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Fiscal multipliers during
consolidation: evidence
from the European Union

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Abstract

This paper investigates the impact of fiscal consolidation on economic growth in European Union countries, between 2004 and 2013. We construct a new dataset of exogenous fiscal adjustments, relying on legally binding recommendations issued to countries under Excessive Deficit Procedure, and we identify exogenous policy changes by using this dataset as instrumental variable in a GMM framework. We estimate the size of the fiscal multiplier both in a linear setting as well as in a state-dependent setting, considering four different circumstances: the state of the business cycle, the degree of openness to trade, the composition of the fiscal adjustment and the presence of a stressed credit market, as manifested by an impaired monetary policy transmission. We find that the size of the multiplier varies significantly under the various states: the distribution of multipliers is quite asymmetric, and a few consolidation episodes yield multipliers above one. We find that the composition of the fiscal adjustments is crucial in containing the output cost of consolidation, and in determining its persistence. Fiscal adjustments made via cuts to transfers and subsidies, or via tax increases, are usually associated with multipliers at or below unity, even when the economy is in recession. We also find evidence of confidence effects when consolidation is made under stressed credit markets and high interest rates. In a small number of episodes, involving open economies benefitting from confidence effects, we find that fiscal adjustments seem to be expansionary.

Key words: fiscal policy and growth, fiscal multiplier, panel data.

JEL: C33, E62.

Non-technical summary

This paper investigates the impact of fiscal consolidation on economic growth, using a panel of 27 European Union countries in the years between 2004 and 2013. The output cost associated to a reduction in government budget deficits has been the subject of a major public policy debate in the aftermath of the 2007-08 financial crisis: in particular it has been suggested that fiscal consolidation might be more harmful in the short-term than it was previously thought.

In this paper we quantify the amount of fiscal consolidation by relying on the fiscal framework of the European Union: the Stability and Growth Pact. In particular, we recover a measure of discretionary fiscal adjustments from legally binding recommendations issued by the ECOFIN Council to countries under Excessive Deficit Procedure. Other studies use public information to quantify fiscal policy measures, usually taken from government or parliamentary sources: our method has the advantage of relying on documents that stem from a single legal framework, which are therefore not subject to credibility issues and are fully harmonized across countries.

We begin by estimating the average impact of fiscal consolidation on growth, and then we investigate how the growth effects of fiscal adjustments are influenced by four different factors: the state of the business cycle, the degree of openness to trade, the composition of the fiscal adjustment and the presence of a stressed credit market, as manifested by impairment in the transmission mechanism of monetary policy.

We present four main results. First, we find that fiscal consolidation, on average, is not more harmful in the short-term than what was usually assumed by institutional forecasters before the financial crisis. In our full sample of EU countries, a fiscal adjustment of 1% of GDP is associated to a short-term output decline of -0.5%; for countries belonging to the euro area or with a currency pegged to the euro, the short-term output decline associated to a 1% fiscal adjustment is larger at -0.76%, possibly because of a more limited ability of monetary policy to offset country-specific adjustments. Second, we find evidence of strong confidence effects that significantly reduce the cost of fiscal consolidation during times of credit stress, when interest rates are high due to an impaired transmission of monetary policy. In our sample, this is particularly the case for those countries that were hit by a sovereign debt crisis from 2010 onwards. Third, we find that the growth effects of fiscal consolidation are strongly affected by the state of the economy. In particular, there is a small number of instances in which fiscal adjustments seem to be associated with expansionary effects in the short-term: this is the case for economies that are not in recession, open to trade and benefitting

from confidence effects. On the other hand, there is a number of episodes in which the short-term output cost of consolidation is over two times larger than average: this is the case when consolidation is implemented during a recession, in an economy closed to trade and via reductions in government consumption and investment spending, or a reduction in government wages. Finally, we find that the composition of the fiscal adjustment is very important in minimizing the adverse impact of consolidation: the fiscal multiplier is almost always at or below unity when the adjustment is accomplished by reducing government transfers and subsidies, or by increasing revenues, even if the economy is in recession and closed to trade.

Two significant policy implications follow from our results. First, countries under credit stress which are not in recession should frontload fiscal consolidation, rather than postpone it to a time when monetary policy is again fully capable of stimulating the economy by lowering lending rates. Those countries would in fact benefit from confidence effects that would strongly reduce, or even eliminate, the adverse effects of consolidation on output. On the other hand, the large negative effects of consolidation in closed economies under recession would call for postponing fiscal consolidation relative to the baseline approach. The second implication for policy concerns the composition of the fiscal adjustment. Previous studies suggested that fiscal adjustments based on spending cuts, rather than revenue increases, are more successful in reducing the deficit and stabilizing government debt: our results indicate that an adjustment focused on cuts to transfers and subsidies will also enable the government to significantly reduce the adverse effects of consolidation on growth when they tend to be the largest. Fiscal consolidation via these categories of spending should be preferred when governments are forced to adjust during adverse economic conditions.

1. Introduction

This paper provides an empirical investigation on the impact of fiscal consolidation on output growth in a panel of annual data for European Union countries, during the years between 2004 and 2013. We analyse the size of the output cost of fiscal adjustments, both in a linear and in a state dependent framework. In particular we look into four different determinants of the size of fiscal multipliers: the state of the business cycle, the degree of openness to trade, the composition of the fiscal adjustment and the presence of a stressed credit market, as manifested by impairment in the transmission mechanism of monetary policy.

The size of the fiscal multiplier, defined as the change in output associated to a unit change in discretionary fiscal policy, has been the subject of a major public policy debate in recent years. Following the global financial crisis of 2007-08 and the ensuing recession, European governments found themselves with unusually large budget deficits, and from 2010 onwards a prolonged phase of substantial fiscal consolidation was implemented to restore the sustainability of public finances. This fiscal retrenchment occurred when European economies were still recovering from the financial crisis, and while several countries were hit by a sovereign debt crisis that significantly disrupted credit markets; by 2012 many European countries were back in recession. Following these events, some policymakers and economists questioned the timing and size of the fiscal adjustment, suggesting that the disappointing growth performance of the last years is due to a substantial underestimation of the effects of fiscal consolidation on growth.

A major obstacle in the estimation of fiscal multipliers lies in the difficulty to identify exogenous changes in fiscal policy: several methods have been employed in the literature, leading to different results. In this paper we identify episodes of fiscal consolidation for 27 European countries by relying on the institutional framework of the EU. In particular, we construct a new dataset of exogenous fiscal adjustments using the measure of fiscal effort contained, explicitly or implicitly, in recommendations issued by the ECOFIN Council in the context of the Excessive Deficit Procedure (EDP); we then use this dataset as an instrumental variable to estimate fiscal multipliers in a dynamic panel with GMM methods.

This paper proceeds as follows: Section 2 discusses the challenges in the identification of exogenous fiscal policy, and justifies our instrumental variable approach; Section 3 explains how we construct our fiscal instrument relying on official documents derived from the implementation of the EU fiscal framework; in Section 4 we estimate a linear multiplier for our panel of countries, which can be

considered as the "average" response of output to fiscal consolidation; in Section 5 we discuss how different circumstances might lead to a fiscal multiplier that is either larger or smaller than average; Section 6 provides an estimate for a state-dependent multiplier, and shows how the size of the fiscal multiplier is distributed during the episodes of consolidation that we considered; in Section 7 we look into the degree of persistence of the output effects of fiscal adjustments and Section 8 presents our conclusions.

2. Identification strategy

Finding an exogenous measure for fiscal policy is an inherently difficult exercise: changes in the level of government revenues and spending are often correlated with other factors driving economic growth, and are therefore endogenous. In order to estimate the size of fiscal multipliers, there are in general two main sources of omitted variable bias that have to be dealt with. The first source of bias is due to the mechanical response of fiscal balances to economic developments, which does not directly stem from the implementation of new discretionary policy actions: high economic growth, for instance, will generate revenue windfalls and will result in a decline of several categories of spending, such as spending related to unemployment insurance. The second source of bias is due to the fact that some discretionary policy measures are taken by the government for countercyclical purposes, in response to current or expected economic developments: the government might plan a fiscal stimulus programme during a recession, and this inversion of causality might mislead us into believing that a fiscal expansion is contractionary.

The empirical literature on fiscal policy has proposed several ways to identify exogenous changes in the fiscal stance. One popular method, employed in structural VARs, addresses the first source of endogeneity by relying on cyclically adjusted variables, constructed using institutional information about the tax and transfer systems in order to identify the automatic response of taxes and spending to economic activity. To address the second source of endogeneity it exploits the lag in the implementation of fiscal policy, which implies that discretionary changes in the fiscal stance do not respond to unexpected contemporaneous shocks to output (Blanchard and Perotti (2002)). A drawback of such procedure lies in the fact that some cyclical factors, most notably asset price fluctuations, have still a significant impact on cyclically adjusted budget variables, leading to a biased estimation of the discretionary fiscal stance of the government (Morris and Schuknecht (2007)). This problem is apparent in the European Union before the 2007-08 financial crisis: a real estate bubble in

several countries generated large temporary revenue windfalls that might incorrectly be interpreted as instances of fiscal consolidation.

The "narrative" or "action-based" literature tries to address this issue by directly identifying exogenous fiscal impulses, using documents such as presidential speeches and Congressional reports (Romer and Romer (2010); Devries et al. (2011)). The narrative approach crucially depends on an assessment of the intentions that led policymakers to adopt a particular change in fiscal policy: only those policy changes that are not taken to offset other factors affecting current economic developments can be properly considered as exogenous fiscal shocks. An immediate drawback of such method therefore lies in the possibility that the motivations stated in public documents might not be true. Another possible problem stems from the possibility that the democratic process causes policy changes to be correlated with cyclical developments (Romer and Romer (2010)): voters will be more likely to elect a government intent on fiscal consolidation when the economy is growing strongly and, in a similar way, an elected government might postpone its decision to tighten the fiscal stance when the economy is growing poorly, or is in recession, in order to avoid upsetting voters. Finally, the assessment of fiscal measures used in narrative studies requires the formulation of a "no-policy change" scenario: different governments will likely use different methodologies to assess such scenarios, making cross-country studies even more problematic. Additionally, if the assessment of the yields of fiscal measures is taken from government documents, rather than independent organisations, it might be subject to political biases. Finally, Jordà and Taylor (2013) find that the IMF narrative measure is not fully exogenous, because it can be predicted by excluded controls that are correlated with the dependent variable: to solve this issue they employ a novel technique based on propensity score methods.

In this paper we identify exogenous fiscal policy changes with an instrumental variable approach, exploiting the features of the fiscal framework that governs the European Union: the Stability and Growth Pact (SGP). The Treaty on the Functioning of the European Union establishes a threshold of 3% of GDP above which a government deficit is considered excessive and in need of rapid reduction. When a country exceeds the threshold for its budget deficit, the ECOFIN Council may launch an Excessive Deficit Procedure (EDP), unless the excess deficit is the result of temporary developments and doesn't prejudice the overall fiscal sustainability of government balances. After an EDP has been opened, the Council will then issue a recommendation to the government of the country under scrutiny, listing a series of annual budgetary targets and policy measures to be taken by that government, together with a deadline for eliminating the excess deficit. These recommendations are

legally binding and the compliance of national governments with their prescriptions is continually monitored by the Council until the EDP is abrogated.

The excessive deficit rule of the SGP is outcome-based, in the sense that it merely requires the respect of a threshold for the headline government deficit: this can be achieved even in the absence of new discretionary policy measure, e.g. just as a result of positive cyclical developments. On the other hand, the EDP recommendations issued by the Council are action-based in the sense that they require the government to implement a "fiscal effort" consisting in new discretionary measures, which have to be taken within a deadline of "effective action" that expires a few months after the EDP recommendation is issued. In order to construct our exogenous instrument for fiscal shocks, we use this measure of fiscal effort contained in the EDP recommendations either explicitly or implicitly.

This method is similar to a narrative approach, in the sense that we rely on official documents in order to identify exogenous policy changes. Our method however does not suffer from the problems mentioned before. First, the motivation behind the fiscal adjustments that we consider is clearly defined as the need to consolidate the government budget, in compliance with the SGP. Second, since the EDP recommendations result from the implementation of a legal framework, they are not subject to the type of democratic pressure that can affect government decisions in narrative studies. Finally, since the implementation of the SGP is overseen in a centralized way at the EU level, our dataset of fiscal shocks relies on macroeconomic scenarios and fiscal measures that are estimated by the European Commission for all EU member states, therefore avoiding the problem of cross-country heterogeneity in methodologies, as well as the possible political biases that might arise from estimates made by national governments. At the same time, the approach hinges on the assumption that EDP recommendations are related to future GDP growth solely via their impact on countries' fiscal effort, controlling for past economic developments. A number of tests suggest that this indeed the case.

3. Constructing a dataset of EDP-based fiscal adjustments

As mentioned earlier, we estimate the size of the fiscal multiplier via an instrumental variable approach. In order to identify exogenous episodes of fiscal consolidation, we instrument changes in the primary structural balance with a dataset constructed from EDP recommendations. We construct such dataset distinguishing between recommendations issued by the Council before and after 2009. Council recommendations issued after 2009 contain a direct quantification of the fiscal effort that a

government under EDP has to implement in order to correct its excess deficit. This fiscal effort is quantified in structural terms, and provides a measure of the amount of the discretionary change in fiscal policy that is required to meet the deficit targets, given an underlying macroeconomic scenario forecast at the time of the recommendation. We therefore directly use this measure of fiscal effort to construct our instrumental variable. Every time a revised recommendation is issued by the Council, our series is updated according to the fiscal effort specified in the latest recommendation.

Older Council recommendations, issued before 2009, usually do not contain an explicit quantification of the discretionary fiscal effort that the national governments have to undertake: these documents simply mention the deadline by which the country under EDP has to correct its excess deficit, establishing intermediate annual deficit targets that have to be met in the case of multi-year EDPs. In many cases, governments with an excess deficit already anticipate the opening of an EDP, and commit themselves to achieve a series of deficit targets when they submit their Stability and Convergence Programmes to the European Commission. If the Council assesses these budgetary targets as realistic, and if it considers them sufficient to correct the excessive deficit in a sustainable manner, then the EDP recommendation simply asks the government to implement the consolidation measures already announced. To construct our series of consolidation episodes before 2009, we recover the targets in the headline deficit that are specified by the Council, either directly in the EDP recommendation or by reference to the Stability and Convergence Programmes, and we compute the structural adjustment that is necessary to achieve these targets given the macroeconomic scenario underlying the Council recommendation. Finally, in the spirit of this approach, if a country is not under EDP we do not consider it to be undertaking any consolidation.

We therefore construct our series of consolidation episodes C_{it} , for a given country i in year t , in the following way:

$$(1) \quad C_{it} = \begin{cases} 0 & \text{if } i \text{ is not under EDP} \\ \Delta B_{it}^{REC} - E_{t_{REC}}[\in \Delta OG_{it}] & \text{if } t_{REC} < 2009 \\ FE_{it}^{REC} & \text{if } t_{REC} \geq 2009 \end{cases}$$

where ΔB_{it}^{REC} is the nominal budgetary adjustment specified by the Council in the EDP recommendation. $E_{t_{REC}}[\in \Delta OG_{it}]$ is the expected cyclical improvement (or worsening) in the budget balance that was forecast at the time of the recommendation, computed as the product between the change in the output gap over the adjustment period and the semi-elasticity of the budget balance to the economic cycle, as estimated by the European Commission. Finally FE_{it}^{REC} is the fiscal effort in

structural terms directly specified in the EDP recommendations issued after 2009. It is important to note that the time at which the EDP recommendation is issued, t_{REC} , predates the time at which the fiscal adjustment is implemented, t : the EDP recommendation will be based only on economic developments realised up to the point when the EDP is launched. For instance, a country under recession is more likely to end up with an excessive deficit, and be subject to an EDP in the following years. Controlling for past economic developments, we can therefore exploit the predeterminedness of our instrumental variable to identify fiscal adjustments.

This method clearly does not identify all instances of fiscal consolidation that occurred within the EU, as national governments underwent phases of consolidation also in years not subject to EDPs. Our technique therefore focuses mainly on episodes of budgetary consolidation that are usually large and in some cases prolonged over several years.

In a limited number of instances, a number of countries under EDP did not actually implement any consolidation, or they implemented an adjustment that significantly fell short of the Council recommendation: we ignore these episodes and we treat the countries in question as if they were not under EDP. The instrumental variable C_{it} allows us to identify 87 episodes of fiscal consolidation in our panel (see Table 1). Estonia, Luxembourg and Sweden are the only three countries that have never been under an EDP between 2004 and 2013, and therefore we do not record any consolidation episode for those countries under our technique.

Table 2 presents the results of a regression of changes in the primary structural balance over our EDP-based consolidation instrument, for those years in which countries are under EDP. A consolidation effort of 1% of GDP recommended by the Council is associated with an improvement in the structural primary balance of 0.87% of GDP and the regression has an F-statistics of 27: our instrumental variable is therefore sufficiently strong. Table 3 and Chart 1 provide, respectively, descriptive statistics and a distribution of the fiscal adjustments we identified. Recommended efforts range from 0.27% to 2.75%, with over half of them over 1% of GDP.

4. Estimating a linear multiplier

The concept of fiscal multiplier should not be interpreted as a mechanical relationship between discretionary fiscal policy and output growth: the size of the fiscal multiplier depends instead on the conditions prevalent in the economy. Nonetheless, we start by estimating a first-year linear

multiplier, which can be considered an estimate of the output effects of fiscal consolidation under average circumstances.

We estimate the following dynamic panel regression:

$$(2) \quad \Delta Y_{it} = \sum_{j=1}^L \alpha_j \Delta Y_{it-j} + \beta \Delta SB_{it} + \delta_t + \mu_i + \varepsilon_{it}$$

where ΔY_{it} is the annual growth rate of real GDP for country i during year t ; ΔSB_{it} is the annual change in the primary structural balance³ as a percent of GDP; δ_t is a time dummy that takes value 1 in year t and value zero elsewhere; μ_i is an unobservable country-fixed effect with zero mean and ε_{it} is an error term with mean zero and no cross-country correlation.

We use the primary structural balance, rather than narrower indicators of fiscal measures, to capture the aggregate fiscal stance of the government. The primary structural balance is also corrected for the impact of one-off and other temporary measures: this is necessary because after the 2007-08 financial crisis many governments implemented large financial assistance programmes for credit institutions under stress, which had a substantial impact on the government budget but not necessarily on the real economy. Equation (2) is estimated for a panel of annual time series over the period 2004 – 2013 for 27 European Union countries (Croatia, which entered the European Union only in 2013, is excluded). We include lagged values of the dependent variable to control for the dynamic behaviour of output, and to take into account possible factors affecting GDP growth that may be serially correlated: we find that two lags of GDP growth are sufficient to remove autocorrelation in the idiosyncratic error term ε_{it} . A time dummy allows us to control for factors driving the synchronized business cycle within the European Union.

To estimate Equation (2) we employ the GMM estimator proposed by Blundell and Bond (1998). An advantage of this estimator is that it is designed for panels of data with a limited time dimension, such as the one used in this paper. We therefore consider a system of first-differenced and levels versions of Equation (2) to generate a set of moment conditions. The country fixed-effect μ_i in Equation (2) is unobservable, and therefore is a source of omitted variable bias when estimating the coefficients on the lags of the dependent variable: we rely on the first-differenced version of

³ The series used for GDP growth and the change in primary structural balance are computed by the European Commission. The primary structural balance is defined as the general government balance excluding interest, adjusted for the cyclical component and net of one-off and other temporary measures. The cyclical component of the balance is derived as the product between the output gap and the semi-elasticity of the budget balance to the cycle. For details about the Commission's approach to the cyclical adjustment of budget balances see Larch and Turrini (2009) and Mourre et al. (2013).

Equation (2) to remove the fixed effects and generate a series of moment conditions to estimate the coefficients on the lags of the dependent variable. Since we use two lags of GDP growth as covariates, we instrument them with their first two lags. Lags of order two or more of GDP growth are an appropriate instrument in the first-differenced version of Equation (2), provided that there is no autocorrelation in the idiosyncratic error term ε_{it} : we verify that this is the case with a specification test for the null hypothesis of no autocorrelation.

The EDP-based consolidation series that we defined in Section 3 can be used as instrumental variable for fiscal policy if it is unrelated to the unobservable component $\mu_i + \varepsilon_{it}$ in Equation (2). We first note that our EDP-based shocks do not seem to be affected by growth heterogeneity across countries. Table 4 shows that average country growth is not statistically significant in predicting our EDP-based series, once lagged growth is taken into account: this suggests that countries with systematically lower growth are not more prone to be under EDP and that our instrumental variable is uncorrelated with the fixed effects μ_i . Furthermore, we note that our EDP-based instrument is determined prior to the realisation of the idiosyncratic shocks ε_{it} and is therefore unrelated to current economic developments, realised at time t . This is because the Council sets EDP requirements for a given year t on the basis of past information, which is available up to the time of the recommendation $t^{REC} < t$. In order to use our EDP-based shocks as instruments, we need to control for past economic developments, realised at the time of the EDP recommendation, which affect both the EDP requirements and current GDP growth. We therefore included lagged growth in Equation (2) to control for the dynamics of output, and for the possibility that a recession will make a country slip into an EDP in the following years. Lagged GDP growth also allows us to control for a variety of other factors affecting output growth that are serially correlated. Finally, we rely on the moment conditions generated by Equation (2) in levels to estimate the size of the fiscal multiplier.

Our identification strategy hinges on the assumed exogeneity of the EDP recommendation to GDP growth in the following years. We check the validity of our identification strategy using a Hansen test. The results suggest that our instrumentation is indeed valid. Still, it cannot be excluded that future GDP growth is driven by exogenous variables that also enter the determination of the adjustment targets set in the EDP recommendation so that the exogeneity assumption would be violated. Our robustness checks including alternative variables, however, suggest that none of the conventionally used factors are statistically significant (see further below for details).

After estimating Equation (2) for our full sample of 27 countries, we investigate the sensitivity of our results to excluding several countries with common characteristics that might set them apart from

the rest of the sample, and affect the estimate of the size of the fiscal multiplier. First we re-estimate our equations excluding Greece and Latvia, which are two clear outliers in our sample: according to our EDP-based consolidation series, these countries are associated the two largest cumulated fiscal adjustments since 2010, yet they experienced very different GDP growth outcomes. Greece is the country that faced the deepest recession in the European Union, it is also the country most hit by the sovereign debt crisis since 2010 and it underwent debt restructuring. In addition to these severe economic developments, there are also statistical problems due to the ex-post downward revision of past structural deficits: this implies that the actual fiscal consolidation that took place in the country was higher than what had been initially suggested by our EDP-based series. Latvia, on the other hand, is one of the fastest growing countries in the sample: while our EDP-based consolidation series indicates an high amount of consolidation after 2009, Latvia managed to comply with EDP targets also thanks to a strong cyclical improvement in its budget, which implies that the actual consolidation it implemented was lower than what is suggested by our instrument series. The second sub-sample we consider excludes countries that were under EU/IMF assistance programmes and were part of the euro area, or had a currency pegged to the euro: these countries are Greece, Portugal, Ireland and Latvia. Economic adjustment might be more difficult for euro area programme countries, because the role of monetary policy and the interest rate channel is limited: it is possible that the output cost of fiscal adjustments for these countries is larger than in the rest of the sample, thereby leading us to overstate the size of the multiplier. Then we consider a third sample excluding economies in Eastern Europe: Bulgaria, Latvia, Lithuania, Estonia, Hungary, Poland, Romania, Czech Republic and Slovakia. Those economies are among the fastest growing in our sample, and exhibit several structural differences with the others. They have both characteristics that are associated with lower multipliers, such as a higher degree of openness to trade, and characteristics that might increase the size of the multiplier, such as low government debt. Finally we consider a sample containing only countries that belong to the euro area, or have a currency pegged to the euro: this excludes Czech Republic, Hungary, Poland, Romania, Sweden and the United Kingdom. The impact of fiscal adjustment is likely to be larger in countries belonging to a currency union, or a fixed exchange rate system, because there is less room for monetary policy to offset country-specific fiscal adjustments.

Finally, as mentioned earlier, we check the robustness of our results with respect to several control variables: this allows us to control for the residual presence of some omitted variable bias, and helps us to confirm whether our instrument for fiscal shocks is truly exogenous. The first control variable is the degree of coordinated consolidation, measured for each country as the weighted sum of the

EDP-based fiscal adjustment of every other country in the sample, where the weights are the exports to each country as a share of total intra-EU export⁴. Given that most countries in our sample consolidate simultaneously after the 2009 recession, this allows us to control that we are not overstating the size of the multiplier by attributing to domestic fiscal policy the effects of the adjustment implemented by trading partners. Second, we control for the average government debt ratio⁵ in the pre-crisis period, before 2009: countries that had already high public debt ratios before the financial crisis might experience a slower growth afterwards, and might be pressed to implement larger consolidation packages. We do not consider the debt level after 2009 because for several countries it is significantly influenced by one-off measures that, while having a large impact on the debt ratio, do not necessarily have an equally large impact on output. Our third control variable is the lagged spread on long-term sovereign bonds⁶. Countries most exposed to the sovereign debt crisis, as captured by this variable, will likely have experienced worse growth outcomes and will certainly have implemented a larger fiscal adjustment. Finally we control for the lagged level of household leverage⁷: an indebted private sector may be a brake on growth; moreover, after the financial crisis, governments have transferred on their balance sheets part of the losses incurred on private sector debts, deepening the need for successive fiscal consolidation.

Table 5 presents the results of estimating of Equation (2): our specification tests are passed. The estimate of the multiplier is statistically significant across all samples. In the full sample of countries, a consolidation effort of one percent of GDP results in a decline of 0.50% of GDP in the same year. This result is in line with the multipliers implicitly used by institutional forecasters prior to the crisis, for a fiscal adjustment with a balanced composition between revenues and expenditures (see Blanchard and Leigh (2013)). It is, as mentioned earlier, a multiplier that is valid on average across all episodes of consolidation, and therefore might not be fully useful for analysing special developments: it is nonetheless interesting to note that the developments in the years after the 2007-08 financial crisis have not altered the size of such average impact of fiscal policy, despite the fact that approximately 75% of the consolidation episodes that we consider occur after 2009. The size of the multiplier varies across subsamples: as expected it is lowest when euro area programme countries are excluded, at -0.37, and is highest when countries with flexible exchange rate are excluded, at -0.76. Table 6 shows the estimation results of Equation (2) for the full sample of

⁴ Based on Eurostat data; export of goods only.

⁵ Based on European Commission data.

⁶ Based on Eurostat and OECD data; spreads vis-à-vis Germany; 10-year government bonds or equivalent assets are considered.

⁷ Households' leverage is computed as the ratio between loan liabilities over gross disposable income.

countries, when controlling for the variables mentioned above. The estimate of the multiplier is robust to all the controls, ranging in size from -0.39 to -0.52.

5. Determinants of the size of fiscal multipliers

As mentioned earlier, the impact of fiscal consolidation on output growth will likely depend on the prevailing economic conditions that the economy is facing. We extend our analysis to determine how four different economic conditions affect the size of the fiscal multipliers we estimated before.

First, we consider the state of the business cycle. Fiscal policy tends to have stronger effects during recessions rather than in expansions: during a downturn, for instance, the economy is not subject to the same supply constraints that exist when output is at its potential, and the presence of liquidity-constrained consumers may amplify the economic impact of fiscal consolidation. Auerbach and Gorodnichenko (2012) find that the impact of government spending shocks on output is usually small and not statistically significant when the economy is expanding, and it is significantly larger during a recession. Out of the 87 episodes of fiscal consolidation that we identify, 25 occur during a recession, defined as a decline in real GDP.

The second state that we consider is the degree of countries' openness to trade. Open economies may have a lower fiscal multiplier, because the effect of fiscal policy on aggregate demand is diluted through the trade channel. In our sample of EU countries there is a large degree of heterogeneity in terms of trade-openness: the average sum of the import and export shares of GDP ranges from 55% in the case of France and Italy, to 316% for Luxembourg. We estimate the different size of consolidation multipliers in Equation (3) for open and closed economies, by considering closed to trade the quartile of economies with the lowest average sum of the export and import share of GDP⁸. These economies are: Greece, Spain, France, Italy, Poland, Portugal and the United Kingdom.

The third state is the composition of the fiscal adjustment. The economic literature on fiscal policy generally suggests that the fiscal multipliers associated with changes in government consumption and investment expenditure are larger than those associated with changes in taxes and transfer payments (Gechert and Will (2012)). We therefore consider an aggregate of non-transfer government spending, defined as the overall amount of public expenditure on consumption,

⁸ Average export and import shares of GDP are computed based on European Commission data.

investment and government wages⁹, and we estimate how the multiplier in Equation (3) changes when reductions of non-transfer spending constitute more than half of the overall fiscal adjustment. This allows us to identify in our sample 29 episodes of consolidation driven by non-transfer spending, out of 87 consolidation episodes in total.

The final state is the degree of stress on credit markets. Our sample of EU countries contains several economies characterized by weaker and less developed financial systems than those of the rest of the sample. Interest spreads tend to be higher in such countries, and a reduction in central bank interest rates might not fully translate into a decline in bank lending rates. At the same time, starting in 2010 several euro area economies were hit by a sovereign debt crisis, which triggered large capital flights due to the fear of a possible breakup of the monetary union: the banking systems in those countries experienced significant funding problems, which led to a tightening of lending conditions even in the presence of very low central bank rates. The effect of an impaired credit system on the size of the fiscal multiplier might go in both directions. On the one hand, fiscal consolidation may be more disruptive if monetary policy is unable to accommodate a fiscal contraction with an easing of credit conditions. On the other hand, fiscal consolidation might be less disruptive if it leads to confidence and credibility effects: if agents believe that the consolidation is credible and avoids a possible default on government debt, they will ask for lower risk premia on government bonds, and this might also lead to a reduction in lending rates to the private sector (see Alesina (2010)).

We determine the degree of credit stress and impaired transmission of monetary policy in the following way: for each country in our sample we regress the short-term lending rate to small and medium-sized businesses on the interbank rate¹⁰ until 2009, the year before the start of the European sovereign debt crisis, and we project the fitted values until 2013. We then use the residuals as an indicator of credit stress: in particular we consider a country to be under stress when actual lending rates are at least 50 basis points above the level predicted by interbank rates¹¹. Under this threshold of 50 basis points we identify the quartile of consolidation episodes with the largest degree of credit stress.

⁹ Based on European Commission data. Series considered are: final consumption expenditure, gross fixed capital formation and compensation of employees.

¹⁰ Specifically, we consider the new business lending rates to non-financial corporations, up to 1 year and up to 1 million euro. Due to lack of data, for Slovakia and the United Kingdom we use lending rates up to 1 year based on outstanding amounts. Series are provided by the ECB. For interbank rates, we use the 3-month interbank rates provided by the European Commission.

¹¹ Considering real interest rates might be more appropriate, we lack however a reliable measure of inflation expectation for each country in our sample.

6. Estimating state-dependent multipliers

It is possible that the four states considered above are correlated among themselves: countries with an impaired credit system, for instance, are more likely to be under recession. We would need to consider all four states simultaneously when estimating the size of the multiplier, but having 16 different states, and therefore 16 different multipliers, makes a direct estimation difficult with the available data. We proceed by estimating the marginal impact of each state over a "baseline multiplier", and we recover the multiplier in each different state by aggregating the various marginal impacts.

We extend the model in Equation (2) to allow for the possibility of state-dependent multipliers, as in Hondroyiannis and Papaoikonomou (2014), and we estimate the following equation:

$$(3) \quad \Delta Y_{it} = \sum_{j=1}^L \alpha_j \Delta Y_{it-j} + \beta \Delta SB_{it} + \sum_{j=1}^S \tilde{\beta}_j \Delta SB_{it} I_j^\tau(x_{it}^j) + \delta_t + \mu_i + \varepsilon_{it}$$

where $I_j^\tau(x_{it}^j)$ is an indicator function for state j , that assumes value one if a certain variable x_{it}^j is above or below a threshold τ . Under this specification, if none of the states is satisfied then all the indicator dummies $I_j^\tau(x_{it}^j)$ will be equal to zero and the fiscal multiplier will be β , our "baseline multiplier". If on the other hand all states are satisfied, the indicator dummies will be all equal to one and the multiplier will be $\beta + \sum_{j=1}^S \tilde{\beta}_j$, where each $\tilde{\beta}_j$ represents the marginal impact of state j on the baseline multiplier β . We rely again on the EDP-based consolidation series constructed in (1) to identify exogenous policy changes: we instrument ΔSB_{it} with C_{it} as before; in addition we instrument $\Delta SB_{it} I_j^\tau(x_{it}^j)$ with $C_{it} I_j^\tau(x_{it}^j)$ for each j .

The baseline multiplier that we consider refers to the case of an open economy in expansion, which is not under credit stress and is consolidating mainly via tax increases or cuts to subsidies and transfers, rather than cuts to non-transfer expenditures. This is the most common state in which fiscal consolidation occurs in our sample, capturing approximately one third of all consolidation episodes. We then estimate the marginal impact of the four states considered by setting our indicator variables equal to one according to the criteria mentioned in Section 5. Once again we check the robustness of our results with respect to a different composition of countries, as well as to the control variables used in the linear case.

Table 7 presents the result of the estimation of the state-dependent multiplier of Equation (3): once again our specification tests are passed. In the full sample, our baseline multiplier has a small positive value of 0.21 which is not statistically significant. This multiplier remains non-significant and near-zero in value in all the samples considered: in our baseline case, therefore, the short-term cost of fiscal adjustments is negligible. Fiscal consolidation when the economy is under recession has a significantly larger cost on output: a fiscal adjustment of one percent of GDP during a recession will lead to an additional cost of -0.92% of GDP in our full sample of countries. This result is in line with previous literature suggesting that the state of the business cycle has a strong effect on the impact of fiscal policy: the additional cost of consolidation during recession varies from -0.75 when euro area programme countries are excluded, to -1.27 when we consider only euro area countries, or countries with a currency pegged to the euro. As expected, consolidation achieved via cuts to non-transfer spending is more costly than consolidation via cuts to transfers and subsidies or via increases in taxes: in the first case, the additional cost of a fiscal adjustment is -0.42, and is lowest when Eastern European economies are excluded, at -0.27. The additional impact on the multiplier of being closed to trade is large, at -0.66. This additional cost declines to -0.35 when Eastern European economies are excluded, as those fast growing economies tend to be open to trade and their exclusion also decreases the baseline multiplier, and it increases to -0.76 when only euro-pegged countries are considered. The marginal impact on the multiplier of consolidations driven by non-transfer spending, and consolidations implemented in closed economies, is not statistically significant in some of the sub-samples. Finally, the marginal impact on the multiplier of a stressed credit market, as manifested by an impaired transmission of monetary policy, is positive and statistically significant in the full sample, at 0.58: this suggests the existence of a large confidence effect when consolidation is achieved in the presence of high interest spreads. This confidence effect on the fiscal multiplier is large and statistically significant across all samples, and is exceptionally high when only euro-pegged countries are considered, at 1.05. The presence of a confidence effect suggests that countries under credit stress would benefit from a frontloaded fiscal adjustment, rather than postponing consolidation to a time when credit conditions are normalized.

Table 8 shows that the results of the estimation of Equation (3) are overall robust to controlling for the presence of coordinated consolidation, the average pre-crisis level of debt, lagged sovereign bond spreads and lagged household's leverage. One significant exception is the marginal impact of being closed to trade, which declines substantially when controlling for the average pre-crisis level of debt: this is due to the fact that closed economies in our samples tend to be more indebted. The

coefficient for government debt therefore captures part of the effect that was previously attributed to having a closed economy, while leaving the other coefficients roughly unchanged.

By aggregating the marginal impact of the various states in Equation (3), we recover the size of the multiplier for each episode of consolidation in our sample: Chart 2 shows the cumulative distribution of the values of the fiscal multipliers. In all the samples considered, approximately 40% of the overall consolidation episodes are associated with a fiscal multiplier that is near-zero and non-significant, or even positive in a small number of episodes: this suggests that the output cost of fiscal adjustments is negligible for a large share of episodes. In general, the majority of consolidation episodes in each sub-sample are associated with a state-dependent multiplier that is below the linear multiplier estimated under Equation (2) for that same sub-sample. The distribution of fiscal multipliers is therefore quite asymmetric: in a limited number of instances it appears that fiscal consolidation has even an expansionary effect in the short-term, in particular when an economy is growing, is open to trade and lending rates are higher than predicted by interbank rates, due to an impaired transmission of monetary policy. In particular, under our aggregation method, 3 consolidation episodes in the full sample of countries are associated with a positive multiplier above 0.5. This is the case of Lithuania in 2010, and Ireland and Slovakia in 2013: all three countries improved their primary structural balances by more than 2% of GDP and nonetheless experienced moderate growth.

At the other end of the spectrum there are a number of fiscal adjustments that resulted in multipliers significantly larger than average. In the full sample of countries, 14% of multipliers are larger than one, with the highest being -1.2. When we re-estimate Equation (3) excluding euro area countries under programme from the sample, only 6% of estimated multipliers are above unity, with the largest being -1.1. Finally, when we estimate the model only for euro area countries, or countries with a currency pegged to the euro, 23% of fiscal adjustments have a multiplier larger than one, with the highest equal to -1.6. Moreover, almost all these episodes of large multipliers refer to adjustments achieved via a reduction of non-transfer expenditures. The only exception is that of open economies in recession, in the two sub-samples excluding Eastern European economies and excluding countries with a floating exchange rate: in this case, a consolidation achieved via cuts to transfers and subsidies, or an increase in taxes, is associated with a multiplier of -1.3. There is only one such episode and it is that of Slovenia in 2012: all other instances of fiscal adjustments achieved via transfers, subsidies and revenues yield a multiplier at or below one across all samples. Previous literature suggested that fiscal consolidations implemented via cuts to government spending tend to be more successful in reducing the primary deficit and stabilizing the debt ratio. Our results indicate that an adjustment focused on cuts to transfers and subsidies will also enable the government to

significantly reduce the adverse effects of consolidation on growth when they tend to be the largest, such as during a recession or in a closed economy.

7. Medium-term effects of consolidation

So far we considered only the first-year fiscal multiplier. Fiscal adjustments have medium-term effects, and the fiscal shocks that we considered in Equations (2) and (3) might have a direct impact on subsequent years that goes beyond their indirect effect via lagged output growth. We re-estimate both equations for our full sample of 27 countries by including the first lag of the policy shocks, and instrumenting them with the first lag of our EDP-based consolidation series. Table 9 shows the results for the linear multiplier: only the contemporaneous coefficient on the fiscal instrument is found significant, with the same size as before. This suggests that the direct impact of fiscal adjustments mostly occur within the first year, and the shocks propagate in time mainly via the indirect effect due to the lags of the dependent variable.

Table 10 shows the estimation results for our state-dependent multiplier, augmented to include the first lag of the policy instruments. The size of the contemporaneous coefficients is unchanged for all states. Lagged coefficients are smaller than contemporaneous ones, with the exception of our baseline case which has a positive and significant coefficient. The lagged marginal impact of a consolidation driven by non-transfer government spending is still statistically significant: this suggests that the direct output cost of cuts to non-transfer spending is more persistent than the cost associated with cuts to transfers and subsidies, or tax increases.

Chart 3 shows the impulse response functions associated to a fiscal contraction of 1% of GDP in six different cases. Panel A shows the linear case, derived from the estimates in Table 9: the effect of a unit fiscal impulse vanishes rapidly, and is found to be statistically different from zero only in the year of the adjustment. This can be considered to be the average dynamic response of output to fiscal consolidation. Panel B shows the impulse response in the state-dependent case derived from the estimates in Table 10, under our baseline state of an open economy in expansion without credit stress, which is consolidating via reductions in transfers and subsidies, or via increases in taxes. This is the most common type of consolidation in our sample, accounting for one third of total consolidation episodes. In this case, fiscal consolidation has no significant impact on output in the year of the adjustment, but has an expansionary effect in the following year with a positive and significant output response of 0.48; the response of output then vanishes from the third year

onwards. Panels C and D show the output response to consolidations driven by non-transfer spending: for open economies under recession (Panel C) and for closed economies with credit stress (Panel D). These are the two cases in which fiscal multipliers are the largest: the effect of a fiscal contraction of 1% of GDP is still relevant in the first year following the adjustment, with a lower growth of approximately -0.5 percentage points in both cases, and vanishes from the second year onwards. Panels E and F shows the impulse response functions in the same circumstance as Panel C and D, but with a consolidation driven by cuts to transfers and subsidies, or by tax increases. These are the two cases in which these policy instruments yield the largest multipliers. As the chart shows, the fiscal multiplier is negative and statistically significant only in the year of the adjustment, and drops immediately to zero in the following year. The effects of consolidations driven by transfers, subsidies and taxes are therefore less persistent, other than less pronounced, than the effects of adjustments driven by non-transfer spending.

8. Conclusion

In this paper we present four main results. First, we obtain an estimate of the short-term average multiplier of -0.5: this is in line with the multipliers assumed by institutional forecasters before the financial crisis, while approximately 75% of the episodes of consolidation that we identify in our sample occur after 2009. The size of the multiplier is however larger, at -0.76, when considering only countries belonging to the euro or with a currency pegged to the euro, where monetary policy is more limited in its ability to offset country-specific fiscal adjustments. On the other hand, when euro area countries under EU/IMF programme are excluded, the average fiscal multiplier declines to -0.37.

Second, we find evidence of strong confidence effects when fiscal consolidation is implemented during times of credit stress, when lending rates are higher than predicted by interbank rates, due to an impaired transmission mechanism of monetary policy. This is particularly the case of several European economies hit by a sovereign debt crisis from 2010 onwards: in those countries, sharp capital outflows triggered a tightening of lending conditions while domestic banks were subject to intense funding pressure. Under such circumstances, a credible fiscal consolidation that avoids the possibility of a default on government debt might lead to lower risk premia on government bonds, and this might in turn lead to a reduction in lending rates to the private sector.

Third we find that, depending on the state of the economy, the distribution of multiplier values is quite asymmetric: it is therefore important for forecasters and policymakers to pay attention to the

economic conditions prevailing when the fiscal adjustment is made. In general, the large majority of consolidation episodes yield a multiplier that is below the average value that we estimated in our linear model. In particular we find a small set of episodes in which consolidation has an expansionary effect: this is typically the case of open economies not in recession, benefitting from a confidence effect during times of credit stress. These episodes account for 7% of all consolidation episodes in our sample, and for 29% of all consolidation episodes under credit stress. On the other hand, we find several fiscal adjustments associated with output costs that are over two times larger than average: this occurs when the economy is in recession, closed to trade and consolidation is achieved mainly via cuts to government consumption, investment and wage expenditures. In the full sample of countries, 14% of multipliers are larger than one, with the highest being -1.2; when we estimate the model only for euro area countries, or countries with a currency pegged to the euro, 23% of fiscal adjustments have a multiplier larger than one, with the highest equal to -1.6.

Finally, we find that the composition of the fiscal adjustment is very important in determining its effects: when consolidation is achieved via cuts to transfers and subsidies, or via tax increases, the size of the fiscal multiplier is significantly reduced, and fiscal consolidation is more growth-friendly. In particular, even when the economy is in recession and closed to trade, these types of adjustment are almost always associated with multipliers at or below one, under every specification. Consolidation achieved via cuts to transfers and subsidies, or via tax increases, has also a much less persistent effect on output than adjustments achieved via cuts to non-transfer spending: in the former case, we find that output returns to normal in the year following the adjustment.

Two major policy implications follow from our results. First, countries that are experiencing credit stress but are not in recession should frontload fiscal consolidation, rather than postpone it to a time when monetary policy is again capable of reducing interest rates: those countries would benefit from confidence effects that would greatly reduce, or even eliminate, the adverse effects on output. On the other hand, countries that closed to trade and in recession would benefit from initially reducing the speed of consolidation relative to the baseline results, to avoid significant negative effects on output. Second, countries should carefully determine the composition of the adjustment. Past studies found that spending-driven consolidation is more effective than revenue-driven adjustments in stabilizing the debt and in achieving a lasting reduction in the primary deficit: we find that reductions in spending on transfers and subsidies is also helpful in reducing the short term costs of fiscal adjustments. If policymakers are forced to consolidate during adverse economic conditions, such as a recession, they should focus their attention to reducing these categories of spending, and

later consolidate via reductions in public sector wages, consumption and investment spending when the economy is growing.

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10. Annex

Table 1 - Episodes of consolidation identified.

COUNTRY	CONSOLIDATION EPISODES
Belgium	2010; 2012-2013
Bulgaria	2011
Czech Republic	2004; 2007; 2010-2013
Denmark	2011
Germany	2004-2007; 2011-2012
Estonia	--
Ireland	2010-2013
Greece	2005; 2010-2013
Spain	2010-2013
France	2010-2013
Italy	2006-2007; 2010-2012
Cyprus	2004-2005; 2012-2013
Latvia	2010-2012
Lithuania	2010; 2012
Luxembourg	--
Hungary	2007-2009; 2012
Malta	2005-2006; 2011; 2013
Netherlands	2005; 2011-2013
Austria	2011-2013
Poland	2005; 2007; 2011-2012
Portugal	2006-2007; 2011-2013
Romania	2010-2012
Slovenia	2011-2013
Slovakia	2010-2013
Finland	2011
Sweden	--
United Kingdom	2006; 2010-2011; 2013

Notes:
Years in which a country was under EDP but did not improve its primary structural balance by around 0.2% of GDP are not considered as consolidation episodes.

Table 2 – Relationship between actual changes in primary structural balance and EDP recommendations for countries under EDP.

Equation: $\Delta SB_{it} = \alpha + \beta C_{it} + \varepsilon_{it}$ where C_{it} is the consolidation series constructed in (1), ΔSB_{it} is the change in the primary structural balance.

α	0.498** (0.236)
β	0.869*** (0.167)
F-stat	27.23
R ²	0.24
Observations	87
Notes: Robust standard errors in parentheses; *, ** and *** indicate significance at 10%, 5% and 1% levels respectively.	

Table 3 – Descriptive statistics for fiscal adjustments recommended under EDP

Mean	1.25
Std.	0.67
Median	1
Max	2.75
Min	0.27

Chart 1 – Distribution of EDP-based consolidation series (Percent of total consolidation episodes).

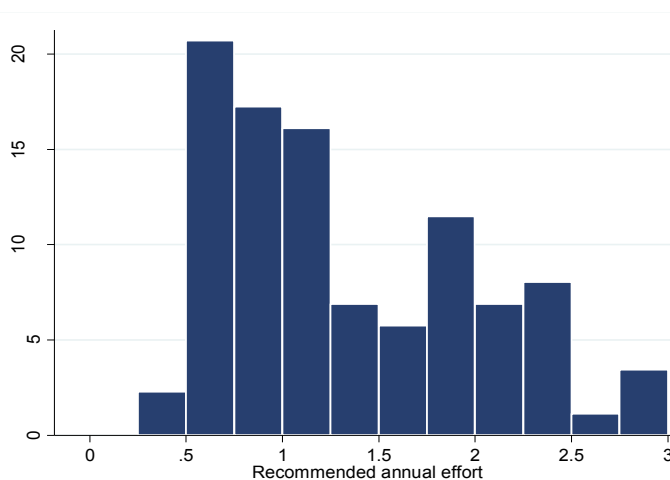


Table 4 – Relationship between average country growth and EDP recommendations

Equation: $C_{it} = \alpha + \beta \Delta Y_{it-1} + \gamma \overline{\Delta Y}_i + \varepsilon_{it}$, where C_{it} is as defined in Equation (1), and $\overline{\Delta Y}_i$ is the average GDP growth for country i .

	Estimated coefficient	p-value
β	-0.062*** (0.010)	0.000
γ	0.011 (0.032)	0.730
R ²	0.127	
Observations	270	
Note: Robust standard errors in parentheses; *, ** and *** indicate significance at 10%, 5% and 1% levels respectively.		

Table 5 - Linear Multiplier

$$\text{Equation: } \Delta Y_{it} = \sum_{j=1}^L \alpha_j \Delta Y_{it-j} + \beta \Delta SB_{it} + \delta_t + \mu_i + \varepsilon_{it}$$

	Full sample	Excluding Greece and Latvia	Excluding euro area programme countries	Excluding eastern European countries	Only euro area and euro-pegged countries
GDP growth (t-1)	0.504*** (0.116)	0.408*** (0.089)	0.422*** (0.090)	0.404*** (0.120)	0.529*** (0.124)
GDP growth (t-2)	-0.211** (0.096)	-0.171 (0.118)	-0.192* (0.116)	-0.036 (0.087)	-0.282*** (0.076)
Structural adjustment	-0.499** (0.245)	-0.407*** (0.103)	-0.369*** (0.113)	-0.691* (0.362)	-0.763*** (0.281)
Autocorrelation p	0.921	0.995	0.811	0.132	0.672
Hansen p	0.698	0.564	0.760	0.234	0.882
Observations	270	250	230	180	210
Countries	27	25	23	18	21

Notes:

Euro area programme countries are: Greece, Ireland, Portugal and Latvia. Eastern European countries are: Bulgaria, Latvia, Lithuania, Estonia, Hungary, Poland, Romania, Czech Republic and Slovakia. Countries without the euro, or a euro-pegged currency, are: Czech Republic, Hungary, Poland, Romania, Sweden and the United Kingdom. Two-step system GMM estimator. The instruments used for the equation in first differences are the second to fourth collapsed lags of GDP growth and the time dummies; the instrument used for the equation in levels is the EDP-based consolidation series. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at 10%, 5% and 1% levels respectively.

Table 6 - Linear Multiplier: robustness tests

$$\text{Equation: } \Delta Y_{it} = \sum_{j=1}^L \alpha_j \Delta Y_{it-j} + \beta \Delta SB_{it} + \gamma X_{it} + \delta_t + \mu_i + \varepsilon_{it}$$

	-	Coordinated consolidation	Average pre-crisis government debt	Lagged long-term sovereign spreads	Lagged household leverage ratio
GDP growth (t-1)	0.504*** (0.116)	0.499*** (0.114)	0.525*** (0.109)	0.504*** (0.113)	0.495*** (0.120)
GDP growth (t-2)	-0.211** (0.096)	-0.216** (0.103)	-0.215** (0.095)	-0.223** (0.093)	-0.225** (0.091)
Structural adjustment	-0.499** (0.245)	-0.482* (0.257)	-0.388** (0.177)	-0.486*** (0.174)	-0.521** (0.256)
Control coefficient	-	-0.896 (1.173)	-0.022*** (0.004)	-0.026 (0.078)	-0.008*** (0.002)
Autocorrelation p	0.921	0.929	0.993	0.474	0.898
Hansen p	0.698	0.665	0.806	0.796	0.751
Observations	270	270	270	267	256
Countries	27	27	27	27	26

Notes:

Two-step system GMM estimator. The instruments for the equation in first differences are the second to fourth collapsed lags of GDP growth and the time dummies; the instrument used for the equation in levels is the EDP-based consolidation series. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at 10%, 5% and 1% levels, respectively. Household leverage ratio data missing for Malta, which is excluded from the regression. Lagged long-term sovereign spreads missing for Romania in 2004-2006: observations are dropped.

Table 7 - State-dependent multiplier

$$\text{Equation: } \Delta Y_{it} = \sum_{j=1}^L \alpha_j \Delta Y_{it-j} + \beta \Delta SB_{it} + \sum_{j=1}^S \tilde{\beta}_j \Delta SB_{it} I_j^T(x_{it}^j) + \delta_t + \mu_i + \varepsilon_{it}$$

	Full sample	Excluding Greece and Latvia	Excluding euro area programme countries	Excluding Eastern European countries	Only euro area and euro-pegged countries
GDP growth (t-1)	0.511*** (0.093)	0.407*** (0.066)	0.438*** (0.075)	0.338** (0.138)	0.522*** (0.102)
GDP growth (t-2)	-0.172* (0.098)	-0.169 (0.128)	-0.191 (0.129)	-0.101 (0.090)	-0.243*** (0.054)
Structural adjustment	0.208 (0.215)	-0.040 (0.097)	-0.058 (0.111)	-0.095 (0.216)	-0.032 (0.321)
Marginal impact $\tilde{\beta}_j$ on the coefficient for structural adjustment due to:					
Recession	-0.922*** (0.227)	-0.808*** (0.240)	-0.750*** (0.247)	-1.255*** (0.281)	-1.271*** (0.267)
Non-transfer spending	-0.421*** (0.155)	-0.328* (0.186)	-0.271 (0.218)	-0.266 (0.164)	-0.325 (0.204)
Closed economy	-0.660** (0.272)	-0.394 (0.313)	-0.426 (0.377)	-0.353* (0.187)	-0.757*** (0.234)
Credit stress	0.580** (0.247)	0.683** (0.298)	0.805** (0.351)	0.699*** (0.176)	1.048*** (0.280)
Autocorrelation p	0.649	0.819	0.910	0.342	0.837
Hansen p	0.567	0.505	0.629	0.941	0.777
Observations	270	250	230	180	210
Countries	27	25	23	18	21
Notes: See the footnote in Table 5. The instruments used for the equation in levels are the EDP-based consolidation series and the product between the EDP-based consolidation series and each state dummy.					

Table 8 - State-dependent multiplier: robustness tests

$$\text{Equation: } \Delta Y_{it} = \sum_{j=1}^L \alpha_j \Delta Y_{it-j} + \beta \Delta SB_{it} + \sum_{j=1}^S \tilde{\beta}_j \Delta SB_{it} I_j^T(x_{it}^j) + \gamma X_{it} + \delta_t + \mu_i + \varepsilon_{it}$$

	-	Coordinated consolidation	Average pre-crisis government debt	Lagged long-term sovereign spreads	Lagged household leverage ratio
GDP growth (t-1)	0.511*** (0.093)	0.510*** (0.092)	0.501*** (0.085)	0.496*** (0.087)	0.501*** (0.093)
GDP growth (t-2)	-0.172* (0.098)	-0.175* (0.104)	-0.183* (0.097)	-0.172* (0.099)	-0.189** (0.090)
Structural adjustment	0.208 (0.215)	0.212 (0.217)	0.239 (0.159)	0.149 (0.158)	0.152 (0.225)
Marginal impact $\tilde{\beta}_j$ on the coefficient for structural adjustment due to:					
Recession	-0.922*** (0.227)	-0.925*** (0.226)	-0.856*** (0.215)	-0.952*** (0.239)	-0.881*** (0.195)
Non-transfer spending	-0.421*** (0.155)	-0.398*** (0.124)	-0.586*** (0.152)	-0.408** (0.158)	-0.377*** (0.141)
Closed economy	-0.660** (0.272)	-0.675** (0.270)	-0.264 (0.195)	-0.604** (0.272)	-0.722*** (0.248)
Credit stress	0.580** (0.247)	0.593** (0.265)	0.432** (0.191)	0.458 (0.292)	0.642*** (0.199)
Control variable	-	-0.528 (1.131)	-0.022*** (0.004)	0.063 (0.080)	-0.008*** (0.002)
Autocorrelation p	0.649	0.653	0.697	0.964	0.562
Hansen p	0.567	0.554	0.585	0.570	0.638
Observations	270	270	270	267	256
Countries	27	27	27	27	26
Notes: See the footnote in Table 6. The instruments used for the equation in levels are the EDP-based consolidation series and the product between the EDP-based consolidation series and each state dummy.					

Chart 2 – Cumulative distribution of state-dependent multipliers

Estimated via aggregation from the results in Table 7.

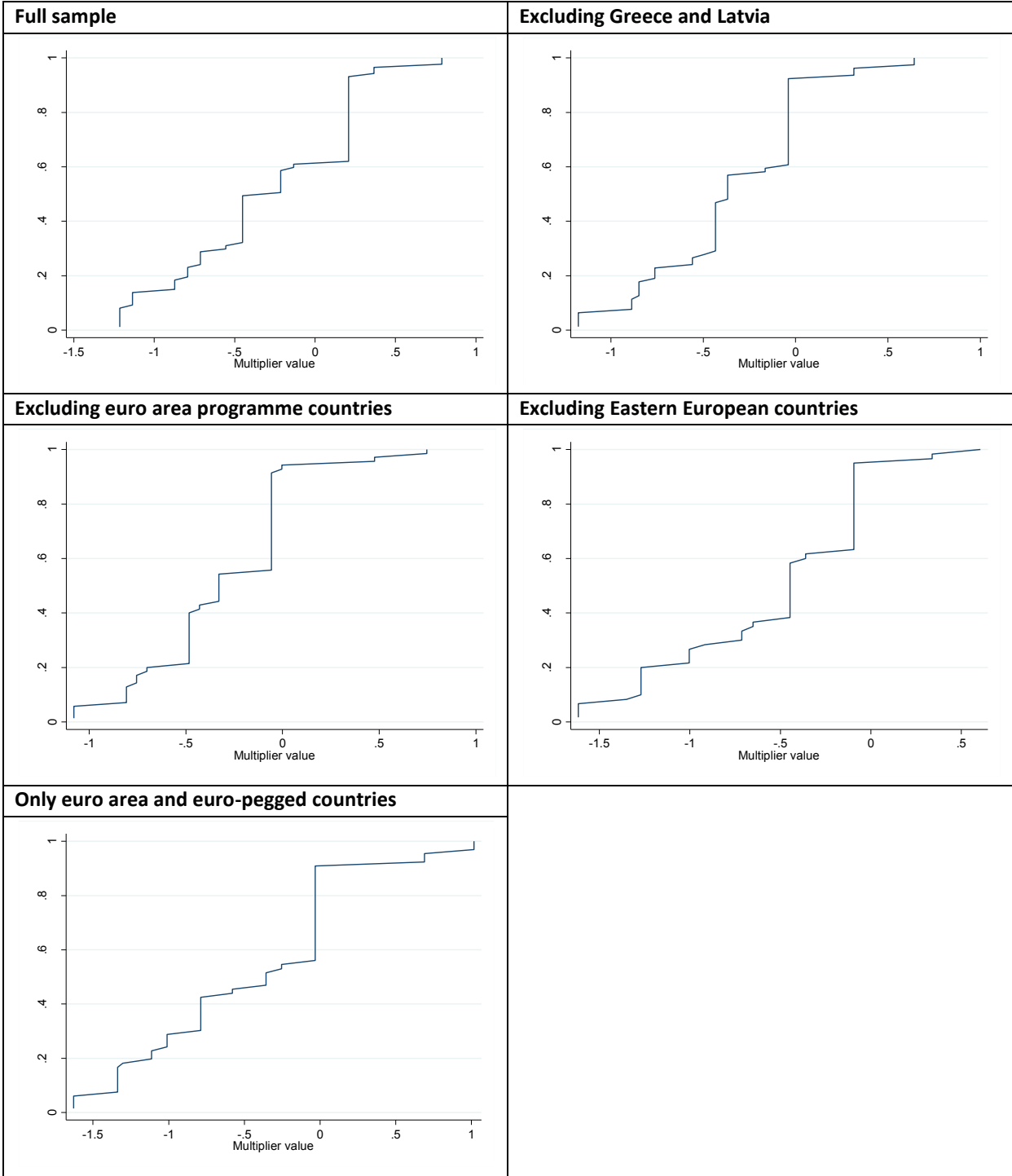


Table 9 – Dynamic multiplier: linear case

$$\text{Equation: } \Delta Y_{it} = \sum_{j=1}^L \alpha_j \Delta Y_{it-j} + \beta_1 \Delta SB_{it} + \beta_2 \Delta SB_{it-1} + \delta_t + \mu_i + \varepsilon_{it}$$

	Contemporaneous coefficient	Lagged coefficient
GDP growth (t-1)	0.623*** (0.159)	-0.225** (0.107)
Structural adjustment	-0.470** (0.239)	0.177 (0.174)
Autocorrelation ρ	0.903	
Hansen p	0.652	
Observations	243	
Countries	27	

Notes:

Two-step system GMM estimator used. The instruments used for the equation in first differences are the second to fourth collapsed lags of GDP growth and the time dummies. The instruments used for the equation in levels are the EDP-based consolidation series, and its first lag. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at 10%, 5% and 1% levels respectively.

Table 10 - Dynamic multiplier – states

$$\text{Equation: } \Delta Y_{it} = \sum_{j=1}^L \alpha_j \Delta Y_{it-j} + \beta_1 \Delta SB_{it} + \beta_2 \Delta SB_{it-1} + \sum_{j=1}^S \tilde{\beta}_{1j} \Delta SB_{it} I_j^r(x_{it}^j) + \sum_{j=1}^S \tilde{\beta}_{2j} \Delta SB_{it-1} I_j^r(x_{it-1}^j) + \delta_t + \mu_i + \varepsilon_{it}$$

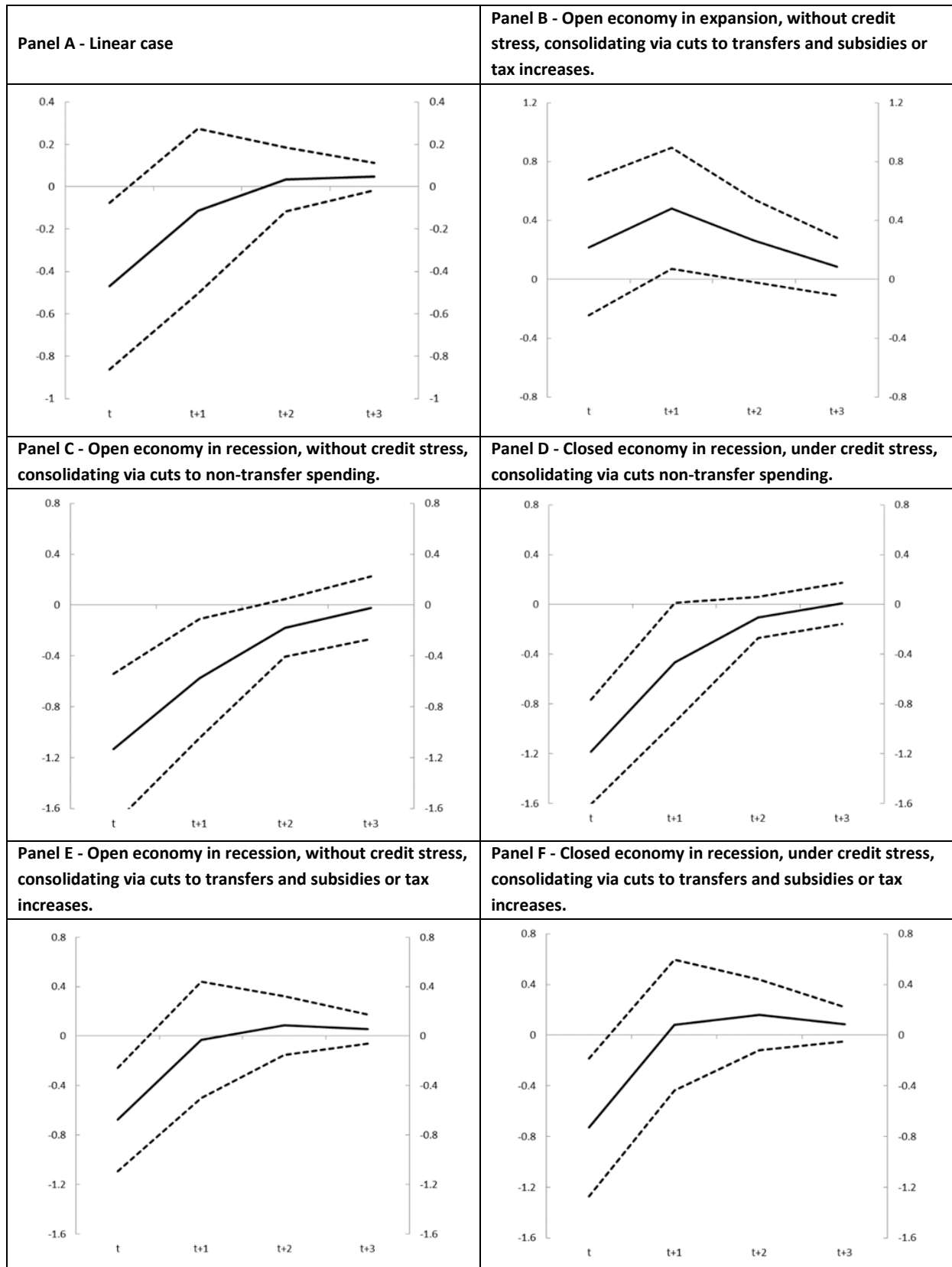
	Contemporaneous coefficient	Lagged coefficient
GDP growth (t-1)	0.613*** (0.130)	-0.154 (0.130)
Structural adjustment	0.217 (0.280)	0.351** (0.159)
Marginal impacts $\tilde{\beta}_{1j}$ and $\tilde{\beta}_{2j}$ on the contemporaneous and lagged coefficients for structural adjustment due to:		
Recession	-0.894*** (0.292)	0.034 (0.236)
Non-transfer spending	-0.456** (0.213)	-0.267* (0.149)
Closed economy	-0.653** (0.322)	-0.191 (0.184)
Credit stress	0.601 (0.368)	0.333 (0.413)
Autocorrelation ρ	0.577	
Hansen p	0.455	
Observations	243	
Countries	27	

Notes:

Two-step system GMM estimator used. The instruments used for the equation in first differences are the second to fourth collapsed lags of GDP growth and the time dummies. The instruments used for the equation in levels are the EDP-based consolidation series, for the baseline state, the product between the EDP-based consolidation series and each state dummy for the various states, and the first lag of each of these series. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at 10%, 5% and 1% levels respectively.

Chart 3 – Impulse response functions to a 1% of GDP fiscal contraction in different states.

Panel A is derived from the linear results in Table 9; Panels B-F are derived from the state-dependent results in Table 10. 90% confidence intervals calculated via delta method.



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