fiscal adjustments is critical for their effects on the economy. Figures 2 and 3 show that the adjustments made in the 2009-2014 period were fairly equally split between tax-based and expenditure-based actions. However, our sample contains several examples of important consolidations affecting both expenditure and revenue, so it will be crucial to estimate the impact of both types of consolidations jointly. This observation contrasts with the fiscal adjustment episodes examined by Alesina et al. (2015). They find that most consolidation efforts made in the 2009-2013 period have been based on expenditure cuts. Although we have not been able to compare their dataset sources with ours, we have found that the calculated total consolidation is fairly similar for six out of the eleven countries their dataset contains. The starkest difference occurs in Spain, where we have detected a total consolidation of 10.5 % of GDP, fairly balanced between expenditure cuts and tax hikes, while Alesina and co-authors computed a total consolidation of more than 15% of GDP, almost entirely based on adjustments in expenditure. We consider our measures more accurate. There is a general consensus that fiscal consolidation in Spain has been relatively balanced, with some authors putting more weight on the revenue side (Hernández de Cos and López Rodríguez, 2014). Moreover, with respect to 2012-2013, several official documents identify a balanced path of consolidation, with total consolidation amounting to around 6,5%-7,5% of GDP (see, for example IMF, 2013), in contrast with more than 9% of anticipated and unanticipated measures in Alesina et al. (2015).

Lastly, we have also observed significant differences from one region to another. Overall, advanced non-stressed euro area and emerging economies are the regions that have consolidated less, whereas Baltic and stressed euro area countries are the ones that have made most efforts. In relative terms, taxes have been raised more in the emerging countries and expenditure has been cut more in the Baltic and the advanced non-European countries.

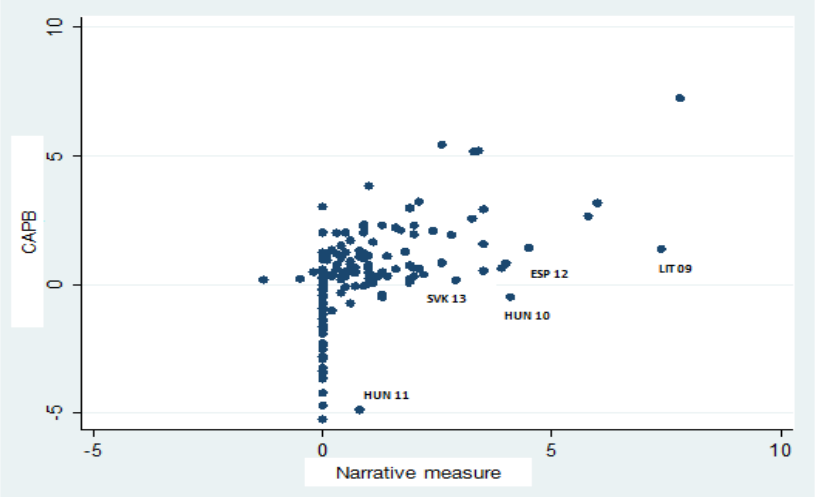
2.1 Comparison of fiscal policy measures

We have said that the conventional approach to measure policy-driven changes in fiscal policy is through the cyclically-adjusted primary balance (CAPB) that excludes changes in fiscal variables induced by business cycle fluctuations. To have a uniform indicator we selected the variable constructed by the IMF's Fiscal Monitor database. In total there are 101 cases where these 27 countries took budgetary actions as measured by CAPB. The median of the adjustments is 0.77% of GDP and the average is 1.2%, with a standard deviation of

0.12 pp. Thus, in general, the CAPB adjustments are smaller than those identified in the narrative approach.

Before analysing the real effects of the fiscal narrative measures we compare them with the more standard CAPB measures. Figure 4 plots the observations of the two fiscal consolidation indicators in the period 2009-2014. There are no major discrepancies observed between the two and in principle it would be impossible to say which measure provides a more reliable identification. However, we have found a total of eight episodes with large differences, defined as more than 3 pp of difference between the two approaches. And we have identified five large one-off accounting measures that could explain the inaccuracies in the CAPB (Ireland 2009, Lithuania 2010, Hungary 2011, Spain 2012 and Slovakia 2013).

Figure 4. Narrative episodes vs. CAPB: 2009-2014



The econometric findings for the period before 2009 are that the narrative episodes are more exogenous to output than the CAPB.[2] But if the financial crisis period is included, the CAPB measure may possibly be more accurate. In order to check for contemporaneous orthogonality with output, we perform a test of weak exogeneity of both the CAPB and the narrative measures. Following Guajardo et al. (2014) we construct a measure of economic surprises, based on the IMF's GDP forecast revisions. We define the economic news index ($News_{it}$) as the log-difference between GDP at time *t* in the October World Economic Outlook (WEO) of year *t* and GDP at time *t* of the WEO at time *t-1* for each country. We perform the following regression:

$$\Delta F_{it} = \mu_i + \lambda_t + \beta\, News_{it} + u_{it} \qquad (1)$$

where, ΔF_{it} is the fiscal consolidation measure (CAPB or narrative-based), μ_i is an unobservable country-fixed effect and λ_t is a common year effect for all economies. In order to avoid potential small-sample bias, we merge our sample with the 1978-2009 period, giving

2. See, for example, Hernández de Cos and Moral-Benito (2013), and Jordá and Taylor (2013).

373 observations for 15 economies that had consolidation episodes in both periods.[3] [4] This exercise does not test for orthogonality with past (and future) output developments. In fact, the current fiscal actions are likely to be correlated with past large fiscal deficits and will be used as instruments to predict output movements.

Table 1 presents the results. The β coefficient of the news index on the narrative measure equation is negative and only weakly significant, while the coefficient on the CAPB equation is positive and strongly significant. This result is consistent with that obtained for the pre-crisis period. Moreover, the explanatory power of the narrative-based measures (0.26) is lower than that of the CAPB measures (0.48), supporting the theory of the greater exogeneity of the narrative-based approach to contemporaneous changes to output movements. In addition, when we perform the same test for narrative-based revenue and expenditure, we find that the coefficient related to the tax changes is near zero, it is not significant and it is less correlated with output than with government spending changes. The greater exogeneity of tax changes signals that spending actions may respond to tax actions or other variables correlated with output, and therefore that revenue actions will be more help in the identification strategy. Another avenue, as in Ramey and Shapiro (1998), would be to rely on specific government spending items that do not respond to economic events.

Table 1. An exogeneity test of fiscal policy changes (1978-2014)

Equation: $\Delta F_{it} = \mu_i + \lambda_t + \beta News_{it} + u_{it}$

Dependent variable: ΔFit	Narrative fiscal consolidations	CAPB	Narrative revenue consolidations	Narrative expenditure consolidations
β coefficient	-0.120	0.254	-0.037	-0.082
	[0.067]*	[0.081]***	[0.032]	[0.039]*
Observations	373	371	373	373
No. of countries	15	15	15	15
R2	0.256	0.482	0.205	0.228

Note: country and time-fixed effects included. Robust standard errors in brackets.

3. The simple contemporaneous correlation between the surprises on output and CAPB change for the 2009-2014 period is 0.59. The correlation with the narrative measure is –0.11.

4. The 15 countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain, the United Kingdom and the United States.

3 The estimated effects of fiscal consolidation on economic activity

The estimation strategy first examines the output effect on a single equation specification and latter on a vector autoregressive (VAR) model. In order to make the fiscal multipliers comparable across specifications we normalize the fiscal change so that the CAPB ratio rises by 1% on impact. In the VAR model, we will report the short-term fiscal multiplier after one year and medium-term fiscal multiplier after four years. The first section presents the results for the aggregated fiscal measures and analyses the real effects before and after the financial crisis. The second section presents the composition results, splitting the fiscal actions between revenues and expenditures, and considers also large fiscal consolidations as defended by the non-keynesian view.

3.1 Fiscal multipliers

Following the empirical literature in this area we estimate the effect of fiscal consolidation on a single-equation specification that regresses real output growth (ΔY_{it}) on lagged output growth and the contemporaneous values and lags of the fiscal changes (ΔF_{it-s}). It takes the following form:

$$\Delta Y_{it} = \mu_i + \lambda_t + \sum_{s=1}^{2} \gamma_s \Delta Y_{it-s} + \sum_{s=0}^{2} \delta_s \Delta F_{it-s} + u_{it} \quad (2)$$

Including past output allows us to control for the state of the economy in each country and thus helps to estimate the discretionary part of fiscal action. As is standard in the panel data approach, the estimation includes country-fixed effects and year-fixed effects, and based on the information criteria we choose two lags in the dynamic specification.[5]

Denoting ΔF_{it} the CAPB-based fiscal measures, the estimation by ordinary least squares (OLS) of the regression coefficients would be biased by several factors. First, the presence of an unobservable country-fixed effect would be correlated with the error term. In order to deal with country heterogeneity, we will estimate our set of parameters using a fixed-effect estimator, although this estimator will be biased under the presence of the lagged output on the right-hand side for a small T specification. Second, if there is endogeneity in the CAPB measures it will be correlated with the error term, and therefore an instrumental variables approach should be used. In particular, we use a two-stage least squares (TSLS) estimator with our exogenous narrative measures as an instrument for the CAPB. Third, when the number of observations per country is small (a problem present mainly in the 2009-2014 sample) a Nickell bias related to the correlation between the lagged dependent variable and the error term is more likely to be found. Against this background, this bias will overestimate the negative sign of the fiscal multiplier. To overcome this problem, we use a Generalized Method of Moments (GMM) estimator. However, the small number of countries in our sample precludes us from using the full amount of moment restrictions available, i.e. all the lags of the dependent variable (and the CAPB) as instruments, and in consequence we use the Anderson-Hsiao estimator.

5. GDP data taken from the OECD Economic Outlook (Nov 2014) and Eurostat.

Our fourth specification is a natural variation of the first one. We run a three-vector auto-regression model (VAR) with the change in GDP, the change in the CAPB ratio and the narrative fiscal measures. Thus, lagged output and past cyclically-adjusted primary balance also affect the current cyclically-adjusted primary balance. This specification also includes two lags and a full set of country and time effects. Consistent with the tested exogeneity of the historical episodes of the fiscal consolidations and the TSLS estimation in the single equation approach, the narrative measures are ordered first in the VAR and the CAPB second, allowing it to have a contemporaneous effect on output (the last variable in the system equation) when considering a Cholesky orthogonalisation of the residuals.

The estimation results under the three single equation specifications are shown in Table 2. The first column presents the fiscal multipliers in the OLS case with fixed effects, the second column the results with the TSLS estimator and the third column the results with the GMM estimator. We show the effect of a 1% change of fiscal consolidation in GDP, at the time of the consolidation, and calculate the dynamic response function one year later.

Table 2. Estimated dynamic output effect of a 1% CAPB change: single equation specification

Equation: $\Delta Y_{it} = \mu_i + \lambda_t + \sum_{s=1}^{2} \gamma_s \Delta Y_{it-s} + \sum_{s=0}^{2} \delta_s \Delta F_{it-s} + u_{it}$

		OLS	TSLS	GMM	Observations
2009-2014 (25 countries)	(1)	-0.691 [0.221]***	-1.951 [0.521]***	-0.961 [0.23]***	150
1978-2009 (15 countries)	(2)	0.246 [0.121]**	-0.871 [0.335]***	---	445
1978-2014 (15 countries)	(3)	0.138 [0.115]	-1.180 [0.33]***	---	520
	(4)	---	-1.560 [0.467]***	---	520

Note: Country and time-fixed effects included. Robust standard errors in brackets
Accumulated output effect after one year. The instruments in the two-stage least squares (TSLS) estimation are the narrative fiscal measures. In panel (4) the instruments are the narrative fiscal revenue measures. In the GMM specification, narrative measures are included as external instruments and the second lags of GDP and CAPB are used as GMM instruments (18 instruments in total).

Panel 1 shows the results for the period 2009-2014, after the great recession, with the full set of 25 countries. The OLS estimator shows an effect of -0.69 pp one year after the consolidation. The effect is statistically significant and after that period the responses on output stabilise. In column 2, CAPB is instrumented with the narrative measures.[6] The effect after one year is a highly significant 1.95 pp, almost three times more than with the OLS. As expected, the GMM estimator lowers the calculated fiscal multiplier to 0.96 pp.[7]

In Panel 2 we report the results with a smaller sample of countries (15 instead of 25) for the period 1978-2009, given our interest in comparing the fiscal consolidation effects after the financial crisis with the international episodes before 2009. The estimates reproduce the stark differences between OLS and TSLS found by Guajardo et al. (2014):[8] the positive OLS estimate (0.24) with the CAPB measure is consistent with the "expansionary austerity" found previously in the literature; the instrumental estimate with the narrative shocks is negative (–0.87) and significant. Note that this discrepancy between estimation methods was not present when studying only the crisis period in Panel 1.

6. The F-test of the first-stage has a p-value of less than 0.05 in all the equations, reinforcing the explanatory power of our narrative measures on CAPB.

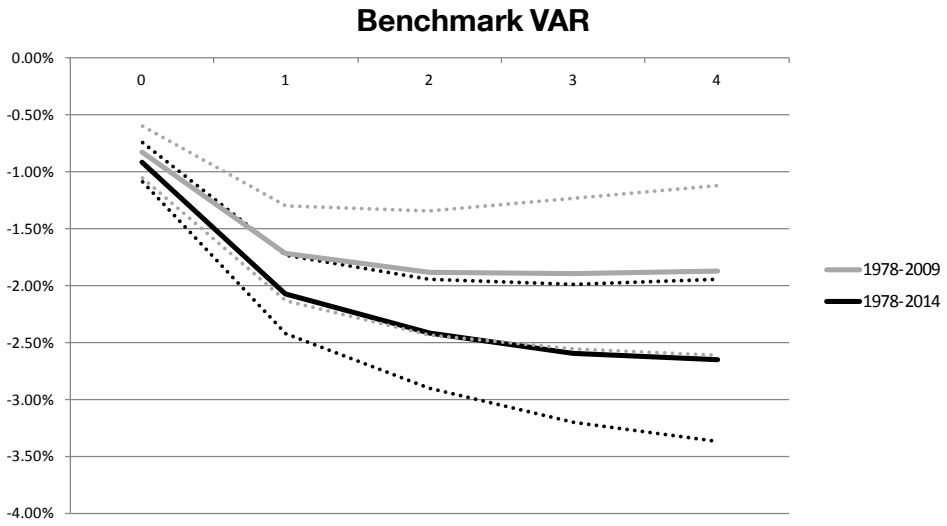
7. The Hansen test (p-value=0.331) provides further evidence of the exogeneity of our instruments.

8. The sample comprises the same 15 countries as in Section 2.

In Panel 3 the analysis is extended to include the crisis period. The qualitative results are maintained, but the short-term effects on real activity are larger (–1.18 with TSLS). This is primary evidence that the contractionary effect of consolidations was larger in depressed environments and is consistent with recent findings that have stressed the relevance of the state of the economy when measuring the size of fiscal multipliers (e.g. Auerbach and Gorodnichenko, 2012).

Finally, in Panel 4, we use the CAPB only with the narrative measures from the revenue side. This is based on the idea that the main motivation for tax changes, usually implemented through new legislation, may be to reduce the inherited fiscal deficit, whereas expenditure changes may respond more to other developments affecting output. The estimated fiscal multiplier in the TSLS estimation (-1.56) supports the possibility of a downward bias towards zero in the above multipliers because the expenditure measures are less exogenous than the revenue ones, which is consistent with the exogeneity test shown in Section 2.

Figure 5. Responses of output to a narrative fiscal shock: 1978-2009 vs. 1978-2014



Note: All specifications contain a full set of country and time-fixed effects. The shock on output is an orthogonalised narrative fiscal innovation, normalised to 1% of CAPB. Dashed lines represent one-standard-deviation confidence intervals.

Figure 5 depicts the impulse response function from the benchmark VAR specification together with one-standard deviation confidence bands.[9] The size of the shock on the narrative fiscal measures is normalised to generate a response on impact (t = 0) of 1% of GDP on the CAPB. That allows the VAR response to be comparable with the single equation results. We can see first that fiscal consolidation has a significant negative effect on output. Second the chart shows that the response is more contractionary when the international sample includes the most recent period after the financial crisis. And lastly, it is clear that the real response to the fiscal shock is more persistent with the full sample, since there is a stronger tendency for output to return to normal when the sample ends in 2008.

9. The Akaike information criterion pointed to a lag structure with two lags.

Table 3 shows the value of the output response after one year and the corresponding standard error in the VAR. Together with the accumulated response of output to a narrative shock we report the fiscal multipliers both in the short and the long run, calculated as the accumulated response of output divided by the accumulated response of CAPB. The results shown for the two sample periods (columns 1 and 2 in Table 3) coincide with the instrumental variable estimation in the single equation specification: there is a significant contractionary effect of fiscal consolidation and that effect is larger when considering the most recent period.

Table 3. Response of output to a narrative fiscal shock: VAR specification

	Benchmark VAR	Benchmark VAR	Additonal variable: debt	Additional variables: debt, sovereign rating index
	1978-2009	1978-2014	1978-2014	1978-2014
Response of output to a shock of 1% of CAPB	-1.715 [0.420]***	-2.076 [0.343]***	-2.366 [0.432]**	-2.159 [0.564]***
Fiscal multiplier (after one year)	-1.004	-1.143	-1.352	-1.220
Fiscal multiplier (after four years)	-0.731	-0.989	-0.969	-0.900
Observations	445	520	406	391

Robust standard errors are obtained using Monte Carlo simulation.

All specifications contain a full set of country and time-fixed effects. The shock on output is an orthogonalised narrative fiscal innovation. The accumulated output response is after 1 year. The fiscal multiplier is the ratio between the cumulated effect on output and the cumulated effect on GDP

In order to test for parameter stability in the more recent period, we perform a test of whether overall parameter values are unchanged after and before 2009, when we think it may exist a break date. Against this background, we perform a sample-split test by introducing in the VAR model an interacted dummy variable in the right-hand side of all the regressions, and we compute our structural break statistic as in Sims (1980):

$$(T-k)\log|\Sigma_{re}| - \log|\Sigma_{un}| \tag{3}$$

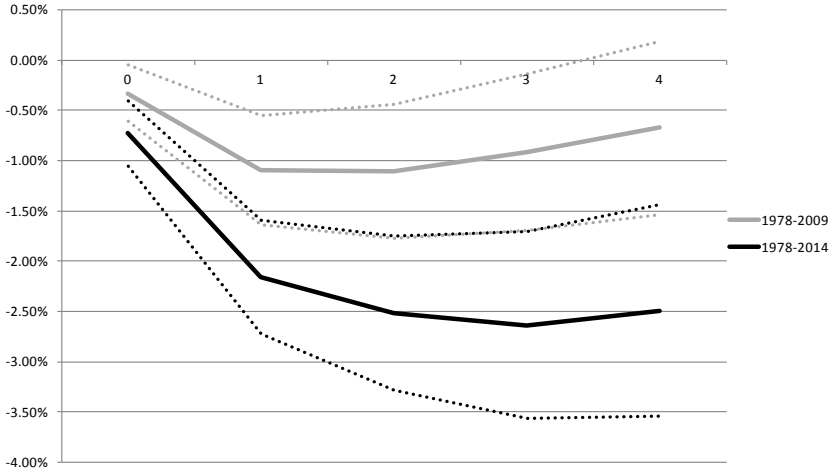
Where *T* is the number of observations, *k* is the number of regressors and Σ_{re} and Σ_{un} are the residual covariance matrices for the restricted and the unrestricted model. Under the null hypothesis of parameter stability, the test statistic is asymptotically chi-squared with the degrees of freedom equal to the total number of constraints. The value of the statistic $\chi^2(18) = 42.88$ corresponds to a significance level below 0.005, rejecting the null. However, this result could be driven by the important economic changes (and not just fiscal) as a consequence of the crisis. In order to check if the fiscal variables are drivers of the structural change, we have corroborated that the coefficient of the dummy variable interacted with the narrative consolidations is negative and significant in the regression with GDP on the left-hand side.

We also test the robustness of our findings by increasing the VAR information set. The fiscal consolidation periods are in many cases related to situations of large public debt and/or financial stress combined with other macroeconomic imbalances that may be perceived as affecting sovereign risk. In order to control for such factors we have considered two additional variables, namely government debt to GDP in the previous period and an index

of the sovereign ratings[10] that are included at the end in the ordering of the VAR. Figure 6 presents the impulse response function from the 5-variable VAR specification. The greater real effect when considering the most recent sample period is more evident when controlling for financial and fiscal variables.

Figure 6. Responses of output to a narrative fiscal shock: 1978-2009 vs. 1978-2014

5 variable VAR



Note: All specifications contain a full set of country and time-fixed effects. The shock on output is an orthogonalised narrative fiscal innovation, normalised to 1% of CAPB. 5-variable VAR includes lagged debt and sovereign rating index. Dashed lines represent one-standard-deviation confidence intervals.

Table 3 presents the fiscal multiplier effects in the extended sample period (columns 3 and 4). The results are robust to the inclusion of these variables since the short-run fiscal multiplier stays around 1.2%, a value similar to that obtained in the instrumental variable estimation and the 3-variable VAR. We see a slightly larger multiplier in the short run when controlling for public debt, consistent with the results in Burriel et al. (2009).

3.2 The composition effect

The standard literature that supports "expansionary fiscal contractions" has emphasised the role of composition (e.g. Alesina and Ardagna, 2010). Their evidence shows that fiscal adjustments based on spending cuts are more effective than tax increases in stabilising the debt ratio and avoiding economic contraction. The approach has been to identify historical cases of fiscal retrenchment, looking at the cyclically-adjusted changes in fiscal variables.

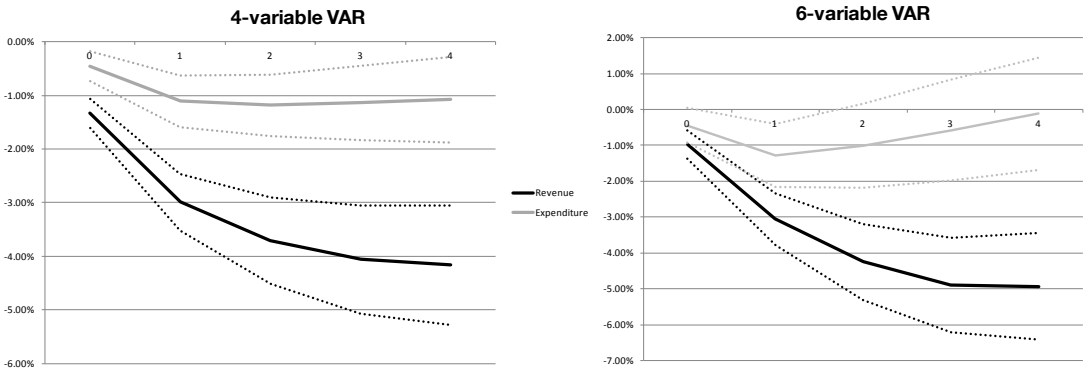
Here we investigate the relevance of composition by including the narrative fiscal expenditure and revenue measures in the previous VAR framework.[11] We consider both sets of measures at the same time given the importance of consolidations involving both expenditure and revenue measures, in order to account for the combined effect. In the 4-variable VAR, revenue and expenditure are first and second in the order of the system, which is consistent with our exogeneity evidence in Section 2. As a robustness exercise we also report the output responses in a 6-variable system that includes the debt ratio and the sovereign rating index.

10. The variable is taken from Broto and Molina (2014).

11. CAPB data for revenue and expenditure to compare the VAR with the instrumental variable estimation is not available for all countries.

Figure 7 depicts the impulse response functions of revenue and expenditure shocks to output for the 4-variable and 6-variable VAR. We find a significant negative contemporaneous impact of the expenditure shock but, when we include the financial and fiscal controls, the shock only lasts for one year, returning to the baseline after two years. By contrast the revenue shock has a stronger impact contemporaneously on GDP and a much more persistent effect in both specifications.

Figure 7. The response of output to narrative fiscal shocks: the composition effect



Note: All specifications contain a full set of country and time-fixed effects. The shock on output is an orthogonalised narrative fiscal innovation, normalised to 1% of CAPB. 6-variable VAR includes lagged debt and sovereign rating index. Dashed lines represent one-standard-deviation confidence intervals.

Table 4 confirms the previous results when taking into account the CAPB response and calculating the fiscal multiplier. After one year the expenditure multiplier (-0.67) is significantly smaller than the revenue multiplier (-1.54). Similarly, four years after the shock, the expenditure multiplier (-0.43) is much smaller than the revenue multiplier (-1.50). Interestingly, when the debt ratio and rating index variables are included in the VAR (column 2 in Table 4) the differences between the two shocks increase since the responses to the expenditure shock are not significant after one year.

Table 4. Response of output to a narrative fiscal revenue/expenditure shock (1978-2014): VAR specification

	4-variable VAR	Additional variables: debt, sovereign rating index	4-variable VAR (large consolidations)
Revenue			
Response of output to a shock of 1% of CAPB	-2.990 [0.529]***	-3.060 [0.730]***	-3.561 [0.704]***
Fiscal multiplier (after one year)	-1.545	-1.590	-2.117
Fiscal multiplier (after four years)	-1.498	-1.354	-2.315
Expenditure			
Response of output to a shock of 1% of CAPB	-1.111 [0.476]**	-1.275 [0.878]	-0.839 [0.51]*
Fiscal multiplier (after one year)	-0.673	-0.753	-0.478
Fiscal multiplier (after four years)	-0.434	-0.060	-0.260
Observations	520	391	520

Notes: see Table 3

As in Guajardo et al. (2014), fiscal consolidations are contractionary even when they are based on spending cuts. But here we also find that for certain specifications expenditure adjustments are significantly different from revenue increases. Thus, these results are also consistent with Alesina et al. (2015) suggesting that expenditure cuts are less harmful for the economy than tax hikes. Similarly, Beetsma et al. (2015) report that consolidation affects consumer confidence negatively but more significantly through the revenue component than the spending component.

The non-Keynesian view is that large fiscal adjustments, especially expenditure-based ones, are more effective in avoiding economic downturns, based on the argument that cutting sensitive items such as transfer programmes or government consumption may signal a credible commitment to long-term debt reduction. To test that hypothesis we re-estimated the 4-variable VAR with the narrative revenue measures greater than 1% of GDP, and 0 otherwise, and similarly for the narrative expenditure measures. We find nine cases where both variables detect a large consolidation; we also find 35 more cases of large expenditure consolidations and 18 cases of only large revenue consolidations. Of the total 71 cases of large consolidations, 23 were detected in the 2009-2014 period. However, given the limited number of observations, the following results should be treated with caution.

Column 3 in Table 4 summarises the results. We find a significant negative response of large revenue-related fiscal consolidations, amounting to an output multiplier that stands at -2.1. The interesting result is in the effect of large expenditure-related consolidations. The effect after one year is negative but not different from zero. Specifically, we find that large expenditure consolidations, after a negative contemporaneous real effect, have a non-significant effect after one year and onwards. Although the data limitation problem becomes more of a concern if we investigate this effect in the 1978-2009 period, it seems that both large expenditure-related and revenue-related consolidations are more contractionary when the recent crisis period is considered.

Thus, consistent with the "expansionary fiscal contraction" literature, we find evidence that the composition of fiscal consolidation matters. The large expenditure-based

adjustments performed when considering the Great Recession have fiscal multipliers that are not significantly different from zero, whereas large revenue-related consolidations are highly contractionary and very persistent.

4 Extensions

4.1 Monetary policy

The interaction between fiscal and monetary policy can greatly affect the size of fiscal multipliers. For example, in a Keynesian framework, monetary policy may react to fiscal consolidation episodes by reducing interest rates because inflationary pressures diminish. Moreover, under a Taylor-rule based monetary reaction, fiscal consolidation could produce a negative output gap, therefore leading to a drop in interest rates. Similarly, the probable response of the exchange rate could help to cushion the impact of fiscal retrenchment on domestic demand. However, as Christiano et al. (2011) have shown, the counteracting effect of monetary policy could be less noticeable in a context where the economy hits the zero lower bound (ZLB) of interest rates since the space for more accommodative policies is exhausted.

Our sample includes an important period where the ZLB is present for most economies, and therefore we expect a weaker response of monetary policy to fiscal developments. Consequently, we anticipate a lower fiscal multiplier if we control for interest rates in the period previous to 2009. To check that out, a policy interest rate[12] is included in a 4-variable VAR of fiscal consolidations, with the results presented in Table 5. The estimated multiplier, -1.0, is not very much affected by the inclusion of monetary policy rates, which is consistent with a less responsive monetary policy when the crisis period is considered. That result is even stronger when the debt ratio and the sovereign rating index are considered in the VAR. In that case, the short-run fiscal multiplier over -1.0 remains robust, while in the 1978-2009 period the multiplier shrinks from -1.0 to less than -0.5.

Table 5. Fiscal multipliers: the influence of monetary policy. VAR specification

	1978-2009		1978-2014	
	4-VAR	6-VAR	4-VAR	6-VAR
Response of output to a shock of 1% of CAPB	-1.363	-0.691	-1.811	-1.953
	[0.392]***	[0.488]	[0.344]***	[0.515]***
Fiscal multiplier (after one year)	-0.815	-0.486	-1.022	-1.132
Fiscal multiplier (after four years)	-0.544	-0.164	-0.844	-0.864
Observations	420	298	495	520

Notes: see Table 3

With respect to the benchmark, 4-VAR includes an intervention interest rate. 6-VAR incorporates the lagged debt-to-GDP ratio and the sovereign rating index.

Thus, the ZLB on interest rates may have precluded the authorities from adopting a more accommodative monetary policy during the crisis that would have reduced the magnitude of the fiscal multipliers. Nevertheless, this analysis is largely limited by the inclusion of other variables reflecting the effects of non-conventional monetary policy actions after 2009 in many of the countries of the sample.

Another line of investigation was the role of monetary policy in relation to the composition of the fiscal adjustments. We have obtained (not shown) that the short-run multiplier of revenue consolidation is not affected if we include monetary policy in the 1978-

12. Policy interest rates for countries are taken from Datastream.

2014 period, while the expenditure multiplier is slightly reduced. This effect is stronger in the period 1978-2009, suggesting a more accommodative monetary policy stance for expenditure consolidations in the pre-crisis period, as suggested by the IMF (2010).

4.2 Euro area countries

Under financial stress, the confidence channel may be more present in fiscal consolidation, for several reasons. First, consolidation today could avoid more extensive and more harmful consolidation in the future, as in the model presented in Blanchard (1990); second, risk premia could be reduced by the consolidation, reflecting a lower financial risk of sovereign debt.

We could test these hypotheses by restricting our sample to the stressed euro area countries that received external financial support after the crisis. However, given the low number of countries in that group, we prefer to focus on all the euro area economies.[13] Although these economies had very different fiscal positions, the consolidations in the euro area took place in a more financially restricted environment, with higher debt-to-GDP ratios. Against this background, the probability of an unstable sovereign risk scenario was greater. Additionally, the euro area economies are also highly interconnected, so spillovers from a large number of countries pursuing a consolidation of public finances at the same time could impact significantly on the size of the fiscal multiplier for the whole group.

The results are summarised in Table 6. The one year multiplier is close to unity in the benchmark 3-variable VAR (column 1). This -0.98 multiplier is lower than the estimated -1.14 for the whole sample (in Table 3). However, if we include lagged debt and the sovereign rating index, the multiplier is greatly affected, becoming non-significant. This difference of estimates between specifications in the euro area contrasts with the more stable multiplier found for the whole sample.

Table 6. Fiscal multipliers: the euro area effect. VAR specification

	Benchmark VAR	Additional variables: debt, sovereign rating index
Response of output to a shock of 1% of CAPB	-1.656	-0.771
	[0.442]***	[0.53]
Fiscal multiplier (after one year)	-0.984	-0.457
Fiscal multiplier (after four years)	-0.733	-0.201
Observations	345	252

Notes: see Table 3. The Euro Area economies included are: Austria, Belgium, Finland, France, Germany, Italy, Netherlands, Portugal and Spain

The estimation results are consistent with those of Guajardo et al. (2014), reported for a sample not including the recent crisis: fiscal consolidations preceded by high perceived sovereign default risk are less contractionary. Nevertheless, the estimation carried out in Table 6, only for the euro area countries, presents some instability depending on the chosen specification and that may be due to the inclusion of the most recent years and the loss of observations after restricting the sample.

13. The euro area countries in this sample are Austria, Belgium, Finland, France, Germany, Italy, Netherlands, Portugal and Spain. We consider the whole 1978-2014 period, although in the first part of that period each economy had its own independent monetary policy.

5 Conclusions

We have examined the fiscal consolidation episodes that have taken place in a group of OECD countries after the global financial crisis (2009-2014). For that purpose we have constructed a dataset of policy actions – narrative approach – from a broad set of official documents. Compared with previous periods of fiscal consolidation, during this episode the average size of the adjustment was larger, with more countries consolidating at the same time and with a strong focus on tax measures.

Using dynamic panel data estimation, we are interested in the short-term effects of fiscal consolidation on economic activity. The different specifications – from single equation to VAR systems – take into account the possible endogeneity of the regressors. Across all estimation methods the fiscal multiplier is negative and significant, in contrast to the results found previously with standard cyclically-adjusted fiscal balance measures. Moreover, the average output effect one year after the consolidation is between -1.0 and -2.0 pp of GDP, a higher multiplier than that found with historical episodes before 2009.

We also obtain a significant real effect of revenue measures of around -1.6%, while expenditure consolidations have an effect close to -0.7%. These differences are even higher when looking at large consolidation episodes, with expenditure cuts having a non- significant effect after one year under certain specifications. This evidence showing the importance of the composition is closer to the expansionary fiscal contractions hypothesis, since it supports the view that spending cuts are more effective in stabilising debt and avoiding economic downturns.

In the last section we also present some evidence in favour of the need to consider non-conventional monetary policies to obtain a more accurate fiscal multiplier after the financial crisis and of the existence of a confidence channel for specific countries under financial stress that reduces the cost of fiscal consolidation.

Lastly, we believe there are two other natural extensions of this paper that need to be pursued. First, the current fiscal consolidation episodes are still ongoing in many economies and it is not yet possible to determine whether they have been successful in stabilising and reducing high public debt ratios. Thus, more time observations will be needed to obtain a better assessment of this ongoing fiscal adjustment process. Second, our investigation has only disaggregated between revenues and expenditures. Efficiency arguments would also demand an analysis of current expenditure versus public investment and of direct versus indirect taxes

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APPENDIX 1: TABLE A.1. NARRATIVE CONSOLIDATIONS

Country	Year	Consolidation	Revenue	Expenditure
Australia	2012	0.3	0.2	0.1
Australia	2013	0.4	0.2	0.2
Austria	2011	0.7	0.4	0.3
Austria	2012	0.5	0.3	0.2
Austria	2013	0.7	0.2	0.5
Austria	2014	0.4	-0.1	0.5
Belgium	2010	0.4	0.1	0.3
Belgium	2011	0.5	0.2	0.3
Belgium	2012	1.9	1.1	0.8
Belgium	2013	0.9	0.5	0.4
Canada	2011	0.1	0.05	0.05
Canada	2012	0.1	0	0.1
Canada	2013	0.3	0.05	0.25
Canada	2014	0.5	0.1	0.4
Czech Repu	2010	2.6	1.7	0.9
Czech Repu	2011	1.6	0.8	0.8
Czech Repu	2012	1.4	0.8	0.6
Czech Repu	2013	1.1	0.8	0.3
Denmark	2011	1.3	0.4	0.9
Denmark	2012	0.5	0.3	0.2
Denmark	2013	1.1	0.4	0.7
Estonia	2009	9.2	3	6.2
Finland	2010	0.2	0.1	0.1
Finland	2011	0.6	0.7	-0.1
Finland	2012	0.3	0.3	0
Finland	2013	1.3	0.7	0.6
France	2011	0.9	0.4	0.5
France	2012	1.4	0.8	0.6
France	2013	2	1.4	0.6
France	2014	0.7	0.3	0.4
Germany	2011	0.6	0.1	0.5
Germany	2012	0.6	0.2	0.4
Germany	2013	0.4	0	0.4
Greece	2010	7.8	4.1	3.7
Greece	2011	2.6	1	1.6
Greece	2012	3.5	2	1.5
Greece	2013	1.6	0.7	0.9
Hungary	2010	4.1	0.6	3.5
Hungary	2011	0.8	0	0.8
Hungary	2012	3.3	2.1	1.2
Hungary	2013	1	0.3	0.7
Ireland	2009	5.8	3.6	2.2
Ireland	2010	1	0.2	0.8
Ireland	2011	3.26	0.86	2.4
Ireland	2012	2	0.8	1.2
Ireland	2013	2	0.8	1.2
Ireland	2014	1.3	0.6	0.7
Italy	2011	1	0.4	0.6
Italy	2012	2.8	2.3	0.5
Italy	2013	0.8	0.2	0.6
Italy	2014	1	0	1

Country	Year	Consolidation	Revenue	Expenditure
Latvia	2009	9.75	3.8	5.95
Latvia	2010	4.7	2.2	2.5
Latvia	2011	2.3	1.6	0.7
Latvia	2012	0.7	0.3	0.4
Lithuania	2009	7.4	1.6	5.8
Lithuania	2010	4.5	0.5	4
Lithuania	2011	1.9	0.1	1.8
Lithuania	2012	1.3	0	1.3
Mexico	2010	0.7	0.7	0
Mexico	2011	0.8	0.8	0
Mexico	2012	0.2	0.2	0
Netherlands	2011	1.8	0.2	1.6
Netherlands	2012	0.4	0.2	0.2
Netherlands	2013	2.1	1.1	1
Netherlands	2014	1	0.5	0.5
New Zealand	2011	0.4	0	0.4
New Zealand	2012	0.9	0	0.9
New Zealand	2013	0.9	0	0.9
New Zealand	2014	0.9	0	0.9
Poland	2010	0.6	0	0.6
Poland	2011	2.4	1.3	1.1
Poland	2012	0.5	0.3	0.2
Poland	2013	0.2	0.1	0.1
Poland	2014	0.1	-0.3	0.4
Portugal	2010	2.2	1.7	0.5
Portugal	2011	3.4	1.6	1.8
Portugal	2012	6	2.2	3.8
Portugal	2013	3.5	2.8	0.7
Portugal	2014	1.9	0.5	1.4
Slovakia	2011	1.9	1.1	0.8
Slovakia	2012	1	0.3	0.7
Slovakia	2013	3.9	2.6	1.3
Slovenia	2010	2.6	0	2.6
Slovenia	2011	0.7	0.1	0.6
Slovenia	2012	2.9	0.5	2.4
Slovenia	2013	2	1	1
Spain	2010	0.9	0.7	0.2
Spain	2011	2.1	0.5	1.6
Spain	2012	4	1.6	2.4
Spain	2013	3.5	2	1.5
Spain	2014	1.2	0.7	0.5
Turkey	2010	1	0.8	0.2
Turkey	2011	1	0.8	0.2
Turkey	2012	1	0.8	0.2
United Kingdc	2010	0.3	0.3	0
United Kingdc	2011	1.7	1.4	0.3
United Kingdc	2012	1.1	0.8	0.3
United Kingdc	2013	0.6	0.2	0.4
United States	2012	0.2	0.1	0.1
United States	2013	0.5	0.4	0.1

APPENDIX 2: DETAILED DESCRIPTION OF SOURCES OF NARRATIVE EPISODES

Australia: figures come from the measures announced in the "Mid Year Economic and Fiscal Outlook 2009-2010" http://www.budget.gov.au/2009-10/content/myefo/download/MYEFO_2009-10.pdf?bcsi_scan_9659b900cfc0c762=0&bcsi_scan_filename=MYEFO_2009-10.pdf (page 32), updated with data from OECD 2012 document "Restoring Public Finances".

Austria: For 2011, data come from the "Assessment of the national reform programme and stability programme for Austria of the European Commission" (hereafter, these documents will be referred as EC (Country) (Year)), available at: http://ec.europa.eu/europe2020/pdf/recommendations_2011/swp_austria_en.pdf

It states that (page 8): "At the end of December 2010, the Austrian parliament adopted a budget law for 2011, which contained a package of measures (amounting to around 0.75% of GDP) aimed at bringing Austrian public finances back to a sustainable path".

Analogously, 2012-2014 data comes from EC Austria 2013 and EC Austria 2014, available at http://ec.europa.eu/europe2020/pdf/nd/swd2013_austria_en.pdf (page 12) and http://ec.europa.eu/europe2020/pdf/csr2014/swd2014_austria_en.pdf (page 9)

Belgium: EC Belgium 2011, available at http://ec.europa.eu/europe2020/pdf/recommendations_2011/swp_belgium_en.pdf (page 7); EC Belgium 2012, available at http://ec.europa.eu/europe2020/pdf/nd/swd2012_belgium_en.pdf (page 10) and , EC Belgium 2013, available at http://ec.europa.eu/europe2020/pdf/nd/swd2013_belgium_en.pdf (page 12) complemented with OECD 2012 document "Restoring Public Finances".

Canada: our figures correspond with OECD 2012 document "Restoring Public Finances".

Czech Republic: for 2010, we capture the data from OECD 2012 document "Restoring Public Finances". For 2011 onwards, we rely on the EC Czech Republic 2012, available at http://ec.europa.eu/europe2020/pdf/nd/swd2012_czech_en.pdf (page 9) and EC Czech Republic 2013, available at http://ec.europa.eu/europe2020/pdf/nd/swd2013_czech_en.pdf (page 11)

Denmark: Our main source is EC Denmark 2013, available at http://ec.europa.eu/europe2020/pdf/nd/swd2013_denmark_en.pdf (page 11)

Estonia: although the OECD 2011 "Restoring Public Finances" calculated consolidation for 2009 and 2010, reviews of those figures increased the impact in 2009 and lowered the impact in 2010, as stated in OECD 2012 document "Restoring Public Finances": "Compared to OECD 2011 "Restoring Public Finances" it seems that the cumulative consolidationefforts have been less than what was previously reported". Therefore, we take the consolidation size from this last document. The phasing out of the measures is registered as negative consolidation for 2010, 2011 and 2012.

Finland: EC Finland 2011 available at http://ec.europa.eu/europe2020/pdf/recommendations_2011/swp_finland_en.pdf (page 6) and EC Finland 2013, available at http://ec.europa.eu/europe2020/pdf/nd/swd2013_finland_en.pdf (page 11) complemented with OECD 2012 document "Restoring Public Finances".

France: Our main source is EC France 2012, available at http://ec.europa.eu/europe2020/pdf/nd/swd2012_france_en.pdf (page 11) and EC France 2013, available at http://ec.europa.eu/europe2020/pdf/nd/swd2013_france_en.pdf (page 14)

Germany: From OECD 2011 document "Restoring Public Finances": "In June 2010, the government announced plans for an ambitious consolidation programme beginning in 2011 that will help Germany meet its structural deficit target over the medium term. In addition to phasing out temporary fiscal stimulus measures, Germany announced a EUR 80 billion consolidation programme", which measures around 2,9% of average nominal GDP, which we distribute between the four years of the consolidation plan. However, several measures were not implemented. The European Commission stated in 2012 (EC Germany 2012) that "In the light of the favourable budgetary development in 2011, the federal government decided not to implement additional measures to offset, for example, the fall in revenues from the nuclear fuel tax and delays in introducing a financial transaction tax". http://ec.europa.eu/europe2020/pdf/nd/swd2012_germany_en.pdf (page 8). We therefore reduce the revenue side of the consolidation plan. In 2013, more changes were introduced, especially in the expenditure side: "The favourable budgetary development and the positive trends in wages and employment have led the federal government to reduce taxes, social insurance contributions and fees. Overall, this is expected to provide businesses and citizens with cost cuts of nearly EUR 8 billion", EC Germany 2013: http://ec.europa.eu/europe2020/pdf/nd/swd2013_germany_en.pdf (page 10). By 2014, we could not find evidence of the continuation of the fiscal plan.

Greece: a first package measures were announced in June 2009, with a total amount of around 1,2% of GDP (Annex B, page 62 in http://ec.europa.eu/economy_finance/economic_governance/sgp/pdf/20_scps/2009-10/01_programme/el_2010-01-15_sp_en.pdf). Moreover, additional measures were implemented in early 2010, as stated in the revision of the Stability Programme "The breakdown of the sources of the additional resources is the following: 1.1% additional revenues from changes in the tax system; 0.5% one-off taxation measures; 0.5% revenues from reducing tax evasion; 0.5% additional EU funds for the public investment programme." (page 17) "The expenditure reduction is €1,825 million, or 0.74 percent of GDP" (page 20). In March, 2010, another set of measures amounting to 2% of GDP were implemented: http://ec.europa.eu/economy_finance/publications/occasional_paper/2010/pdf/ocp61_en.pdf "Shortly after a visit of Commissioner Rehn to Athens, Greece announces new deficit reducing measures of over 2% of GDP, including an increase in the VAT rates and other indirect taxes and a cut in the wage bill" (page 9). A revision of the fiscal consolidation path could be found in OECD 2012 "Restoring Public Finances" document. It acknowledges that "the consolidation process lost steam in 2011".

Hungary: EC Hungary 2012, available at http://ec.europa.eu/europe2020/pdf/nd/swd2012_hungary_en.pdf (page 12) and EC Hungary 2013, available at http://ec.europa.eu/europe2020/pdf/nd/swd2013_hungary_en.pdf (page 16) complemented

with OECD 2012 document "Restoring Public Finances". We account for several one-off measures.

Ireland: Measures present in the Memorandum of Understanding of 2010 are calculated to amount around 3.25% of GDP in 2011 http://ec.europa.eu/economy_finance/articles/eu_economic_situation/pdf/2010-12-07-mou_en.pdf (pages 1 and 2). We complement this source with OECD 2012 document "Restoring Public Finances" for 2012 and 2013. The budgetary measures for 2014 are provided in EC Ireland 2014 http://ec.europa.eu/europe2020/pdf/csr2014/swd2014_ireland_en.pdf (page 10)

Italy: Our main source is EC Italy 2012, available at http://ec.europa.eu/europe2020/pdf/nd/swd2012_italy_en.pdf (page 12) and EC Italy 2013, available at http://ec.europa.eu/europe2020/pdf/nd/swd2013_italy_en.pdf (page 15)

Latvia: A review of fiscal consolidation in 2009 and 2010, with a detailed set of measures by year is provided in the "EC staff report from the 3rd review mission to Riga", 2010, available at http://ec.europa.eu/economy_finance/eu_borrower/balance_of_payments/pdf/staff_report_riga_mission_en.pdf (page 11), which complements the measures announced in 2009, and reviewed by the European Commission in the "Community balance of payments assistance, Latvia, 1st review linked to the 2nd installment", 2009, available at http://ec.europa.eu/economy_finance/eu_borrower/balance_of_payments/pdf/note_to_efc_lv_bop_facility_1st_review_en.pdf

After 2011, the consolidation effort was lowered as seen in EC Latvia 2012, http://ec.europa.eu/europe2020/pdf/nd/swd2012_latvia_en.pdf

Lithuania: fiscal consolidation in 2009 and 2010 amounted to around 12% of GDP, with 80% based on expenditure cuts, per several sources. A detailed overview of these measures could be found in Hawkseworth et al. (2010) "OECD Budgeting in Lithuania" http://www.oecd.org/gov/budgeting/48170576.pdf. These calculation is broadly in line with Geng (2013) "Toward A Sustainable and Inclusive Consolidation in Lithuania: Past Experience and What is Needed Going Forward", WP/12/157, IMF, available at http://www.imf.org/external/pubs/ft/wp/2013/wp13157.pdf. For 2012 and onwards, data is extracted from EC Lithuania 2013, available at http://ec.europa.eu/europe2020/pdf/nd/swd2013_lithuania_en.pdf, adjusted in 2013 and 2014 because of a constitutional ruling against cuts in high wages and pensions.

Mexico: our figures correspond with OECD 2012 document "Restoring Public Finances".

Netherlands: the Stability Programme update of April 2011 provided a detailed set of measures from the Budget Memorandum and the Coalition Agreement in 2011 http://ec.europa.eu/europe2020/pdf/nrp/cp_netherlands_en.pdf (pages 7 and 8). For 2012, 2013 and 2014, we review the EC document "Analysis by the Commission services of the budgetary situation in the Netherlands following the adoption of the council recommendation to the Netherlands of 2 December 2009 with a view to bringing an end to the situation of an excessive government deficit", available at

http://ec.europa.eu/economy_finance/economic_governance/sgp/pdf/30_edps/other_documents/2013-05-29_nl_126-7_commission_-_swd_en.pdf (page 7) and EC Netherlands 2014 http://ec.europa.eu/europe2020/pdf/csr2014/swd2014_netherlands_en.pdf (page 12).

New Zealand: our figures correspond with OECD 2012 document "Restoring Public Finances".

Poland: EC Poland 2012, available at http://ec.europa.eu/europe2020/pdf/nd/swd2012_poland_en.pdf (page 10), and EC Poland 2013, available at http://ec.europa.eu/europe2020/pdf/nd/swd2013_poland_en.pdf (page 10) complemented with OECD 2012 document "Restoring Public Finances".

Portugal: fiscal consolidation in 2010 and 2011 is calculated using OECD 2012 document "Restoring Public Finances". For 2012 and 2013, we use "Analysis by the Commission services of the budgetary situation in the Netherlands following the adoption of the council recommendation to Portugal of 9 December 2012 with a view to bringing an end to the situation of an excessive government deficit" available at http://ec.europa.eu/economy_finance/economic_governance/sgp/pdf/30_edps/other_documents/2013-05-29_pt_126-7_commission_-_swd_en.pdf (page 7), and EC Portugal 2014, available at http://ec.europa.eu/europe2020/pdf/csr2014/swd2014_portugal_en.pdf (page 10).

Slovakia: EC Slovakia 2012, available at: http://ec.europa.eu/europe2020/pdf/nd/swd2012_slovakia_en.pdf (page 9) and EC Slovakia 2013, available at http://ec.europa.eu/europe2020/pdf/nd/swd2013_slovakia_en.pdf (page 12)

Slovenia: EC Slovenia 2012, available at: http://ec.europa.eu/europe2020/pdf/nd/swd2012_slovenia_en.pdf (page 10), EC Slovenia 2013, available at http://ec.europa.eu/europe2020/pdf/nd/swd2013_slovenia_en.pdf (page 16) and EC Slovenia 2014, available at http://ec.europa.eu/europe2020/pdf/csr2014/swd2014_slovenia_en.pdf (pages 10 and 11) complemented with OECD 2012 document "Restoring Public Finances".

Spain: EC Spain 2012, available at: http://ec.europa.eu/europe2020/pdf/nd/swd2012_spain_en.pdf (page 11), EC Spain 2013, available at http://ec.europa.eu/europe2020/pdf/nd/swd2013_spain_en.pdf (page 16) and EC Spain 2014, available at http://ec.europa.eu/europe2020/pdf/csr2014/swd2014_spain_en.pdf (pages 10 and 11) complemented with OECD 2012 document "Restoring Public Finances".

Turkey: our figures correspond with OECD 2012 document "Restoring Public Finances".

United Kingdom: our figures are similar to those in OECD 2012 document "Restoring Public Finances", complemented with the information in the 2010 Budget and Riley et al. (2014) "Crisis and consolidation in the public finances", Working Paper no.7, Office for Budget Responsibility http://budgetresponsibility.org.uk/wordpress/docs/WorkingPaper7a.pdf

United States: fiscal consolidation is calculated as the impact of the Budget Control Act as measured by the CBO, and amounts to roughly 0,7% of GDP, see http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/123xx/doc12357/budgetcontrolactaug1.pdf , Table 1).

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