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Panel Data Evidence on the Effects of Fiscal Policy Shocks in the EU New Member States*

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Abstract

We identify fiscal policy shocks in the EU new member states using four different methods. We use panel data techniques to estimate the output response to these shocks. We find that investment and export growth increase after fiscal consolidation and decelerate after fiscal stimulus when the shocks are expenditure-based. In contrast, private consumption does not respond to fiscal policy shocks. Expenditure-based fiscal consolidations reduce wages, supporting the view that fiscal consolidation of such composition enhances the competitiveness and profitability of domestic enterprises. In contrast, we do not find evidence of fiscal shocks affecting households' confidence.

Policy points

- The composition of fiscal policy actions is relevant for their macroeconomic effects. Fiscal stimulus is effective in boosting GDP

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JEL classification numbers: C23, D22, D81, E23, E32, E44, E62.

growth when it is tax-based, but not when it is mainly expenditure-based. In turn, expenditure-based fiscal consolidation does not appear to be costly in terms of GDP growth, but tax hikes reduce GDP growth.
- Reduction in government expenditure is often accompanied by acceleration in exports and private investment growth. Expenditure-based consolidations contribute to improvements in countries' short-term cost competitiveness by limiting wage pressure.
- Discretionary changes in public deficit do not affect households' expectations and consumption.

I. Introduction

The seminal paper by Giavazzi and Pagano (1990) has renewed an argument in the economics profession regarding the effect of fiscal policy shocks on output.[1] The debate has been intensified by the outbreak of the global financial crisis and subsequent fiscal crises in some advanced economies. Both the strength and the sign of the effect have been the subject of debate.

This paper contributes to the debate by analysing that effect using panel data for the EU new member states (NMS) over the period 1995–2011. We find that fiscal consolidation tends to be followed by faster output growth. Conversely, fiscal stimulus tends to be followed by output growth deceleration. Such expansionary fiscal consolidation and contractionary fiscal stimulus are often called 'non-Keynesian'. We do not use this label, as we consider it to be imprecise. Even according to the simplest textbook Keynesian model (i.e. the Samuelson model), fiscal consolidation may boost aggregate demand, and fiscal stimulus may dampen demand provided that the fiscal policy shock has the appropriate composition. However, models that are based solely on neoclassical assumptions typically generate positive fiscal multipliers.[2]

Our motivation to focus on the NMS is twofold. First, these states represent a set of under-studied countries. Most of the existing papers focus on advanced economies. European Union membership and the prospect of joining the euro area have imposed greater fiscal discipline on the NMS. Most of the NMS have also made great efforts to consolidate their public finances after the outbreak of the global financial crisis. Hence, there is a sufficient number of fiscal policy shocks of various compositions and sizes. Second, the topic of the effect of fiscal shocks on output is of great policy relevance for the NMS. Although large fiscal consolidations have been

[1]We define a fiscal policy shock (or innovation) as a discretionary change in the fiscal balance. Fiscal consolidation is a discretionary improvement of that balance, whereas fiscal stimulus consists of its discretionary deterioration.

[2]See, for example, Hall (2009).

undertaken in recent years, the fiscal deficit is still higher than in the pre-crisis period in most NMS.

In addition to using a set of under-studied countries, this paper makes three other contributions to the existing literature.

First, as opposed to the majority of existing studies, the current study does not use a single method to identify fiscal policy shocks but rather applies four alternative approaches to test the robustness of the results obtained. Moreover, to the best of our knowledge, this paper represents the first study on a topic that exploits the concept of underlying fiscal balance (UB). This study is also the first attempt to use the 'action-based' (AB) method that has been proposed to the NMS by the International Monetary Fund (2010).

Second, the effect of fiscal policy shocks on output is only the starting point in our analysis. We also estimate the response of various output components to those shocks. Most studies do not undertake this step, despite the usefulness of evaluating the channels that potentially lead to output expansion after fiscal consolidation and output contraction after fiscal stimulus. We complement the analysis by directly investigating the effect of fiscal policy shocks on wages (i.e. the cost channel) and on households' confidence (i.e. the expectation channel).

Third, we estimate the effects of both types of fiscal policy shocks, whereas other studies typically focus either on fiscal consolidation (most often) or on fiscal stimulus (less frequently). Analysing both types of shocks increases the number of observations and thereby improves the accuracy of the estimates obtained. Meanwhile, this approach allows one to draw more general conclusions (i.e. conclusions that also apply to fiscal stimulus rather than solely to fiscal consolidation).

The main conclusion from the analysis is that the composition of fiscal policy shocks is crucial for their effects.

We find that investment and export growth increase after fiscal consolidation and decelerate after fiscal stimulus when expenditure-based shocks are present. This effect is quite strong. In our preferred specification, investment growth changes by 3.19 percentage points on impact in response to an expenditure-based shock of 1 per cent of GDP, and export growth changes by 1.57 percentage points. The effect of a tax-based shock on investment and export growth has the opposite sign and is economically weaker, amounting to 0.77 and 1.17 percentage points respectively. By contrast, private consumption does not respond to fiscal policy shocks. In line with findings for exports and investment, the response of GDP growth to fiscal shock depends on the composition of the shock. In our preferred specification, the government spending multiplier is equal to –0.56 (not

significantly different from 0), while the tax multiplier is 0.68 (significant at the 5 per cent level).[3]

Direct investigation of the cost channel shows that expenditure-based fiscal consolidations reduce wages. The share of labour remuneration in output falls by 0.19–0.47 percentage points over two years in response to an expenditure-based consolidation of 1 per cent of GDP. This result supports the view that expenditure-based consolidation enhances the competitiveness and profitability of domestic enterprises. By contrast, we do not find evidence of fiscal shocks affecting households' confidence.

Most of the results obtained are robust to changes in the estimator or in the method used to identify fiscal shocks. The importance of shock composition is clearest when the concept of UB is used. We find this method to be the most reliable. Additionally, we do not find evidence that the standard methods used to identify fiscal shocks tend to underestimate fiscal multipliers compared with the AB approach proposed by the International Monetary Fund (2010). However, it must be borne in mind that we use only a 'reduced' version of the AB approach because of data scarcity.

The remainder of the paper is organised as follows. In Section II, we systematise the theoretical explanations of expansionary fiscal consolidation and contractionary fiscal stimulus. We review the empirical research on the topic in Section III. In Section IV, we discuss the methodological issues of the research and describe the results of the panel data analysis. Section V concludes the paper.

II. Theories

The structure of our research reflects the major differences between the theoretical explanations of expansionary consolidation and contractionary stimulus.

The models that allow for those effects can be divided into two groups.[4] These model groups differ in two major respects. The first group focuses on private consumption and interest-rate-sensitive expenditures, whereas the second group focuses on exports and corporate investment. Models in the first group attribute the source of such effects to the concerns of private agents regarding the solvency of the government. According to the models in the second group, these effects may be caused by supply shocks that are induced by fiscal policy shocks.

According to the first type of explanation, both the strength and sign of the output response to fiscal policy shocks depend on households'

[3]Presented multipliers refer to a change in GDP growth within a year after a fiscal shock increasing the deficit by 1 per cent of GDP.

[4]See, for example, Alesina (2010). A more detailed survey of the theory of the effects of fiscal policy can be found in the work of Briotti (2005).

expectations. In the aftermath of fiscal consolidation, households may reach the conclusion that they have had overly pessimistic expectations regarding the cumulative tax burden. In that case, improvement in their expectations may encourage them to increase their spending sufficiently to more than offset the direct negative effect of fiscal consolidation on output. Output will grow if households believe that consolidation considerably increases the cumulative flow of disposable income in their horizon of utility maximisation relative to their previous expectations.

Fiscal consolidation is more likely to be expansionary when public debt is high and growing. In such circumstances, households expect to be soon burdened with the repayment of the debt that they have accumulated.[5] Furthermore, when public debt is high and growing, a rise in taxation to a level causing serious distortions becomes increasingly likely.[6] A sufficiently large fiscal consolidation would dispel both of these concerns. Conversely, an increase in the fiscal deficit could strengthen households' pessimistic expectations.

The effect of fiscal policy shocks on output may also depend on the public expenditure to output ratio. If this ratio is low, then the increase in public expenditure is offset to a considerable degree by the decrease of private consumption. Households are aware that the government is unlikely to reduce public expenditure until its financing becomes a problem; thus, they consider the increase to be permanent. Each subsequent increase in government spending leads to a weaker decrease in private consumption and, in effect, a stronger increase in aggregate demand because higher expenditures indicate that a greater proportion of households consider its further increase to be temporary. However, if public expenditure exceeds a certain threshold, then households may cease to believe in the temporary nature of its previous increases. As the expected cumulative tax burden increases sharply, households tend to reduce their consumption considerably. In effect, increased public expenditures are associated with a decrease in aggregate demand.[7]

According to the first type of explanation, fiscal policy shocks may also have an effect on output because of their influence on interest rates and thus on interest-rate-sensitive private expenditures. When public finances raise households' concerns, fiscal consolidation may crowd in private expenditures much more strongly than in 'normal' times by the substantial decrease in the previously high currency and country credit risk premium.[8] Fiscal stimulus should have the opposite effect.

[5]See, for example, Sutherland (1995).
[6]See, for example, Blanchard (1990).
[7]See, for example, Bertola and Drazen (1993).
[8]See, for example, Miller, Skidelsky and Weller (1990).

Let us now turn to the second type of explanation. Fiscal policy shock may induce supply shocks that lead to changes in output. In particular, fiscal policy shock may trigger changes in wages. The sign of this supply shock depends on the composition of the fiscal policy shock. Reductions in expenditures – particularly reductions in wages and salaries – or reductions in taxes reduce wages, whereas increased expenditures or higher taxes increase wages. The former shocks enhance the competitiveness of domestic enterprises and increase their profits and thus their capacity and propensity to invest. The latter shocks have the opposite effect.[9]

Based on the major differences between the theoretical explanations of expansionary consolidation and contractionary stimulus, we undertake two steps beyond the standard analysis of the effect of fiscal policy shocks on output. First, we estimate the effect of fiscal policy shocks on various output components. Second, we directly investigate the effect of fiscal policy shocks on labour costs and households' confidence.

III. Previous empirical studies

The experience of Denmark in 1983–86 and Ireland in 1987–89 triggered numerous empirical studies of the effect of fiscal policy shocks on output. The experience of these two countries was thoroughly analysed in the seminal paper by Giavazzi and Pagano (1990). Many more episodes of expansionary fiscal consolidation or contractionary fiscal stimulus have been identified and discussed since that seminal research.

As the next step, analyses of the experiences of a wide group of countries have been undertaken. Our paper belongs to that strand of the literature; that is, the current study exploits multiple countries rather than only one country.

Those analyses were initially based on simple descriptive models and were focused on the sustainability of fiscal consolidation rather than on its effect on output.[10] Gradually, more emphasis has been placed on estimating private consumption or investment equations. Those equations have been used to evaluate the channels that make fiscal consolidations expansionary or fiscal stimuli contractionary. Such evaluations began with estimations of single equations that were constructed on an ad hoc basis.[11] Subsequently, the multi-equation approach, in the form of the structural vector autoregression (VAR) framework, began to be applied.[12] We do not use the structural VAR framework because of the short time frame of the analysed panel.[13] Rather, we use panel data techniques to estimate the effect of fiscal

[9]See, for example, Alesina et al. (2002) or Lane and Perotti (2003).

[10]See, for example, McDermott and Wescott (1996).

[11]See, for example, Giavazzi, Jappelli and Pagano (1999).

[12]See, for example, Perotti (2002).

[13]Even resorting to quarterly data (which are available for most of the variables that we consider from 1999) would not solve the problem because it would require deseasonalising the fiscal data, which would

policy shocks on output and its various components as well as on labour costs and households' confidence.

The global financial crisis has recently given momentum to a new wave of research on the effects of fiscal policy. Notably, a dynamic stochastic general equilibrium (DSGE) framework has been extensively used to show that fiscal multipliers exceeding 1 are possible when the central bank is constrained by the zero lower bound (ZLB).[14] However, even with the ZLB binding, fiscal consolidation may prove to be expansionary and fiscal stimulus to be contractionary if the fiscal policy shock is sufficiently persistent,[15] if long-term interest rates depend strongly on public debt[16] or if the liquidity trap is not caused by a fundamental shock but rather by households' pessimism.[17] We do not use the DSGE framework but rather leave that approach for a future study because the ZLB has no policy relevance for the NMS; indeed, it has never been binding in the NMS. Furthermore, both productivity growth and inflation expectations in the NMS indicate that there is no serious risk of the ZLB becoming binding in the foreseeable future (with the possible exception of the Czech Republic).

The main conclusions that one can draw from empirical studies of the effects of fiscal policy shocks appear to support our choice of analysed countries and of the structure of the research. The following conclusions are made:

1. Fiscal consolidations are often followed by accelerated output growth. Giudice, Turrini and in 't Veld (2003) report that approximately half of the consolidations in Europe have had this feature. In our sample, growth accelerations after fiscal consolidations were even more frequent (34 out of 58 cases; see Figure 1). Conversely, fiscal stimuli were more often followed by growth decelerations (42 out of 76 cases).
2. Growth acceleration after fiscal consolidation is driven by both private consumption and investment, although the growth rate of the latter increases much more than that of the former.[18] The acceleration of investment growth is preceded by a decrease in the share of labour

clearly be a difficult task, as quarter-on-quarter changes in government revenues depend on both economic performance and tax collection legislation. Seasonality patterns are affected by, for example, changes in the legislated timing of tax collection. These changes have been more frequent in the NMS than in advanced economies. Therefore, standard 'mechanical' deseasonalising could lead to unsatisfactory results in the case of the NMS. The existing VAR models estimated based on quarterly data for single NMS countries are plagued by a poor quality of estimates (which manifests in wide confidence intervals for the impulse response function), which means that strong conclusions cannot be drawn (see Mirdala (2009) or Franta (2012), for example).

[14]See, for example, Eggertsson (2009 or 2011), Christiano, Eichenbaum and Rebelo (2011) or Woodford (2011).

[15]See, for example, Woodford (2011), particularly figure 3, or Cwik and Wieland (2011).

[16]See, for example, Costa Carvalho (2009) or Corsetti et al. (2012).

[17]See, for example, Mertens and Ravn (2010).

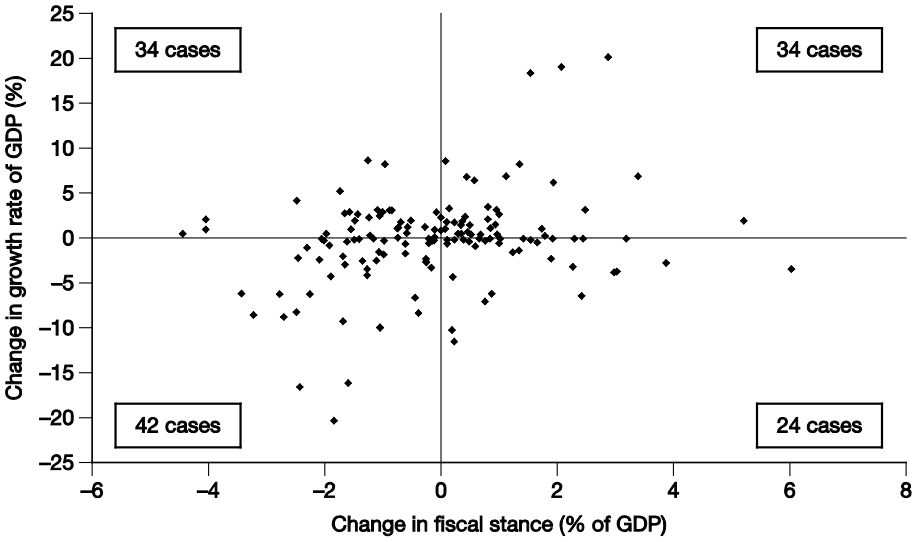
[18]See, for example, Alesina, Perotti and Tavares (1998) or Broadbent and Daly (2010).

remuneration in output.[19] To verify the robustness of these findings for the NMS, we estimate consumption, investment and labour cost equations (among other equations).

3. Some evidence suggests that the change in interest rates is an important factor leading to expansionary fiscal consolidation or contractionary fiscal stimulus.[20] Thus, in the basic regressions, we do not control for the effect of interest rate changes on output and investment (see also conclusion 8).
4. Fiscal consolidations are more likely to be expansionary, and fiscal stimuli are more likely to be contractionary, in open economies than in closed economies.[21] This finding and the theory summarised in Section II justify the inclusion of the exports equation among the equations that we estimate. Our sample appears to be suitable for checking the robustness of this finding because all the NMS are open economies, so export performance may be vital for their GDP growth.

FIGURE 1

Correlation between fiscal policy shocks and changes in GDP growth rate



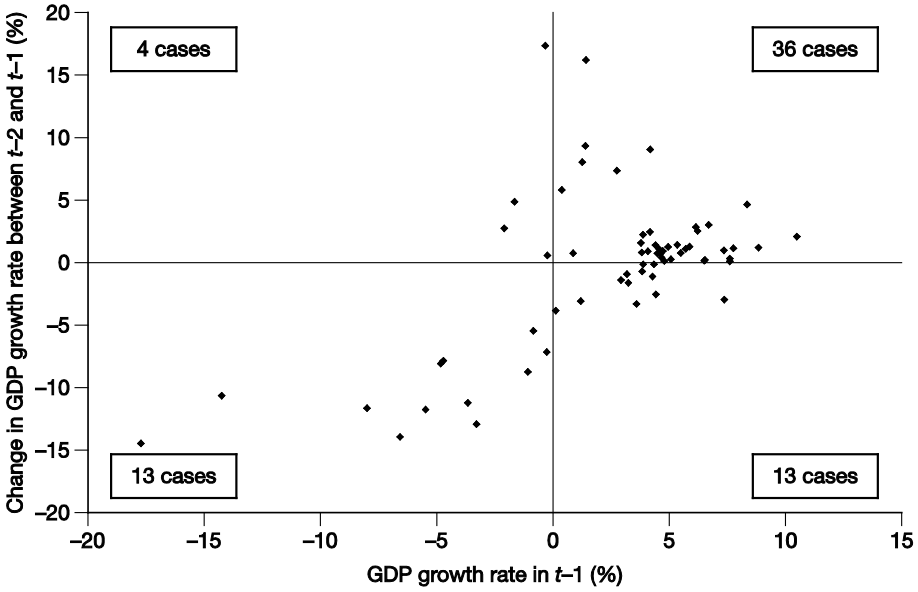
Note: Change in growth rate of GDP after a fiscal shock occurring at time t is measured as the difference between the average GDP growth rate in years t and t+1 and the growth rate in year t−1. Fiscal stance is measured by the underlying balance (see Section IV.1). Positive values for fiscal stance changes refer to consolidation and negative to stimulus.
Source: Authors' calculations based on data from AMECO, the European Commission's annual macroeconomic database.

[19]See, for example, Alesina and Ardagna (1998).
[20]See, for example, Baldacci and Kumar (2010) and Alesina and Ardagna (2013).
[21]See, for example, Hemming, Mahfouz and Schimmelpfennig (2002) or Ilzetzki, Mendoza and Végh (2013).

5. Consolidations are expansionary primarily when external economic conditions are favourable,[22] which calls for careful controlling of these conditions in empirical analyses and suggests the importance of the export channel for expansion after fiscal consolidation. We control for these conditions. We estimate the exports equation and directly study the cost channel that is likely to make exports important. By contrast, weak domestic demand in the period preceding fiscal consolidation does not present an obstacle to growth acceleration[23] and may even favour expansion.[24] This tendency sharply contrasts with the popular claim[25] that fiscal multipliers tend to be high when capacity utilisation is low. Our study may contribute to the evaluation of this controversy because a significant number of consolidations in the NMS were undertaken after a decline in output or a weakening of output growth (30 out of 66 cases of consolidation; see Figure 2).

FIGURE 2

GDP growth rate and its change in periods preceding consolidations

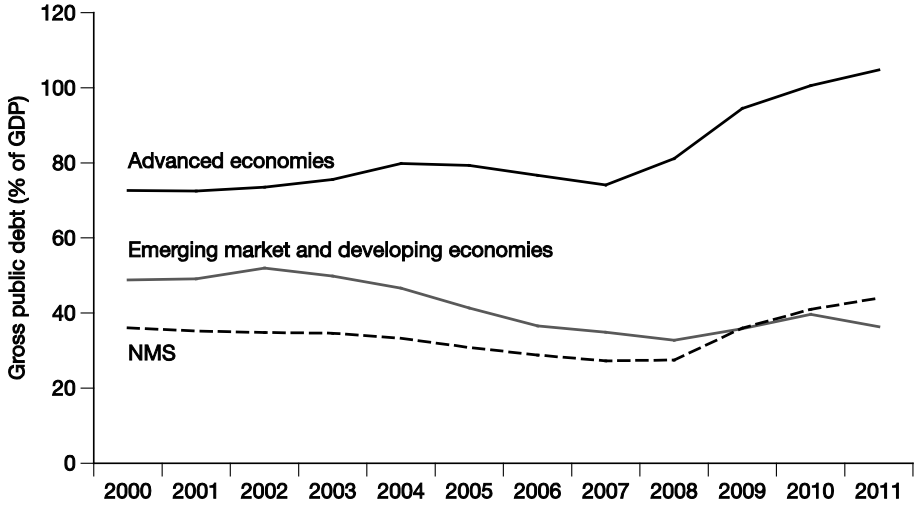


Source: Authors' calculations based on data from AMECO, the European Commission's annual macroeconomic database.

[22]See, for example, McDermott and Wescott (1996).
[23]See, for example, Alesina and Perotti (1997).
[24]See, for example, Segura-Ubiergo, Simone and Gupta (2006).
[25]See, for example, DeLong and Summers (2012).

FIGURE 3

Gross public debt in selected groups of countries



Source: International Monetary Fund's World Economic Outlook (WEO) database.

6. It follows from most studies that fiscal consolidations are more often expansionary when they are sustained[26] and large.[27] Some of these studies note that expansionary consolidations are particularly frequent when public debt is high[28] or when public debt is rapidly growing.[29] In the NMS over the period 2000–11, public debt was lower than average in emerging economies and in advanced economies (see Figure 3); however, public debt showed rapid growth in some periods (see also conclusion 10).
7. Fiscal consolidations are more often sustained and expansionary if they are based on expenditure reduction rather than on tax increases.[30] We carefully investigate the relevance of the composition of fiscal shock to its effects in the NMS.
8. The central bank lowers interest rates in response to expenditure-based fiscal consolidations. Although central bank reactions follow such consolidations rather than tax-based consolidations, the difference in the effects of both types of consolidations cannot be attributed solely to changes in monetary policy.[31] Studying the NMS' experiences is helpful in verifying the robustness of this finding. Most NMS have had a fixed

[26]See, for example, Alesina and Perotti (1997).
[27]See, for example, Giavazzi and Pagano (1996).
[28]See, for example, Bhattacharya (1999) or Ilzetzki, Mendoza and Végh (2013).
[29]See, for example, Giavazzi, Jappelli and Pagano (2000).
[30]See, for example, Alesina, Perotti and Tavares (1998) or Tsibouris et al. (2006).
[31]See, for example, Alesina and Ardagna (2013) or Alesina, Favero and Giavazzi (2012).

exchange rate or have joined the euro area; thus, such countries have had no independent monetary policy.

9. The composition of fiscal consolidation is of far greater importance in terms of its effects than in terms of its size. Expansionary consolidations are typically focused on reductions in wages, subsidies or transfers to households.[32] However, with respect to merely consumption (and thus the expectation channel), the size of the consolidation plays a crucial role.[33] We verify the relevance of the size of fiscal policy shocks to the effect on consumption and households' confidence.
10. Most empirical studies analyse advanced economies. In this paper, we consider the NMS, which have received less research attention. These countries appear to have been especially prone to expansion after fiscal consolidation and to contraction after fiscal stimulus, not only because of their aforementioned openness but also because of high levels of uncertainty regarding the sustainability of their public finances.[34] Such states often experienced substantial duress at debt levels that would be perceived to be easily manageable in advanced economies.[35] Several descriptive analyses covering the NMS confirm that both the composition[36] and the size of consolidations[37] are relevant to output response. Moreover, expenditure-based consolidations have proved to be more successful in debt reduction in the NMS than tax-based consolidations[38] or comparable consolidations in advanced economies.[39] We conduct a more detailed analysis than in previous empirical studies covering the NMS. To the best of our knowledge, this study is the second attempt (after Rzońca and Ciżkowicz (2005)) to investigate the response of output components to fiscal policy shocks in the NMS.[40] Moreover, we are the first to use new measures of fiscal shocks (i.e. UB and the 'reduced' AB approach) for the NMS, allowing us to check the robustness of the results to changes in the method applied to identify fiscal policy shocks, which is a topic that has received a great deal of attention in many recent studies on advanced economies. Finally, our research involves the first attempt for the NMS (and one of the first for

[32]See, for example, Alesina and Perotti (1997), von Hagen, Hughes Hallett and Strauch (2002) or Alesina and Ardagana (1998 or 2010).

[33]See, for example, Giavazzi et al. (2005).

[34]See, for example, Gupta et al. (2002).

[35]See, for example, Reinhart, Rogoff and Savastano (2003).

[36]See, for example, Rzońca and Ciżkowicz (2005) or Horváth et al. (2006).

[37]See, for example, Segura-Ubiergo, Simone and Gupta (2006) or Neicheva (2007).

[38]See, for example, Purfield (2003).

[39]See, for example, Afonso, Nickel and Rother (2006).

[40]Compared with the work of Rzońca and Ciżkowicz (2005), we use longer data series and a broader robustness check (with respect to the methods used to identify fiscal policy shocks and the estimators that are applied).

any countries) to directly validate the existence of the cost and expectation channels.

Before concluding this section, we must emphasise that none of the aforementioned studies considers output expansion after consolidation and output contraction after fiscal stimulus to be certain. In the literature, the prevalent view is that output contraction is more plausible in response to fiscal consolidation and that output expansion is more likely in response to fiscal stimulus. We do not attempt to challenge this view. However, it follows from most empirical studies that the output response to fiscal policy shocks is modest. The tax multiplier hardly exceeds ½ and the expenditure multiplier hardly exceeds 1.[41]

IV. Econometric analysis

In this section, we use panel data estimation to estimate the effects of fiscal policy shocks in the NMS over the period 1995–2011. First, we briefly describe the methods that we use to identify fiscal policy shocks. Next, we present the data, the specification of the equations and the estimation techniques used. Finally, we provide the results of the estimation.

1. Fiscal policy shocks

To properly analyse the effect of fiscal shocks on the economy, one must distinguish between changes in the budget balance triggered by cyclical fluctuations of government spending or revenue and changes resulting from the discretionary actions of policymakers. Only the latter category may be exogenous to output growth and thus can be used as an explanatory variable for the variation in GDP growth. There are several approaches to identifying fiscal policy shocks.

The most popular approach involves examining the cyclically-adjusted primary balance (CAPB), which is used as the main indicator of the fiscal policy stance by international institutions such as the OECD or the European Commission. In this paper, we apply the CAPB with the output gap calculated using the production function approach, as it is better anchored in economic theory than is the approach based on filters (such as the Hodrick–Prescott filter). Nevertheless, this choice reduces the number of observations, as output gap estimates that are based on the production function are not always available.

Although the CAPB method is conceptually simple and allows for cross-country comparisons based on data availability, the method should be used

[41]See, for example, Blanchard and Perotti (2002), Hall (2009), Barro and Redlick (2011), Ramey (2011) or Gechert and Will (2012).

with caution, as observed by the International Monetary Fund (2010) and by Girouard and André (2005). To account for this observation in this paper, we also use the UB concept that was developed by Joumard et al. (2008). The UB is the CAPB corrected for changes in net capital transfers, a proxy for government one-off transfers. Typically, such one-off transfers are shown in the CAPB as periods of sizeable fiscal shocks. The correction leading to the UB is easy to apply and ensures consistency in the identification of one-off transfers across time and countries.[42]

The third method that we use is based on a simplified growth accounting method proposed by von Hagen (2003). This approach (HAGEN) does not require estimates of government spending or tax elasticities and potential GDP. This feature is important if one analyses countries that have undergone economic transition and that have not since completed a sufficient number of business cycles to provide reliable estimates of those elasticities. However, this method may be oversimplified, as it assumes that aggregate government expenditures and revenues react to business-cycle fluctuations in the same manner across countries.

We also attempt to use a fourth method, the AB method proposed by the International Monetary Fund (2010).[43] This method concentrates on the actions (legislation changes) that are implemented to change the fiscal balance regardless of the recorded changes in the balance. This method allows identification of fiscal policy shocks *ex ante*, not *ex post* as in the case of other methods. However, this method has at least three serious drawbacks. First, it implicitly assumes that economic agents make decisions based on the government's plans rather than on the observed effects of actions, although a government may tend to withdraw or modify its plans through the budget year. These modifications may be caused not only by unpredicted economic development (which would lead to bias when using *ex-post* fiscal shock measures) but also by social pressure or erroneous preliminary estimates of an action's effects. Second, this method also ignores the tendency that some channels through which fiscal policy affects the economy work as a function of actual rather than announced changes; for example, labour supply is likely to increase after a reduction in transfers to households rather than after the announcement of such a reduction. Third,

[42]Another step to improve CAPB reliability would be to adjust it for balance changes driven by asset price movements, which is an effect that is not considered in the CAPB estimates provided by the OECD or the European Commission (see Tagkalakis (2009), for example). The problem appears to be on researchers' agenda (see Morris and Schuknecht (2007), for example), and the International Monetary Fund recently began publishing data on structural fiscal balance, i.e. the CAPB adjusted for the effect of asset price movement. Unfortunately, the data for the NMS are still too scarce to apply the concept of structural fiscal balance in this paper. Even if corrected for one-off transfers and asset price changes, the CAPB may fail to provide an accurate estimate of the fiscal stance in periods in which the values of certain taxes or expenditure elasticities differ from those estimated for 'normal' times.

[43]See also Devries et al. (2011).

the AB approach requires discretion, as detailed and coherent data on the planned effects of fiscal actions (and the relevant intentions of policymakers) are rarely reported on an annual basis. This problem is particularly severe in the case of emerging economies. Because of the absence of appropriate data, we are unable to strictly follow the methodology proposed by the International Monetary Fund (IMF). However, to account for the IMF's critique of the standard measures of fiscal policy shocks, we propose a 'reduced' version of the AB approach. Rather than identifying the exact size of the planned deficit changes that result from government actions, we create a variable that takes values in the set {–1, 0, 1}, where –1 represents fiscal stimulus, 0 represents no notable action being taken and 1 represents consolidation.[44] In the next step, we compare our reduced AB fiscal shocks with the recorded changes in UB to find the episodes in which the two methods yield results that are qualitatively the same. Finally, in the regression analysis, we test whether a potential inconsistency between UB and 'reduced' AB shocks is relevant to the results obtained.[45]

2. Data

We use panel data recorded on an annual basis for 10 NMS (i.e. Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia) over the 1995–2011 period. The data on fiscal variables (including the CAPB estimates), national accounts data and labour market statistics (labour productivity, compensation and unemployment) are obtained from the European Commission's AMECO database.[46] The data concerning the consumers' confidence indicator originate from the European Commission's surveys and the data on the consumer price index come from the IMF's International Financial Statistics (IFS) database. A detailed description of each variable used can be found in the online appendix.[47] The data do not cover the entire period for all countries; hence, the estimated models are based on an unbalanced panel.

In using annual data, we follow Corsetti, Meier and Müller (2012), who argue that discretionary changes in fiscal policy are usually not implemented

[44]In cases in which we were able to obtain estimates of the planned budgetary effect of an action, we coded our fiscal shock variable in the following manner: 1 (–1) if the consolidation (stimulus) accounted for no less than 0.5 per cent of GDP and 0 in the remaining cases. To obtain data on the reduced AB fiscal shocks, we used the information from the OECD, IMF and European Commission surveys and other available country reports.

[45]In fact, our approach to AB fiscal shocks allows us to avoid the possible truncation bias that is present in regressions using the original IMF estimates. The bias occurs because the IMF identifies only periods of fiscal consolidations. Thus, all cases of fiscal stimulus are coded as 0 by the IMF regardless of their size – a problem that is noted in Perotti (2012).

[46]With the exception of labour compensation in Poland for years 1995–99, where the data come from the OECD.

[47]http://www.ifs.org.uk/docs/fsjun14_borysetal_appendix.pdf.

on a quarterly basis.[48] However, the main reason that we do not base regressions on quarterly data is the scarcity of such data (namely, quarterly estimates of the CAPB and UB are not available for the NMS) and their questionable quality for the countries analysed.

3. Specification of equations

As a starting point, we estimate the effect of fiscal policy shocks on GDP growth. We include both current and lagged fiscal policy shocks (*fis_bal*) in the regression, as suggested by Alesina and Ardagna (2013). The rationale for such a lag structure is the focus on the short-term rather than long-term influence of fiscal policy shocks on output growth.[49] We then introduce lagged real GDP growth to capture the persistence of this variable.[50] We also control for changes in external conditions proxied by the growth rate of total real GDP in the EU27 countries.[51] Finally, we add the artificial variable *art_exp* distinguishing between expenditure- and tax-based fiscal policy shocks. The variable *art_exp* is equal to the *fis_bal* variable if the contribution of government expenditure reduction (increase) to fiscal consolidation (stimulus) is at least 50 per cent, and it is 0 otherwise. Furthermore, in models in which the fiscal shock is identified as a change in the UB, we add the variable *art_ab_ub*. This variable takes the value of the *fis_bal* variable when indications of UB and AB fiscal policy shocks are consistent, and it is 0 otherwise.[52]

Hence, we estimate the following equation:

[48]See also Born and Müller (2012).

[49]It must be emphasised that a possible output contraction in response to fiscal consolidation upon impact and after a one-period delay should be followed by output expansion, if the fiscal deficit is indeed costly in terms of output level (or even growth) in the steady state (see, for example, Fischer (1993), Elmendorf and Mankiw (1999) or Friedman (2006)). A complete impulse response analysis is needed to answer the question of when the possible costs of fiscal consolidations are outweighed by the long-term benefits. This question is fundamental, but it is beyond the scope of this paper, which focuses on the short term.

[50]Another reason is that lagged variables reduce the potential consequences of spurious regression outcomes, as suggested by Hamilton (1994).

[51]In general, one may also want to control for the stance of monetary policy by including a variable that corresponds to interest rate changes. However, the presented theory suggests that interest rate changes are among the potential channels that lead to output expansion after fiscal consolidation and to output contraction after fiscal stimulus. Thus, controlling for them would not be appropriate here. Nevertheless, as a robustness check, we added a real short-term (three-month) interest rate as a regressor. The addition of this regressor did not change the basic results; thus, the expansionary fiscal consolidations and contractionary fiscal stimuli were not driven by the interest rate channel.

[52]To be precise, we assume that the results for the AB and the UB are mutually consistent in the case in which (i) both methods record fiscal actions of the same sign and the absolute value of the UB fiscal shock exceeds 0.5 per cent of GDP or (ii) no fiscal action was taken according to the AB approach and the absolute value of the UB shock is less than or equal to 0.5 per cent of GDP.

$$gdp_{i,t} = \mu + \delta_1 gdp_{i,t-1} + \rho_1 gdp\_eu27_{i,t} + \sum_{k=0}^{1} \beta_k fis\_bal_{i,t-k} + \sum_{k=0}^{1} \gamma_k art\_exp_{i,t-k} + \alpha_i + \varepsilon_{i,t} \quad (1)$$

with an additional term on the right when UB shocks are used:

$$+ \sum_{k=0}^{1} \phi_k art\_ab\_ub_{i,t-k}$$

where μ is the intercept, *gdp* is real GDP growth, *gdp_eu*27 is real total GDP growth in the EU27 countries, *fis_bal* is the fiscal policy shock (positive values for consolidation and negative values for stimulus), *art_exp* is an artificial variable that controls for the composition of the fiscal policy shock (expenditure- versus tax-based), *art_ab_ub* is an artificial variable that accounts for possible differences between UB and AB fiscal policy shocks, α represents a time-invariant, country-specific disturbance (individual effect) and ε is random noise. The variable subscripts *i* and *t* represent the country number (from 1 to 10) and year (from 1 to 17) respectively. If tax-based fiscal consolidation is expansionary and fiscal stimulus is contractionary, then at least one of the estimated coefficients β_k in equation (1) should be positive and statistically significant. For expenditure-based adjustment, the relevant terms are $\beta_0+\gamma_0$, describing the immediate output response, and $\beta_1+\gamma_1$, describing a delayed response. To estimate the overall two-period effect of an expenditure-based fiscal policy shock, we test the linear restriction in which $\beta_0+\beta_1+\gamma_0+\gamma_1 = 0$. If the null hypothesis is rejected and the obtained statistic proves positive, then the result will be consistent with the theory of expansionary fiscal consolidation and contractionary fiscal stimulus as described in Section II. We perform a similar test in the case of equations (2)–(6), discussed below.[53] Finally, negative values of ϕ_k would support the claim made by the International Monetary Fund (2010) that the mechanical methods of identifying fiscal shocks (in our case, the UB approach) may be biased towards detecting cases of expansionary fiscal consolidations that are not justified. In turn, positive estimates of ϕ_k would support the hypothesis that widely-announced consolidation (stimulus) is more likely to cause output expansion (contraction) than consolidation (stimulus) that is not announced.

In the next step, we investigate the effect of fiscal policy shocks on various output components. In this part of the analysis, we follow Alesina and Ardagna (2013). Most studies of expansionary fiscal consolidations do

[53]In the case of equations (2), (3) and (5), the test takes exactly the same form. In equations (4) and (6), instead of testing the impact of expenditure-based consolidation, we test the impact of a large consolidation, regardless of its composition (see the description of variables used in equation (4)).

not undertake this step, but it is helpful in evaluating the channels that may cause output expansion. Studies typically merely describe the contribution of various GDP components to its growth after fiscal policy shocks.[54] Some studies focus on the effect of a fiscal policy shock for a single output component, including consumption,[55] investment[56] or exports.[57]

First, we determine whether the export channel is relevant. The channel receives the strongest support in previous empirical studies, as surveyed in Section III. If the channel actually works, then expenditure-based consolidations should boost exports more than tax-based consolidations. The estimated equation has the following form:

$$export_{i,t} = \mu + \lambda_1 export_{i,t-1} + \delta_1 gdp_{i,t-1} + \rho_1 imp\_eu27_{i,t} + \sum_{k=0}^{1} \beta_k fis\_bal_{i,t-k} + \sum_{k=0}^{1} \gamma_k art\_exp_{i,t-k} + \alpha_i + \varepsilon_{i,t} \quad (2)$$

with an additional term on the right when UB shocks are used:

$$+ \sum_{k=0}^{1} \phi_k art\_ab\_ub_{i,t-k}$$

where *export* represents the growth rate of exports at constant prices. The set of control variables is similar to that in the GDP growth regressions; however, here we use the growth rate of imports rather than the GDP growth rate in the EU27 to control for changes in external economic conditions.[58]

Second, to examine whether the investment channel works, we estimate the following equation:

[54]See, for example, Giudice, Turrini and in 't Veld (2003).

[55]See, for example, Giavazzi, Jappelli and Pagano (2000) or Bhattacharya and Mukherjee (2013).

[56]See, for example, Alesina et al. (2002).

[57]See, for example, Devries et al. (2011).

[58]We do not use current GDP growth as a control variable, as it could lead to biased estimates because of reverse causality. Exports are a component of GDP; thus, the acceleration of their growth may automatically translate into the acceleration of GDP growth. For the same reason, we use only lagged GDP growth in the regressions that explain investment and consumption growth. Moreover, because output expansion after consolidation and output contraction after stimulus could be driven through the exchange rate channel, we do not control for changes in the exchange rate in the basic setting. Nevertheless, as an exercise, we ran regressions of equation (2) and included the real exchange rate as a control variable, and we obtained results that are consistent with the basic specification.

$$pinv_{i,t} = \mu + \lambda_1 pinv_{i,t-1} + \delta_1 gdp_{i,t-1} + \rho_1 gdp\_eu27_{i,t} + \sum_{k=0}^{1} \beta_k fis\_bal_{i,t-k} + \sum_{k=0}^{1} \gamma_k art\_exp_{i,t-k} + \alpha_i + \varepsilon_{i,t} \quad (3)$$

with an additional term on the right when UB shocks are used:

$$+ \sum_{k=0}^{1} \phi_k art\_ab\_ub_{i,t-k}$$

where *pinv* represents the real growth of private investment. As in previous regressions, we not only examine parameters β_k and γ_k but also test their joint significance by assuming a null hypothesis of linear restriction: $\beta_0+\beta_1+\gamma_0+\gamma_1 = 0$.

Third, we explore the response of private consumption to fiscal policy shocks. To validate the hypothesis according to which fiscal policy shock should be large to accelerate consumption growth, we include a new artificial variable in the regression: *art_high*. This variable takes the value of the fiscal shock variable if the latter is among the 5 per cent largest consolidations or the 5 per cent largest stimuli in the sample; otherwise, *art_high* is equal to 0.[59] As theoretical considerations presented in Section II suggest that the composition of the shock should matter less for consumption performance than the size of the shock (through the impact on expectations and interest rates), we exclude the *art_exp* variable from the regression. Hence, the regression specification is as follows:

$$pcons_{i,t} = \mu + \lambda_1 pcons_{i,t-1} + \delta_1 gdp_{i,t-1} + \rho_1 gdp\_eu27_{i,t} + \sum_{k=0}^{1} \beta_k fis\_bal_{i,t-k} + \sum_{k=0}^{1} \gamma_k art\_high_{i,t-k} + \alpha_i + \varepsilon_{i,t} \quad (4)$$

with an additional term on the right when UB shocks are used:

$$+ \sum_{k=0}^{1} \phi_k art\_ab\_ub_{i,t-k}$$

where *pcons* represents the real growth rate of private consumption.

The final step in our analysis is the direct investigation of the cost and expectation channels.[60] As explained in Section II, the former may contribute to export and investment growth and the latter largely determines

[59]In the existing literature, it is popular to use fixed thresholds for the size of the fiscal policy shock to recognise it as 'large'. Typically, the thresholds are set to 1.5 per cent of GDP (see, for example, Alesina and Ardagna (2010) or International Monetary Fund (2010)). However, applying this approach to our data sample leads to a problem of collinearity between the *fis_bal* and *art_high* variables. Applying thresholds based on 0.05 and 0.95 data quantiles solves this problem.

[60]We are grateful to an anonymous referee for the suggestion to extend our analysis to this element.

the reaction of consumption to fiscal policy shocks. We draw from Alesina and Ardagna (2013) in the cost channel analysis and from Alesina, Favero and Giavazzi (2012) when examining the expectation channel. Surprisingly, few other studies on the effects of fiscal policy shocks undertake this step.

To verify the cost channel, we estimate the following equation:

$$\begin{aligned} lab\_share_{i,t} = {} & \mu + \lambda_1 lab\_share_{i,t-1} + \delta_1 lab\_prod_{i,t} \\ & + \varphi_1 unemp_{i,t} + \sum_{k=0}^{1} \beta_k fis\_bal_{i,t-k} + \sum_{k=0}^{1} \gamma_k art\_exp_{i,t-k} \\ & + \alpha_i + \varepsilon_{i,t} \end{aligned} \tag{5}$$

with an additional term on the right when UB shocks are used:

$$+ \sum_{k=0}^{1} \phi_k art\_ab\_ub_{i,t-k}$$

where *lab_share* is employee compensation as a share of GDP. The growth rate of labour productivity (*lab_prod*) measured as GDP per person employed and the rate of unemployment (*unemp*) are included to control for cyclical determinants of the dependent variable. In this specification, we are especially interested in the effect of expenditure-based fiscal policy shocks (*art_exp*), which are the driving force of the cost channel according to the theories discussed in Section II. If this channel works, then the sum $\beta_0+\beta_1+\gamma_0+\gamma_1$ should be significantly lower than 0.

To analyse the expectation channel, we estimate the following equation:

$$\begin{aligned} con\_exp_{i,t} = {} & \mu + \lambda_1 con\_exp_{i,t-1} + \delta_1 gdp_{i,t} + \rho_1 hicp_{i,t} + \varphi_1 unemp_{i,t} \\ & + \sum_{k=0}^{1} \beta_k fis\_bal_{i,t-k} + \sum_{k=0}^{1} \gamma_k art\_high_{i,t-k} + \alpha_i + \varepsilon_{i,t} \end{aligned} \tag{6}$$

with an additional term on the right when UB shocks are used:

$$+ \sum_{k=0}^{1} \phi_k art\_ab\_ub_{i,t-k}$$

where *con_exp* is a balance of the consumer confidence indicator at the end of the given year.[61] In this regression, we include the real GDP growth rate (*gdp*), the HICP (harmonised index of consumer prices) inflation rate (*hicp*) and the rate of unemployment (*unemp*). These variables are often perceived by households as common indicators of the current economic situation. Hence, one may treat them as the basis for the formation of household

[61]We use indicators from European Commission surveys. The balance is roughly the difference between the percentage of respondents who are optimistic about the economy and the percentage of respondents who are pessimistic about the economy.

expectations. According to the first of the explanations presented in Section II, sufficiently large fiscal policy shocks would influence household confidence. Therefore, we include an artificial variable that identifies shocks of a large scale (*art_high*), as in the case of the consumption channel.

4. Methodological issues

The estimation of the equations described in the previous subsection may pose several methodological problems. First, because the equations are dynamic in nature, standard panel data estimators such as fixed effects (FE) and random effects (RE) are biased. One approach to addressing this problem is to apply an instrumental variable estimator such as that proposed by Arellano and Bond (1991), the so-called difference estimator, or the estimator proposed by Arellano and Bover (1995), the so-called system estimator. These estimators are asymptotically consistent, but their properties may be unsatisfactory in the case of short samples. As Kiviet (1995) notes, it is possible to correct the bias of the standard estimators without affecting their efficiency. In this paper, we apply a corrected least squares dummy variable estimator (LSDVC) by following the procedure proposed by Bun and Kiviet (2002) and then modifying it for the analysis of the unbalanced panels as detailed by Bruno (2005). Second, the regressors used in equations (1)–(6) may be exposed to an endogeneity problem. This potential problem is controlled to some extent by using estimates of fiscal policy shocks rather than simply changes in the level of the general government deficit; however, the use of these estimates may be insufficient to fully eliminate the endogeneity bias. Again, a possible solution is to apply the instrumental variable estimator; however, the severe bias of this estimator when applied to short samples prevents us from using it in this research. Third, the absence of a sufficient number of observations renders it impossible to allow for the heterogeneity of the structural parameters. If the estimated parameters varied across countries, then the standard approach would be to estimate the model separately for each country with ordinary least squares (OLS) and to average the parameters obtained in this manner.[62] In our case, each of the separate country regressions would be based on 17 or fewer observations, which would make the estimates clearly unreliable. The fourth problem that could affect the results is a possible cross-sectional dependence (or spatial correlation) of the error terms. In the model that is analysed, this possibility is equivalent to the assumption that there are unobserved time-varying omitted common variables that influence individual states. If these unobservable common factors are uncorrelated with the independent variables, then the coefficient estimates based on the

[62]This approach is called the mean group estimator method and was first proposed by Pesaran and Smith (1995).

OLS or FE regression are consistent[63] while the standard error estimates are biased. Therefore, we use the Driscoll and Kraay (1998) non-parametric covariance matrix estimator (DK), which corrects for the error structure spatial dependence as well as heteroscedasticity and autocorrelation.

Considering all of the above-mentioned restrictions, we use four types of panel data estimators: FE, RE, DK and LSDVC. Each of the equations presented in the previous subsection is estimated in 12 different versions; namely, for each of the three main methods of fiscal shock identification, we apply four different estimators. We do realise that the results obtained could be affected by some of the above-mentioned problems and that the conclusions drawn on their basis should be made with caution.

5. Estimation results

Table 1 presents the results of estimating equation (1). They indicate that the GDP growth response to tax-based fiscal policy shocks has a rather Keynesian flavour. The parameter related to the *fis_bal* variable in the case of the CAPB and the UB is negative and significant regardless of the estimator. The assessment changes if one considers expenditure-based fiscal policy shocks. For all three shock identification methods, the coefficient of *art_exp* is larger than zero. (The effect is weakest in the case of the HAGEN shock and strongest for the UB shock.) Given the potential problems with the estimation and identification of the fiscal policy shocks outlined in the previous subsections, we argue that most of the attention should be devoted to the DK and LSDVC estimates with the fiscal policy shocks identified by the UB method. The estimated coefficients indicate that an expenditure-based fiscal consolidation equal to 1 per cent of GDP accelerates output growth by approximately 0.55 percentage points in the same period, whereas the expenditure-based fiscal stimulus has the opposite effect. The calculated total two-period effect is positive for all estimators and fiscal shock measures, but the effect is not significantly different from zero in most cases.

Thus, we find evidence that tax-based fiscal stimuli are more effective in stimulating GDP growth than expenditure-based stimulus. In turn, expenditure-based consolidations do not appear to be costly in terms of GDP growth.

Apart from fiscal policy shocks, GDP growth is also affected by changes in external conditions proxied by the variable *gdp_EU*27. Moreover, the dependent variable shows high levels of inertia. Finally, we do not find

[63]If the unobserved common factors are correlated with the independent variable, then the coefficient estimates become inconsistent. The common correlated effects estimator proposed by Pesaran (2006) is a possible solution. Unfortunately, similar to the mean group estimator, the common correlated effects estimator requires a separate estimation of the model for each country in the sample.

TABLE 1 *The effects of fiscal policy shocks on GDP growth*

	FE			RE			DK			LSDVC		
	HAGEN	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*
gdp_{-1}	0.379***	0.296***	0.333***	0.401***	0.309***	0.342***	0.379***	0.296***	0.333***	0.420***	0.341***	0.374***
	(6.954)	(4.889)	(5.499)	(7.619)	(5.301)	(5.846)	(6.017)	(6.222)	(6.485)	(6.805)	(5.094)	(6.191)
gdp_eu27	1.467***	1.572***	1.515***	1.471***	1.573***	1.518***	1.467***	1.572***	1.515***	1.449***	1.563***	1.501***
	(10.327)	(12.209)	(11.481)	(10.512)	(12.565)	(11.878)	(6.462)	(7.338)	(6.616)	(9.837)	(10.513)	(10.583)
fis_bal	–0.067	–0.728***	–0.702*	–0.087	–0.725***	–0.788**	–0.067	–0.728***	–0.702**	–0.040	–0.695***	–0.682**
	(–0.329)	(–3.641)	(–1.971)	(–0.446)	(–3.887)	(–2.392)	(–0.256)	(–8.960)	(–2.712)	(–0.195)	(–3.783)	(–1.981)
fis_bal_{-1}	0.013	–0.055	0.125	–0.002	–0.037	0.067	0.013	–0.055	0.125	–0.004	0.006	0.162
	(0.057)	(–0.233)	(0.372)	(–0.009)	(–0.167)	(0.212)	(0.090)	(–0.410)	(0.630)	(–0.014)	(0.025)	(0.459)
art_exp	0.452**	0.989***	1.208***	0.475**	0.981***	1.203***	0.452	0.989***	1.208***	0.439*	0.972***	1.237***
	(1.989)	(3.981)	(3.844)	(2.175)	(4.256)	(4.138)	(1.011)	(8.243)	(8.633)	(1.777)	(4.424)	(3.349)
art_exp_{-1}	–0.036	0.097	0.122	–0.051	0.068	0.088	–0.036	0.097	0.122	–0.035	0.032	0.064
	(–0.145)	(0.341)	(0.381)	(–0.211)	(0.255)	(0.294)	(–0.383)	(0.967)	(0.929)	(–0.130)	(0.097)	(0.198)
art_ab_ub			–0.281			–0.188			–0.281			–0.292
			(–0.751)			(–0.552)			(–1.216)			(–0.858)
$art\_ab\_ub_{-1}$			0.010			0.095			0.010			0.017
			(0.029)			(0.292)			(0.077)			(0.045)
constant	–0.416	–0.072	–0.109	–0.509	–0.126	–0.176	–0.416	–0.072	–0.109			
	(–1.015)	(–0.181)	(–0.269)	(–1.266)	(–0.329)	(–0.451)	(–1.397)	(–0.367)	(–0.505)			
N	153	136	134	153	136	134	153	136	134	153	136	134
R^2	0.68	0.67	0.68	0.61	0.67	0.68	0.61	0.67	0.68	0.61	0.67	0.68
F test p-value	0	0	0	0	0	0	0	0	0			
Linear restriction:												
value	0.362	0.303	0.753	0.335	0.287	0.570	0.362	0.303	0.753	0.360	0.315	0.781
p-value	0.0418**	0.1954	0.1834	0.0513*	0.1968	0.2215	0.2753	0.2691	0.0001***	0.0334**	0.1890	0.1302

Note: See next page.

Note to Table 1
The dependent variable is the annual real growth rate of GDP. Definitions of the explanatory variables are given in the online appendix (http://www.ifs.org.uk/docs/fsjun14_borysetal_appendix.pdf). The first row of the table lists the estimators used in the subsequent regressions, while the second row describes the methods used to calculate fiscal policy shocks. We use four types of panel data estimators: fixed effects (FE), random effects (RE), Driscoll–Kraay with corrected standard errors (DK) and a bias-corrected least squares dummy variable (LSDVC). Fiscal policy shocks used in the regressions are obtained in line with three different approaches: underlying balance (UB), von Hagen decomposition (HAGEN) and cyclically-adjusted primary balance (CAPB). Additionally, we test whether a potential inconsistency between UB and 'reduced' AB identification methods is relevant to the results (*art_ab_ub* variable). The linear restriction on parameters being tested is $fis\_bal + fis\_bal_{-1} + art\_exp + art\_exp_{-1} = 0$; the row labelled 'value' gives the value of the left-hand side of this restriction. t-statistics are reported in parentheses. Stars denote estimates significant at 1 (***), 5 (**) and 10 (*) per cent levels.

evidence that the AB approach to fiscal shock identification should lead to results that differ from those obtained with shocks that are identified by the UB changes. We elaborate on this matter later, as this result is shared by most of the subsequent regressions.

The results of estimating equation (2) are included in Table 2 and confirm that the export channel works. The coefficient on *art_exp* is significantly larger than zero, regardless of the estimator, when the shock is identified by CAPB or UB. Conversely, the coefficients on the *fis_bal* variable are largely negative, but this result is less robust than the result for *art_exp*. These coefficients are statistically significant only for CAPB shocks (at a 5 per cent significance level). This finding suggests that in contrast to expenditure-based fiscal consolidations, tax-based consolidations have a negative or neutral effect on export performance. To be precise, in our preferred specification, export growth decelerates by 1.17 percentage points on impact in response to a tax-based fiscal consolidation of 1 per cent of GDP (however, the value is not significantly different from zero). By contrast, an export growth acceleration in response to an expenditure-based consolidation of the same size amounts to 1.57 percentage points. Moreover, the overall two-period effect of expenditure-based consolidation (stimulus) appears to be expansionary (contractionary) if one considers the UB shock estimates. In their case, the statistics of the linear restriction test are positive and significant at a 5 per cent level for three of the four estimators.

The results of estimating equation (3) are reported in Table 3 and indicate that the investment channel also works. Tax-based fiscal consolidation (stimulus) largely has a negative (positive) but statistically insignificant effect on private investment growth (for the CAPB and UB fiscal policy shocks). The effect of expenditure-based fiscal shocks has the opposite sign. In our preferred specification, private investment growth decelerates by 0.77 percentage points on impact in response to a tax-based consolidation of 1 per cent of GDP and accelerates by 3.19 percentage points in response to an expenditure-based consolidation of the same size. As in the case of

TABLE 2 *The export channel: the effects of fiscal policy shocks on export growth*

	FE			RE			DK			LSDVC		
	HAGEN	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*
export$_{-1}$	–0.125	–0.050	–0.147*	–0.097	–0.017	–0.085	–0.125*	–0.050	–0.147*	–0.079	–0.002	–0.105
	(–1.589)	(–0.643)	(–1.779)	(–1.275)	(–0.221)	(–1.060)	(–1.893)	(–0.538)	(–2.167)	(–1.099)	(–0.024)	(–1.346)
gdp$_{-1}$	0.084	–0.220	0.012	0.039	–0.267	–0.093	0.084	–0.220	0.012	0.047	–0.278	–0.035
	(0.516)	(–1.212)	(0.065)	(0.252)	(–1.519)	(–0.528)	(0.698)	(–1.056)	(0.084)	(0.316)	(–1.584)	(–0.210)
import_eu27	0.937***	1.112***	1.029***	0.928***	1.108***	1.048***	0.937***	1.112***	1.029***	0.931***	1.104***	1.025***
	(7.738)	(10.208)	(9.397)	(7.791)	(10.298)	(9.588)	(7.773)	(14.234)	(8.772)	(9.303)	(9.145)	(9.266)
fis_bal	0.421	–1.112**	–1.158	0.530	–0.981**	–1.491*	0.421	–1.112**	–1.158*	0.390	–1.142**	–1.170
	(0.794)	(–2.204)	(–1.322)	(1.044)	(–2.046)	(–1.787)	(1.635)	(–2.789)	(–2.152)	(0.791)	(–2.438)	(–1.376)
fis_bal$_{-1}$	–0.618	–1.132*	–0.876	–0.628	–1.050*	–1.152	–0.618	–1.132**	–0.876*	–0.695	–1.132*	–0.841
	(–1.013)	(–1.910)	(–1.065)	(–1.066)	(–1.831)	(–1.449)	(–1.451)	(–2.749)	(–1.971)	(–1.267)	(–1.826)	(–1.030)
art_exp	0.213	1.646***	2.774***	0.120	1.474**	2.278***	0.213	1.646***	2.774**	0.242	1.665***	2.735***
	(0.355)	(2.637)	(3.578)	(0.210)	(2.501)	(3.088)	(0.401)	(6.411)	(3.149)	(0.343)	(3.114)	(3.084)
art_exp$_{-1}$	0.848	1.204*	2.401***	0.868	1.079	1.889**	0.848*	1.204**	2.401***	0.894	1.171	2.262***
	(1.276)	(1.684)	(2.937)	(1.353)	(1.577)	(2.423)	(2.124)	(3.097)	(5.945)	(1.505)	(1.445)	(2.814)
art_ab_ub			–0.036			0.539			–0.036			–0.035
			(–0.039)			(0.627)			(–0.109)			(–0.042)
art_ab_ub$_{-1}$			–0.592			0.065			–0.592*			–0.587
			(–0.666)			(0.079)			(–2.109)			(–0.650)
constant	4.443***	4.722***	5.169***	4.426***	4.634***	4.780***	4.443***	4.722***	5.169***			
	(3.777)	(4.433)	(4.785)	(3.836)	(4.423)	(4.470)	(7.129)	(8.415)	(7.958)			
N	152	136	134	152	136	134	152	136	134	152	136	134
R^2	0.40	0.50	0.52	0.40	0.50	0.53	0.40	0.50	0.52	0.40	0.50	0.52
F test p-value	0	0	0	0	0	0	0	0	0			
Linear restriction:												
value	0.864	0.607	3.141	0.890	0.522	1.524	0.864	0.607	3.141	0.831	0.562	2.986
p-value	0.0620	0.3020	0.0293**	0.0464**	0.3574	0.2029	0.1184	0.4163	0.0006***	0.0912*	0.3391	0.0220**

Note to Table 2
The dependent variable is the annual real growth rate of goods and services exports. Definitions of the explanatory variables are given in the online appendix (http://www.ifs.org.uk/docs/fsjun14_borysetal_appendix.pdf). The first row of the table lists the estimators used in the subsequent regressions, while the second row describes the methods used to calculate fiscal policy shocks. We use four types of panel data estimators: fixed effects (FE), random effects (RE), Driscoll–Kraay with corrected standard errors (DK) and a bias-corrected least squares dummy variable (LSDVC). Fiscal policy shocks used in the regressions are obtained in line with three different approaches: underlying balance (UB), von Hagen decomposition (HAGEN) and cyclically-adjusted primary balance (CAPB). Additionally, we test whether a potential inconsistency between UB and 'reduced' AB identification methods is relevant to the results (*art_ab_ub* variable). The linear restriction on parameters being tested is $fis\_bal + fis\_bal_{-1} + art\_exp + art\_exp_{-1} = 0$; the row labelled 'value' gives the value of the left-hand side of this restriction. t-statistics are reported in parentheses. Stars denote estimates significant at 1 (***), 5 (**) and 10 (*) per cent levels.

the export channel, the overall two-period effect of expenditure-based consolidation (stimulus) on investment is expansionary (contractionary) if one examines the UB shock estimates.

The results of estimating equation (4) are shown in Table 4 and indicate that there is no robust relationship between private consumption growth and fiscal policy shocks. The coefficients of the current *fis_bal* variable are positive but mostly not significant (with the exception of the DK estimator with the UB impulse). The coefficient on lagged *fis_bal* is insignificant regardless of the estimator and fiscal shock measure used. The situation does not change substantially if one considers only large fiscal policy shocks or those identified by both the AB and UB approaches. Finally, the overall two-period effect is not significantly different from zero in any of the regressions.

Note to Table 3
The dependent variable is the annual real growth rate of private investment. Definitions of the explanatory variables are given in the online appendix (http://www.ifs.org.uk/docs/fsjun14_borysetal_appendix.pdf). The first row of the table lists the estimators used in the subsequent regressions, while the second row describes the methods used to calculate fiscal policy shocks. We use four types of panel data estimators: fixed effects (FE), random effects (RE), Driscoll–Kraay with corrected standard errors (DK) and a bias-corrected least squares dummy variable (LSDVC). Fiscal policy shocks used in the regressions are obtained in line with three different approaches: underlying balance (UB), von Hagen decomposition (HAGEN) and cyclically-adjusted primary balance (CAPB). Additionally, we test whether a potential inconsistency between UB and 'reduced' AB identification methods is relevant to the results (*art_ab_ub* variable). The linear restriction on parameters being tested is $fis\_bal + fis\_bal_{-1} + art\_exp + art\_exp_{-1} = 0$; the row labelled 'value' gives the value of the left-hand side of this restriction. t-statistics are reported in parentheses. Stars denote estimates significant at 1 (***), 5 (**) and 10 (*) per cent levels.

Note to Table 4
The dependent variable is the annual real growth rate of private consumption. Definitions of the explanatory variables are given in the online appendix (http://www.ifs.org.uk/docs/fsjun14_borysetal_appendix.pdf). The first row of the table lists the estimators used in the subsequent regressions, while the second row describes the methods used to calculate fiscal policy shocks. We use four types of panel data estimators: fixed effects (FE), random effects (RE), Driscoll–Kraay with corrected standard errors (DK) and a bias-corrected least squares dummy variable (LSDVC). Fiscal policy shocks used in the regressions are obtained in line with three different approaches: underlying balance (UB), von Hagen decomposition (HAGEN) and cyclically-adjusted primary balance (CAPB). Additionally, we test whether a potential inconsistency between UB and 'reduced' AB identification methods is relevant to the results (*art_ab_ub* variable). The linear restriction on parameters being tested is $fis\_bal + fis\_bal_{-1} + art\_high + art\_high_{-1} = 0$; the row labelled 'value' gives the value of the left-hand side of this restriction. t-statistics are reported in parentheses. Stars denote estimates significant at 1 (***), 5 (**) and 10 (*) per cent levels.

TABLE 3 *The investment channel: the effects of fiscal policy shocks on private investment growth*

	FE			RE			DK			LSDVC		
	HAGEN	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*
$pinv_{-1}$	0.030	0.035	–0.028	0.087	0.086	0.038	0.030	0.035	–0.028	0.160**	0.179**	0.087
	(0.263)	(0.303)	(–0.234)	(0.789)	(0.770)	(0.328)	(0.284)	(0.270)	(–0.245)	(2.207)	(2.192)	(0.972)
gdp_{-1}	1.130***	1.102***	1.310***	1.006***	1.000***	1.149***	1.130**	1.102**	1.310***	0.973***	0.854**	1.129***
	(3.221)	(2.877)	(3.415)	(2.982)	(2.697)	(3.056)	(2.338)	(2.540)	(3.347)	(3.796)	(2.474)	(3.528)
gdp_eu27	3.676***	3.947***	3.606***	3.705***	3.922***	3.691***	3.676***	3.947***	3.606***	3.579***	3.905***	3.519***
	(6.598)	(7.451)	(6.718)	(6.658)	(7.532)	(6.923)	(8.433)	(8.945)	(6.985)	(6.591)	(5.539)	(5.231)
fis_bal	1.212	–0.824	–1.093	0.992	–0.872	–1.723	1.212	–0.824***	–1.093	1.444*	–0.571	–0.771
	(1.450)	(–0.987)	(–0.735)	(1.215)	(–1.107)	(–1.211)	(1.513)	(–3.519)	(–1.441)	(1.720)	(–0.659)	(–0.464)
fis_bal_{-1}	1.978**	1.415	2.010	1.554*	1.385	1.398	1.978**	1.415***	2.010	1.521	1.393	1.948
	(2.215)	(1.456)	(1.471)	(1.778)	(1.480)	(1.066)	(2.318)	(3.836)	(1.117)	(1.599)	(1.146)	(1.212)
art_exp	–0.072	2.206**	3.913***	0.120	2.221**	3.485***	–0.072	2.206***	3.913***	–0.270	2.003*	3.961**
	(–0.079)	(2.156)	(3.065)	(0.135)	(2.317)	(2.880)	(–0.045)	(3.194)	(3.556)	(–0.223)	(1.909)	(2.287)
art_exp_{-1}	–2.143**	–1.330	0.691	–1.812*	–1.397	0.129	–2.143***	–1.330*	0.691	–1.781*	–1.507	0.382
	(–2.186)	(–1.136)	(0.529)	(–1.888)	(–1.252)	(0.103)	(–3.915)	(–2.047)	(0.783)	(–1.723)	(–0.962)	(0.251)
art_ab_ub			–0.123			0.736			–0.123			–0.373
			(–0.079)			(0.504)			(–0.098)			(–0.233)
$art\_ab\_ub_{-1}$			–2.027			–1.033			–2.027			–1.891
			(–1.373)			(–0.763)			(–1.723)			(–1.061)
constant	–5.026***	–6.021***	–5.891***	–5.049***	–5.890***	–6.046***	–5.026***	–6.021***	–5.891***			
	(–2.978)	(–3.522)	(–3.383)	(–3.023)	(–3.526)	(–3.502)	(–4.556)	(–6.069)	(–7.347)			
N	152	136	134	152	136	134	152	136	134	152	136	134
R^2	0.45	0.46	0.46	0.45	0.46	0.47	0.45	0.46	0.46	0.45	0.46	0.47
F test p-value	0	0	0	0	0	0	0	0	0			
Linear restriction:												
value	0.975	1.467	5.52	0.854	1.337	3.29	0.975	1.466	5.52	0.914	1.318	5.520
p-value	0.1542	0.1288	0.018**	0.2046	0.1491	0.0946*	0.4968	0.3257	0.0001***	0.3068	0.2382	0.0247**

TABLE 4 *The consumption channel: the effects of fiscal policy shocks on private consumption growth*

	FE			RE			DK			LSDVC		
	HAGEN	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*
pcons$_{-1}$	0.137	0.299**	0.196	0.201*	0.368***	0.291**	0.137	0.299***	0.196***	0.138	0.299***	0.196**
	(1.101)	(2.134)	(1.459)	(1.718)	(2.768)	(2.346)	(1.344)	(4.039)	(3.850)	(1.569)	(3.480)	(2.241)
gdp$_{-1}$	0.429***	0.198	0.328**	0.377***	0.134	0.232	0.429**	0.198**	0.328***	0.432***	0.198	0.330**
	(2.783)	(1.162)	(2.010)	(2.615)	(0.826)	(1.529)	(2.871)	(2.879)	(6.395)	(4.568)	(1.384)	(2.319)
gdp_eu27	1.513***	1.583***	1.571***	1.504***	1.575***	1.572***	1.513***	1.583***	1.571***	1.522***	1.583***	1.574***
	(7.544)	(8.450)	(8.479)	(7.637)	(8.565)	(8.629)	(7.524)	(6.686)	(7.544)	(4.624)	(4.652)	(5.333)
fis_bal	0.077	0.210	0.854	0.101	0.231	0.637	0.077	0.210	0.854***	0.074	0.210	0.853
	(0.344)	(0.696)	(1.621)	(0.465)	(0.781)	(1.292)	(0.324)	(0.943)	(4.825)	(0.237)	(0.433)	(1.211)
fis_bal$_{-1}$	–0.038	0.121	0.186	–0.028	0.114	0.008	–0.038	0.121	0.186	–0.043	0.121	0.182
	(–0.175)	(0.392)	(0.384)	(–0.133)	(0.383)	(0.018)	(–0.146)	(0.455)	(0.234)	(–0.137)	(0.232)	(0.229)
art_high	0.087	–0.481	–0.710	0.046	–0.532	–0.657	0.087	–0.481*	–0.710***	0.091	–0.481	–0.708
	(0.312)	(–1.242)	(–1.592)	(0.169)	(–1.413)	(–1.585)	(0.203)	(–2.065)	(–3.989)	(0.219)	(–0.688)	(–1.073)
art_high$_{-1}$	–0.074	–0.093	–0.154	–0.127	–0.119	–0.149	–0.074	–0.093	–0.154	–0.064	–0.094	–0.152
	(–0.280)	(–0.248)	(–0.347)	(–0.492)	(–0.326)	(–0.357)	(–0.287)	(–0.425)	(–0.313)	(–0.178)	(–0.128)	(–0.208)
art_ab_ub			–0.783			–0.537			–0.783***			–0.786
			(–1.449)			(–1.085)			(–3.537)			(–1.073)
art_ab_ub$_{-1}$			0.007			0.214			0.007			0.008
			(0.012)			(0.448)			(0.018)			(0.010)
constant	–1.121*	–0.746	–0.749	–1.174**	–0.758	–0.848	–1.121***	–0.746**	–0.749***			
	(–1.927)	(–1.296)	(–1.306)	(–2.069)	(–1.349)	(–1.511)	(–3.804)	(–2.484)	(–3.222)			
N	154	126	134	154	126	134	154	126	134	154	126	134
R^2	0.51	0.56	0.56	0.51	0.56	0.56	0.51	0.56	0.56	0.51	0.56	0.56
F test p-value	0	0	0	0	0	0	0	0	0			
Linear restriction:												
value	0.052	–0.244	0.177	–0.008	–0.305	–0.161	0.052	–0.244	0.177	0.058	–0.244	0.175
p-value	0.8444	0.5304	0.8259	0.9754	0.4123	0.8098	0.8582	0.2526	0.7063	0.8652	0.7448	0.8755

Thus far, we have established that the effects of fiscal policy shocks depend on their composition. Expenditure-based consolidation (stimulus) is less likely than tax-based consolidation (stimulus) to hamper (accelerate) GDP growth. The responses of private investment and exports appear to be the most relevant to the results.

The results of estimating equation (5) are reported in Table 5 and they show that although tax-based fiscal shock is neutral to labour costs, expenditure-based consolidation (stimulus) leads to their decline (rise). The variable *art_exp* has a negative and significant effect in most regressions. This result also holds for the overall two-period effect, as the value of the tested linear restriction is negative and statistically significant in most cases. An expenditure-based fiscal consolidation of 1 per cent of GDP is associated with an overall two-period reduction of the share of labour remuneration in GDP by 0.19–0.47 percentage points.

The results of estimating equation (6) are included in Table 6 and do not support the expectation channel. Most coefficients of the variables *fis_bal* and *art_high* (and their lags) are not significantly different from zero. Unlike in the previous regressions, there is a discrepancy between the results for fiscal policy shocks measured by the UB and the AB. The parameters of *art_ab_ub* are negative and mostly significant, which indicates that a fiscal consolidation (stimulus) recorded by both the UB and the AB is more contractionary (expansionary) than a consolidation (stimulus) recorded by

Note to Table 5
The dependent variable is the share of employee compensation in GDP. Definitions of the explanatory variables are given in the online appendix (http://www.ifs.org.uk/docs/fsjun14_borysetal_appendix.pdf). The first row of the table lists the estimators used in the subsequent regressions, while the second row describes the methods used to calculate fiscal policy shocks. We use four types of panel data estimators: fixed effects (FE), random effects (RE), Driscoll–Kraay with corrected standard errors (DK) and a bias-corrected least squares dummy variable (LSDVC). Fiscal policy shocks used in the regressions are obtained in line with three different approaches: underlying balance (UB), von Hagen decomposition (HAGEN) and cyclically-adjusted primary balance (CAPB). Additionally, we test whether a potential inconsistency between UB and 'reduced' AB identification methods is relevant to the results (*art_ab_ub* variable). The linear restriction on parameters being tested is $fis\_bal + fis\_bal_{-1} + art\_exp + art\_exp_{-1} = 0$; the row labelled 'value' gives the value of the left-hand side of this restriction. t-statistics are reported in parentheses. Stars denote estimates significant at 1 (***), 5 (**) and 10 (*) per cent levels.

Note to Table 6
The dependent variable is the balance of consumers' confidence indicator at the end of a year. Definitions of the explanatory variables are given in the online appendix (http://www.ifs.org.uk/docs/fsjun14_borysetal_appendix.pdf). The first row of the table lists the estimators used in the subsequent regressions, while the second row describes the methods used to calculate fiscal policy shocks. We use four types of panel data estimators: fixed effects (FE), random effects (RE), Driscoll–Kraay with corrected standard errors (DK) and a bias-corrected least squares dummy variable (LSDVC). Fiscal policy shocks used in the regressions are obtained in line with three different approaches: underlying balance (UB), von Hagen decomposition (HAGEN) and cyclically-adjusted primary balance (CAPB). Additionally, we test whether a potential inconsistency between UB and 'reduced' AB identification methods is relevant to the results (*art_ab_ub* variable). The linear restriction on parameters being tested is $fis\_bal + fis\_bal_{-1} + art\_high + art\_high_{-1} = 0$; the row labelled 'value' gives the value of the left-hand side of this restriction. t-statistics are reported in parentheses. Stars denote estimates significant at 1 (***), 5 (**) and 10 (*) per cent levels.

TABLE 5 *The cost channel: the effects of fiscal policy shocks on labour compensation share in GDP*

	FE			RE			DK			LSDVC		
	HAGEN	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*
lab_share$_{-1}$	0.750***	0.854***	0.864***	0.895***	0.922***	0.925***	0.750***	0.854***	0.864***	0.836***	0.872***	0.937***
	(13.432)	(17.569)	(17.583)	(36.235)	(42.595)	(42.698)	(11.652)	(42.056)	(41.684)	(15.330)	(13.144)	(18.920)
lab_prod	–0.056	–0.083***	–0.079**	0.002	–0.037	–0.039	–0.056	–0.083***	–0.079***	–0.060	–0.084**	–0.072**
	(–1.463)	(–2.724)	(–2.579)	(0.050)	(–1.236)	(–1.288)	(–1.603)	(–3.642)	(–3.396)	(–1.369)	(–2.097)	(–2.398)
unemp	–0.181***	–0.222***	–0.223***	–0.170***	–0.166***	–0.156***	–0.181***	–0.222***	–0.223***	–0.208***	–0.231***	–0.246***
	(–4.940)	(–6.850)	(–6.610)	(–5.964)	(–6.708)	(–6.186)	(–4.277)	(–7.018)	(–10.966)	(–4.789)	(–5.234)	(–7.011)
fis_bal	0.006	0.06	–0.033	0.023	0.003	0.039	0.006	0.060	–0.033	0.020	0.070	–0.004
	(0.073)	(0.793)	(–0.231)	(0.264)	(0.039)	(0.263)	(0.303)	(0.592)	(–0.224)	(0.244)	(0.625)	(–0.020)
fis_bal$_{-1}$	0.010	–0.010	–0.101	0.087	–0.058	0.038	0.010	–0.010	–0.101	0.018	–0.003	–0.083
	(0.107)	(–0.122)	(–0.783)	(0.863)	(–0.694)	(0.281)	(0.266)	(–0.341)	(–1.631)	(0.165)	(–0.028)	(–0.532)
art_exp	–0.157	–0.234**	–0.282**	–0.216**	–0.251**	–0.323**	–0.157***	–0.234	–0.282*	–0.151	–0.242	–0.306**
	(–1.503)	(–2.205)	(–2.251)	(–1.991)	(–2.271)	(–2.465)	(–4.551)	(–1.662)	(–2.276)	(–1.388)	(–1.482)	(–2.109)
art_exp$_{-1}$	–0.091	–0.074	–0.052	–0.167	–0.056	–0.026	–0.091	–0.074*	–0.052	–0.080	–0.074	–0.050
	(–0.828)	(–0.717)	(–0.465)	(–1.468)	(–0.508)	(–0.216)	(–1.142)	(–2.027)	(–1.468)	(–0.637)	(–0.530)	(–0.378)
art_ab_ub			0.114			–0.033			0.114			0.094
			(0.801)			(–0.225)			(1.165)			(0.570)
art_ab_ub$_{-1}$			0.109			–0.125			0.109*			0.106
			(0.778)			(–0.922)			(1.899)			(0.747)
constant	12.592***	8.677***	8.222***	6.084***	5.008***	4.807***	12.592***	8.677***	8.222***			
	(5.503)	(4.327)	(4.055)	(5.124)	(4.853)	(4.640)	(5.055)	(9.315)	(8.910)			
N	136	121	121	136	121	121	136	121	121	136	121	121
R^2	0.92	0.95	0.95	0.93	0.95	0.95	0.92	0.95	0.95	0.93	0.95	0.95
F test p-value	0	0	0	0	0	0	0	0	0			
Linear restriction:												
value	–0.231	–0.257	–0.468	–0.273	–0.362	–0.272	–0.231	–0.257	–0.468	–0.194	–0.248	–0.442
p-value	0.0095***	0.0163**	0.0245**	0.0021***	0.0009***	0.1618	0.0021***	0.0016***	0.0000***	0.0398**	0.0972*	0.0554*

TABLE 6 *The expectations channel: the effects of fiscal policy shocks on households' confidence*

	FE			RE			DK			LSDVC		
	HAGEN	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*	*HAGEN*	*CAPB*	*UB/AB*
con_exp$_{-1}$	0.265**	0.229	0.292**	0.448***	0.453***	0.407***	0.265***	0.229**	0.292**	0.348***	0.311***	0.352***
	(2.267)	(1.652)	(2.311)	(4.824)	(4.314)	(3.955)	(3.358)	(2.590)	(2.791)	(3.665)	(2.659)	(3.704)
hicp	–0.567**	–0.961***	–0.970***	–0.654***	–1.052***	–1.038***	–0.567	–0.961	–0.970*	–0.515*	–0.924**	–0.944***
	(–2.246)	(–2.767)	(–3.004)	(–2.700)	(–3.382)	(–3.611)	(–1.592)	(–1.753)	(–1.927)	(–1.666)	(–2.346)	(–2.645)
unemp	0.275	–0.030	0.156	0.155	0.085	0.066	0.275	–0.030	0.156	0.312	0.043	0.213
	(0.698)	(–0.062)	(0.358)	(0.598)	(0.283)	(0.238)	(0.818)	(–0.091)	(0.822)	(0.655)	(0.074)	(0.435)
gdp	1.445***	1.232***	1.058***	1.055***	0.919***	0.904***	1.445***	1.232***	1.058***	1.408***	1.178***	1.017***
	(5.181)	(4.389)	(4.262)	(3.910)	(3.423)	(3.760)	(5.837)	(6.690)	(5.865)	(4.514)	(4.563)	(3.216)
fis_bal	–0.781	–0.935	1.007	–0.355	–0.594	1.519	–0.781	–0.935	1.007	–0.766	–0.942	1.093
	(–1.260)	(–1.117)	(0.711)	(–0.563)	(–0.715)	(1.104)	(–1.116)	(–1.210)	(1.716)	(–1.058)	(–0.948)	(0.598)
fis_bal$_{-1}$	0.180	–0.309	2.209	0.228	–0.104	2.772**	0.180	–0.309	2.209	0.154	–0.312	2.206
	(0.295)	(–0.345)	(1.611)	(0.366)	(–0.116)	(2.098)	(0.414)	(–0.384)	(1.395)	(0.197)	(–0.329)	(1.231)
art_high	–0.569	0.864	1.842	–0.567	0.538	1.957*	–0.569	0.864	1.842***	–0.645	0.834	1.798
	(–0.711)	(0.809)	(1.495)	(–0.698)	(0.504)	(1.704)	(–1.197)	(1.814)	(4.753)	(–0.652)	(0.638)	(0.967)
art_high$_{-1}$	–1.290	0.208	–1.986*	–0.993	0.331	–1.734	–1.290***	0.208	–1.986*	–1.339	0.236	–2.036
	(–1.619)	(0.181)	(–1.664)	(–1.240)	(0.286)	(–1.525)	(–3.730)	(0.235)	(–2.192)	(–1.317)	(0.151)	(–1.293)
art_ab_ub			–3.204**			–3.594***			–3.204***			–3.271
			(–2.240)			(–2.622)			(–5.959)			(–1.551)
art_ab_ub$_{-1}$			–0.433			–1.150			–0.433			–0.380
			(–0.299)			(–0.834)			(–0.443)			(–0.196)
constant	–22.965***	–18.269***	–17.032***	–15.511***	–12.598***	–12.382***	–22.965***	–18.269***	–17.032***			
	(–5.706)	(–3.648)	(–3.732)	(–4.774)	(–3.327)	(–3.611)	(–6.835)	(–4.902)	(–6.584)			
N	123	110	115	123	110	115	123	110	115	123	110	115
R^2	0.48	0.48	0.56	0.50	0.50	0.55	0.48	0.48	0.55	0.49	0.55	0.55
F test p-value	0	0	0	0	0	0	0	0	0			
Linear restriction:												
value	–2.460	–0.171	3.071	–1.686	0.171	4.515	–2.460	–0.171	3.072	–2.596	–0.183	3.061
p-value	0.0037***	0.8740	0.1417	0.0330**	0.8740	0.0121**	0.0444**	0.7918	0.0180**	0.8763	0.8931	0.2558

only one of the methods. This result may be explained in two ways: either the UB is biased towards detecting consolidations with a less negative effect on household confidence compared with the AB, or agents believe that fiscal consolidations are likely to be followed by worsened economic performance and thus tend to form more pessimistic expectations after consolidations that are widely announced.[64]

The results of the regressions discussed above have two common features worth noting. First, the relevance of the fiscal policy shock composition is clearer when the shock is identified by the UB rather than the CAPB. This finding suggests that the previous analyses that applied the CAPB could be biased towards detecting larger fiscal multipliers than are actually the case. Second, with the exception of the expectation channel, we do not find evidence that the UB approach leads to the underestimation of fiscal multipliers compared with the 'reduced' AB approach. This finding is inconsistent with the widely-discussed results in International Monetary Fund (2010). Although we compare not the CAPB but the UB to the AB, it should be noted that the majority of the IMF's theoretical arguments against the CAPB should also be valid for the UB.

In summary, we confirm the results already established in the literature that the output response to fiscal policy shock depends on the composition of the shock. The conclusions from the analysis are also broadly consistent with the existing empirical research concerning the NMS. However, we present a more detailed picture, covering analysis of not only the response of output to fiscal policy shocks but also the response of its components as well as the response of labour costs and households' confidence.

V. Conclusions

The main conclusions from the analysis are as follows:

- The composition of fiscal policy shocks is relevant. Only tax-based fiscal stimulus is effective in boosting GDP growth. In turn, expenditure-based fiscal consolidation does not appear to be costly in terms of GDP growth; it tends to be accompanied by export and private investment growth acceleration.
- Private consumption does not respond to fiscal policy shocks regardless of their size.
- Direct investigation of the cost and expectation channels suggests that the former is of primary importance. Expenditure-based consolidation (stimulus) leads to improvement (deterioration) in the competitiveness and profitability of domestic enterprises, which is consistent with the

[64]As a reminder, the AB detects only announced consolidations, whereas the UB identifies all actions that ended with substantial changes in structural deficit.

results discussed for investment and export responses to fiscal policy shocks. By contrast, we do not find any evidence of fiscal shocks affecting households' confidence.

- Most of the results remain qualitatively unchanged regardless of the shock identification method used. The relevance of fiscal policy shock composition is clearest when the concept of UB is used, which is the method that we find to be the most reliable.
- We take preliminary steps to apply the AB approach to fiscal policy shock identification as proposed by the International Monetary Fund (2010). We do not find evidence supporting the IMF's claim that the mechanical methods for identifying fiscal policy shocks tend to underestimate fiscal multipliers. However, one must bear in mind that we use only a 'reduced' version of the AB approach.

The results should be treated with caution because of the estimation problems that are typical of panel data models, notably the limited number of available observations. Nevertheless, these findings provide further support for the claim that expansionary fiscal consolidation and contractionary fiscal stimulus are possible.

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