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Abstract

We investigate the short-term effects of fiscal adjustment on economic activity in 20 OECD countries from 1970 to 2009. We compare two approaches: the traditional approach based on changes in cyclically adjusted primary balance (CAPB) and the narrative approach based on historical records. Proponents of the latter argue that it captures discretionary fiscal adjustment more accurately than the traditional approach. We propose a new definition of CAPB that takes account of fluctuations in asset prices and reflects idiosyncratic features of fiscal policy in individual countries. Using this new definition, we find that fiscal adjustments always have contractionary effects on economic activity in the short term; we find no evidence of expansionary (non-Keynesian) fiscal adjustments. Spending-based fiscal adjustments lead to smaller output loses than tax-based fiscal adjustment. These results are in line with the literature using the narrative approach, suggesting that the CAPB, when correctly specified, can be used as a measure of fiscal adjustments.

JEL-Code: E130, E220, E620.

Keywords: fiscal policy, fiscal adjustment, narrative approach, cyclically adjusted primary balance.

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1. Introduction

The recent global economic and financial crisis, and the associated austerity reforms, have resulted in a renewed interest in the relationship between fiscal austerity and economic growth. The reason is that many countries have accumulated large government deficits and public debt. As a result, many governments, most notably in the peripheral countries of the Eurozone, have undertaken large spending cuts and tax hikes to improve the sustainability of their public finance. Even in the U.S. and U.K., fiscal adjustment has been at the forefront of academic and policy discussions alike.

Although there is a widespread agreement that a reduction of deficit and debt has important benefits in the long term, there is less of a consensus regarding the short-term effects of fiscal adjustment. In the 1980s, Denmark and Ireland experienced improved growth performance after periods of strict fiscal austerity.[1] Their experience defies the conventional Keynesian theory which predicts negative short-run economic effects of restrictive fiscal policy. Subsequently, Giavazzi and Pagano (1990), Alesina and Perotti (1997), Alesina and Ardagna (1998, 2010) and others investigated this issue and sought to find examples of similar expansionary fiscal adjustments and the conditions under which they prevail. As a result, some argue that fiscal adjustment can stimulate economic growth even in the short term, a phenomenon referred to as 'Non-Keynesian effects' or 'expansionary fiscal contraction'.

Many studies develop theories to explain the existence of expansionary fiscal contractions as well as explore their determinants empirically. Most rely on changes in the cyclically adjusted primary balance (CAPB) to identify fiscal adjustment episodes. The CAPB is an indicator that captures discretionary fiscal policy and other noncyclical factors by excluding the automatic effects of business cycle fluctuations (transfer, tax system, and interest payments) on the budget.[2] However, Guajardo et al. (2011) introduce the narrative approach whereby they use historical documents to identify fiscal adjustments episodes in OECD countries. They fail to identify any expansionary fiscal adjustments and argue that the CAPB measure is methodologically flawed.

In this paper, we build on and extend Guajardo et al. (2011). First, we consider 20

1. According to Giavazzi and Pagano (1990), the sharp fiscal contractions (primary fiscal deficit reduction equal to 10% of GDP) for 1983-1986 in Denmark and (primary fiscal deficit cut equal to 7% of GDP) for 1987-1988 in Ireland were accompanied by revived growth of average 3.6% and 3.7% in real GDP respectively with the improvement in the primary budget.

2. The CAPB is calculated by taking the actual primary balance (balance minus net-interest payment) and subtracting the estimated effects of business cycles on the budget.

OECD countries so that our scope is similar to that of their paper. Second, in contrast to their approach, we use the CAPB instead of the narrative approach. However, we modify the CAPB measure to take account of the problems that Guajardo et al. (2011) point out. Among the several alternative measures of CAPB, we follow the method suggested by Blanchard (1993; see also Alesina and Perotti, 1995, and Alesina and Ardagna, 1998, 2010, and 2012). However, contrary to those studies, we construct the CAPB measure so that it reflects fluctuations in asset prices, as these strongly affect revenues, and it takes into account the heterogeneity of fiscal policy for each country. Using this new measure of fiscal adjustment, we obtain results that are very similar to those that Guajardo et al. (2011) obtain with the narrative approach.

This paper makes three main contributions. First, we develop and refine the measurement of CAPB. The resulting measure, as we show, is a good indicator of fiscal policy and is comparable to the narrative approach. Second, we seek to confirm the existence of Non-Keynesian effects empirically and conclude that they are a very unusual phenomenon. Third, we confirm that spending-based fiscal adjustments have more beneficial macroeconomic effects than tax-based fiscal adjustments, which is in line with the previous theoretical and empirical evidence.

This paper is organized as follows. Section 2 reviews the theoretical and empirical literature on the effects of fiscal adjustments. Section 3 analyzes and compares fiscal adjustment episodes identified by the two types of approaches: those of Alesina and Ardagna (2010, 2012) and Guajardo et al. (2011). Then, in section 4, we explain our new measure to identify fiscal adjustments and list the fiscal adjustment episodes that we identify. Section 5 outlines the empirical framework and presents the results. Section 6 examines the robustness of our results. Finally, section 7 concludes.

2. Related literature

2.1. Theoretical considerations

There is a general agreement that reducing government debt via active fiscal consolidation contributes to long–run economic growth. However, Keynesian economics advocates the use of automatic or discretionary countercyclical fiscal policies to lessen the impact of the business cycle. On the other hand, others favour a laissez-faire fiscal policy. In practice, the pro-cyclical fiscal policy is often observed in developing countries due to various reasons such as imperfections in international credit markets that constrain

developing countries from borrowing in recessions (Gavin and Perotti, 1997; Kaminsky et al., 2004) or political distortions that intensify the competition of common resources and rent-seeking in booms (Tornell and Lane, 1999; Alesina et al., 2008). Even in advanced countries, pro-cyclical policies such as 'austerity in recession' and 'budgetary expansions during booms' became common.

In this context, there is no consensus regarding the short-run effects of fiscal adjustment. A standard Keynesian model such as the IS-LM framework predicts that a cut in government spending or an increase in taxes reduces the aggregate demand and income directly, which leads to negative multiplier effects on the output in the short term. In this case, the government debt ratio may not be reduced as much as expected because both output and tax revenues fall due to contractionary effects of the fiscal adjustment.

In the Neoclassical model, fiscal adjustments aimed at reducing the government budget deficit can stimulate the economy with an increase in private consumption and investment through several transmission mechanisms even in the short term, which helps reduce the government debt ratio. These mechanisms can be explained by both demand and supply side effects. First, on the demand side, wealth effects or credibility effects are suggested to be at work. Blanchard (1990) proposes a model in which a consumer reacts to two kinds of effects. One is the intertemporal tax redistribution effect by non-Ricardian agents in a Keynesian model where an increase in taxes decreases consumption. The other is that in the presence of deadweight loss of distortionary taxes, an increase in taxes can eliminate the need for larger and more disruptive adjustment above the critical level in the future. As a result, people can expect to an increase in their permanent income due to the future reduction in the deadweight loss and increase their consumption. He argues that if people exhibit little myopia and the fiscal adjustment is made from a high debt level, consumption can react positively. Bertola and Drazen (1993) present an optimizing model and demonstrate that if a change of fiscal policy induces sufficiently strong expectation of future policy change in the opposite direction, it can cause a nonlinear relationship between private consumption and government spending. If a cut in government spending induces expectation of significantly lower future taxes, it may induce an increase in the current private consumption. Similarly, Sutherland (1997) uses a model that links current fiscal policy and future expected taxes. His model emphasizes the dynamics of government debt and considers consumers with finite horizons. At low levels of debt, fiscal policy has the usual Keynesian effects because people expect the debt stabilization programme as something distant from their perspective. On the other hand, at high levels of debt, as a major fiscal consolidation is imminent, people react to government

spending in a non-Keynesian way, expecting that they will have to pay more taxes shortly. In other words, when the debt ratio is near the threshold level, an increase in taxes delays reaching the threshold and the associated major stabilization programs, so that it can induce people to expect higher permanent income and to increase their consumption. In these models, the positive wealth expectation effects can be at work especially when fiscal adjustment occurs with a high and rapidly growing debt-to-GDP ratio. Other mechanisms include the credibility effects, whereby fiscal adjustment can improve the credibility of government finances by reducing the default and inflation risk via the decline in interest rates (Feldstein, 1982). When a high level of government debt affects the interest rate risk premium, a reliable fiscal adjustment can reduce the premium and, in turn, the reduction of interest rate contributes to raise people's permanent income. In addition, lower interest rate can also lead to the appreciation of financial assets which triggers higher consumption and investment. As another mechanism, expansionary fiscal adjustment may take place on the supply side via the labour market and investment (Alesina et al, 2002). If fiscal adjustment is performed through a cut in public spending, especially in the area of public employment, rather than an increase in taxes, it can lead to a reduction of overall wage pressure in the economy and stimulate private employment and investment.

2.2. Empirical considerations

There is large empirical literature seeking to document expansionary fiscal adjustments (Non-Keynesian effects) since Giavazzi and Pagano (1990) suggested, based on the examples of Denmark and Ireland in the 1980s, that large and decisive fiscal adjustment could stimulate private consumption. In the bulk of empirical studies, fiscal adjustment is defined in terms of an improvement of CAPB. The individual adjustment episodes are, correspondingly, identified according to how large the fiscal adjustment is over a given period or according to how long is the period over which fiscal adjustment is performed. Two strands of empirical studies have evolved in verifying the above-discussed theoretical views on the possibility of an expansionary fiscal adjustment. One focuses on the factors that are associated with expansionary or successful fiscal adjustment.[3] The other sets out to analyze the effects of fiscal adjustment in terms of macroeconomic outcomes rather than fiscal outcomes such as government debt.

The former seeks to classify the episodes according to the definition of expansionary or

3. Successful fiscal adjustment means a sustained reduction in the debt-to-GDP ratio.

successful fiscal adjustment and then to perform a descriptive analysis of the characteristics of fiscal components and other related macroeconomic variables such as GDP and interest rate before, during, and after the fiscal adjustment period (Alesina and Perotti, 1995, 1997; Alesina and Ardagna 1998, 2010, 2012; McDermott and Westcott, 1996; and Giudice et al., 2007). These studies tend to find that fiscal consolidations based on spending cuts rather than on tax increases are more likely to be expansionary or successful. Other papers use mainly binary dependent variable models such as logit or probit to analyze which factors determine the success of fiscal consolidations (McDermott and Westcott, 1996; Afonso et al., 2006) and their expansionary effects (Alesina and Ardagna, 1998; Giudice et al., 2007). McDermott and Westcott (1996) argue that the success in reducing the debt ratio depends on the size and composition of fiscal adjustments. They show that fiscal adjustments based on spending cuts are more likely to be successful than tax-based ones. Furthermore, the greater the magnitude of the fiscal adjustment, the more likely it is to succeed. On the other hand, they show that fiscal adjustments are more likely to fail in a global recession. Afonso et al. (2006) use a logit model to assess fiscal consolidation in Central and Eastern European countries and suggest that spending-based consolidation tends to be more successful. With probit regression analysis, Giudice et al. (2007) conclude that fiscal consolidation is more likely to promote economic growth during periods of below potential output and in case the fiscal adjustment is based on spending cuts.

The latter strand is relatively rare compared with the former. Using panel data of industrial and developing countries, Giavazzi et al. (2000) analyze the general relationship between fiscal policy and national savings and conclude that their relationship can be nonlinear when the fiscal impulse is sufficiently large and persistent, similar to the previous studies for fiscal policy and private consumption (Giavazzi and Pagano 1990, 1995). Ardagna (2004) studies the determinants and channels through which fiscal adjustment affect GDP growth. She shows that whether a fiscal adjustment is expansionary depends largely on the composition of fiscal policy, and that spending cuts can lead to higher GDP growth rates via the labor market rather than through agent's expectation. On the other hand, Burger and Zagler (2008) analyze the relation between U.S. growth and fiscal adjustments in the 1990's and argue that non-Keynesian effects prevail through an increase in consumption because of improved consumer confidence and an increase in investment via the labour market and financial market. Afonso (2010) assesses expansionary fiscal adjustment in European countries and finds that fiscal consolidations tend to have long-term expansionary effects, but no significant effects in the short-run.

In summary, although there are some differences among these empirical studies in the factors affecting expansionary fiscal adjustment such as the size, composition and the initial conditions, overall, the empirical literature based on fiscal adjustment episodes identified by the changes in the CAPB supports the existence of non-Keynesian effects.

On the other hand, several papers take issue with the results of the aforementioned empirical studies. First, the results can be plagued by selection bias, measurement error, spurious correlations, or simultaneity issues when identifying fiscal consolidation episodes using the CAPB. Using the same panel data as Giavazzi et al. (2000), Kamps (2006) challenges their finding that non-Keynesian effects are a general and easily exploitable phenomenon by showing that the nonlinear effect disappear when cross-country heterogeneity is taken into account. Song and Park (2010) and Hernández de Cos and Moral-Benito (2011) raise the possibility of endogeneity of the fiscal consolidation decision and finds that fiscal adjustment has negative effects on GDP when taking endogeneity into account. IMF (2010), Guajardo et al. (2011) and its companion paper, Devries et al. (2011), suggest an alternative way of identifying fiscal consolidations instead of the CAPB. They choose the episodes of discretionary fiscal changes motivated by the desire to reduce the budget deficit following the narrative approach based on historical documents similar to Romer and Romer (2010). They then compare their episodes with those of Alesina and Ardagna (2010) and show that their episodes have contractionary effects on GDP, while the CAPB-based episodes are associated with a rise in GDP. Hence, using the CAPB is likely to lead to a bias toward supporting non-Keynesian effects. They also identify a number of problems related to using the CAPB. First, using a statistical concept such as the CAPB can result in including non-policy related changes caused by other developments affecting economic activity such as a boom in the stock market.[4] Second, the CAPB method is likely to ignore the motivation behind fiscal changes. For example, the rise of CAPB can be aimed restraining economic overheating, not at reducing the budget deficit.[5] In addition, it can omit some episodes of fiscal adjustment followed by an adverse shock and discretionary fiscal stimulus.[6] Third, the CAPB data cannot exclude some cases of offsetting positive changes in

4. They use an example of Ireland in 2009 when a collapse in stock and house prices due to sharp recession induced a decrease of CAPB in 2009 in spite of fiscal consolidation.

5. For example, in responding to the rapid domestic demand growth in Finland in 2000, the government adopted a spending cut to stabilize economy.

6. They explain this using the example of Germany in 1982. Although deficit-reduction packages were implemented in 1981, countercyclical stimulus measures were introduced during 1982 because of a sudden economic recession.

the CAPB caused by large one-off accounting operation in the previous year that are unrelated to fiscal adjustment measures, such as the capital transfer of Japan in 1998 and of Netherlands in 1995 .[7] Based on their new dataset, they conclude that fiscal adjustments have contractionary effects on economic activity, and argue that large spending-based fiscal consolidations cannot be expansionary. On the other hand, Alesina and Ardagna (2012) re-estimate the effect with new episodes identified based on the persistence of CAPB changes rather than on their size in Alesina and Ardagna (2010). They make a somewhat intermediate conclusion that results of the two different approaches are not different in that spending-based adjustment cause smaller recession than tax-based one. They also argue that even an expansionary fiscal adjustment is possible when it is combined with monetary policy.

In fact, the studies using the CAPB usually identify the expansionary fiscal adjustment episodes on the basis of ex-post criteria at first and then analyze the characteristics of fiscal and macro variables. Hence, the results of these studies do not necessarily mean that fiscal consolidation generates economic growth. Fiscal adjustment may affect the economic activity and vice versa. In addition, countries are more likely to consider using fiscal adjustment to reduce the debt-to-GDP ratio when they are experiencing relatively favorable economic growth. Therefore, expansionary fiscal adjustment can be a result of self-selection so that the decision to implement fiscal adjustment is endogenous. Despite being cyclically adjusted, the CAPB can be biased toward overstating expansionary effects as Guajardo et al. (2011) speculate. Moreover, as many theoretical studies argue, if wealth effects and expectations are the main channels by which the fiscal adjustment affects economic activity, the episodes identified by the narrative approach based upon announced plans for deficit cuts can capture the fiscal adjustment and its effects better and more correctly than those identified by the CAPB based on actual fiscal outcomes. In contrast, the main advantages of CAPB for identifying fiscal adjustments are its simple and easy application. Therefore, if the criteria of CAPB are improved to reflect the problems pointed out by the narrative approach, the CAPB can nevertheless be a useful indicator of fiscal policy.

3. Comparison of the two approaches

This section investigates and compares the fiscal adjustment episodes identified by the two approaches and presents basic results in order to assess which one can capture

7. For example, the one-time capital transfers to the Japan National Railway in Japan in 1998 and to the social housing subsidy in Netherlands in 1995 caused large increases in the CAPB in the following years.

discretionary fiscal adjustment more accurately. Firstly, we use the episodes identified by Alesina and Ardagna (2010, 2012) – henceforth AA (10) and AA (12) –based on the changes in the CAPB. These are identified based on the size and persistence criteria, respectively.[8] Secondly, the episodes of Guajardo et al. (2011) – henceforth IMF (11) – are used as ones identified by the narrative approach because they are the refined version of IMF (2010) constructed using the same methodology. AA (10) identify 107 instances (years) of fiscal adjustment in 21 OECD countries from 1970 to 2007 and AA (12) find 159 fiscal adjustments in 21 OECD countries from 1970 to 2010. On the other hand, IMF (11) identifies 173 instances in 17 OECD countries from 1978 to 2009.[9] All fiscal and macroeconomic data are from the OECD Economic Outlook database No.88. In addition, in order to consider the political and institutional determinants of fiscal adjustments, we collected also data on elections, federal system, and presidential system from the Comparative Political Data Set I of the Institute of Political Science at the University of Bern.

3.1. Endogeneity of fiscal adjustment

The first issue in assessing fiscal adjustment episodes is whether these episodes are indeed exogenous with respect to the state of the economy. Both approaches are based on the assumption that the discretionary changes in fiscal policy are exogenous. However, as Alesina and Ardagna (2010) admit, the decision on fiscal adjustment might not be exogenous to the developments in the economy. Especially, although the cyclically adjusted fiscal variables should, by definition, be free of the effects of the business cycle, the methodology cannot be perfect. For example, an increase in the CAPB to GDP ratio may be due to the fall of the denominator so that it may be unrelated to discretionary fiscal policy. Moreover, even in the narrative approach, which identifies the episodes based on the motivation of fiscal policy, fiscal adjustment itself also can be endogenous because a country is likely to decide to implement fiscal adjustment when it is relatively unconcerned about economic growth. Therefore, in comparing the two approaches, we need to test whether the decision on fiscal adjustment depends on economic activity.

Much of the relevant literature uses binary dependent variable models with the dummy for fiscal adjustment as the dependent variable in order to find determinants of expansionary

8. AA (10) identify fiscal adjustments as large changes in CAPB (at least 1.5 % of GDP) in a given year. AA (12) consider only multi-year adjustments in order to include small but sustained changes in the CAPB.

9. Appendix A shows the list of fiscal adjustment periods identified by the two approaches.

or successful fiscal consolidations. Our methodology is akin to this. However, we try to find the determinants of the implementation of fiscal adjustments (whether successful, expansionary, or not). To do this, we run a logit model of the fiscal adjustment dummy equal to one when the adjustment episodes are identified in a given year, and zero otherwise, on GDP growth and other variables of interest.[10] The logit model takes the following form,

$$FA_{i,t} = \begin{cases} 1, \text{if a fiscal adjustment is identified in a given year,} \\ 0, \text{if a fiscal adjustment is not identified in a given year,} \end{cases}$$

$$FA_{i,t} = \log\left(\frac{P_{i,t}}{1-P_{i,t}}\right) = \beta_0 + \beta_1 E_{i,t} + \beta_2 F_{i,t} + \beta_3 S_{i,t} + e_{i,t},$$

where $P_{i,t}$ is the probability that a fiscal adjustment is implemented in country i during a given year t. On the right hand side of our model, three sets of explanatory variables are included. $E_{i,t}$ = (GDP growth, GDP gap, inflation, long-term interest rate)′ is a vector of macroeconomic variables, and $F_{i,t}$ = (primary balance, gross debt) is a vector of fiscal variables. The last set, $S_{i,t}$ = (Election, Federal system, Presidential system) is a vector of political dummy variables.[11] $e_{i,t}$ denotes the error term. In this simple analysis, if macroeconomic variables play a significant role in the decision to implement a fiscal adjustment, we can argue that the episodes are likely to be endogenous.

When fiscal authorities decide on what type of fiscal policy to pursue, they usually consider the conditions that are expected to prevail as well as the past state of the economy. As a result, the decision on a fiscal adjustment can be correlated with the past and future growth. Therefore, the expected GDP growth rate (at time t) after the fiscal adjustment should be included in the vector of macroeconomic variables. As this is not available, we include the actual GDP growth rate (t) instead. For the past economic conditions just before the decision, we include the lag of GDP growth, GDP gap, inflation, and long-term interest rate. However, including contemporaneous GDP growth (t) can potentially introduce the reverse endogeneity of GDP growth in fiscal adjustment. Therefore, we analyze also alternative models that only control for contemporaneous GDP growth (t) or the lagged GDP growth (t-1).

Table 1 shows the results obtained with the fiscal adjustment episodes of AA (10), AA (12) and IMF (11), respectively. First, among the macroeconomic variables, the impact of growth is different across the approaches. In fiscal adjustment episodes of AA (10) and AA

10. As another binary dependent model, a probit model also is used but the results are almost same to those of the logit model.

11. If the election of the national parliament occurs in a given year, the dummy variable is equal to 1 and is 0 otherwise. Similarly, if a country has a federal system, the dummy variable takes the value 1 and is 0 otherwise, and if a country has a presidential system, the dummy variable is equal to 1 and is 0 otherwise.

(12), contemporaneous growth and lagged growth have significantly positive coefficients. Hence, the decision on fiscal adjustment could be affected by economic growth. If so, the assumption of exogeneity of fiscal adjustment is invalidated as Guajardo et al. (2011) and Hernández de Cos and Moral-Benito (2011) argue. On the other hand, for the episodes of IMF (11), the coefficients estimated for economic growth are never significant. For the other macroeconomic variables which capture the initial conditions, there is little difference across the three approaches. In particular, the long-term interest rate has the expected positive coefficient, which means that as the long-term interest rates go up, the government becomes more likely to adopt fiscal adjustment because of the increased burden of interest payments. Therefore, the episodes identified with the narrative approach appear much more likely to be exogenous than those based on the CAPB.

As for the fiscal variables, the previous level of the primary balance and the debt to GDP ratio also affect the decision on fiscal adjustment significantly with the expected signs in all the specifications. The probability of fiscal adjustment is likely to decrease as the level of primary balance increases. The positive coefficient of the lagged debt-to-GDP ratio also is consistent with the finding of previous literature that a country with high level of debt is more likely to implement fiscal adjustment to improve the fiscal sustainability. Tuning to the political variables holding an election reduces the probability of fiscal adjustment, but insignificantly in the specification using IMF (11). On the other hand, there is no common significant result across the specifications for the variables reflecting the nature of the political system.

In summary, our results show that the episodes of fiscal adjustment based on the CAPB are less likely to be exogenous than those identified by the narrative approach in regard to the relation between economic growth and the decision to undertake a fiscal adjustment. Therefore, the narrative approach appears to capture discretionary fiscal adjustment more precisely.

3.2 Non-Keynesian effects?

Next, we turn to the effects of fiscal adjustment on economic growth under the two approaches to see whether we can detect any evidence of non-Keynesian effects. In order to compare the results of the two approaches, we re-estimate the same specification as Guajardo et al. (2011) and Alesina and Ardagna (2012):

$$\Delta Y_{i,t} = C + \sum_{j=1}^{2} \alpha_j \Delta Y_{i,t-j} + \sum_{j=0}^{2} \beta_j FA_{i,t-j} + \mu_i + \lambda_t + \nu_i$$

where $Y_{i,t}$ is the logarithm of real GDP and $FA_{i,t-j}$ is the fiscal adjustment: the dummy variables for AA (10) and AA (12) and the dummy and the size of fiscal adjustment in percent of GDP for IMF (11) respectively.[12] The term μ_i denotes country-fixed effects to take account of differences among countries and λ_t denotes year-fixed effects to consider global shocks. ν_i is a reduced form innovation.

Table 2 presents the results from estimating the models. Columns (1) and (2) report the coefficient estimates based on fiscal adjustment identified by AA (10) and AA (12) respectively. Although the coefficient of current fiscal adjustment has a positive sign in case of AA (10), the effect on economic growth is not statistically significant at conventional levels in any specification. On the other hand, the column (3) and (4) show the results for the fiscal adjustment based on the narrative approach. Although we use two types of fiscal adjustment variables: dummy and the size in percent of GDP, respectively, both results are almost same. As the current fiscal adjustment appears with significantly negative coefficient, the results show the typical Keynesian effects: the fiscal adjustment produces a negative effect on growth in the short term. This result also is in line with the finding of Guajardo et al. (2011). In addition, the fact that the results in columns (3) and (4) are almost the same implies that the effect of fiscal adjustment on growth depends on its timing and implementation itself rather than its size.

To sum up, the episodes of fiscal adjustment using the changes in the CAPB do not provide significant evidence of non-Keynesian effects, whereas the episodes based on the narrative approach show that the fiscal consolidation has negative effect on real growth. Therefore, as Guajardo et al. (2011) suggest, the narrative approach appears superior in identifying fiscal adjustment episode, compared to using the CAPB. However, the CAPB has advantages in terms of methodological simplicity and convenience. Therefore, the following section seeks to improve the criteria and definitions of fiscal adjustment within the CAPB-based approach.

12. Although Alesina and Ardagna (2010, 2011) use the changes in the CAPB in their regression, they do not provide the detailed data for the size of changes in the CAPB except for the list of years of fiscal adjustment. However, in a similar manner, Ramey and Shapiro (1998) also use a dummy variable which identifies discretionary government spending shocks in estimating the effects of government spending on the economic activity.

4. Data and identification of fiscal adjustment episodes

4.1. Data

We use an unbalanced panel of OECD countries covering the period from 1970 to 2009. All fiscal and macroeconomic data are obtained from the OECD Economic Outlook No.88.[13] The sample includes 20 countries for which we have data on 20 years or more: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, United Kingdom, and United States. Appendix B describes the fiscal and macroeconomic data employed in more detail.

We use cyclically adjusted primary fiscal variables to identify the instances of discretionary fiscal adjustment. In particular, we use primary fiscal variables which exclude interest payments because the fluctuations in interest payments cannot be regarded as discretionary. Then, to make the cyclical correction, we follow the method proposed by Blanchard (1993). His method has also been used by Alesina and Perotti (1995, 1996) and Alesina and Ardagna (1998, 2010 and 2012). It is simpler and more transparent than the more complicated official measures such as those of OECD and IMF which rely on the potential output and fiscal multipliers (Alesina and Ardagna, 1998 and 2010). The basic principle of this method is that since the government spending can be negatively related to GDP due to unemployment benefits and the revenues can be positively related to GDP due to tax receipts, the changes in the cyclically adjusted fiscal variables can be calculated from the difference between the value which would prevail if unemployment had not changed from the previous year and the actual value in previous year.

In the process of this simple procedure, especially for cyclically adjusted revenues, the unemployment rate is the only indicator of the state of the economy in the previous year. However, the CAPB can also be affected crucially by sharp changes in asset prices. Asset price fluctuations can therefore bias the correlation between cyclically-adjusted fiscal variables and economic activity. For example, a stock market boom can increase both the cyclically-adjusted tax revenues because of capital gains and also raise private consumption and investment. This can lead to an upward-biased estimate of the effect of fiscal consolidation on output. This is one of the problems that Guajardo et al. (2011) identify with respect to using the CAPB. The importance of asset price changes to fiscal policy outcomes has received considerable attention in the literature recently. Morris and Schuknecht (2007)

13. More recent OECD Economic Outlook data cover a more limited period. For example, the data for Germany is available only from 1991 onward from Outlook No. 89.

and Price and Dang (2011) find that the changes in asset prices are a major factor behind unexplained changes of fiscal revenues in cyclically adjusted balances. Tagkalakis (2011a, 2011b) finds that financial markets have quite a significant impact on the fiscal positions and suggests that higher asset prices improve fiscal balances and contribute to initiating a successful fiscal adjustment.[14]

Therefore, we use a share price index as additional variable determining the CAPB. The impact on fiscal balance, especially tax revenues, can be different according to the types of asset price and tax systems (Morris and Schuknecht, 2007; Tagkalakis, 2011a). Therefore, when considering asset price variables as a business cycle factor, it would be ideal to include other types of asset prices such as equities and property prices. We use only the share price index due to data availability and its particular relevance to tax revenues. This can be deemed a limitation of our methodology, but we believe this index is representative of the way other asset prices behave.[15]

Our measure for the changes in the CAPB is constructed following Alesina and Ardagna (1998). First, to get the cyclically adjusted spending as a ratio to GDP, we regress primary spending on a time trend and the unemployment rate (U_t) for each country in the sample:

$$G_t = \alpha_0 + \alpha_1 Trend + \alpha_2 U_t + e_t \qquad (1)$$

Then, with the estimated coefficients ($\hat{\alpha}_1$, $\hat{\alpha}_2$) and the residuals ($\hat{e}_t$) and the preceding-year unemployment rate (U_{t-1}) in t-1, we calculate the value of primary spending adjusted for business cycles and changes in unemployment:

$$G^*_t(U_{t-1}) = \hat{\alpha}_0 + \hat{\alpha}_1 Trend + \hat{\alpha}_2 U_{t-1} + \hat{e}_t \qquad (2)$$

The changes in discretionary spending are calculated as $G^*_t(U_{t-1}) - G_{t-1}$. A similar procedure is applied to compute the cyclically adjusted revenues. However, this time, the asset price index is added to the regression.

$$R_t = \alpha_0 + \alpha_1 Trend + \alpha_2 U_t + \alpha_3 Assetprice_t + e_t$$

$$R^*_t(U_{t-1}, Assetprice_{t-1}) = \hat{\alpha}_0 + \hat{\alpha}_1 Trend + \hat{\alpha}_2 U_{t-1} + \hat{\alpha}_2 Assetprice_{t-1} + \hat{e}_t$$

Finally, the changes in discretionary fiscal policy are obtained as follows

14. There are many studies that show that the financial market variables have significant impact on fiscal primary balance, particularly through government revenues (Eschenbach and Schuknecht, 2002; Tujula and Wolswijk, 2007; Reinhart and Rogoff, 2009; Tagkalakis, 2012, etc.)

15. For robustness, we use the house price index as an asset price index instead of the share price index, although the number of observations gets smaller. However, the results, reported in the section on robustness, are very similar.

$$\Delta CAPB = [R^*_t - R_{t-1}] - [G^*_t - G_{t-1}]$$

Guajardo et al. (2011) criticize the CAPB using the example of Ireland in 2009. In that instance, the CAPB to GDP ratio, used by Alesina and Ardagna (2010), fell because of the decline in tax receipts due to the sharp fall in stock and house prices. They argue that this shows the inaccuracy of the CAPB. However, our new measure that takes account of fluctuations in asset price has the Irish CAPB improving by 1.3% of GDP in 2009.

4.2. Definition of fiscal adjustment

In the literature, it is common to identify fiscal adjustment episodes as large and long lasting changes in the CAPB. However, as Table 3 shows, the criteria of size and persistence are considerably different across the various studies, and even a little arbitrary. In addition, although these studies impose different thresholds, the same threshold is applied to all countries. In other words, they do not allow for country-specific heterogeneity in discretionary fiscal shocks and the private sector responses to them. Since the expectations and confidence of the private sector are key factors for the transmission of fiscal shocks, past fiscal record should be considered. For example, for a country which has seldom experienced large changes in discretionary fiscal policy, a small fiscal adjustment can send a strong signal of the government's willingness to reduce the budget deficit. However, for a country that has had large fluctuations of fiscal policy in the past, a similarly sized fiscal adjustment can be too weak to elicit any response from the private sector. As a result, while Burger and Zagler (2008)[16] and Guajardo et al. (2011) identify several episodes in the U.S., Alesina and Ardagna (2010, 2012) identify no fiscal adjustment episode in that country. Therefore, when identifying episodes of fiscal contractions, one should consider the idiosyncrasy of fiscal policy in each country. For this reason, we consider the average (μ_i) and standard deviations (σ_i) of the changes in the CAPB for each country (i).

Our definition for identifying fiscal adjustment episodes has 4 criteria, incorporating size, persistence and country-specific heterogeneity, as follows

① A fiscal adjustment occurs in a given year if the CAPB improves by at least the average (μ_i) + standard deviation (σ_i) in that year.

② A fiscal adjustment takes place over a period of multiple years when the CAPB

16. This paper focuses on the fiscal adjustment episodes of the U.S. and economic growth. in 1990s.

improves by at least $\mu_i + 1/3\sigma_i$ in the first year and the cumulative change is at least $\mu_i + 4/3\sigma_i$ over 2 years or $\mu_i + 2\sigma_i$ over 3 or more years.

③ A spell of fiscal adjustment terminates if the CAPB improves by less than $\mu_i + 1/3\sigma_i$ or deteriorates in one year, except when the change in the CAPB is between $\mu_i + 1/3\sigma_i$ and $\mu_i - 1/3\sigma_i$ in that year, and the cumulative change over the following year is an improvement of at least $\mu_i + 1/3\sigma_i$.

④ A fiscal adjustment does not occur in a given year (T) if the CAPB improves by at least $\mu_i + \sigma_i$ in that year, but in the previous (T-1) or following year (T+1), the CAPB worsens by over $\mu_i + \sigma_i$.

These criteria are chosen for the following reasons. First, as already explained, the different cut-off values are used to reflect the heterogeneity of each country, as embodied in the average (μ_i) and standard deviation (σ_i) of the changes in the CAPB. In fact, the standard deviation (σ_i) during 1970 - 2009 ranges from 3.73% points of GDP in Norway to 0.88% points of GDP in the U.S. (Criterion ① and ②). Second, Criterion ③ ensures that episodes when the CAPB improves less or deteriorates temporary, but this is offset in the following year, are also counted. Third, Criterion ④excludes cases of sharp increases in the CAPB due to one-off accounting operations such as one-time capital transfers. As in the other literature, there is also an element of arbitrariness in our definition, in particular in choosing the multiples (1, 1/3, 4/3, 2) of standard deviation. In the robustness section, we use alternative rules and thresholds in order to check whether the results are sensitive to these values.

4.3. Identifying fiscal adjustment episodes

According to our definition, we identified 199 instances of fiscal adjustment in 20 OECD countries from 1970 to 2009. These consist of 66 episodes, as reported in Table 4.[17] These episodes include only those that, once started, lead to a sufficiently large improvement in the CAPB. This list includes several well-known episodes such as Denmark (84~86), Ireland (82~84, 86~88) and captures also the episodes that Guajardo et al. (2011) use to illustrate the discrepancies between the two approaches.[18]

17. Multi-year fiscal adjustment is regarded as a single episode following Alesina and Ardagna (2012) because fiscal adjustments often are multi-year processes. Moreover, it is very difficult to distinguish the episodes and correct timing during years of long-lasting improvement of the CAPB

18. Our list includes the episodes of Germany (1982) and Italy (1993), but excludes the episodes of Finland (2000), Germany (1996), Japan (1999), and Netherlands (1996) just as Guajardo et al. (2011).

As Figure 1 shows, most episodes are of short duration. Of the 66 episodes, 11 account for only one year, and 19 episodes last for two or three consecutive years. The longest lasting episode is 9 years for Japan from 1979 to 1987. Figure 2 shows that the episodes of fiscal adjustment appear more frequently during the 1980's and 1990's. In particular, we can observe instances of concentrated fiscal adjustments which have relatively short duration occur more often in the EU countries. It is likely to be related to the Maastricht treaty in 1992 which set criteria for euro area membership (Guichard et al., 2007).[19]

4.4. Determinants of fiscal adjustment

In this subsection, we analyze the various factors that affect the decision on starting or continuing the fiscal adjustment by means of a binary dependent variable model. The dependent variable is equal to one during periods of fiscal adjustment and zero otherwise. Although the multi-year fiscal adjustments are regarded as a single episode in this chapter, a fiscal authority should decide not only on initiating fiscal adjustment, but also on its continuation in the subsequent years. Therefore, the dummy variable takes value of one for each year during an episode of fiscal adjustment. However, for robustness, we present also results with only the first year of each episode coded as financial adjustment, in line with Guichard et al. (2007). Initial conditions such as the economic and policy environments can be related to the decision on fiscal adjustment. Therefore, at the right hand side of our model, explanatory variables are composed of three sets of variables: macroeconomic, fiscal and political variables like in the earlier section comparing the two approaches for identifying the fiscal adjustment.

The probability of fiscal adjustment is estimated by a panel logit model.[20] The results are reported in Table 5. As for the variables capturing the state of the economy, the results are similar to those using the narrative approach in the previous section. First, current and lagged growth rates have no significant effect on the probability of fiscal adjustment. This suggests that the episodes identified with our definition are less at risk of being endogenous than those of Alesina and Ardagna (2010, 2012). It also suggests that the our modified measure of

19. The Maastricht criteria imposed limits on inflation, public debt and the public deficit, exchange rate stability and the convergence of interest rates. In particular, the ratio of government deficit and the ratio of gross government debt to GDP were not to exceed 3 % and 60% of GDP, respectively, at the end of fiscal year.

20. As another binary dependent variable model, we use the probit model too. However, the choice of model has no impact on the results. According to Afonso et al. (2006), logit model is to be preferred because of its statistical advantages in dealing with binary outcomes.

cyclically adjusted primary balance performs better than those used in the previous literature. However, in the results based on the first year of fiscal adjustment episodes (columns 4, 5, and 6), the decision on undertaking a fiscal adjustment is still moderately affected by growth. Therefore, it shows weaker evidence for exogeneity than narrative episodes of Guajardo et al. (2011).[21]

Furthermore, the output gap in the previous year has a significant coefficient. Although fiscal adjustment is exogenous to contemporaneous output, it can reflect the initial economic conditions. Interestingly, the coefficient of the output gap has a different sign according to the type of dummy variable for fiscal adjustment. In particular, while positive output gap increases the probability of initiating a fiscal adjustment when considering only the first year of each episode (column 4, 5, and 6), the opposite results are obtained with the dummy variables for each fiscal adjustment year, indicating that fiscal adjustments are more likely in bad economic conditions (columns 1, 2, and 3). Therefore, the effect of output gap is not clear.[22] A possible interpretation is that in the first year of episodes, when the output gap is positive, the fiscal authority tends to be less concerned about the contractionary effect of fiscal adjustment on the economy and is readier to undertake fiscal adjustment in good economic times, but during the periods of fiscal adjustment, the longer the output gap stays positive, the less it is necessary to continue with fiscal adjustment due to the reduction of the deficit and debt over GDP ratio from the economic boom. In other words, the relationship between the decision on fiscal adjustment and output gap can be non-linear. When we add the square of output gap alongside output gap as a quadratic function in the same logit model, the square of output gap has negative and significant coefficient in both specifications.[23] Therefore, the persistence of a positive output gap is likely to play a significant role in starting and stopping fiscal adjustment.

The inflation rate also has a positive effect on the decision on fiscal adjustment, but only at the 10% significance level. The long-term interest rate plays a significant role in prompting fiscal adjustment at the 1% significance level: high long-term interest rate imposes greater

21. For the endogeneity problem, we check the assumption of exogeneity in the section for robustness.

22. Literature on role of the initial output gap also show different results. While von Hagen and Stauch (2001) show the positive coefficient (significant) of lagged output gap on the basis of each year of fiscal adjustment episodes, Tagkalakis (2011b) shows negative coefficient (insignificant) of lagged output gap. In the other hand, Guichard et al.(2007) show that there is no evidence of significant role of output gap in triggering fiscal adjustment episodes, but positive output gap increases the likelihood of stopping the episodes on the basis of the first year of episodes.

23. The results are presented in Appendix C.

burden on government debt, so that it is likely to encourage fiscal adjustment.

As for the fiscal variables, the primary balance of the previous year plays a significant role. A rise in the initial primary balance by 1% of GDP decreases the likelihood of fiscal adjustment by 2.2%. Moreover, the effect of fiscal balance is consistent across the specifications. In contrast, the initial debt-to-GDP ratio is only weakly associated with fiscal adjustment. Although the coefficient of gross debt is positive in the columns (1), (2) and (3) of Table 5, it is significant only at the 10% significance level and the size is very small. This result deviates somewhat from the previous findings, given that the fiscal adjustment is typically motivated by fiscal sustainability.

Finally, most political variables turn out insignificant. Specifically, there is no evidence supporting the 'political budget cycle' story, whereby the incumbent adopts expansionary fiscal policy in an election year to stimulate the economy so as to increase the chances of re-election for himself or his party. The probability of adopting fiscal adjustment does not decrease significantly in the year of general election. This may be because our data are composed of only OECD countries with a higher level of development, democracy and greater transparency.[24] In addition, Table 5 shows that federal nations are more likely to undertake fiscal adjustment, at the 10 % significance level when considering only each year of episodes.

5. Specification and baseline results

In this section, we estimate the effects of fiscal adjustment on the economic activity in the short term, especially focusing on testing the existence of expansionary fiscal adjustment and its transmission.

5.1. Specification

The following fixed-effects panel model is estimated:

$$\Delta Y_{i,t} = \alpha_0 + \alpha_1 \Delta Y_{i,t-1} + \beta_0 \Delta FA_{i,t} + \beta_1 \Delta FA_{i,t-1} + \mu_i + \lambda_t + \nu_{i,t} \qquad (3)$$

where $Y_{i,t}$ represents the logarithm of real economic activity (GDP, private consumption, private investment, wage, interest, etc.) for country i (i = 1, 2, 3, …..N) in year t (t = 1, 2, …..T). Economic variables are in logs except for the unemployment and interest rates. ΔFA denotes the changes in the CAPB in percent of GDP in periods of fiscal adjustment and zero

24. Political budget cycles are discussed in Shi and Svensson (2006) and Klomp and Haan (2013).

otherwise. The term μ_i indicates country-fixed effects, λ_t denotes year-fixed effects and ν_i is a reduced form innovation. For the lag selection, we started with several lags of the economic activity variables and changes in the CAPB and iteratively reduced the lag length when the longest lag turned out to be insignificant. As a result, we select one lag for ΔY and ΔFA each.[25]

With respect to the estimation, we follow the methodology of Guajardo et al. (2011) and Alesina and Ardagna (2012). First, we estimate equation (3) by ordinary least squares and then compute the estimated cumulative responses of real GDP and its components to a shock of 1% point change in the CAPB-to-GDP ratio for the first three years in order to measure the response on the level of real economic activity variables in the log terms.[26] We calculate the standard errors of the impulse response with the delta method.[27]

5.2. Estimation results

Table 6 presents the estimated coefficients of the changes in the CAPB on the economic activity variables in our baseline model. The first column reports that growth responds negatively to contemporaneous changes in the CAPB, but positively to its lagged change. As the negative effect of contemporaneous fiscal adjustment is much larger than the lagged positive effect, the fiscal adjustment is found to have contractionary effect in the short term. In other words, non-Keynesian effects, or expansionary fiscal adjustments, are hard to find. The results are very similar to those of Guajardo et al. (2011) based on the narrative approach. This finding is mirrored in the results for the individual components of GDP. The effects of current and lagged fiscal adjustment on private consumption and investment are very much in line with those on growth (columns 2 and 3). As for the labour market, the effect on the real wage is also negative, but insignificant. On the other hand, the effect on unemployment rate

25. Guajardo et al. (2011) and Alesina and Ardagna (2012) select 2 lags for similar specifications. For the robustness checks, we also use 2 lags. The coefficients of second lags of growth and fiscal adjustment are small and insignificant so that the results of impulse-responses are not affected.

26. In the fixed-effects dynamic panel model when lagged values of the dependent variable are included as regressors, ordinary least squares estimates can be inconsistent due to the correlation of the lagged dependant variable with the error term. Therefore, in this case, Arellano-Bond estimator (GMM estimator) is usually used. However, according to Roodman (2006), this estimator is designed for situations with "small T, large N" panels, and in case of sufficiently large T panel, the bias is likely to be negligible. In our dataset, T is over 30 years and N is 20 countries; so we do not need to use this estimator.

27. In statistics, the delta method is a method to derive an approximate probability distribution for a function of an asymptotically normal statistical estimator (see Oehlert,1992). We use the syntax for 'Nonlinear combination of estimators' using the delta method in the Stata program.

is large and positive at the 1% significance level, both contemporaneously and with a lag. This shows that fiscal adjustment reduces output and raises unemployment in the short term. The columns (6) and (7) show the impacts of fiscal adjustment on interest rates. Interest rates fall when country's fiscal position improves, which is consistent with the finding of Ardagna (2009).

Table 7 shows the corresponding impulse-responses resulting from an improvement in the CAPB by 1% of GDP for three years following fiscal adjustment, based on the results in Table 6. The growth rates are cumulated to obtain the estimated impact of fiscal adjustment on the level of economic activity, following Guajardo et al. (2011) and Alesina and Ardagna (2012). Fiscal adjustment has statistically significant effects on GDP, private consumption and other macroeconomic variables with peak contractionary effect occurring within 1 or 2 years. In particular, a fiscal adjustment equal to 1% of GDP reduces real GDP by about 0.3% in the year of fiscal adjustment. These results are very similar to Guajardo et al. (2011), despite the different definition of fiscal adjustments, specification and data. Figure 3 compares the responses of GDP to fiscal adjustment shock between our baseline and Guajardo et al.'s (2011) baseline. Although the timing of peak contractionary effects is different, both sets of results report negative effects on GDP sustained for three years and diminishing gradually over time.

In summary, our results suggest that fiscal consolidation has a significant contractionary effect in the short term. In addition, although Guajardo et al. (2011) raise some issues with respect to using the CAPB, our fiscal adjustment variable, although identified based on the changes in the CAPB under our new criteria, shows results which are very similar to theirs.

6. Robustness checks

In this section, we present several alternative approaches to our baseline model to test the robustness of our results. First, as our measures and criteria for identifying episodes of fiscal adjustments in section 4 have an element of arbitrariness, we consider different definitions. Second, as the discretionary fiscal policy cannot be entirely exogenous to the state of the economy, we consider endogeneity in our model. Third, we investigate the role played by the composition of fiscal adjustment in terms of tax increases and spending cuts. Fourth, we check the robustness of our finding to the inclusion of other variables in the baseline model to control for monetary or exchange rate policies. Finally, we also investigate the sensitivity of results across country groups.

6.1. Alternative definitions of fiscal adjustment

As section 4 shows, our measures of the changes in the CAPB and the resulting definition of fiscal adjustment are different from the other literature using the CAPB. In particular, our cyclical correction and thresholds are admittedly arbitrary to some extent. Therefore, additional analysis is necessary to assess whether changes in the threshold would affect critically the baseline results.

First, we change the thresholds applied to the standard deviation from smaller ones to larger values. Second, since the average and standard deviation of the changes in the CAPB for each country can be affected by exceptional outliers or time span, we re-apply our rule after dropping the largest positive and negative values of the changes in the CAPB. Third, we replace the share price index with the house price index.[28] Finally, we use the CAPB reported by the OECD instead of computing them ourselves.[29]

Tables 8 and 9 show that the baseline results are robust to a series of alternative criteria for the definition of fiscal adjustment and also to alternative CAPB definitions. As Table 8 shows, fiscal adjustment has a similarly sized negative effect on growth when using the alternative criteria. As for alternative CAPB specifications, the result obtained when the house price index is used instead of the stock price is not different from the baseline (column 6). The result with the OECD CAPB measure shows an insignificantly negative effect (column 7). This difference is likely to be due to the different assumptions and methodology. As Alesina and Perotti (1995) and Alesina and Ardagna (1998) point out, the OECD method depends on measures of potential output which are regarded highly arbitrary and a set of elasticity of taxes and expenditures. In addition, although the OECD also eliminates one-off transactions from the primary fiscal balance, it may still suffer from the potential biases due to one-off transaction highlighted by Guajardo et al. (2011) because one-off transactions in its methodology are derived simply from the deviation just from trend in net capital transfers, not from individual records. For instance, the Netherlands in 1996 is one of the cases that historical records indicate as having a one-off transaction in the previous year, but is included in the fiscal adjustment episodes

28. The house price index data (1975~2009) are taken from the International House Price Database of the Federal Reserve Bank of Dallas.

29. We use the CAPB data (Underlying primary fiscal balance) from the OECD Economic Outlook No.88 which are said to eliminate the impact of one-off transactions from the cyclically-adjusted financial balances. These data have been used in much literature such as McDermott and Wescott (1996), Kamps (2006), Guichard et al. (2007).

according to the OECD CAPB version.[30]

Table 9 compares the impulse-responses based on the estimation results. The larger the thresholds, the more negative effect fiscal adjustment on GDP. When dropping outliers, the negative effects are smaller than even those of threshold 1, but still significant. While the response in case of OECD CAPB is not significant, most estimates indicate a decline of GDP similar to the baseline result for three years.

6.2. Endogeneity of fiscal adjustment

Although various approaches have been followed for identifying the discretionary fiscal adjustment, it is very hard to identify unambiguously exogenous discretionary fiscal policy. While the narrative approach adopted by Romer and Romer (2010) and Guajardo et al. (2011) is regarded as ensuring exogeneity, the cyclical correction as per the conventional approach is not fully free from potential endogeneity. In this subsection, therefore, we check the robustness of our results by relaxing the exogeneity assumption. First, we check the assumption of the baseline model that the changes in the CAPB during the periods of fiscal adjustment are exogenous and uncorrelated with those in all other 'normal' periods. Following Alesina and Ardagna (2012), we investigate whether the estimated coefficients of fiscal adjustment change when the changes in the CAPB in normal periods (i.e. periods free of fiscal adjustment) are included as additional terms ($\Delta NFA_{i,t-j}$).

$$\Delta Y_{i,t} = \alpha_0 + \alpha_1 \Delta Y_{i,t-1} + \sum_{j=0}^{1} \beta_j \Delta FA_{i,t-j} + \sum_{j=0}^{1} \gamma_j \Delta NFA_{i,t-j} + \mu_i + \lambda_t + \nu_{i,t}$$

Second, we estimate the effects of fiscal adjustment on growth under the assumption that the decisions on fiscal adjustment and its size are endogenous to the state of the economy. This means that since the cyclical correction cannot remove the automatic changes of fiscal variables in response to output entirely, some of the discretionary fiscal changes are related to the fluctuation of contemporaneous output. As a result, the current fiscal adjustment variable ($\Delta FA_{i,t-j}$) can be correlated with the contemporaneous error term ($\nu_{i,t}$) ($E(\nu_{i,t} | \Delta FA_{i,t-j}) \neq 0$). Therefore, similar to Hernández de Cos and Moral-Benito (2011), who also take the potential endogeneity into consideration, we estimate the effect of fiscal adjustment via two-stage least squares (2SLS).[31] We select the fiscal adjustment based on the narrative approach by

30. The list of fiscal adjustment episodes identified from the OECD CAPB is presented in Appendix D.

31. Although some authors such as Biorn and Klette (1999) advocate the use of the GMM estimator to tackle endogeneity, we use 2SLS rather than GMM estimator because our dataset has small number of countries (20) and a large number of time periods (30), as explained earlier.

Guajardo et al. (2011) as the first instrument because it is more likely to be exogenous given that the identification is based on historical records. In addition, we use lagged long-term interest rate which shows the significant strong correlation with fiscal adjustment in the logit analysis of section 4 and is predetermined but not strictly exogenous to the contemporaneous error term.

The results are reported in Tables 10 and 11. First, in the augmented OLS regression including the changes in the CAPB during normal periods, although the magnitude of the coefficient of fiscal adjustment in Table 10 and the response of GDP to a fiscal adjustment shock in Table 11 are somewhat larger than those of the baseline model, the results change little, showing contractionary effects which are very similar to the baseline. Importantly, the changes in the CAPB that are not associated with fiscal adjustment (NFA) do not have any effect on growth, as expected. This means that the assumption of fiscal adjustment being different from other changes in the CAPB in normal periods is reasonable. Next, when using instrumental variables to control for potential endogeneity of fiscal adjustment, the effect of fiscal adjustment on growth is stronger (more negative) than that of the baseline. This pattern appears regardless of the instruments used. Table 12 reports the results of first stage regressions, confirming the validity of the instruments considered. Both instruments have strong relation with fiscal adjustment. However, the test results indicate that the narrative fiscal adjustment of Guajardo et al. (2011) has more explanatory power than the lagged long-term interest rate. In addition, according to the Durbin-Wu-Hausman test for endogeneity of fiscal adjustment, the null hypothesis that the fiscal adjustment can be treated as exogenous is rejected at the 5% significance level. Therefore, we can conclude that fiscal adjustment identified by the changes in the CAPB is not strictly exogenous to growth. Nevertheless, the results corrected for endogeneity of fiscal adjustment support our baseline finding of contractionary effects.

6.3. Does composition of fiscal adjustment matter?

Many studies analyze the effects of fiscal adjustment according to its composition. They generally agree that fiscal adjustments focusing on the spending side rather than on the tax side are more likely to have expansionary effects on GDP. Therefore, in this subsection, we investigate what role the composition of fiscal adjustment plays in the response of economic growth. First, we divide the fiscal adjustments episodes into two types: ‘spending-based’ ones in which the change in the CAPB is mainly (by at least 50%) due to spending cuts and ‘tax-

based' ones in which the change in the CAPB is mainly (by at least 50%) due to revenue increase (Guajardo et al., 2011, and McDermott and Westcott, 1996, apply the same criterion). In addition, we split the fiscal adjustments into three types: the 'pure spending-based' ones where the improvement in the CAPB is entirely due to spending cuts, 'pure tax-based' ones which are totally due to revenue increases, and 'mixed' cases that combine the two types of adjustment.

Figure 4 shows the estimated effects of fiscal adjustment according to its composition. First, although spending-based adjustments do not have a significant expansionary effect, they also do not have significantly negative effect on GDP and private consumption except in the year of fiscal adjustment. When compared with tax-based adjustments, spending-based adjustments are less contractionary and can even offset the large negative effects of tax-based adjustment because the response of the baseline is in between the responses associated with the two types of fiscal adjustment. This result is consistent with Alesina and Ardagna (2012). On the other hand, a tax-based fiscal adjustment has a contractionary and statistically significant effect on GDP with a peak negative effect of -0.68% and on private consumption with a peak negative effect of -0.71% within three years. When the composition of fiscal adjustment is classified into three types, as shown in column (2) of Figure 4, the results do not differ much. While the results for mixed adjustments are almost the same as the baseline, pure tax-based fiscal adjustments decrease GDP significantly and pure spending-based fiscal adjustments appear contractionary, but the effect is not statistically significant even in the year of fiscal adjustment.

An alternative way is to identify fiscal adjustments based on large changes of fiscal variables rather than by looking at changes of fiscal balance: as an increase in cyclically-adjusted revenues or a decrease in cyclically-adjusted spending. Although this method is different from the conventional method based on fiscal balance, it has several advantages. First, we can capture some episodes of fiscal adjustment which might be otherwise excluded. This is the case when the fiscal adjustment on spending (revenue) side is offset by a counter-balancing change of revenue (spending). Second, we can reduce the risk that the results are driven by a particular threshold (e.g. 50%) chosen to identify tax-based and spending-based adjustments. Therefore, we re-identify fiscal adjustments based on large changes of cyclically-adjusted revenues and spending respectively.[32] The former are denoted as 'tax side'

32. The definition for a fiscal adjustment on tax (spending) side follows the 4 criteria in Section 4, but uses changes of cyclically-adjusted revenues (spending) instead of changes of CAPB. For example, as the criterion for a fiscal adjustment of a given year, tax (spending)-side adjustment is defined when the cyclically-adjusted

and the latter denoted as 'spending side'. Then, we replace ΔFA in the baseline specification with these two types of fiscal adjustments to estimate their effects on GDP and private consumption.

Figure 5 shows the estimated effects of fiscal adjustment according to its composition. While fiscal adjustment based on an increase in revenues has a largely contractionary and statistically significant effect on GDP and private consumption, fiscal adjustment based on a decrease in spending has a small expansionary but not statistically significant effect on GDP and negligible effects on private consumption. Therefore, we still cannot find any firm evidence of expansionary effects even in the case of fiscal adjustment based on large spending-cuts. However, this reconfirms that spending-based adjustments are less contractionary than tax-based ones, which is consistent with the previous results of compositions of fiscal adjustment based on the CAPB.

Guajardo et al. (2011) argue that a possible reason for the different effects depending on the compositions of fiscal adjustment is that monetary policy is more favourable in case of spending cuts. They suggest that central banks conduct monetary stimulus more actively following spending cuts than after tax hikes so that the policy rate increases in response to tax hikes and decreases in response to spending cuts.[33] Therefore, we investigate the response of short-term interest rate to the two types of fiscal adjustment. As Figure 6 shows, the response of the short-term interest rate is significantly different according to the two types of fiscal adjustment only in the year of fiscal adjustment. After one year, the short term interest rate falls significantly in both cases. Therefore, this result can partially support the argument of Guajardo et al. (2011) that the different effects depending on the composition of fiscal adjustment are ascribed to different monetary policy stances.

6.4. The role of the economic environment

Much of the literature studying the factors determining the effect of fiscal adjustments investigates what role the macroeconomic environments play. Therefore, we check the robustness of our findings by including the short-term interest rate and the real effective

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revenue increases (decreases) by at least the average + standard deviation of the changes of cyclically-adjusted revenue (spending) for each country in 1 year.

33. Guajardo et al. (2011) contend that central banks prefer spending-based, rather than tax-based, fiscal adjustment because they interpret the former as a signal for a stronger commitment to fiscal discipline, but they are averse to an increase in taxes such as the indirect tax because of the possibility of subsequent high inflation, inducing the Central Bank to raise interest rates.

exchange rate among the regressors of the baseline model.[34] These two additional control variables are aimed at accounting for monetary policy and exchange rate policy respectively.

Table 14 and Figure 7 show the results. The fit of the regression improves when we include variables relating to the economic policy. The coefficients of fiscal adjustment, as well as that for tax-based adjustment, remain significantly negative, although they are smaller than those without controlling for policy variables. Similarly, spending-based fiscal adjustment has a smaller negative coefficient, but is still statistically insignificant. The change of effects can be attributed to monetary policy in that the short-term interest rate has the significantly negative effect on growth, as expected, but the exchange rate is not significant. Figure 7 confirms that fiscal adjustments have less contractionary effects on GDP when we control for monetary policy than in the baseline. Therefore, monetary policy can affect the response of GDP to fiscal adjustment shocks. If the short-term interest rate falls, it leads to an increase in GDP. Therefore, if fiscal adjustment coincides with a large reduction in the short-term interest rate, this may stimulate the economy in the following periods. However, even in this case, this result is to be attributed not to the fiscal adjustment, but to the lax monetary policy. In regard to the effects of composition of fiscal adjustment, Figure 7 shows that the response of GDP is larger in tax-based fiscal adjustments than in spending-based ones. Therefore, as Figure 6 in the previous subsection shows, if the discretionary monetary policy responds differently according to the type of fiscal adjustment, this could help account for the different effects depending on the composition of fiscal adjustment. However, it cannot be a decisive factor, contrary to the argument of Guajardo et al. (2011), in that when in control for the short-term interest rate, there is still a large difference between the effects of tax-based and spending-based fiscal adjustment on GDP.

Furthermore, there can be other omitted factors that are likely to influence the effects of fiscal adjustment on economic activity. The omission of some variables can bias the response of output in estimating the effects of fiscal adjustments. Therefore, we add additional variables into the baseline model one by one. First, the initial government debt is considered because a high debt level is argued to lead to expansionary fiscal adjustment via the wealth effects. International factors such as the exchange rate regime and financial openness can be taken into account as another potential factor. As Ilzetzki et al (2011) find that the degrees of exchange rate flexibility and openness are critical determinants of the size of fiscal multiplier;

34. Nominal short term interest rate is obtained from OECD Economic Outlook No.88. Real effective exchange rate is drawn from international finance statistics of the Bank for International Settlement. When using the real interest rate calculated using GDP deflator, the result is not affected.

exchange rate regime and the extent of openness in capital account transactions can have an impact on economic activity via net exports and international borrowing. Therefore, we include the exchange rate regime and financial openness index as control variables.[35] Table 14 and 15 show the results of estimating the effects of fiscal adjustment when we control for the impact of these potential factors. The results are similar to the baseline.

Aside from the variables considered, regulatory reform such as labor and product market institutions, and structural reforms should be considered as significant and relevant factors influencing the estimated effects of fiscal adjustment on economic activity. Several studies investigate the interactions between fiscal adjustment and these market institutions and structural reforms and show that these regulatory policies can play a significant role in initiating fiscal adjustment and determining its success (Tagkalakis, 2009; Guichard et al. 2007, and Huaptmeier et al. 2006).[36] However, when these are controlled for, the qualitative effects on economic activity of fiscal adjustment does not change (Hernández de Cos and Moral-Benito, 2011; Alesina and Ardagna, 2012). Although we do not address the effects of labor and product market institutions and structural reforms during the fiscal adjustment episode in this chapter, they can affect the responses of output to fiscal adjustment in the long term as well as quantitatively via employment and investment behaviour.

6.5. Effects of fiscal adjustment across country groups

The effects of fiscal adjustment on the economic activity may be different according to the sensitivity of private agents, which in turn depend on the past trajectory of fiscal policy. In this subsection, we explore this issue by dividing the 20 countries into two groups on the basis of two criteria: the frequency of fiscal adjustments and the volatility of discretionary fiscal policy. For the first criterion, high and low frequency groups include 10 countries each .[37] Similarly, high and low fluctuation groups each consist of 10 countries according to

35. For exchange rate regime, we use the IMF official classification from Ilzetzki et al. (2009) to determine the exchange rate regime of each country in every year and construct a binary variable that takes the value of 1 for the fixed regime and 0 for the flexible regime, following Ilzetzki et al. (2011). For financial openness index, we use the KAOPEN index based on restrictions on cross-border financial transactions from Chinn and Ito (2008).

36. Tagkalakis (2009) shows that a reduction in the unemployment benefit replacement rate, weak bargaining coordination and centralization of union increase the likelihood of initiating and of successfully concluding a fiscal adjustment, but more flexible employment protection legislation and product market regulation work in the opposite direction.

37. The frequency indicates the ratio of the number of fiscal adjustment years to the sample period for each country. This ratio and list of groups are presented in Appendix D.

the standard deviation of changes in the CAPB.[38]

Table 16 reports the estimated responses of GDP and private consumption to a fiscal adjustment shock. Interestingly, for the high group in terms of both frequency and fluctuation, economic activity displays a significantly negative response only in the year of fiscal adjustment. On the other hand, the low groups in frequency and fluctuation alike display a strong response to fiscal adjustment in all years. This finding supports the notion that economic agents respond more sensitively to unexpected or unusual shocks. When fiscal policy undergoes frequent changes, agents become accustomed to such changes and their responses become smaller.

7. Conclusions

This paper investigates the short-term macroeconomic effects of fiscal adjustment in 20 OECD countries over the period 1970-2009. This issue has been studied in many previous contributions already. Recently, it has become more central in academic and policy circles due to the rising fiscal deficits and public debts during the current global crisis. Much of the literature argues that fiscal adjustment can promote economic output even in the short term. However, after identifying fiscal adjustment episodes from historical documents, Guajardo et al. (2011) conclude that fiscal adjustment is always contractionary. They also criticize the CAPB-based measures used in the rest of literature as being imprecise and biased towards overstating the potential expansionary effects of fiscal adjustments.

This paper reconsiders the CAPB-based measure in order to identify the fiscal adjustment episodes more accurately, taking into account the problems identified by Guajardo et al. (2011). The main features of our new measure of fiscal adjustment are as follows. First, we consider the fluctuation in asset prices related to the changes in revenues when making a cyclical correction of the fiscal balance. Second, our criteria for selecting fiscal adjustment episodes allow for the heterogeneity of individual countries in fiscal policy, contrary to the uniform approach in the previous literature. Third, our criteria eliminate temporary one-off transactions which can undermine the accuracy of the CAPB. Finally, we consider the fiscal adjustment episodes which can be excluded due to changes in the CAPB by temporary adverse shocks during a period of multiple years of fiscal adjustments. Although Guajardo et al. (2011) argue that the CAPB is an unreliable guide regarding fiscal adjustment, our new criteria

38. The standard deviation of changes in the CAPB per country and the list of groups are presented in Appendix E.

identify fiscal adjustment episodes that largely overlap with their narrative- based ones.

Based on the fiscal adjustments identified, we estimate the effects of fiscal adjustment on economic activity, and seek to find evidence of expansionary fiscal adjustment. Our key result is that a fiscal adjustment has contractionary effects on economic activity in the short term. This provides little support for the expansionary fiscal adjustment hypothesis. Therefore, so-called 'Non-Keynesian effects' are very limited and probably occur only under specific conditions, not generally. This is consistent with the results of Guajardo et al. (2011). As for the role of the composition of fiscal adjustment, spending-based fiscal adjustments lead to smaller reductions of output than tax-based fiscal adjustments. This finding is in line with most of the literature regardless of the approach used.

Further work could explore in more depth the effects of fiscal adjustments. First, as for the reasons behind the different effects of tax-based and spending-based adjustments, more detailed disaggregation of fiscal spending and taxes could be used for the analysis. Second, most of the literature on fiscal policy has studied developed countries such as the OECD because of data limitations. However, as the data for developing countries have become more easily available lately, the fiscal adjustment in developing countries also needs to be investigated for the comparison with developed countries' results. Another possible extension is about anticipation effects by private agents through comparing the narrative data based on announced plans with the CAPB-based data based on actual outcomes. However, to capture the accurate timing of fiscal adjustment for the anticipation effects, quarterly rather than annual data may be required.

References

Ardagna, S. (2004), "Fiscal stabilizations: when do they work and why", *European Economic Review, 48, 1047-1074.*

Ardagna, S. (2009), "Financial markets' behavior around episodes of large changes in the fiscal stance", *European Economic Review, 53, 37-55.*

Afonso, A. Nickel, C., and Rother, P. (2006), "Fiscal Consolidations in the central and eastern European countries", *Kiel institute, 402-421.*

Afonso, A. (2010), "Expansionary fiscal consolidation in Europe: New evidence", *Applied Economics Letters, 17, 105-109*.

Ahrend, R., Catte, P., and Price, R. (2006), "Interactions between monetary and fiscal policy: how monetary conditions affect fiscal consolidation," *OECD working papers, 49.*

Alesina, A., and Ardagna, S. (1998), "Tales of fiscal adjustment", *Economic Policy, 27, 489-545.*

Alesina, A., and Ardagna, S. (2010), "Large changes in fiscal policy: Taxes versus spending", *Tax Policy and the Economy, 24.*

Alesina, A., and Ardagna, S. (2012), "The design of fiscal adjustments", *NBER working paper, 18423.*

Alesina, A., Campante, F.R., and Tabellini, G. (2008), "Why is fiscal policy often procyclical?", *Journal of the European Economic Association, 6(5), 1006–1036.*

Alesina, A., and Perotti, R. (1995), "Fiscal expansion and adjustments in OECD countries". *Economic Policy, 21, 5-248.*

Alesina, A., and Perotti, R. (1997), "Fiscal adjustments in OECD countries: Composition and macroeconomic effects". *IMF Staff Papers, 2, 210-248.*

Bertola, G., and Drazen, A. (1993), "Trigger points and budget cuts: Explaining the effects of fiscal austerity", *American Economic Review 83, 11-26.*

Biorn, E., and Klette, T. J. (1999), "The labour input response to permanent changes in output□: An errors-in-variables analysis based on panel data", *Scandinavian Journal of* Economics, 101(3), 379-404.

Blanchard, Olivier. J. (1990), "Comments on Giavazzi and Pagano (90)", NBER *Macroeconomics Annual, 5, 111-116.*

Blanchard, Olivier. J. (1993), "Suggestion for a new set of fiscal indicators", *OECD Economic Department working paper 79.*

Burger, A., and Zagler, M. (2008), "US growth and budget consolidation in the 90s: was there a non-Keynesian effects?", *International Economics and Economic Policy, 5, 225-235.*

Devries, P., Guajardo, J., Leigh, D., and Pescatori, A. (2011), "A new action-based dataset of fiscal consolidation", *IMF working paper, 11/128.*

Eschenbach F., Schuknecht L. (2002) "Asset prices and fiscal balances", *European Central Bank working paper, 141.*

Feldstein, M. (1982), "Government deficits and aggregate demand", *Journal of Monetary Economics 9, 1-20.*

Gavin, M., and Perotti, R. (1997), "Fiscal policy in Latin America", *NBER Macroeconomics Annual, 12, 11-72.*

Giavazzi, F., Jappelli, T., and Pagano, M. (2000) "Searching for Non-linear effects of fiscal policy: Evidence from industrial and developing countries", *European Economic Review, 44, 1259-1289.*

Giavazzi, F., and Pagano, M. (1990) "Can severe fiscal contraction be expansionary? Tales of two small European countries", NBER *Macroeconomics Annual, 5, 75-111.*

Giavazzi, F., and Pagano, M. (1995) "Non-Keynesian effects of fiscal policy changes: international evidence and the Swedish experience", *NBER working paper, 5332.*

Giudice, G., Turrini, A., and Veld, J. I. (2007), "Non-Keynesian fiscal adjustment? A close look at expansionary fiscal consolidations in the EU", *Open Economic Review, 18, 613-630.*

Guichard, S., Kennedy, M., Wurzel E., and André C. (2007) "What promotes fiscal consolidation: OECD country experiences," *OECD working papers, 13.*

Guajardo, J., Leigh, D., and Pescatori, A. (2011), "Expansionary Austerity: New international evidence", *IMF working paper, 11/158.*

Hernández de Cos, P., and Moral-Benito, E. (2011), "Endogenous fiscal consolidations", *Bank of Spain working paper, 1102.*

Ilzetzki, E., Reinhart,C., and Rogoff, K. (2009), "Exchange rate arrangements entering the 21st century: Which anchor will hold", *manuscript.*

Ilzetzki, E., Mendoza, E. G., and Végh, C. A. (2011), "How big (small?) are fiscal multipliers?", *IMF working paper 11/52.*

IMF. (2010), "Will it hurt? Macroeconomic effects of fiscal consolidation", *World Economic Outlook, Ch.3, October.*

Joumard, I., Minegishi, M., André, C., Nicq, C., and Price, R. (2009) "Accounting for one-off operations when assessing underlying fiscal position", *OECD working paper, 642.*

Kaminsky, G., Reinhart, C., and Végh, C. (2004), "When It Rains, It Pours: Procyclical Capital Flows and Macroeconomic Policies", *NBER Working Paper, 10780.*

Kamps, C. (2006), "Are the effects of fiscal policy really nonlinear? A note", *Empirica, 33, 113-125.*

Klomp, J., and Hann, J. D. (2013), "Do political budget cycles really exist?", *Applied Economics, 45:3, 329-341.*

McDermott C. J., and Westcott, R.F. (1996), "An empirical analysis of fiscal adjustment", *IMF Staff Papers, 4, 725-753.*

Morris, R., Schuknecht, L. (2007), "Structural balances and revenue windfalls: the role of asset prices", *European Central Bank working paper, 737.*

Oehlert, G. W. (2008), "A note on the Delta Method", *American Statistician*, *46(1), 27-29.*

Park, H., and Song, H. (2010), "Current and future tasks for desirable fiscal consolidation policy", *Korea Institute of Public Finance.*

Price, R., and Dang, T. (2011), "Adjusting fiscal balances for asset price cycles", *OECD working paper, 868.*

Ramey, V. A., and Shapiro, M. D. (1998), "Costly Capital Reallocation and the Effects of Government Spending", *Carnegie-Rochester Conference Series on Public Policy, 48, 145- 4.*

Reinhart C. M., Rogoff K. S. (2009) "The aftermath of financial crises", *American Economic Reviews, 99:2, 466–472.*

Romer, C., and Romer, D. (2010), "The macroeconomic effects of tax changes: Estimates based on a new measure of fiscal shocks", *American Economic Review, 100, 763-801.*

Roodman, D. (2006), "How to do xtabond2: An introduction to 'Difference' an 'System' GMM in Stata", *Center for Global Development working paper, 103.*

Schaffer, M.E. (2010), "xtivreg2: Stata module to perform extended IV/2SLS, GMM and AC/HAC, LIML and k-class regression for panel data models", *http://ideas.repec.org/c/boc /bocode/s456501.html.*

Sunderland, A. (1997), "Fiscal crises and aggregate demand: Can high public debt reverse the effects of fiscal policy?" *Journal of Public Economics, 65, 147-162.*

Shi, M., and Svensson, J. (2006), "Political budget cycles: Do they differ across countries and why?", *Journal of Public Economics, 90, 1367–1389.*

Tagkalakis, A. (2009), "Fiscal adjustments: do labor and product market institutions matter?", *Public Choice, 139, 389-411.*

Tagkalakis, A. (2011a), "Fiscal policy and Financial Market Movement", *Journal of Banking and Finance, 35(1), 231-251.*

Tagkalakis, A. (2011b), "Fiscal adjustments and asset price changes", *Journal of Macroeconomics, 33(2), 206-223.*

Tagkalakis, A. (2012), "Fiscal policy and asset price volatility", *Empirica, 35, 123-156.*

Tornell, A., and Lane, P. (1999), "The Voracity Effect", *The American Economic Review, 89(1), 22-46.*

Tujula, M., and Wolswijk, G. (2007), "Budget balances in OECD countries: What makes them changes", *Empirica, 34, 1-14.*

von Hagen, J., and Strauch, R. (2001), "Fiscal consolidations: Quality, economic conditions and success", *Public Choice, 109, 327-346.*

Table 1 Determinants of fiscal adjustment (logit)

Approach	AA(10)			AA(12)			IMF(11)		
Marginal effects	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
GDP growth (T)	0.026*** (0.008)	0.021*** (0.006)	-	0.048*** (0.015)	0.057*** (0.015)	-	0.017 (0.017)	0.016 (0.013)	-
GDP growth (T-1)	-0.009 (0.008)	-	0.009 (0.007)	0.017 (0.014)	-	0.051*** (0.014)	-0.001 (0.021)	-	0.013 (0.016)
GDP gap (T-1)	0.011 (0.008)	0.006 (0.007)	-0.006 (0.008)	-0.017 (0.013)	-0.008 (0.010)	-0.047*** (0.014)	0.004 (0.019)	0.004 (0.015)	-0.007 (0.015)
Inflation (T-1)	0.001* (0.001)	0.001* (0.001)	0.001 (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.003** (0.001)	0.005** (0.002)	0.005** (0.002)	0.005** (0.002)
Interest rate (T-1)	0.013*** (0.005)	0.013*** (0.005)	0.009* (0.005)	0.029*** (0.010)	0.029*** (0.010)	0.021** (0.009)	0.049*** (0.016)	0.049*** (0.016)	0.045*** (0.015)
Primary balance (T-1)	-0.018*** (0.005)	-0.018*** (0.005)	-0.016*** (0.005)	-0.024*** (0.008)	-0.024*** (0.008)	-0.021*** (0.008)	-0.053*** (0.011)	-0.053*** (0.011)	-0.051*** (0.011)
Gross Debt (T-1)	0.002** (0.001)	0.001** (0.001)	0.001* (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.006*** (0.002)	0.006*** (0.002)	0.006*** (0.002)
Election (T)	-0.054** (0.022)	-0.054** (0.022)	-0.059** (0.024)	-0.040 (0.035)	-0.036 (0.034)	-0.048 (0.036)	-0.032 (0.051)	-0.032 (0.051)	-0.031 (0.051)
System (Federal)	-0.065** (0.031)	-0.066** (0.030)	-0.076** (0.030)	0.009 (0.081)	0.014 (0.081)	-0.029 (0.077)	0.150* (0.079)	0.150* (0.079)	0.145* (0.078)
System (Presidential)	-0.043 (0.034)	-0.044 (0.033)	-0.053 (0.033)	0.080 (0.135)	0.079 (0.132)	0.052 (0.122)	0.117 (0.116)	0.117 (0.116)	0.116 (0.113)
Observations	593	601	593	593	601	593	463	463	463
No. Country	20[1」]			20			17		
Period	1970-2009			1970-2009			1978-2009		

Note: 1」 Alesina and Ardagna (2010, 2012) include 21 OECD countries. However, Gross debt and the interest payment data for Greece are not available in OECD Economic Outlook Database for the sample period. Therefore, we include 20 OECD countries excluding Greece. Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.10.

Table 2 Effect of fiscal adjustment on growth

Fiscal adjustment	AA10 (Dummy)	AA12 (Dummy)	IMF (11) (Dummy)	IMF (11) (Size, % of GDP)
	(1)	(2)	(3)	(4)
GDP growth (-1)	0.366***	0.362***	0.502***	0.502***
	(0.039)	(0.039)	(0.046)	(0.046)
GDP growth (-2)	-0.050	-0.046	-0.094**	-0.099**
	(0.039)	(0.039)	(0.047)	(0.047)
FA	0.003	-0.059	-0.424**	-0.317***
	(0.197)	(0.204)	(0.167)	(0.104)
FA (-1)	0.190	0.435*	-0.253	-0.139
	(0.195)	(0.238)	(0.183)	(0.115)
FA (-2)	-0.184	-0.075	0.170	0.217**
	(0.196)	(0.204)	(0.165)	(0.109)
Constant	4.017***	3.993***	-3.920***	1.891***
	(0.392)	(0.390)	(0.365)	(0.383)
Observations	740	740	510	510
R-squared	0.527	0.529	0.657	0.658
No. Country	20	20	17	17

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 3 Definitions of fiscal adjustment

Study	Criteria for the change in the improvement of CAPB
Alesina and Perotti (1995), Alesina and Ardagna (2010)	The change is at least 1.5% p of GDP in 1 year
Alesina and Perotti (1996)	The change is at least 1.5% p of GDP in 1 year or at least 1.25% p of GDP per year in both two consecutive years
McDermott and Wescott (1996)	The change is at least 1.5 % p of GDP over 2 years with the improvement of each year
Alesina and Ardagna (1998), Giudice et al. (2007), Ardagna (2007)	The change is at least 2% p of GDP in 1 year or at least 1.5%p of GDP per year in both 2 consecutive years
Alesina and Ardagna (2012)	The cumulative change is at least 2% p of GDP in 2 consecutive years and at least 3% p of GDP in 3 or more years with the improvement of each year
Giavazzi and Pagano (1996)	The cumulative change is at least 5, 4, 3% p of GDP in respectively 4, 3, or 2 consecutive years, or 3% p in 1 year
Giavazzi et al. (2000), Kamps (2006)	The change is at least 1.5% p of GDP per year over a 2 consecutive years
Afonso et al. (2006)	The change is above the average + 2/3 times the standard deviation for all discretionally changes of budget balance in the entire sample
Ahrend et al. (2006), Guichard et al.(2007)	- Starts if the change is at least 1% p of potential GDP in l year or in 2 consecutive years with at least 0.5% p in the first of the two years. - Continues as long as the CAPB improves or deteriorates at most 0.3% p of GDP but is offset in the following year. - Terminates if the CAPB stops increasing or improves by less than 0.2% p of GDP in one year and then deteriorates.

Table 4 Episodes of fiscal adjustment

Country (sample period)	Period	No. Episode	No. Year
Australia (70~09)	77- 80, 82- 83, 86- 88, 91- 93, 96- 98	5	15
Austria (70~09)	77- 81, 84, 96- 97, 01, 05- 07	5	12
Belgium (86~09)	87, 93- 98	2	7
Canada (70~09)	81- 83, 86- 87, 91- 97	3	12
Denmark (83~09)	84- 86, 03- 05	2	6
Finland (70~09)	76- 77, 92- 94, 96	3	6
France (80~09)	83- 87, 94, 96- 99, 04- 06	4	13
Germany (70~09)	82- 85, 92- 94, 97- 00, 03- 07	4	16
Ireland (70~09)	75- 77, 82- 88	2	10
Italy (70~09)	82- 83, 86- 88, 92- 97	3	11
Japan (70~09)	79- 87, 06	2	10
Korea (81~09)	93- 94, 98- 99	2	4
Netherlands (70~09)	72- 73, 81- 83, 93, 04- 05	4	8
New Zealand (86~09)	87, 89- 93	2	6
Norway (86~09)	94- 96, 99- 00, 04- 06	3	8
Portugal (88~09)	92, 94- 95, 02- 04, 06- 07	4	8
Spain (85~09)	86- 87, 92- 94, 09	3	6
Sweden (70~09)	81- 87, 94- 97, 04- 05	3	13
United Kingdom (70~09)	76- 77, 79- 84, 96- 00, 05- 06	4	15
United States (70~09)	71- 72, 76- 77, 80- 82, 91, 96- 98, 05- 06	6	13
20 countries		66	199

Note: As fiscal consolidation is identified based on the changes in the CAPB from the previous year, the period for the episodes is shorter by one year than the sample period.

Table 5 Probability of fiscal adjustment

Variable (dummy)	Each year of episodes			First year of episodes		
Marginal effects	(1)	(2)	(3)	(4)	(5)	(6)
GDP growth (T)	-0.003 (0.012)	-0.011 (0.010)	-	-0.003 (0.004)	-0.007* (0.004)	-
GDP growth (T-1)	-0.017 (0.015)	-	-0.018 (0.012)	-0.007 (0.005)	-	-0.009** (0.004)
GDP gap (T-1)	-0.038** (0.015)	-0.043*** (0.012)	-0.039*** (0.013)	0.014** (0.005)	0.008* (0.005)	0.016*** (0.005)
Inflation (T-1)	0.002* (0.001)	0.002* (0.001)	0.002* (0.001)	0.001 (0.000)	0.001 (0.000)	0.001 (0.000)
Long-term interest rate (T-1)	0.048*** (0.010)	0.048*** (0.010)	0.048*** (0.010)	0.004* (0.002)	0.006* (0.003)	0.005* (0.002)
Primary balance (T-1)	-0.022*** (0.008)	-0.023*** (0.008)	-0.022*** (0.008)	-0.019*** (0.003)	-0.019*** (0.003)	-0.019*** (0.003)
Gross Debt (T-1)	0.002* (0.001)	0.002* (0.001)	0.002* (0.001)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Election (T)	-0.038 (0.043)	-0.038 (0.042)	-0.040 (0.043)	-0.012 (0.017)	-0.007 (0.018)	-0.013 (0.017)
System (Federal)	0.108* (0.067)	0.109* (0.067)	0.108* (0.067)	0.024 (0.019)	0.027 (0.020)	0.024 (0.019)
System (Presidential)	-0.026 (0.075)	-0.030 (0.075)	-0.026 (0.075)	0.023 (0.024)	0.024 (0.025)	0.022 (0.024)
Observations	584	597	584	584	597	584
No. country		20			20	
Period		1970~2009			1970~2009	

Note: Standard errors in parentheses and *** p<0.01, ** p<0.05, * p<0.10

Table 6 Effect of fiscal adjustment on economic activity

Dependent variable	GDP growth (%)	Private consumption (%)	Private investment (%)	Hourly wage (%)	Unemploy-ment rate (%)	Short Interest rate (%)	Long Interest rate (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged dependent variable (T-1)	0.354*** (0.040)	0.357*** (0.040)	0.378*** (0.040)	0.519*** (0.036)	0.874*** (0.017)	0.719*** (0.029)	0.849*** (0.020)
ΔFA (T)	-0.289*** (0.066)	-0.305*** (0.075)	-0.814*** (0.197)	-0.059 (0.081)	0.332*** (0.031)	-0.102* (0.056)	0.004 (0.029)
ΔFA(T-1)	0.153** (0.065)	0.154** (0.073)	0.471** (0.193)	0.080 (0.080)	0.083*** (0.032)	-0.134** (0.053)	-0.074*** (0.028)
Constant	3.602*** (0.475)	0.811 (0.543)	-4.774*** (1.425)	2.088*** (0.641)	1.171*** (0.240)	4.836*** (0.446)	1.962*** (0.256)
Observations	645	645	645	602	645	612	644
R-squared	0.564	0.420	0.494	0.781	0.904	0.894	0.955
No. country	20	20	20	20	20	20	20

Note: The data on hourly wage is obtained from the OECE. StatExtracts/Labour/Earning dataset-manufacture (index 2005=100). The estimated results are the coefficient estimates.
Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 7 Macroeconomic responses to fiscal adjustment shock equal to 1% of GDP

Dependent variables	GDP	Private consumption	Private investment	Hourly wage	Unemployment rate (%)	Short Interest rate (%)	Long Interest rate (%)
T	-0.289*** (0.066)	-0.305*** (0.075)	-0.814*** (0.197)	-0.059 (0.081)	0.332*** (0.031)	-0.102* (0.056)	0.004 (0.029)
T+1	-0.238** (0.096)	-0.260** (0.110)	-0.650** (0.293)	-0.010* (0.129)	0.373*** (0.036)	-0.208*** (0.060)	-0.071** (0.033)
T+2	-0.220* (0.114)	-0.244* (0.130)	-0.588* (0.350)	0.016* (0.164)	0.325*** (0.031)	-0.149*** (0.045)	-0.060** (0.029)

Note: The table shows the point estimated responses on the level of GDP and its components in terms of logs and on the interest rate and unemployment in terms of the percentage. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 8 Effect of on growth: alternative definitions

Alternatives	Criteria for the definition					CAPB version	
	Baseline	Threshold 1	Threshold 2	Threshold 3	Dropping Outliers	House price Index	OECD CAPB
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Single year (η)	1	3/4	3/2	2	1	1	1
Multiple years (λ)	1/3, 4/3, 2	1/4, 1, 3/2	1/2, 2, 3	3/4, 2, 3	1/3, 4/3, 2	1/3, 4/3, 2	1/3, 4/3, 2
GDP growth (T-1)	0.354*** (0.040)	0.357*** (0.040)	0.355*** (0.040)	0.352*** (0.040)	0.357*** (0.040)	0.391*** (0.039)	0.418*** (0.043)
ΔFA (T)	-0.289*** (0.066)	-0.274*** (0.065)	-0.320*** (0.070)	-0.302*** (0.068)	-0.264*** (0.065)	-0.214*** (0.057)	-0.071 (0.100)
ΔFA (T-1)	0.153** (0.065)	0.146** (0.064)	0.191*** (0.069)	0.149** (0.067)	0.152** (0.064)	0.078 (0.056)	-0.034 (0.097)
Constant	3.602*** (0.475)	3.665*** (0.479)	3.621*** (0.474)	3.595*** (0.474)	3.618*** (0.478)	2.544*** (0.437)	2.075*** (0.420)
Observations	645	645	645	645	645	620	518
No. FA Year	199	219	157	100	204	240	167
R-squared	0.564	0.563	0.566	0.564	0.562	0.560	0.576
No. Country	20	20	20	20	20	20	19
Period	70-90	70-09	70-09	70-09	70-09	70-09	80-09

Note: The new threshold means the change of multiples (of the standard deviation for identifying fiscal adjustment. η and λ are the multiples for a given year and multi-years respectively. Column 2 has weaker threshold than the baseline. However, Column 3 and 4 have stronger threshold than the baseline. Column (7) uses the underlying government primary balance (a percentage of potential GDP) data for 1980-2009 from OECD Outlook No.88. 19 OECD countries excluding Germany due to the limited period for the CAPB are included. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 9 Comparison of response of GDP to alternative measures

	Baseline	Criteria for the definition				CAPB version	
		New threshold 1	New threshold 2	New threshold 3	Dropping outliers	House price Index	OECD CAPB
T	-0.289*** (0.066)	-0.274*** (0.065)	-0.320*** (0.070)	-0.302*** (0.068)	-0.264*** (0.065)	-0.214*** (0.057)	-0.071 (0.100)
T+1	-0.238** (0.096)	-0.226** (0.097)	-0.243** (0.099)	-0.259*** (0.098)	-0.206** (0.097)	-0.220** (0.086)	-0.136 (0.158)
T+2	-0.220* (0.114)	-0.209* (0.115)	-0.216* (0.117)	-0.244** (0.115)	-0.185 (0.114)	-0.222** (0.104)	-0.163 (0.192)

Note: The table shows the point estimated responses of GDP to a shock of fiscal adjustment equal to 1% of GDP. T denotes the year of fiscal adjustment. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 10 Effects of fiscal adjustment on growth: controlling for endogeneity

Estimated Method	OLS	Augmented OLS	2SLS	
Added Variable / IV	Baseline	$CAPB^{NFA}$	Narrative FA	One lagged long-term interest rate
GDP growth (T-1)	0.354*** (0.040)	0.356*** (0.040)	0.402*** (0.049)	0.244*** (0.071)
ΔFA (T)	-0.289*** (0.066)	-0.297*** (0.066)	-0.581*** (0.186)	-1.259** (0.512)
ΔFA (T-1)	0.153** (0.065)	0.147** (0.065)	0.182** (0.076)	0.345*** (0.122)
ΔNFA (T)	-	0.025 (0.052)	-	-
ΔNFA (T-1)	-	0.087 (0.053)	-	-
Constant	3.602*** (0.475)	3.680*** (0.478)	-4.085*** (0.349)	-3.524*** (0.428)
Observations	645	645	502	644
R-squared	0.564	0.566	0.628	0.399
No. Country	20	20	17	20

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 11 Response of GDP to a fiscal adjustment shock of 1 % of GDP

Estimated Method	OLS	Augmented OLS	2SLS	
Added Variable / IV	Baseline	$CAPB^{NFA}$	Narrative FA	One lagged long-term interest rate
T	-0.289*** (0.066)	-0.297*** (0.066)	-0.581*** (0.186)	-1.259** (0.512)
T+1	-0.238** (0.096)	-0.256*** (0.097)	-0.632*** (0.221)	-1.221** (0.476)
T+2	-0.220* (0.114)	-0.241** (0.115)	-0.652*** (0.239)	-1.212** (0.471)

Note: The table shows the point estimated responses of GDP to a shock of fiscal adjustment equal to 1% of GDP. T denotes the year of fiscal adjustment. The Standard errors in parentheses are computed via the delta method, *** p<0.01, ** p<0.05, * p<0.1.

Table 12 First-stage regression of fiscal adjustment in 2SLS

Dependent Variable	$CAPB^{FA}$	
Instrument Variable	Narrative FA	One lagged long-term interest rate
GDP growth (T-1)	-0.082*** (0.027)	-0.103*** (0.025)
ΔFA (T-1)	0.143*** (0.042)	0.173*** (0.040)
Instrument Variable	0.560*** (0.065)	0.098*** (0.027)
Constant	0.004 (0.210)	-0.270 (0.252)
Observations	502	644
R-squared	0.388	0.251
No. Country	17	20
Summary results for the instrument variable test from the first-stage regressions		
① F test of excluded instruments (F value)[1)]	73.87***	12.62***
② Underidentification test (LM value)[2)]	68.26***	13.20***
③ Weak identification test (F value)[3)]	73.87***	13.11
④ Endogeneity test of endogenous variable (P value)[4)]	0.013	0.023

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.
1) Angrist-Pischke Multivariate F test,
2) Anderson canon. Correlation (Ho: equation is underidentified),
3) Cragg-Donald Wald test with Stock-Yogo critical values (Ho: equation is weakly identified),
4) Durbin-Wu-Hausman Test (Ho: OLS estimator of the same equation would yield consistent estimates).

Table 13 Effect of fiscal adjustment on growth: composition

Variables	GDP growth	GDP growth	GDP growth	GDP growth
GDP growth (T-1)	0.354***	0.374***	0.373***	0.389***
	(0.040)	(0.040)	(0.042)	(0.041)
FA (T)	-0.289***		-0.222***	
	(0.066)		(0.066)	
FA (T-1)	0.153**		0.131**	
	(0.065)		(0.063)	
Tax-based (T)		-0.622***		-0.532***
		(0.096)		(0.098)
Tax-based (T-1)		0.228**		0.222**
		(0.100)		(0.099)
Spending-based (T)		-0.104		-0.053
		(0.077)		(0.077)
Spending-based (T-1)		0.103		0.075
		(0.073)		(0.070)
Short- term interest rate			-0.124***	-0.102***
			(0.035)	(0.035)
Real effective exchange rate			0.019	0.018
			(0.012)	(0.012)
Constant	3.602***	3.786***	4.521***	4.320***
	(0.475)	(0.469)	(0.545)	(0.539)
Observations	645	645	615	615
R-squared	0.564	0.580	0.600	0.613
No. country	20	20	20	20

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 14 Effect of fiscal adjustment on growth: controlling for other factors

Additional control variable	Baseline	Gross Debt	Exchange rate regime	Financial openness
GDP growth (T-1)	0.354*** (0.040)	0.387*** (0.042)	0.348*** (0.040)	0.355*** (0.040)
ΔFA (T)	-0.289*** (0.066)	-0.280*** (0.066)	-0.302*** (0.066)	-0.290*** (0.066)
ΔFA (T-1)	0.153** (0.065)	0.146** (0.065)	0.142** (0.065)	0.150** (0.065)
Gross Debt (T-1)		-0.001 (0.004)		
Exchange rate regime (Fixed)			-0.436** (0.218)	
Financial openness				0.148 (0.100)
Constant	3.602*** (0.475)	-0.117 (0.550)	3.890*** (0.495)	0.526 (0.529)
Observations	645	609	645	639
R-squared	0.564	0.593	0.567	0.567
No. Country	20	20	20	20

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 15 Response of GDP to a fiscal adjustment shock of 1 % of GDP

Additional control variable	Baseline	Gross Debt	Exchange rate regime	Financial openness
T	-0.289*** (0.066)	-0.280*** (0.066)	-0.302*** (0.066)	-0.290*** (0.066)
T+1	-0.238** (0.096)	-0.241** (0.100)	-0.264*** (0.097)	-0.243** (0.097)
T+2	-0.220* (0.114)	-0.226* (0.120)	-0.251** (0.114)	-0.226** (0.114)

Note: The table shows the point estimate responses of GDP to a shock of fiscal adjustment equal to 1% of GDP. T denotes the year of fiscal adjustment. The standard errors in parentheses are computed via the delta method, *** p<0.01, ** p<0.05, * p<0.1.

Table 16 Effects of fiscal adjustment across country groups

Variable	GDP					Private consumption				
Group	Baseline	Frequency		Fluctuation		Baseline	Frequency		Fluctuation	
		High	Low	High	Low		High	Low	High	Low
T	-0.289*** (0.066)	-0.151* (0.081)	-0.413*** (0.115)	-0.166** (0.081)	-0.571*** (0.125)	-0.305*** (0.075)	-0.137* (0.085)	-0.493*** (0.139)	-0.097 (0.085)	-0.737*** (0.155)
T+1	-0.238** (0.096)	-0.071 (0.122)	-0.414** (0.165)	-0.130 (0.128)	-0.450** (0.170)	-0.260** (0.110)	-0.085 (0.134)	-0.522*** (0.190)	-0.006 (0.137)	-0.682*** (0.212)
T+2	-0.220* (0.114)	-0.046 (0.143)	-0.414** (0.195)	-0.112 (0.161)	-0.427** (0.187)	-0.244* (0.130)	-0.064 (0.163)	-0.531** (0.216)	0.042 (0.176)	-0.670*** (0.233)
Observations	645	336	309	330	315	645	336	309	330	315
R-squared	0.564	0.605	0.586	0.627	0.576	0.420	0.478	0.443	0.559	0.374
No. country	20	10	10	10	10	20	10	10	10	10

Note: T denotes the year of fiscal adjustment. Standard errors in parentheses are computed via the delta method, *** p<0.01, ** p<0.05, * p<0.1.

Figure 1 Distribution of fiscal adjustment episodes by the duration

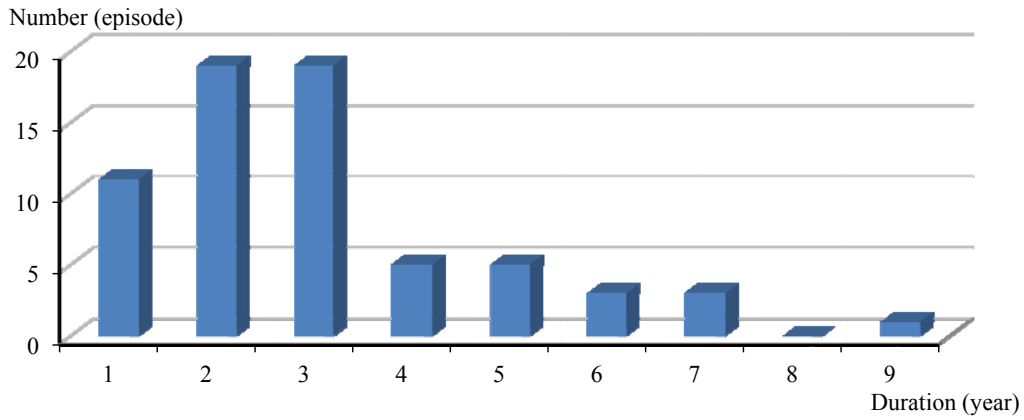


Figure 2 Distribution of fiscal adjustment episodes by the period

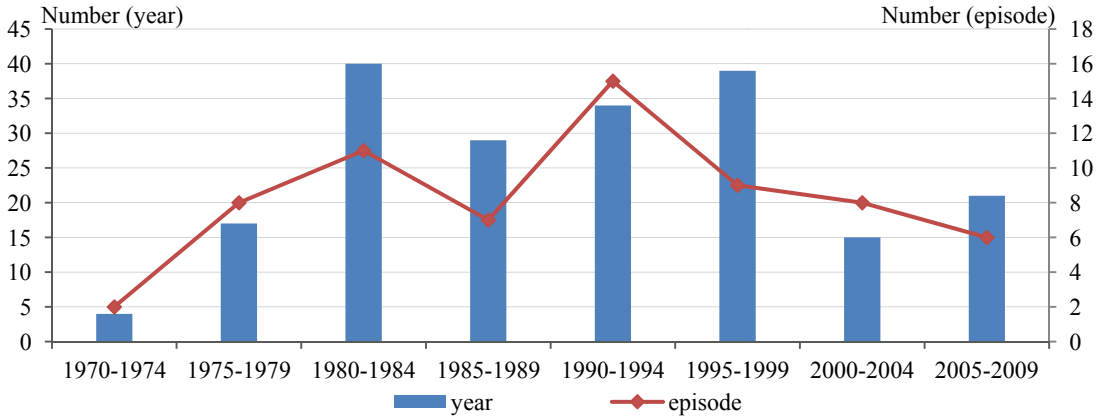
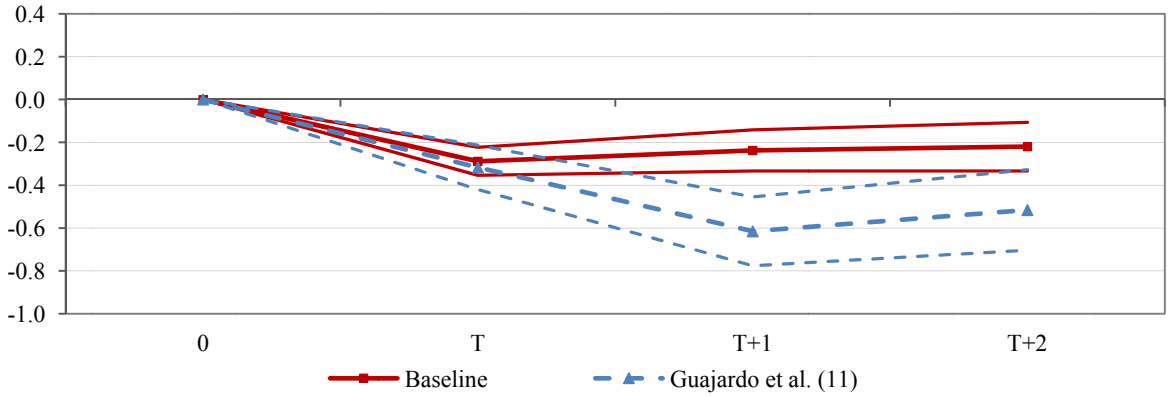
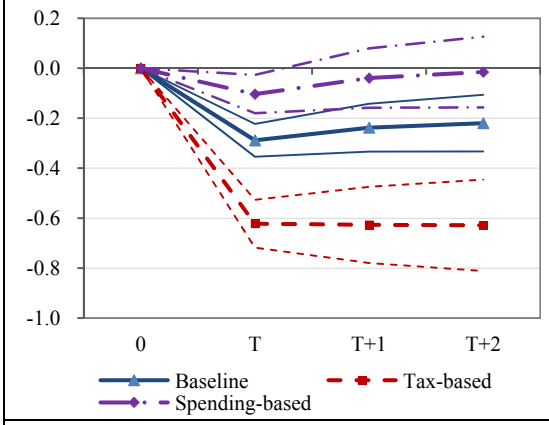
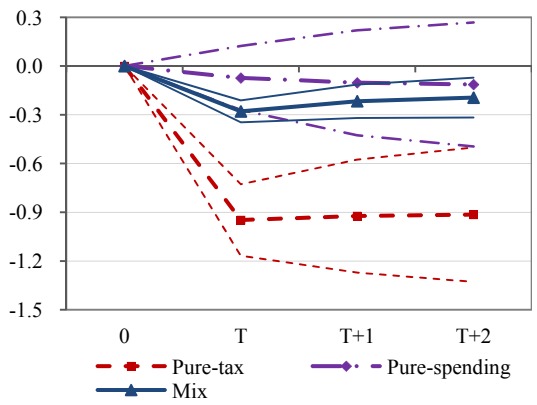
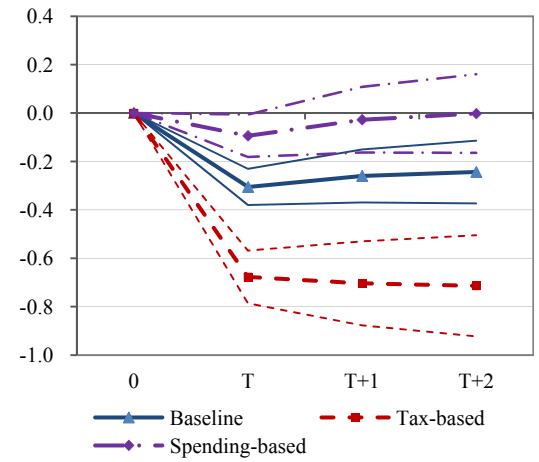
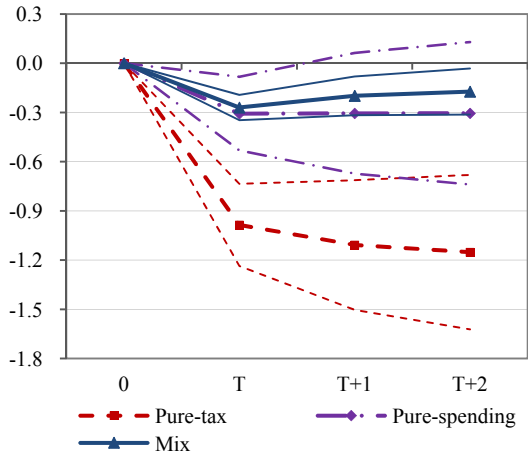


Figure 3 Comparison of responses of GDP to a fiscal adjustment shock



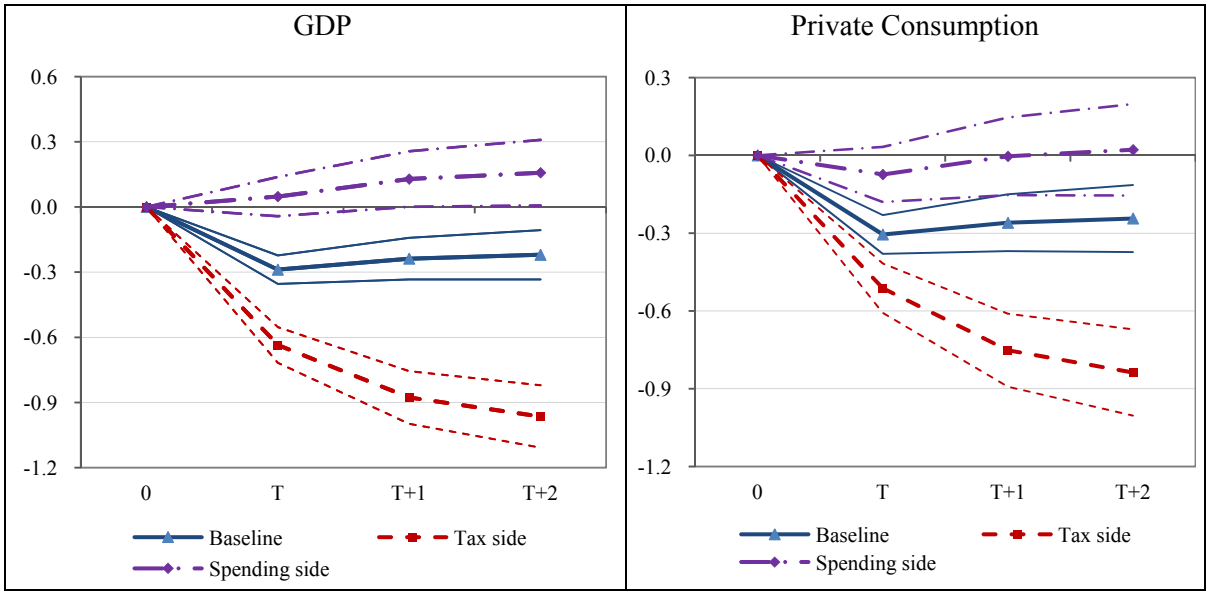
Note: Guajardo et al. (2011) select 2 lags order, but our specification uses one lag. T denotes the year of fiscal adjustment. Figure reports point estimates and one standard error bands.

Figure 4 The effects of the composition of fiscal adjustment

Contribution (more than 50%)	Policy (Pure-tax, Pure-spending, Mixed)
(1)	(2)
GDP	
	
Private consumption	
	

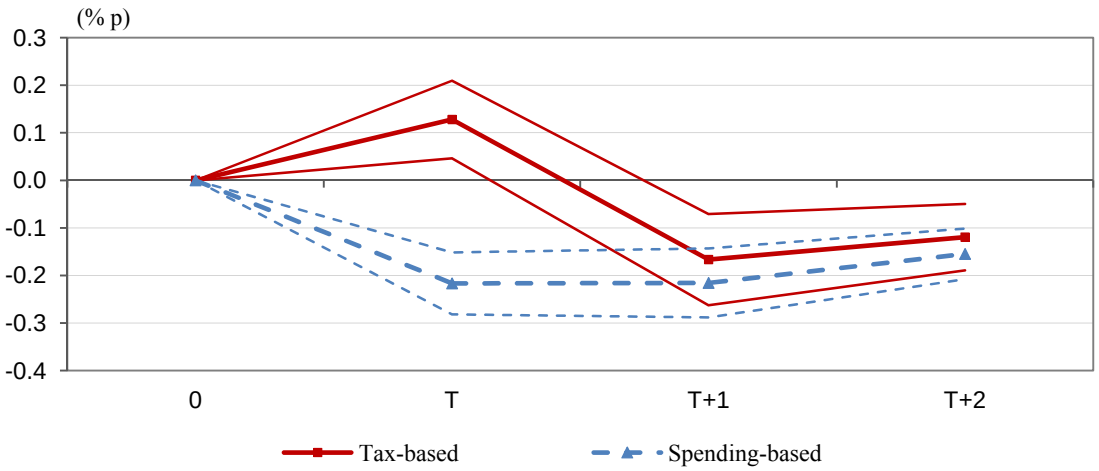
Note: T denotes the year of fiscal adjustment. Figure reports point estimates and one standard error bands. Tax-based means that the improvement in the CAPB for fiscal adjustment is by more than 50% due to the tax hikes. On the other hand, pure-tax indicates the improvement in the CAPB is totally due to the tax hikes.

Figure 5 The effects of composition of fiscal adjustment:
Based on the changes in cyclically-adjusted revenues and spending



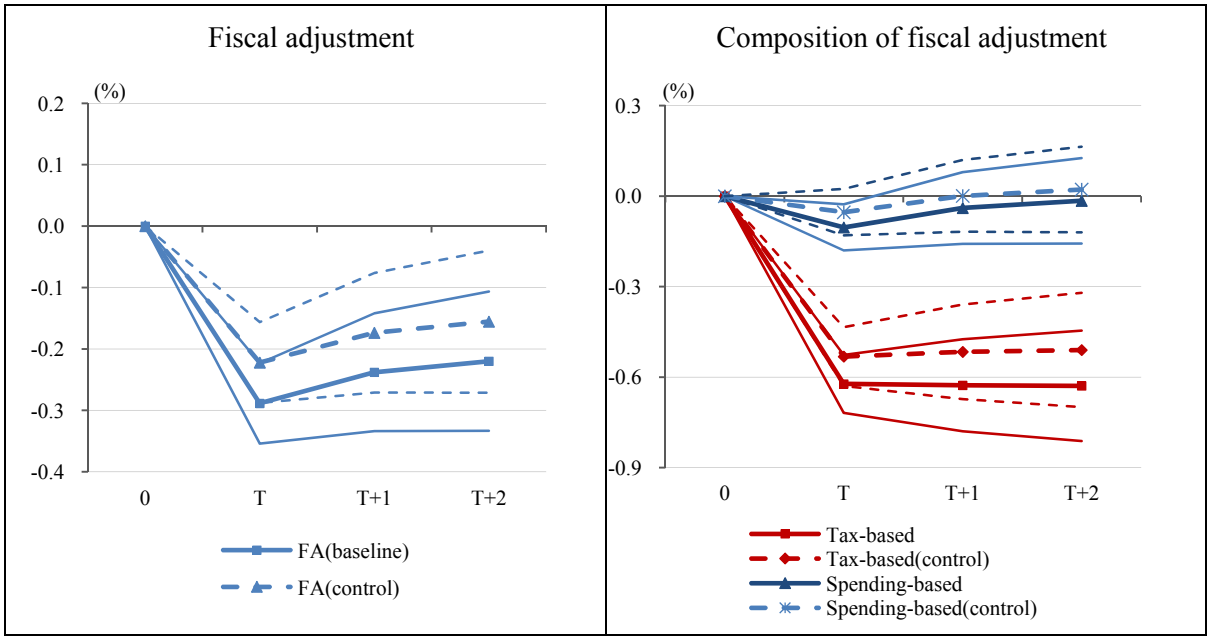
Note: T denotes the year of fiscal adjustment. Figure reports point estimates and one standard error bands. 'Tax side' means the fiscal adjustment based on large increases in cyclically-adjusted revenues and 'spending side' indicates the fiscal adjustment based on large decreases of cyclically-adjusted spending.

Figure 6 Response of short-term interest rate to two compositions of fiscal adjustment



Note: T denotes the year of fiscal adjustment. Figure reports point estimates and one standard error bands

Figure 7 The effects of fiscal adjustment on GDP



Note: T denotes the year of fiscal adjustment. Figure reports point estimates and one standard error bands.

Appendix

A. Episodes of fiscal adjustment in literature

Country	AA10 (70~07)	AA12 (70~10)	IMF 11 (78~09)
Australia	87, 88		85, 86, 87, 88, 94, 95, 96, 97, 98, 99
Austria	84, 96, 97, 05	96, 97	80, 81, 84, 96, 97, 01, 02
Belgium	82, 84, 87, 06	73, 74, 84, 85, 86, 87, 88, 89, 90, 93, 94, 95, 96, 97, 98, 99, 00, 01	82, 83, 84, 85, 87, 90, 92, 93, 94, 96, 97
Canada	81, 86, 87, 95, 96, 97	86, 87, 88, 89, 93, 94, 95, 96, 97, 98, 99	84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97
Denmark	83, 84, 85, 86, 05	83, 84, 85, 86, 04, 05	83, 84, 85, 86, 95
Finland	73, 76, 81, 84, 88, 94, 96, 98, 00	88, 89, 93, 94, 96, 97, 98	92, 93, 94, 95, 96, 97
France	79, 96	94, 95, 96, 97, 98, 99, 00, 01	79, 87, 89 91, 92, 95, 96, 97, 99, 00
Germany	96, 00	96, 97, 98, 99, 00, 03, 04, 05, 06, 07	82, 83, 84, 91, 92, 93, 94, 95, 97, 98, 99,00, 03, 04, 06, 07
Greece	76, 86, 91, 94, 96, 05, 06		
Ireland	76, 84, 87, 88, 89, 00	83, 84, 86, 87, 88, 89, 96, 97, 98	82, 83, 84, 85, 86, 87, 88, 09
Italy	76, 80, 82, 90, 91, 92, 97, 07	76, 77, 82, 83, 88, 89, 90, 91, 92, 93, 95, 96, 97	91, 92, 93, 94, 95, 96, 97, 98, 04, 05, 06, 07
Japan	84, 99, 01, 06	79, 80, 81, 82, 83, 84, 85, 86, 87	79, 80, 81, 82, 83, 97, 98, 03, 04, 05, 06, 07
Netherlands	72, 73, 83, 88, 91, 93, 96	71, 72, 73, 82, 83, 85, 86, 87, 88, 96, 97, 98, 99, 00, 04, 05	81, 82, 83, 84, 85, 86, 87, 88, 91, 92, 93,04, 05
New Zealand	87, 89, 93, 94, 00	91, 92, 94	
Norway	79, 80, 83, 89, 96, 00, 04, 05	78, 79, 80, 82, 83, 88, 90, 99, 00, 04, 05	
Portugal	82, 83, 86, 88, 92, 95, 02, 06	94, 95, 02, 03, 06, 07	83, 00, 02, 03, 05, 06, 07
Spain	86, 87, 94, 96	83, 84, 86, 87, 94, 95, 96, 97	83, 84, 89, 90, 92, 93, 94, 95, 96, 97
Sweden	81, 83, 84, 86, 87, 94, 96, 97, 04	75, 76, 83, 84, 86, 87, 93, 94, 95, 96, 97, 98, 04, 05	84, 93, 94, 95, 96, 97, 98
Switzerland		03, 04, 05, 06, 07, 08	
United Kingdom	77, 82, 88, 96, 97, 98, 00	84, 85, 86, 87, 88, 94, 95, 96, 97, 98, 99, 00	79, 80, 81, 82, 94, 95, 96, 97, 98, 99
United States			78, 80, 81, 85, 86, 88, 90, 91, 92, 93, 94, 95, 96, 97, 98

B. Data description

Variable	Original Series Name	Source	Definition or additional notes
Government Spending	Total disbursements of general government (%, of GDP)	OECD	
Government Revenues	Total receipts of general government (%, of GDP)	OECD	
Net interest Payment	Net government interest payments (%, of GDP)	OECD	Interest paid for government debt - interest received for government assets
Government Debt	General government gross financial liabilities (%, of GDP)	OECD	
GDP	Gross domestic product	OECD	Chained volume series expressed in a reference year
Private Consumption	Private final consumption expenditure	OECD	Chained volume series expressed in a reference year
Private Investment	Gross fixed capital formation	OECD	Chained volume series expressed in a reference year
GDP Gap	Output gap of the total economy	OECD	Percentage difference between the Levels of actual GDP and estimated potential GDP
OECD CAPB	Underlying government primary balance, (%, of potential GDP)	OECD	Eliminates one-off transaction and net interest payment from cyclically-adjusted fiscal balances
Inflation rate	Gross domestic product deflator	OECD	Growth rate from the index
Unemployment	Unemployment rate	OECD	
Hourly wage	Hourly earnings (manufacturing, index 2005=100, SA)	OECD	Monthly Economic Indicators
Long term Interest rate	Long-term interest rate on government bonds (%)	OECD	10-year benchmark government bonds
Short term Interest rate	Short-term interest rate (%)	OECD	3-month money market rates
Real effective Exchange rate	BIS effective exchange rate (CPI-based, Narrow indices, 2010=100)	BIS	Differenced in the logarithm
Share price Index	Share prices (Index 2005=100)	OECD	Annual average from monthly data
House price Index	International House Price Database (Real term, 2005=100)	FRB of Dallas	Annual average from quarterly data
Election	Date of election of national parliament (Lower house)	IPS	Dummy variable equal to one if there is an election in a year, zero otherwise
Federalism	Federalism Coded 0 = no, 1 = weak, 2 = strong	IPS	Dummy variable equal to one if Federalism code 1 or 2, zero otherwise
President system	Presidential system. Coded 0 = parliamentary, 1 = president or collegial executive	IPS	Dummy variable equal to one if Presidential system code 1, zero otherwise

NOTE: **OECD**: Economic Outlook No.88 or OECD StatExtracts.com, **BIS**: Statistics of Bank for International Settlements, **FRB of Dallas**: Data of Globalization & Monetary Policy Institute in Federal Reserve Bank of Dallas, **IPS**: Comparative Political Data Set I (23 OECD Countries) of Institute of Political Science in University of Bern.

C. The probability of fiscal adjustment using the square of output gap

Variable (dummy)	Each year of episodes			The first year of episodes		
Marginal effects	(1)	(2)	(3)	(4)	(5)	(6)
GDP growth (T)	-0.000 (0.012)	-0.010 (0.009)	-	-0.003 (0.004)	-0.007** (0.004)	-
GDP growth (T-1)	-0.019 (0.014)	-	-0.019 (0.012)	-0.007 (0.005)	-	-0.009** (0.004)
GDP gap (T-1)	-0.049*** (0.015)	-0.059*** (0.013)	-0.049*** (0.014)	0.010* (0.006)	0.004 (0.005)	0.012** (0.005)
Square of GDP gap (T-1)	-0.006* (0.003)	-0.006* (0.003)	-0.006* (0.003)	-0.003* (0.001)	-0.003* (0.001)	-0.003* (0.001)
Inflation (T-1)	0.003** (0.001)	0.003** (0.001)	0.003** (0.001)	0.001 (0.000)	0.001 (0.000)	0.001 (0.000)
Long-term interest rate (T-1)	0.049*** (0.010)	0.050*** (0.010)	0.049*** (0.010)	0.005* (0.003)	0.006** (0.003)	0.005* (0.003)
Primary balance (T-1)	-0.023*** (0.008)	-0.024*** (0.008)	-0.023*** (0.008)	-0.018*** (0.003)	-0.019*** (0.003)	-0.019*** (0.003)
Gross Debt (T-1)	0.001 (0.001)	0.002* (0.001)	0.001 (0.001)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Election (T)	-0.037 (0.042)	-0.036 (0.042)	-0.037 (0.042)	-0.011 (0.016)	-0.005 (0.017)	-0.012 (0.016)
System (Federalism)	0.092 (0.064)	0.092 (0.065)	0.093 (0.064)	0.021 (0.018)	0.024 (0.019)	0.021 (0.018)
System (President)	-0.016 (0.073)	-0.022 (0.073)	-0.016 (0.073)	0.024 (0.023)	0.026 (0.025)	0.024 (0.023)
Observations	584	597	584	584	597	584
No. country		20			20	
Period		1970~2009			1970~2009	

Note: Reported coefficients for the logit model are the marginal effects. Standard errors in parentheses and *** p<0.01, ** p<0.05, * p<0.10.

D. Episodes of fiscal adjustment from OECD underlying primary fiscal balance

Country (sample period)	Period	No. episode	No. year
Australia (80~09)	84, 85, 86, 87, 88 / 94, 95, 96, 97, 98 / 02	3	11
Austria (80~09)	81 / 84 / 92 / 96, 97 / 01	5	6
Belgium (86~09)	82, 83, 84, 85, 86, 87 / 93 / 96, 97, 98	3	10
Canada (80~09)	81 / 86, 87, 88 / 94, 95, 96, 97	3	8
Denmark (80~09)	83, 84, 85, 86 / 04, 05	2	6
Finland (80~09)	81 / 84 / 88 / 93, 94, 95, 96, 97, 98 / 99, 00	4	11
France (80~09)	83, 84 / 87 / 94, 95, 96, 97, 98, 99 / 04, 05, 06	4	12
Ireland (80~09)	82, 83, 84, 85, 86, 87, 88	1	7
Italy (80~09)	82, 83 / 90, 91, 92, 93, 94, 95, 96, 97 / 06, 07	3	12
Japan (80~09)	81, 82, 83, 84, 85, 86, 87 / 05, 06, 07, 08	2	11
Korea (87~09)	93, 94, 95 / 00	2	4
Netherlands (80~09)	81, 82, 83 / 91 / 93 / 96, 97 / 04, 05	5	9
New Zealand (86~09)	87 / 92, 93, 94 / 00 / 02	4	6
Norway (80~09)	94, 95, 96, 97 / 99, 00 / 04, 05, 06, 07	3	10
Portugal (81~09)	82, 83, 84 / 92 / 06, 07	3	6
Spain (80~09)	86, 87 / 92, 93 / 96, 97	3	6
Sweden (80~09)	81, 82, 83, 84, 85, 86, 87 / 96, 97 / 04, 05	3	11
United Kingdom (80~09)	81, 82 / 88 / 94, 95, 96, 97, 98, 99	3	9
United States (80~09)	81 / 87, 88, 89 / 93, 94, 95, 96, 97, 98 / 05, 06	4	12
19 countries		60	167

Note: Fiscal consolidations are identified based on the OECD underlying primary fiscal balance with our definition rule.

E. High and low groups according to two standards

Standard	Order	Frequency		Fluctuation	
		Country	Frequency ratio	Country	S.D. of CAPB
High group	1	France	0.448	Norway	3.738
	2	Germany	0.410	Ireland	2.980
	3	United Kingdom	0.385	Finland	2.530
	4	Australia	0.385	Germany	2.504
	5	Portugal	0.381	Netherlands	2.477
	6	Norway	0.348	Sweden	2.440
	7	Sweden	0.333	Japan	1.974
	8	United States	0.333	New Zealand	1.938
	9	Canada	0.308	Portugal	1.925
	10	Austria	0.308	United Kingdom	1.910
Low group	11	Belgium	0.292	Spain	1.834
	12	Italy	0.282	Belgium	1.805
	13	New Zealand	0.261	Italy	1.777
	14	Ireland	0.256	Denmark	1.766
	15	Japan	0.256	Korea	1.550
	16	Spain	0.250	Austria	1.338
	17	Denmark	0.222	France	1.314
	18	Netherlands	0.205	Australia	1.179
	19	Finland	0.154	Canada	1.117
	20	Korea	0.143	United States	0.883