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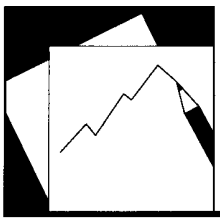

IMF Working Paper

Medium-Term Fiscal Multipliers during Protracted Recessions

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Medium-Term Fiscal Multipliers during Protracted Recessions*

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Abstract

The paper examines the consequences of fiscal consolidation in times of persistently low growth and high unemployment by estimating medium-term fiscal multipliers during protracted recessions (PR) in a sample of 17 OECD countries. Based on Jorda's (2005) local projection methodology, we find that cumulative fiscal multipliers related to output, employment and unemployment at five-year horizons are significantly above one during PR episodes. These results suggest that medium-term fiscal consolidation plans to reduce public debt burdens should proceed gradually if economic activity remains below trend for a prolonged period.

JEL Classification Numbers: E32, E62, H20, H50, J40

Keywords: fiscal consolidations; cumulative multipliers; labour market; protracted recessions

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I. INTRODUCTION

More than five years since the beginning of the global financial crisis, addressing below trend economic growth and weak job creation remain key priorities for many advanced economies. While signs of a robust global recovery in output and jobs remain tentative, fiscal consolidation continues to be pursued in many advanced economies to address high public debt ratios. In this context, the appropriate balance between supporting growth and putting public finances on a sounder footing has been a concern for many analysts. Recent work has added to this debate by highlighting that fiscal consolidation may negatively affect medium-term output and employment in situations of sustained economic slack. The objective of this paper is to investigate this possibility by estimating medium-term fiscal multipliers in a sample of 17 OECD countries.

The size of fiscal multipliers has been a key factor when discussing the appropriate fiscal response to the financial crisis. This debate was initially based on evidence from the pre-crisis literature,[1] which typically found that the short-term output effects of discretionary fiscal policy are small and largely dependent on the type of fiscal instrument.[2] The important policy implications of fiscal multipliers spurred a new literature, which focused on the possible asymmetric effects of fiscal policy in periods of protracted recessions or when monetary policy is constrained by the zero lower bound (ZLB). Under such circumstances, this recent literature has found that short-term multiplier estimates are indeed significantly larger than those found in the previous literature (Mineshima et al., 2014).

The attention has increasingly shifted to the long-term impact of fiscal policy on output and employment. DeLong and Summers (2012) have demonstrated in a simple framework that labor market effects can serve as a transmission mechanism for more sustained effects from fiscal policy changes. During prolonged economic recessions, high cyclical unemployment can translate into higher structural unemployment and lower employment as the skills of unemployed workers depreciate, leading to a decline in labor force participation and potential output. In those episodes, contractionary fiscal policy can amplify adverse labor market effects, implying potentially large medium-term fiscal multipliers.

The objective of this paper is to investigate lasting impact of fiscal consolidation on output and employment by estimating medium-term fiscal multipliers. Our main innovation is to study the impact of fiscal consolidations over a five-year period on output, employment and unemployment in a panel of 17 OECD countries during periods of protracted recession (PR),

[1] See, for example, Spilimbergo et al. (2009) for an extensive review of the literature.

[2] Tax multiplier estimates ranged between 0.3 and 0.6, and spending multiplier estimates ranged between 0.3 and 1. Capital spending tends to have the largest multiplier estimates of between 0.5 and 1.8 (Spilimbergo et al., 2009).

e.g., economic contractions lasting at least two consecutive years. Estimating employment and unemployment multipliers is another key contribution of this paper. The analysis of fiscal multipliers with respect to labor market variables has been in fact largely overlooked with the notable exception of Monacelli et al. (2010).[3]

In line with recent contributions from the post-crisis literature, fiscal consolidation episodes are identified via the narrative approach using the dataset constructed by Devries et al. (2011) and Guajardo et al. (2014). This dataset identifies fiscal shocks that are motivated by the desire to reduce the public deficit, hence exogenous to cyclical considerations. To test for the non-linearity of impulse responses during PRs we use the local projection estimator (Jordà, 2005). Compared to the standard (structural) VAR approach, this method allows for a straightforward estimation of the impulse response function for non-linear models, such as the one analyzed here.[4]

Our empirical findings suggest that the medium-term fiscal multiplier on output is significantly larger during PRs. Specifically, the medium-term multiplier is approximately -2 at a five-year horizon during PRs, compared to -0.6 during normal times. This means that during PR episodes a cumulative increase in the primary surplus of 1 dollar leads to a cumulative decrease in output of 2 dollars over a five-year horizon. We also find that the employment ratio persistently declines after a fiscal consolidation during periods of PR, resulting in a medium-term employment multiplier above -3 compared to -0.5 on average. The unemployment rate also persistently increases with an estimated medium-term multiplier of around 1.5, indicating that a cumulative increase in the primary surplus of 1 percent of GDP leads to a cumulative rise in the unemployment rate by 1.5 percentage points at a five-year horizon.

The distinction between tax- and spending-based adjustments is also investigated. This is motivated by the long empirical and theoretical literature on the effects of government spending and taxes on output and its components (e.g., Guajardo et al., 2014). Neoclassical models suggest that an increase in taxes can be highly contractionary due to a combination of negative wealth effect on consumption with distortions on the supply side, whereas a cut in spending could stimulate economic activity if it is associated with a decrease in distortionary taxation. Keynesian and new Keynesian models, featuring some regidities in prices, suggest that a cut in government spending can be recessionary due to its negative impact on aggregate demand. The effect can be stronger if households cannot smooth consumption over time (Galí et al., 2007). Recent research has shown that government spending can have

[3] This is also relevant given that in some countries the Okun's law may fluctuate in periods of deep or prolonged recessions (Owyang and Sekhposyan, 2012; Ball et al., 2013; and Jaeger, 2014).

[4]For a more detailed discussion of the relative merits of the two estimation methods see Ramey and Zubairy (2013).

particularly large multipliers if the economy is in a recession (Michaillat, 2014; and Canzoneri et al., 2013) or at the zero lower bound (Christiano et al., 2011).

Our empirical results show that the asymmetry in the size of multipliers between PR and non-PR only exist for expenditure-based (EB) adjustments for which medium-term multipliers on output, employment or unemployment, are significantly higher during PR episodes compared to the average response in non-PR periods. Our results for tax-based (TB) consolidations are in line with previous literature, which finds large and symmetric effects of TB consolidations on output (Romer and Romer, 2010). These results are robust to several alternative specifications, including different definitions of the cycle, credit growth, and exclusion of countries with financial crises or with constrained monetary policy.[5]

In the context of the "jobless" and protracted nature of the recent recovery, our findings suggest that the medium-term output and labor market response to fiscal adjustment should be taken into account when designing consolidation packages. They do lend support to a gradual implementation of fiscal consolidation plans (Cottarelli, 2012; Blanchard and Leigh, 2013a).[6]

The rest of the paper is structured as follows. Section II provides a literature review. Section III presents the transmission mechanisms through which fiscal consolidations during protracted recessions could lead to longer term effects on output and unemployment. Section IV describes the dataset and empirical strategy, including the baseline model used. Section V discusses the main results, whereas several robustness checks are analyzed in Section VI. Conclusions and policy implications follow in Section VII.

II. LITERATURE REVIEW

This paper relates to the empirical literature which analyzes the macroeconomic consequences of fiscal consolidations. Earlier work on the topic (Alesina and Perotti, 1995 and 1997; Alesina and Ardagna, 1998 and 2010) identifies episodes of fiscal adjustments on the basis of changes in the cyclically adjusted primary balance (CAPB). The results from this

[5] Batini et al. (2012) find larger medium-term multipliers for expenditure-based consolidation in recessions in line with our estimates. Their medium-term tax-based multipliers are quantitatively smaller than ours.

[6] Batini et al. (2012) and Eyraud and Weber (2013) discuss the implications of fiscal consolidations on the debt-to-GDP dynamics. They show that a combination of high debt and large multipliers could imply increasing debt-dynamics in response to fiscal consolidations in the short term. Therefore, a back-loaded adjustment could dampen the negative feedback of consolidations on output in crisis times.

identification approach are that fiscal adjustments can have expansionary effects, particularly if based on spending cuts rather than tax increases.[7]

IMF (2010a) and Guajardo et al. (2014) argue that the episodes of consolidations identified with the CAPB are biased toward overstating expansionary effects of austerity measures. Thus, they study episodes of fiscal consolidations identified with the narrative approach. Originally pioneered by Romer and Romer (2010), the approach is based on the examination of policy documents to identify episodes of exogenous tax changes in the U.S. to the business cycle. Devries et al. (2011) extend the database for a panel of 17 OECD countries by identifying changes in fiscal stance motivated by the decision to reduce the public deficit and not by business cycle considerations. This allows a correct inference in the estimation of fiscal multipliers.[8] IMF (2010a) and Guajardo et al. (2014) show that, by using the Devries et al.'s (2011) dataset, fiscal consolidations are contractionary, albeit spending-based consolidations are less so than the tax-based ones in the short term.

In this paper we focus on episodes of fiscal consolidations identified through the narrative approach by Devries et al. (2011). We are interested in the estimation of state-dependent, medium-term fiscal multipliers on output and labor market variables. We pay particular attention to the estimation of multipliers during episodes of protracted recessions—a concept more aligned with the behavior of output in the current crisis and test whether consolidations in those protracted contractions can lead to persistent decline in output and employment.

Rather than relying on regime-switching models to estimate state-dependent multipliers (Auerbach and Gorodnichenko, 2012; Baum et al., 2012; and Batini et al, 2012), we use the local projection method (Jordà, 2005) as in Jordà and Taylor (2013) and Ramey and Zubairy (2013). As in Guajardo et al. (2014) and Alesina et al. (2013), we emphasize the distinction between tax-based and expenditure-based consolidations. However, contrary to them, we are interested in testing whether the effects of tax-based vs. expenditure-based consolidations are different in protracted economic recessions compared to other states of the business cycle.

The papers closely related to ours, besides Guajardo et al. (2014), are Jordà and Taylor (2013), Ramey and Zubairy (2013), and Alesina et al. (2013). Jordà and Taylor (2013)

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[7] For a recent theoretical literature on fiscal consolidations see Coenen et al. (2008), Forni et al. (2009), Glomm et al. (2012), and Erceg and Lindé (2013), among others.

[8] The fiscal multipliers literature originally adopted structural vector auto regressive (SVAR) models to obtain structural shocks to spending and taxes (for example, Blanchard and Perotti, 2002; Perotti, 2007; and Mountford and Uhlig, 2009). The SVAR approach consists in applying a set of identifying restrictions on the dynamic system of macroeconomic variables, based on either institutional knowledge (Blanchard and Perotti, 2002) or the expected response of the macroeconomic variable to fiscal policy changes (Mountford and Uhlig, 2009). The responses of macroeconomic variables to fiscal shocks identified through SVAR estimates are typically short lived and the estimated multipliers tend to be below unity.

analyze the impact of fiscal consolidations in a panel of 17 OECD countries. They are interested in comparing the results obtained from the episodes of consolidations identified with the CAPB (Alesina and Ardagna, 1998 and 2010) and the narrative approach of Devries et al. (2011). They find that the expansionary effects of consolidations identified using the CAPB are mainly due to the effects of consolidations in the expansionary phase of the business cycle. On the contrary, by using the narrative approach, the negative effect of fiscal consolidations appears to be more acute during downturns. As in Jordà and Taylor (2013), we use the narrative approach, the estimation strategy via local projection method (Jordà, 2005), and allow the effects of fiscal policy to differ in periods of protracted economic recessions.

Nevertheless, we differ from Jordà and Taylor (2013) in four main ways. *First*, we focus on the distinction between expenditure-based and tax-based consolidations. *Second*, we look at a broader set of macroeconomic variables, including labor market variables. *Third*, we concentrate on estimating medium-term multipliers as in Ramey and Zubairy (2013). *Fourth*, we look at multipliers during protracted recessions.

Alesina et al. (2013) estimate the output effects of fiscal consolidations based on the narrative approach, analyzing the difference between expenditure-based and tax-based consolidations. They extend the narrative dataset of Devries et al. (2011) by introducing the distinction between anticipated and unanticipated consolidations shocks. They find that fiscal adjustments based on spending cuts are far less costly in terms of output. Contrary to us, however, they do not analyze if medium-term fiscal multipliers have asymmetric effects during protracted recessions.

Ramey and Zubairy (2013) estimate state-dependent multipliers for the U.S. using military spending news as exogenous fiscal shocks. They test whether the results of Auerbach and Gorodnichenko (2012) are robust to a longer time sample and a different computation of multipliers. They show that the larger multipliers in recession found in Auerbach and Gorodnichenko (2012) are due to their assumption about the duration of the economic downturn, which is assumed exogenous to fiscal policy. Moreover, Ramey and Zubairy (2013) show that the size of the conversion factor (Y/G) used to transform impulse responses into multipliers—a methodology often employed in the literature—varies over the sample. This way, results based on a sample with high average Y/G will tend to show larger multipliers. Ramey and Zubairy (2013), therefore, suggest defining the variables as in Hall (2009) and Barro and Redlik (2011). Also, taking into account the response of taxes and spending in different states of the business cycle is crucial for the computation of the size of the medium-term multiplier.

While there is a significant amount of empirical studies on the asymmetry of fiscal multipliers (Auerbach and Gorodnichenko, 2012 a,b; and Baum et al., 2012), the theoretical literature on the topic is scarce. One notable exception is Michaillat (2014), who finds in a

search-and-matching framework that fiscal multipliers are higher in recessions. He analyzes the effects of public job creation and finds that the strong effect on GDP in a downturn comes from the labor market through a lower crowding-out of private employment. Another theoretical paper on the asymmetry of fiscal multipliers is Canzoneri et al. (2013), who study government purchases of goods and services in a model with costly financial intermediation. They show that if financial frictions vary over the cycle, asymmetry in fiscal multipliers between recessions and booms can be large, with multipliers exceeding 2 during slumps. More recently, Rendahl (2014) finds that fiscal multipliers are markedly higher in periods of low nominal interest rates and high, persistent, unemployment. With persistent unemployment, any increase in current demand translates into an associated rise in future supply. However, as rational economic agents smooth consumption over time, the increase in future supply feeds back to a further rise in current demand.

III. TRANSMISSION MECHANISMS

Regarding possible transmission mechanisms through which fiscal consolidations can have a medium-run impact on the economy, one potential channel is the effect on labor markets. According to the standard Phillips curve, demand-side shocks can affect the level of unemployment only in the short-run, while long-run unemployment always bounces back to its constant natural level. The hysteresis hypothesis, on the contrary, implies that the natural level of unemployment is itself determined by its previous actual path (Blanchard and Summers, 1987; and Jaeger and Parkinson, 1994). In a series of papers, Ball (1997, 1999, 2009) argues that in these circumstances, monetary policy can affect the long-run potential of the economy.

De Long and Summers (2012) and Romer (2012) also provide reasons why fiscal policy changes may have persistent effects on output and employment in situations similar to the current crisis. *First*, in a depressed economy, workers remain without jobs for an extended period. This negatively affects their future employment prospects and, therefore, the overall level of employment in the long run. Persistent effects in the labor market can arise because workers in a depressed economy may be discouraged or even forced to temporarily drop out of the labor force. This, in turn, may reduce the potential labor force participation rate, making it harder for them to find jobs later on due to the erosion of skills caused by the separation from jobs in the meantime. *Second*, in a depressed economy, investment is low, resulting in lower capital stock accumulation in subsequent periods. This decline in capital stock can have an impact on the aggregate level of potential output.

Farmer (2009) demonstrates that there is scope for active fiscal policy during downturns in a framework with multiple equilibria, in which the natural rate hypothesis does not hold. Fiscal expansion can then be seen as a transfer to the current generation. It stimulates consumption and aggregate demand in the short run, moving the economy to a new equilibrium with lower unemployment level. De Long and Summers (2012) also suggest an explanation for why expansionary fiscal policy can be extremely potent during a major economic downturn. If

fiscal stimulus can increase short-run employment and output, and persistent effects are present, then it can also increase the long-run employment and output (see also, IMF, 2012;[9] and Rendahl, 2014). The size of the impact depends positively on the degree of persistency and on the size of the short-run multiplier.

IV. DATA AND EMPIRICAL STRATEGY

A. Data

The empirical analysis is performed for a sample of 17 OECD countries with annual data spanning period from 1978 to 2007.[10] The series for all the macroeconomic variables used are taken from OECD Economic Outlook No. 93 (EO, 2013). Table 1 displays the descriptive statistics of all variables in the empirical analysis, whereas Table 1A in the Appendix provides the description and sources of the main variables used in the paper.

The episodes of fiscal consolidations are identified with the narrative approach database from Devries et al. (2011). The amount of fiscal consolidation corresponds to the sum of tax increases and spending cuts calculated as percentages of GDP. That database also distinguishes expenditure-based from tax-based consolidations. Accordingly, consolidations are classified as expenditure-based (EB) if the expenditure component on the deficit reduction is larger than revenue increases. Tax-based consolidations (TB) have a larger tax hike component than expenditure reduction.

To identify periods of protracted recession, we use the recession indicators series prepared by the Federal Reserve of St. Louis. These series are based on the identification of turning points (as in the NBER recession definitions) in the composite leading indicators (CLI) series prepared by the OECD.[11] Protracted recessions (PR) are defined by an annual dummy variable equal to 1 for periods of at least 24 consecutive months of economic contraction and 0 otherwise. This way, we select comparable episodes for different economies, which recede

[9] IMF (2012) modifies DeLong and Summers (2012) framework to allow for the debt-to-GDP ratio going back to its baseline value after several years. This assumption has an important implication for the results, as the need for future fiscal consolidation mitigates short-run expansionary effects. It is critical for the outcome whether the multipliers are state-dependent or not. If the multipliers are asymmetric across the business cycle, then gradual fiscal consolidation can indeed be desirable.

[10] The 17 OECD countries are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Portugal, Spain, Sweden, the United Kingdom, and the United States. Our period sample stops at 2007 given the availability of data on episodes of fiscal contractions from Devries et al. (2011).

[11] According to the OECD: "…turning point detection parses local minima and maxima in the cycle series and applies censor rules to guarantee alternating peaks and troughs, as well as phase and cycle length constraints."

from the peak of their economic activity. Our identification abstracts from judgment on the shape or severity of the contraction. Instead, we focus on situations when the economies operate below their capacity for a prolonged period of time.[12]

B. Stylized Facts

Table 2 displays some stylized facts about our data sample. We identify 127 years of protracted recessions (PR) and 162 years of fiscal consolidations in the sample.[13] The average GDP growth rate in PR episodes is lower (1.46 percent) compared to the rest of the periods (2.32 percent). From these consolidation episodes, the majority (122) happened in periods of non-PR, whereas 40 occurred in the PR periods.

Fiscal consolidations in PR periods tend to be equally split between EB and TB consolidations. For years of fiscal consolidation outside the PR periods, most of these consolidations are based on expenditure.[14] Moreover, the average size of the consolidation is larger for EB compared to TB consolidations during protracted recessions. We also compute the average duration of TB and EB consolidations based on the identification of the start of fiscal plans (Dell'Erba et al. 2013). Table 2 shows that EB and TB consolidations have similar duration. However, consolidations (of both types) implemented during protracted recessions are shorter.

C. Methodology

We estimate impulse responses to the fiscal consolidation shocks using the local projection (LP) methodology proposed by Jordà (2005). According to the LP framework, the average effect of policy intervention d_j relative to a baseline d_0 on the outcome variable Y at the

[12] The magnitude of the recession could be important for the size of fiscal policy effects. During a strong economic downturn, a stimulus to aggregate demand could be particularly potent in reviving economic activity (Kinda, Poplawski-Ribeiro, and Woo, 2014). However, since our study focuses on medium-term fiscal multipliers we consider that episodes when the economy operates below full employment for a prolonged period of time are more relevant than episodes of sharp contractions followed by a quick recovery; even though we also control for the initial output gap and output growth prior to the fiscal shock. Moreover, estimating the effect of consolidation during a large contraction is also limited by data, since there are very few of these episodes in our sample. In robustness checks, we verify that the results are not driven by outliers such as countries with banking crises or housing bubbles.

[13] The number of years that include recessions of at least 6 but less than 24 months is 86. So, in total we have 213 recessionary years, of which 127 are PR and 86 are non-PR recessions, and 244 are non-recessionary years.

[14] When we analyze the distribution of TB and EB consolidations between normal and PR recessions, we find that TB consolidations happen during normal recessions more often (14 out of 39 TB outside PR) compared to EB (22 out of 83 outside PR). Therefore, in the non-PR state, around a third of TB consolidations happen in recessions (whether prolonged or non-prolonged recessions), while only a quarter of EB consolidations happen in period of non prolonged recessions.

time period $t+h$, is given by $E\left[\left(Y_{t,h}(d_j)-Y_t\right)-\left(Y_{t,h}(d_0)-Y_t\right)\right]$. Hence, under the selection-on-observable assumption (Jordà, 2005), this average effect of policy intervention can be calculated by the following local projection:

$$Y_{t+h}-Y_t=\alpha^h+\theta^h D_t+\gamma^h\omega_t+\varepsilon_{t+h},$$

where D_t is the fiscal policy variable, and ω_t is the conditioning set. The expected impact of the policy intervention is then:

$$E\left[\left(Y_{t,h}(d_j)-Y_t\right)-\left(Y_{t,h}(d_0)-Y_t\right)\right]=\theta^h(d_j-d_0);\quad for\ h=1,...,H,$$

which is equivalent to an impulse response calculated from a VAR.

The method was chosen because of its numerous advantages, some of which are particularly relevant for our study. *First*, it can easily accommodate non-linearity, which is crucial given that we study state-dependent multipliers. *Second*, it allows having left-hand side and right-hand side variables differently transformed (as opposed to taking all variables in logs as in a VAR), which becomes particularly useful when calculating multipliers. As shown by Ramey and Zubairy (2013), the multipliers calculated from VARs are subject to mismeasurement due to the assumptions used in converting elasticities into multipliers. Instead, these pitfalls are avoided by having both, the left-hand side and the right-hand side, specified in the same units (e.g., percent of year 0 GDP).

We use the narrative approach dataset from Devries et al. (2011) as an identification strategy to enhance the exogeneity of our fiscal shocks to output. One potential source of concern as Hernández de Cos and Moral-Benito (2011) or Jordà and Taylor (2013) argue, is that the fiscal shocks are not exogenous and can be predicted. Thus, in order to test for the exogeneity of our fiscal shocks, we run country by country regressions of the consolidations variable on two lags of GDP growth and lagged public debt. We find, similar to Alesina et al. (2013), that results are not significant except in the case of the Netherlands.[15]

Using the LP framework, we first estimate the following regression model with time and country fixed effects using panel OLS estimator:

[15] In a robustness check, we exclude the Netherlands from the sample. Estimation results are not affected by that. In turn, Jordà and Taylor (2013) address the potential endogeneity problem by estimating the model by inverse-probability weighting (IPW). Under this correction for endogeneity of fiscal shocks, the contractionary effect of fiscal consolidations is confirmed for both expansions and recessions, and the estimates are more precise and larger for recessions. In any case, since our focus is on estimating multipliers during PR periods, we believe that our results are probably less negative than the true effects of fiscal consolidations.

$$Y_{i,t+h} - Y_{i,t-1} = \alpha_i^h + \chi_t^h + \delta trend + \theta^h D_{i,t} + \beta_1^h \left(Y_{i,t-1} - Y_{i,t-2}\right) + \beta_2^h \left(Y_{i,t-2} - Y_{i,t-3}\right) + \beta_3^h Y_{i,t-1}^{GAP} + \varepsilon_{i,t+h}, \quad (1)$$

where $Y_{i,t}$ corresponds to either real GDP, employment, unemployment rates for baseline results; α_i^h is the country i fixed-effect; χ_t^h is the time fixed effect; $trend$ is the time trend; $D_{i,t}$ is the fiscal shock from Devries et al. (2011) dataset; $Y_{i,t-1}^{GAP}$ is the (initial) output gap in the period prior to the fiscal shock; and $\varepsilon_{i,t+h}$ is an i.i.d. error term.[16] The expected effect of fiscal consolidation at horizon h is given by the coefficient θ^h. Equation (1) is estimated for each horizon $h = 0,1,2,3,4,5$.

To accommodate the possibility of the multiplier varying in different states of the economy (Baum et al., 2012), we allow regression coefficients to differ in PR and non-PR periods (see also Ramey and Zubairy, 2013):

$$Y_{i,t+h} - Y_{i,t-1} = \left\{ \begin{array}{l} I_{it}^{PR} \left(\alpha_i^{h,PR} + \theta^{h,PR} D_{i,t} + \gamma^{h,PR} \omega_{i,t-1}\right) + \\ \left(1 - I_{it}^{PR}\right)\left(\alpha_i^{h,non\text{-}PR} + \theta^{h,non\text{-}PR} D_{i,t} + \gamma^{h,non\text{-}PR} \omega_{i,t-1}\right) \end{array} \right\} + \chi_t^h + \delta t + \varepsilon_{i,t+h}, \quad (2)$$

where the indicator function I_{it}^{PR} is equal to 1 in periods of protracted recession and 0 otherwise; and the matrix $\omega_{i,t}$ includes the vectors $\left(Y_{i,t} - Y_{i,t-1}\right)$, $\left(Y_{i,t-1} - Y_{i,t-2}\right)$, and $Y_{i,t-1}^{GAP}$ as in the baseline specification (1). Specification (2) is estimated with panel OLS estimator. We allow all coefficients in the regression equation, except those for the time trend and time fixed effects, to be state-dependent.

D. Medium-Term Multipliers

By definition, the fiscal multiplier is the change in real GDP or other outcome variable in response to a one-unit increase in a fiscal variable, which in our baseline estimation corresponds to the primary balance. In general, multipliers can differ across horizons. We focus on the medium-term multipliers, which are calculated as in Monacelli et al. (2010), and Ramey and Zubairy (2013). Using the LP method, we estimate the impulse response of the variable of interest (e.g., GDP or employment) and the impulse response of the primary balance in our baseline estimation. Since from the estimation of (1) and (2) we obtain an elasticity estimate, one has to convert this estimate into a multiplier by dividing that elasticity by the average ratio of the fiscal variable to GDP. Alternatively, one can rescale the variables appropriately before running the regression, so that the estimate provides the multiplier directly.

[16] We also tried specifications with a further set of potential control variables. These additional control variables include the change in the short-term interest rate, lagged debt-to-GDP ratio, and either current account- or real exchange rate-gap. The results are robust to the inclusions of these variables.

To facilitate the computation of multipliers, we choose the second option and define the fiscal variable as percentage of real GDP in the initial period, $Y_{i,t-1}$. As in Monacelli et al. (2010), real GDP and employment ratio growth are denoted in percentages, and unemployment change in percentage points. Since the coefficient θ^h is the expected effect of fiscal consolidation at horizon h, we need to sum over all horizons up to h to get the cumulative impulse response. The medium-term multiplier is hence computed as the ratio between the cumulative impulse response (sum of each of the impulse responses, IR)—for the variable of interest (e.g., GDP) in the numerator and the fiscal variable (primary balance) in the denominator— over the horizon of five years:

$$MR\ Multiplier = \frac{\sum_{s=0}^{5} IR_s^j}{\sum_{s=0}^{5} IR_s^{PB}}, \tag{3}$$

where $MR\ Multiplier$ stands for cumulative medium-term fiscal multiplier; j corresponds to either GDP, employment or unemployment; and PB corresponds to the primary balance.

V. Results

This section presents the results of estimations using specifications (1) and (2). We first compare the results using our methodology with the previous literature. Next, we present the results of our baseline regressions for GDP, employment and unemployment, distinguishing between PR and non-PR periods and between TB and EB consolidations. We then discuss how these estimations translate into medium-term multipliers and how they differ from the literature.

A. Effects of a Fiscal Consolidation: Replication of the Literature

Figure 1 summarizes the comparison between our results and the previous literature. The first panel on the left presents the effects of all types of fiscal consolidation on the real GDP,[17] while the second and third panels present results focusing only on EB or TB consolidations. In line with the previous literature, we find that fiscal consolidations are indeed contractionary. Moreover, the negative effects of consolidations are persistent: the negative elasticity for real GDP of a consolidation in the primary balance is significant even after five years from the beginning of consolidation.[18] We also find that multipliers in TB

[17] Notice that the dependent variable is specified as the accumulated change in GDP from time *t* to time *t*+*h*.

[18] The medium-term impact of fiscal shocks on growth in our paper implies persistent effects of fiscal policy shocks, which in turn imply a longer time for the economy to recover and transition to its old steady-state growth rate.

consolidations are larger than EB consolidations. The value of the impact multipliers are also similar to the literature (particularly to Romer and Romer, 2010; and Guajardo et al., 2014), with TB consolidations having a multiplier close to -2.

B. Non-Linear Estimation

Figure 2 shows the impulse responses resulting from the estimation of Equation (1). Its left panels distinguish between TB and EB consolidations (upper and lower panels, respectively). Different IRs are also presented resulting from the estimation of Equation (2), which distinguishes between non-PR and PR periods (middle and right panels). For non-PR periods (including both expansions and non-prolonged recessions), the effects of the fiscal consolidation in $t = 0$ on real GDP becomes insignificant after three years independently if the consolidation is TB or EB. During PR periods, however, fiscal consolidations tend to have larger and more persistent effects on output, particularly in EB consolidations.

We also estimate the impact of fiscal consolidations on labor market variables. For that, we replace the variable of real GDP with different labor market variables—employment and unemployment rates—in the left-hand side of Equation (1). Figure 3 displays the results using the overall employment ratio as a dependent variable. It shows that EB consolidations during PR lead to a persistent reduction in the employment rate in our country sample. This effect remains significant over time. TB consolidations have a large and more persistent negative impact on employment on average, even though the uncertainty is wider around TB consolidations during PR episodes. A similar pattern is observed when looking at the unemployment rate (Figure 4). Consolidations based on spending cuts persistently increase unemployment if implemented during PR episodes, while their impact during non-PR periods is short-lived.

Next, we test some restrictions regarding the shape and statistical significance of the IRs. First, we test whether the cumulative impulse responses in non-PR and PR periods statistically differ from zero:

$$H_0 : \sum_{h=0}^{5} \theta^{h,i} = 0; \quad i = PR, non\ PR. \tag{4}$$

Second, we test whether the cumulated impulse responses in non-PR and PR episodes are different from each other:

$$H_0 : \sum_{h=0}^{5} \theta^{h,\text{non-PR}} = \sum_{h=0}^{5} \theta^{h,\text{PR}}. \tag{5}$$

These tests are applied for the sample with all types of consolidation combined as well as for the subsamples of either EB or TB consolidations, separately.

Table 3 reports the results of these tests, for GDP, employment, unemployment, and primary surplus. We also include the calculation of fiscal multipliers according to Equation (3). Our results (Table 3, column "Difference") show that in general, EB consolidations during PR periods have a larger, more persistent, and significantly different cumulative effect on output, employment, and unemployment than in non-PR periods. Moreover, the improvement in primary surplus during non-PR periods is much larger than in PR periods in EB consolidations. On the contrary, we find no statistical difference between IRs of TB consolidations across the two different states of the economy analyzed, including for the changes in primary surplus, albeit such finding, in magnitude, is not robust for different specifications as it will be demonstrated later on.

Fiscal consolidations lead to large (above unity) medium-term output, employment, and unemployment multipliers. Multipliers associated with EB consolidations are significantly larger if undertaken during PR than in non-PR episodes. In a protracted recession, multipliers of EB consolidations are similar in magnitude to those of TB consolidations, despite differences in GDP impulse responses. This similarity can be related to the different fiscal policy reaction between the two types of consolidations. As in TB consolidations, improvements in the primary surplus after EB consolidations are small, if implemented during a PR episode. This is what causes the consolidation multiplier—the change in output relative to improvement in primary budget balance—to be similar for the two styles of fiscal adjustment during PR episodes.

This evidence of larger medium-term effects in the labor market of EB consolidations during PR episodes is consistent with the theoretical result of Michaillat (2014). Using a search-and-matching framework, the author finds that fiscal multipliers are higher in recessions. The type of fiscal policy that Michaillat (2014) studies is public job creation, and the effect on GDP comes from labor market through lower crowding-out of private employment in times of economic slack. In non-PR periods, productivity is higher and the discharged public workers have a higher probability of being hired by the private sector. This makes the medium-term multiplier effect on employment insignificant during these periods. Thus, these results for employment and unemployment rate support the predictions of Michaillat (2014).

Overall, the findings provide support in favor of the presence of negative medium-term effects in the labor market following fiscal consolidations, particularly in PR periods. To the best of our knowledge, this is the first paper to provide such evidence. In non-PR periods, the effect of EB consolidations is moderate and short lived. During PR episodes, the decline in aggregate demand depresses employment and increases unemployment rate persistently.

C. Evidence on Transmission Mechanisms

Figure 5 presents a comparison of the response of various components of aggregate demand and supply to fiscal consolidations contingent on the two states of the economy investigated. In the first panel, we look at total consumption and investment. In the second panel, we look

at import and export. In the third panel, we look at the capital stock and a measure of potential output estimated by the OECD.[19] Finally, the fourth panel looks at a comparison between a measure of private sector employment and overall employment. Within each panel, the top two charts provide a comparison of EB consolidations across PR and non-PR episodes. The bottom two charts display the same comparison for TB consolidations. The results are reported without confidence bands for the sake of exposition. However, in Table 4, we present the hypothesis tests for the IRs restrictions.

The results show that consumption and total investment (public and private) are both negatively affected by consolidations. TB consolidations affect more substantially these two aggregate demand components, but EB consolidations enacted during PR episodes affect consumption more considerably. When looking at export and import, export does not seem to react to consolidations. This could be due to the heterogeneous response of exchange rate policy during fiscal consolidations or to the fact that external demand is not affected by domestic fiscal policy if the exchange rate does not react substantially to the adjustment. However, we do find a larger drop in imports on consolidations during PR periods. This effect is consistent with the evidence from consumption.

To gauge the persistent effects of fiscal consolidations on employment and output, we further look at the response of an indicator of structural unemployment, the non-accelerating inflation rate of unemployment (NAIRU), and a measure of potential output, both constructed by the OECD. During PR episodes, we find that an EB fiscal consolidation of 1 percent of GDP can lead to a cumulative increase in the NAIRU of around 1.2 percentage points at a five-year horizon, while a TB consolidation leads to an increase of 0.49 percentage points. Similarly, we find that an EB fiscal consolidation of 1 percent of GDP can lead to a cumulative decline of potential output of 2.5 percent, whereas a TB consolidation of 1 percent of GDP can lead to a decline of 1.8 percent.

The decline in investment observed during consolidations leads to lower capital stock over the medium term, notably in TB consolidations. While EB consolidations are associated with a moderate decline in capital stock during non-PR periods, the decline is significantly larger during PR episodes. Again, this finding indicates that negative medium-term fiscal effects on output can stem not only from the labor market, but also from investment and capital dynamics owing to the depression in aggregate demand that the fiscal consolidation can cause.

[19] This is based on the methodology using the production function approach (Giorno and others, 1995). Nevertheless, separating cyclical and structural components of a GDP decline may be difficult during protracted contractions, which became particularly apparent during the global recession, being yet another reason for the extensive robustness checks in the coming section.

It is important to stress that the decline in total employment observed during PR episodes is not only driven by the reduction in public sector employment. In fact, both (EB and TB) consolidations are associated to an equally strong decrease in private sector employment during PR episodes. For TB consolidations, this fall in private sector employment also happens in non-PR periods, evincing the negative effects of tax measures over employment even in less recessionary periods.

Finally, we look at the response of monetary policy to understand whether different degrees of monetary accommodation are responsible for different sizes of the consolidation multiplier in PR and non-PR periods. This is done via the analysis of the short-term interest rate (Table 4). As the non-significant Chi-squared test for the short-term rate in Table 4 conveys, monetary policy does not appear to respond significantly differently between the two states of the economy analyzed. During EB consolidations, the short-term interest rate significantly falls in both PR and non-PR periods to compensate the fall in aggregate demand due to the lower spending and to avoid excessively low inflation. However, during TB consolidations, the results show a significant increase in interest rates, indicating that monetary policy has responded in a more contractionary way during these episodes.

VI. Robustness Checks and Additional Tests

The baseline results have shown that medium-run spending multipliers are markedly above unity during periods of prolonged economic contractions. The latter result differs from evidence in Ramey and Zubairy (2013), who find no difference between multipliers across expansions and contractions of the economy in a sample of historical US data. The differences may be due to different factors—e.g., our different definition of states of the economy (PR vs. non-PR), different sampling[20] or different measure of fiscal shocks. Another issue could be the different identification of slack states, here using protracted economic contraction episodes based on the identifications of turning points in the OECD composite leading indicator.

This section first checks if our results are affected by the way periods of economic contraction are identified. For that, we follow Ramey and Zubairy (2013) and use the unemployment rate as indicator of slack states. We then identify episodes of contraction as periods when the economy is at least 1 percent above its long-run level of unemployment. The latter is calculated using a Hodrick-Prescott filter on the actual unemployment series with a smoothing parameter of 100,000.[21] With such rule at least 20 percent of observations

[20] For example, Owyang, Ramey, Zubairy (2013) find significant differences between multipliers across expansions and contractions for Canada (but not for the U.S.). Accordingly, the difference in our results could be due to the sample used (i.e., OECD countries instead of the U.S.).

[21] Results are unaffected by the choice of the smoothing parameters.

are identified as being in slack states, which is quantitatively similar to the identification using the recession indicator.

Figure 6 compares the *IRs* from the two different specifications. With respect to GDP, the shape of the *IR* is similar to what we obtained when using the recession indicator as index of economic activity. For the employment ratio and the unemployment rate, the cumulative multipliers associated with the unemployment gap (Table 5) do not differ quantitatively from those calculated in Section V.B. The main difference is the size of the unemployment multiplier of EB consolidation in PR episodes, which is below unity under this approach. The multiplier for TB consolidations during those PR periods is also larger than the ones obtained with the baseline approach. This result indicates the possibility that the asymmetric effects of TB are sensitive to the choice of the indicator and periods of economic slack, which stands in contrast with the robustness of the asymmetry of the EB multipliers.

The second robustness check tests whether the baseline results are driven by country specific episodes. In our sample of 17 OECD countries, Finland and Sweden have experienced financial crises, which might act as an omitted variable biasing the results toward large contraction of output and employment in recessions. Japan has also experienced a protracted slowdown followed by a period of interest rates against the zero lower bound (ZLB), which might have increased the value of the multipliers during this period. Therefore, we re-run the baseline model excluding one single country at each estimation round. Table 6 shows that the multipliers are in general, quite stable across the sample. In particular, the EB multiplier in PR episodes is on average 1.5, with the lowest value level being 1.3 and the highest value being 2.3. Results are similar for the employment and unemployment spending multipliers. Thus, we conclude that the results are not driven by specific episodes of financial crises or the ZLB.[22,23]

[22] An additional robustness check (not shown here and available upon request) tests whether results are driven by the selection of years identified as PR. Baseline PR identification includes the peak years preceding the recession and full years of contraction based on recession indicator series, but does not include the years of trough. In an alternative identification, we include the years of trough if contraction lasted at least six months during that year. The results are very similar to our baseline with the cumulative IRs of the main variables remaining stable. Exclusion of peak years, in which contraction lasted less than six months, delivers similar results. Hence, we conclude that our findings are not affected by the inclusion/exclusion of peak and trough years.

[23] We also conduct a further robustness check (available upon request) using an alternative regression model, in which the regressors are interacted with I_{t-1} instead of I_t. Since our methodology identifies PR based on at least two years of contraction, a valid concern might be that the indicator I_t includes information in periods t and $t+1$, and thus might be correlated with the left hand side variable. Instead, I_{t-1} includes information at most until time, and therefore, is exempt from this critique. The alternative regression model produces impulse responses and multipliers generally in line with those in Table 3.

As an additional test, we augment our baseline specification to include credit growth as another explanatory variable in Equation (2). Given the importance of past credit growth performances as a predictor of financial crises (Schularik and Taylor, 2009), we control for credit growth in an attempt to capture the build-up of financial instability, which could explain both, the periods of PR and the large negative reaction of macroeconomic aggregates to the fiscal shocks in PR. Table 7 shows the results obtained by augmenting the baseline equation with credit growth. We find that, while the variable enters the equation significantly, the baseline results remain unchanged except for the medium-term multiplier for TB consolidations during PR episodes, which is now also asymmetric. This finding once more indicates the lack of robustness of the symmetric medium-term multipliers during PR and non-PR episodes in TB consolidations obtained with our baseline estimation.

As a final check, we correct for the impulse responses bias identified by Teulings and Zubanov (2014) in local projections estimation using panel data. At some forecasting horizon, the dependent variable may already be affected by the implementation of the consolidation, even though the variable measuring consolidation is set equal to zero. Under these circumstances, the effect of the consolidation on the dependent variable will be soaked up by the fixed effects rather than being reflected by the consolidation variables thus, resulting in a downward bias of the estimation of the fiscal consolidation. Teulings and Zubanov (2014) suggest augmenting the specification to include the consolidation variable forwarded between period zero and the forecasting horizon. We conduct a test using the correction proposed by Teulings and Zubanov (2014) and found results (available upon request) very similar to the baseline.[24]

VII. CONCLUSION

Since the inception of the global financial crisis, the tepid recovery in output and employment, and weak fiscal positions in many advanced countries have spurred a debate on the macroeconomic effects of fiscal consolidation. Arguments have been proposed in favor of either a more gradual approach to fiscal consolidations and, where possible, a more active use of fiscal policy to reduce adverse and persistent effects from fiscal consolidation on the

[24] As a caveat for our analysis, Alesina et al. (2013) argue that the episodes identified by Devries et al. (2011, 2014) are part of multi-year fiscal adjustment plans. Thus, the possibility that planned fiscal adjustment might be anticipated, could lead to inconsistent estimation. Results of Alesina et al. (2013) show that, accounting for fiscal plans and the style of fiscal adjustment ("stop and go" adjustment or executed according to plan), spending multipliers are lower than tax multipliers. Their results, however, do not consider asymmetric effects over the state of the economy, which generate several difficulties. For example, fiscal plans methodology cannot be used with the Jordà method, because unexpected and anticipated shocks are not orthogonal. Alternatively, a truncated MA representation as in Alesina et al. (2013) augmented with state-dependent coefficients, requires additional assumptions on the duration of each state and the transition between them. Ramey and Zubairy (2013) show that such assumptions can also bias multiplier estimates. Therefore, we leave this exercise for future research.

level of output, employment, and unemployment over the medium term (DeLong and Summers, 2012). These effects are consistent with large medium-term fiscal multipliers in contrast to the implications of some conventional macroeconomic models.

This paper provides a novel contribution to the literature by estimating the impact of fiscal consolidations over a five-year period on output, employment, and unemployment in a panel of 17 OECD countries during periods of protracted recessions (PR), e.g., economic contraction lasting at least two consecutive years. During these prolonged recessions, the impact of fiscal shocks can be more prominent increasing the size of medium-term fiscal multipliers.

The results show that medium-term fiscal multipliers on output are around -2 at a five-year horizon during PR periods, which is significantly larger than the multipliers in other periods (-0.6). The medium-term employment multiplier during PR episodes is around -3 (-0.6 in other periods), meaning that a cumulative increase of 1 percent of GDP in the primary surplus leads to a 3 percentage point decrease in the employment ratio. Finally the unemployment multiplier in PR episodes is around 1.5 (0.1 in other periods), indicating that a cumulative increase of 1 percent of GDP in the primary surplus leads to a 1.5 percentage point rise in the unemployment rate.

When distinguishing across types of fiscal consolidation, we find that EB multipliers, whether on output, employment or unemployment, are significantly asymmetric over the two states of the economy and larger during PR episodes. For TB consolidations, we find large and persistent multipliers in line with previous literature (Romer and Romer, 2010), albeit the results related to the asymmetry of TB multipliers are less clear-cut.

Overall, the results have important policy implications for the design and implementation of fiscal consolidations. *First*, while the appropriate pace of consolidation will largely depend on several other conditions than simply the size of fiscal multipliers,[25] our findings suggest the need of a back-loaded adjustment during periods of economic contraction.[26] Rapid fiscal consolidation can further depress demand with negative effects in the labor market. *Second*, given the detrimental effects of EB consolidations, their design could be guided by public expenditure reviews (IMF, 2010b) to minimize the impact on aggregate demand through across-the-board cuts and to assess which types of expenditures would be appropriate to be rationalized (see, for example, IMF, 2013). *Third*, with significantly lower medium-term multipliers, EB consolidations seem to be preferred to TB adjustments in normal periods, i.e., non-PR periods. During prolonged recessions, the differences between these two types of

[25] For a detailed discussion of such conditions see, for instance, Abbas et al. (2013), Blanchard and Leigh (2013a,b), and Eyraud and Weber (2013).

[26] See also Batini et al. (2012) for similar conclusions.

adjustments are less clear-cut, with both having significantly larger effects on the economy (output and employment).[27]

The current analysis offers various possibilities for further research. For instance, the transmission mechanisms between the fiscal adjustment and medium-term output could be further investigated. Moreover, rather than looking at expenditure- vs. tax-based consolidation, it could be interesting to calculate fiscal multipliers for each of the tax and expenditure instruments separately. These refinements would strengthen our understanding of how fiscal consolidation affects medium-term output and employment, which could enhance the design of growth-friendly fiscal consolidations.

[27] From a theoretical perspective, Coenen, et al. (2008) and Forni et al. (2009) suggest that a combination of both types of adjustment spending cuts and tax hikes would provide a higher welfare than only implementing one type of adjustment.

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TABLES AND FIGURES

Table 1. Summary Statistics

	Mean	Standard Dev.	Minimum	Maximum	Observations
Contractionary Episodes	0.28	0.45	0.00	1.00	510
Output Gap	-0.03	2.41	-6.60	17.50	506
Unemployment Gap	0.00	2.20	-9.63	8.38	508
Consolidation	0.33	0.69	-0.75	4.49	510
Tax Consolidation	0.12	0.37	-0.75	2.54	510
Spending Consolidation	0.20	0.48	-0.29	3.71	510
Real GDP	2.65	1.96	-6.19	11.00	468
Real Consumption	2.47	1.99	-3.86	10.18	468
Real Investment	2.99	5.68	-20.10	17.61	468
Real Export	5.58	4.59	-9.03	28.49	468
Real Import	5.62	5.38	-17.40	24.32	468
Potential Output	2.57	1.08	0.42	8.38	476
Capital Stock	3.64	1.45	0.10	9.72	481
Consumer confidence	0.07	2.29	-8.93	9.13	440
Business confidence	0.13	3.06	-12.09	9.24	364
Private employment	0.45	1.94	-9.47	7.97	493
Employment ratio	0.37	1.94	-21.74	8.87	491
Unemployment Rate	7.63	3.84	1.56	24.12	508
NAIRU	7.06	2.68	1.44	15.42	493
Term Structure	0.78	1.63	-5.65	6.87	510
Inflation	4.42	4.23	-1.00	29.30	507
Short rate	7.72	4.68	0.03	24.90	510

Table 2. Stylized Facts

	Total	TB	EB
Number of observations	457	457	457
Number of years of consolidation	162	62	100
Number of years of PR	127	127	127
GDP growth 1 year during PR (percent)	1.46	1.46	1.46
GDP growth 1 year outside PR (percent)	2.32	2.32	2.32
Number of years of consolidation during PR	40	23	17
Average size (percent of GDP)	0.97	0.66	1.40
Average duration (years)	1.42	1.41	1.44
GDP growth 1 year (percent)	0.72	0.57	0.93
Number of of years of consolidation outside PR	122	39	83
Average size (percent of GDP)	0.99	0.85	1.06
Average duration (years)	0.75	0.8	0.7
GDP growth 1 year (percent)	2.03	1.69	2.19

Note: PR=protracted recession

Table 3. Baseline Results
Cumulative Multipliers during Episodes of Non-Protracted and Protracted Recession

Variable	Type	Cumulative IR		Difference	Multipliers	
		Non PR	PR	Chi-sq.	Non PR	PR
GDP	All	-3.76***	-5.76***	2.19	-0.6	-2.0
	EB	-2.93***	-4.94***	2.73*	-0.4	-2.0
	TB	-8.02***	-8.90***	0.11	-1.9	-2.0
Employment	All	-2.59**	-9.65***	10.07***	-0.4	-3.4
	EB	-0.44	-8.95***	16.01***	-0.1	-3.6
	TB	-10.58***	-11.36**	0.03	-2.5	-2.6
Unemployment	All	0.50	4.62***	19.43***	0.1	1.6
	EB	-0.59	4.71***	21.10***	-0.1	1.9
	TB	4.64***	4.06***	0.27	1.1	0.9
Primary Surplus	All	6.34***	2.85***	10.83***		
	EB	6.77***	2.49***	13.81***		
	TB	4.22***	4.44***	0.01		

Note: The column *Cumulative IR* reports the five-year cumulative impulse response of the variable in the row under PR and Non-PR episodes when considering: (i) all types of consolidation episodes (*All*); (ii) expenditure-based (*EB*); (iii) tax-based (*TB*).

*, **, and *** denote the null hypothesis rejection that the cumulative IR is equal to zero at the 10, 5, and 1 percent, respectively. The column *Difference* reports the Chi-squared statistics for the test of the difference between the cumulative IRs. The columns *Multipliers* show the ratio between the five-year cumulative IRs of GDP, employment, and unemployment divided by the five-year cumulative IRs of the primary surplus under the respective type of consolidation and state of the economy.

Table 4. Transmission Channels of Fiscal Consolidations

Variable	Type	Cumulative IR		Difference
		Non-PR	PR	Chi-sq.
Consumption	EB	-1.66***	-3.56***	3.28*
	TB	-6.79***	-5.30***	0.91
Investment	EB	-1.86***	-2.91***	2.6
	TB	-4.48***	-6.99***	1.29
Export	EB	0.4	-1.71	4.80**
	TB	0.97	-1.09	1.3
Import	EB	-2.72***	-5.26***	5.85**
	TB	-2.71***	-5.14***	1.81
Potential Output	EB	0.01	-2.56***	15.72***
	TB	1.06	-1.78*	2.96*
Capital Stock	EB	-2.46**	-4.81***	5.59**
	TB	-7.06***	-11.37***	1.43
Private Sector Employment	EB	1.75	-9.53***	40.71***
	TB	-7.67***	-7.10**	0.03
NAIRU	EB	-0.25	1.21***	43.66***
	TB	-0.08	0.49*	1.46
Short-Term Rate	EB	-2.28***	-1.97*	0.08
	TB	0.21	4.42***	6.03**

Note: The column *Cumulative IR* reports the five-year cumulative impulse response of the variable in the row under PR and Non-PR episodes when considering: (i) expenditure-based (*EB*); (ii) tax-based (*TB*).

*, **, and *** denote the null hypothesis rejection that the cumulative IR is equal to zero at the 10, 5, and 1 percent, respectively. The column *Difference* reports the Chi-squared statistics for the test of the difference between the cumulative IRs.

Table 5. Cumulative Multipliers using Unemployment Gap as Measure of Slack

Variable	Type	Cumulative IR		Difference	Multipliers	
		U-Gap<1%	U-Gap>1%	Chi-sq.	U-Gap<1%	U-Gap>1%
GDP	All	-4.25***	-4.20***	0.00	-0.6	-2.2
	EB	-2.95***	-3.76***	0.68	-0.4	-1.9
	TB	-8.01***	-8.35***	0.02	-2.1	-4.0
Employment	All	-4.03***	-5.10***	0.68	-0.6	-2.7
	EB	-1.10	-4.76***	4.40**	-0.1	-2.5
	TB	-9.80***	-10.12***	0.01	-2.5	-4.9
Unemployment	All	0.93*	1.46***	0.80	0.1	0.8
	EB	0.05	1.09*	2.07	0.0	0.6
	TB	2.69***	6.29***	4.29**	0.7	3.0
Primary Surplus	All	6.64***	1.91**	16.35***		
	EB	7.62***	1.93**	17.83***		
	TB	3.90***	2.07	0.73		

Note: The column *Cumulative IR* reports the five-year cumulative impulse response of the variable in the row under unemployment gap above 1 percent (U-Gap>1%) and below (U-Gap<1%) when considering: (i) all types of consolidation episodes (*All*); (ii) expenditure-based (*EB*); (iii) tax-based (*TB*). See text for details on the calculations of the unemployment gap.

*, **, and *** denote the null hypothesis rejection that the cumulative IR is equal to zero at the 10, 5, and 1 percent, respectively. The column *Difference* reports the statistic of the Chi-squared test of the difference between the cumulative IRs. The column *Multipliers* shows the ratio between the five-year cumulative IRs of GDP, employment, and unemployment divided by the five-year cumulative IR of the primary surplus under the respective type of consolidation and state of the economy.

Table 6. Robustness to the Exclusion of Single Countries

Excluded Country	Variable	Type	Cumulative IR		Difference	Multipliers	
			Non-PR	PR	Chi-sq.	Non PR	PR
FIN	Output	All	-4.12***	-5.05***	0.53	-0.6	-1.4
	Output	EB	-3.17***	-4.18***	0.71	-0.4	-1.3
	Output	TB	-8.36***	-8.37***	0	-2.1	-1.6
	Employment	All	-3.23***	-8.97***	7.97***	-0.5	-2.5
	Employment	EB	-0.95	-8.03***	14.16***	-0.1	-2.4
	Employment	TB	-10.94***	-11.53**	0.02	-2.7	-2.3
	Unemployment	All	0.69	3.84***	17.03***	0.1	1.1
	Unemployment	EB	-0.46	3.81***	18.28***	-0.1	1.1
	Unemployment	TB	4.66***	3.72***	0.82	1.2	0.7
	Primary Surplus	All	6.73***	3.64***	6.65***		
	Primary Surplus	EB	7.35***	3.32***	9.00***		
	Primary Surplus	TB	4.02***	5.09***	0.33		
JPN	Output	All	-4.05***	-5.21***	1.05	-0.7	-1.9
	Output	EB	-3.35***	-5.18***	2.43	-0.5	-2.3
	Output	TB	-7.59***	-5.19**	0.79	-2.1	-0.9
	Employment	All	-2.75***	-8.37***	9.15***	-0.5	-3.0
	Employment	EB	-0.69	-8.69***	14.83***	-0.1	-3.9
	Employment	TB	-10.57***	-6.31	1.27	-2.9	-1.1
	Unemployment	All	0.52	4.22***	17.69***	0.1	1.5
	Unemployment	EB	-0.52	4.66***	20.49***	-0.1	2.1
	Unemployment	TB	4.58***	2.24**	5.17**	1.3	0.4
	Primary Surplus	All	5.79***	2.79***	10.44***		
	Primary Surplus	EB	6.22***	2.23***	13.10***		
	Primary Surplus	TB	3.63***	5.76***	1.28		
NLD	Output	All	-3.93***	-5.92***	1.5	-0.5	-1.9
	Output	EB	-2.90***	-4.76***	1.67	-0.3	-1.6
	Output	TB	-8.71***	-10.00***	0.2	-2.0	-2.5
	Employment	All	-3.06**	-10.36***	8.58***	-0.4	-3.3
	Employment	EB	-0.75	-9.04***	12.88***	-0.1	-3.0
	Employment	TB	-10.83***	-14.18***	0.54	-2.5	-3.6
	Unemployment	All	0.69	4.80***	18.02***	0.1	1.5
	Unemployment	EB	-0.55	4.70***	20.13***	-0.1	1.6
	Unemployment	TB	4.89***	4.79***	0.01	1.1	1.2
	Primary Surplus	All	7.60***	3.15***	16.04***		
	Primary Surplus	EB	8.32***	3.02***	21.03***		
	Primary Surplus	TB	4.29***	3.96***	0.03		
SWE	Output	All	-4.08***	-5.96***	1.65	-0.6	-1.9
	Output	EB	-3.11***	-5.21***	2.23	-0.5	-1.8
	Output	TB	-8.43***	-8.86***	0.03	-2.0	-1.9
	Employment	All	-2.41**	-9.96***	10.03***	-0.4	-3.1
	Employment	EB	0.01	-9.22***	15.42***	0.0	-3.2
	Employment	TB	-10.53***	-11.88**	0.1	-2.5	-2.6
	Unemployment	All	0.39	4.66***	18.04***	0.1	1.4
	Unemployment	EB	-0.81	4.76***	19.35***	0.1	1.6
	Unemployment	TB	4.51***	4.11***	0.13	1.1	0.9
	Primary Surplus	All	6.37***	3.22***	7.34***		
	Primary Surplus	EB	6.84***	2.90***	9.38***		
	Primary Surplus	TB	4.29***	4.65***	0.03		

Note: The rows *FIN*, *JPN*, *NLD*, *SWE*, refer to the results obtained when excluding either Finland, Japan, the Netherlands or Sweden from the sample. The column *Cumulative IR* reports the five-year cumulative impulse response of the variable in the row under PR and Non PR periods when considering: (i) all types of consolidation episodes (*All*); (ii) expenditure-based (*EB*); (iii) tax-based (*TB*).

*, ** and *** denote the null hypothesis rejection that the cumulative IR is equal to zero at the 10, 5, and 1 percent, respectively. The column *Difference* reports the statistics of the Chi-squared test of the difference between the five-year cumulative IR. The column *Multipliers* shows the ratio between the five-year cumulative IR of GDP, employment, and unemployment divided by the five-year cumulative IRs of the primary surplus under the respective type of consolidation and state of the economy.

Table 7. Controlling for Credit Growth

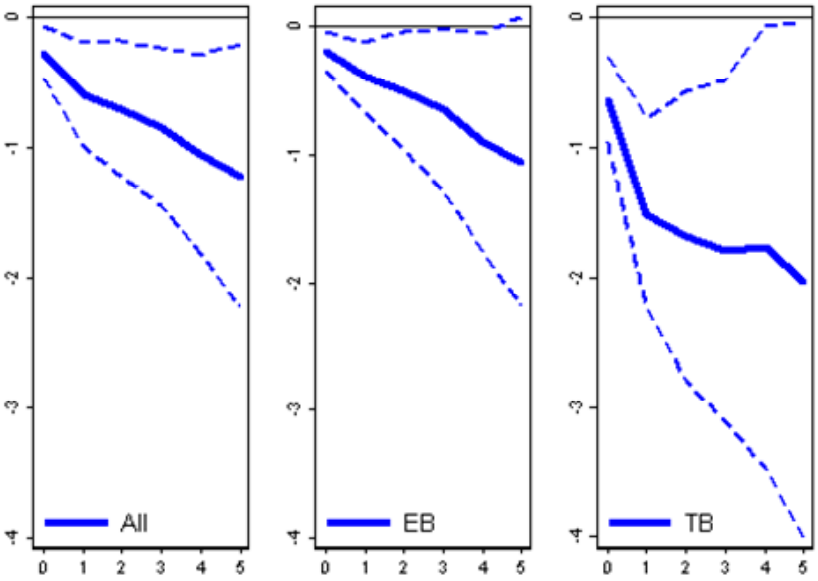
Cumulative Multipliers during episodes of protected recession, and outside.

Variable	Type	Cumulative IR		Difference	Multipliers	
		Non PR	PR	Chi-sq.	Non PR	PR
GDP	All	-4.22***	-5.43***	0.62	-0.8	-2.4
	EB	-3.36***	-3.74***	0.09	-0.6	-1.6
	TB	-10.59***	-11.29***	0.07	-2.7	-5.6
Employment	All	-3.23***	-7.00***	5.55**	-0.6	-3.1
	EB	-2.88**	-7.31***	6.95***	-0.5	-3.1
	TB	-6.21***	-5.74	0.02	-1.6	-2.9
Unemployment	All	0.20	4.98***	35.11***	0.0	2.2
	EB	0.13	4.73***	28.01***	0.0	2.0
	TB	1.06	5.86***	6.35**	0.3	2.9
Primary Surplus	All	5.16***	2.28**	7.69***		
	EB	5.36***	2.39***	7.61***		
	TB	3.88***	2.00	0.70		

Note: The column *Cumulative IR* reports the five-year cumulative impulse response of the variable in the row under PR and Non-PR episodes when considering: (i) all types of consolidation episodes (*All*); (ii) expenditure-based (*EB*); (iii) tax-based (*TB*).

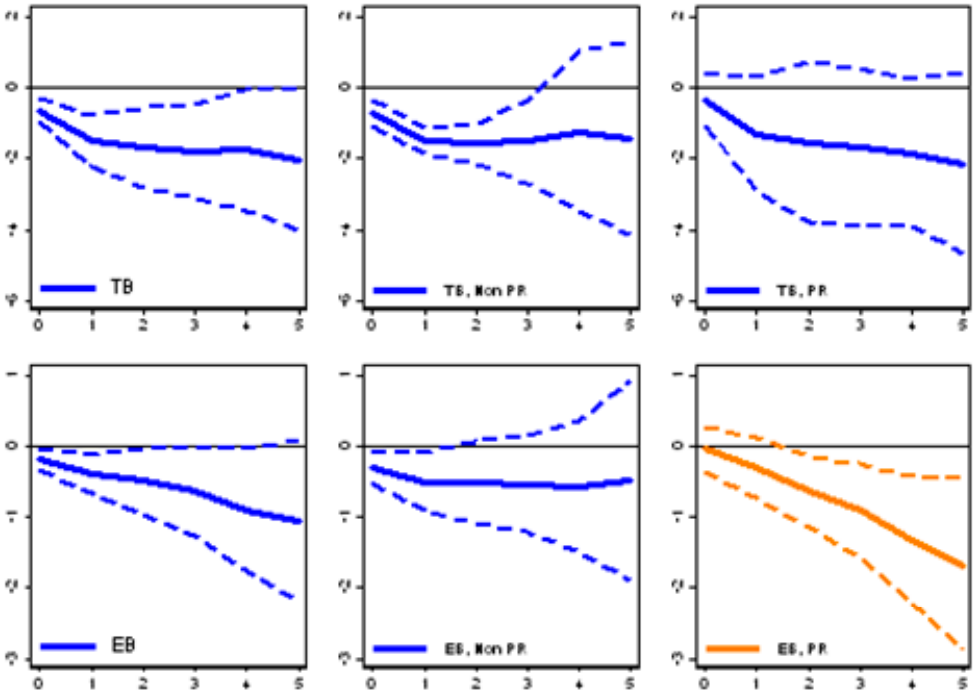
*, **, and *** denote the null hypothesis rejection that the cumulative IR is equal to zero at the 10, 5, and 1 percent, respectively. The column *Difference* reports the statistics of the Chi-squared test of the difference between the five-year cumulative IRs. The column *Multipliers* shows the ratio between the five-year cumulative IRs of GDP, employment and unemployment divided by the five-year cumulative IRs of the primary surplus under the respective type of consolidation and state of the economy.

Figure 1. Effects of Consolidation on Real GDP: Replication of the Literature



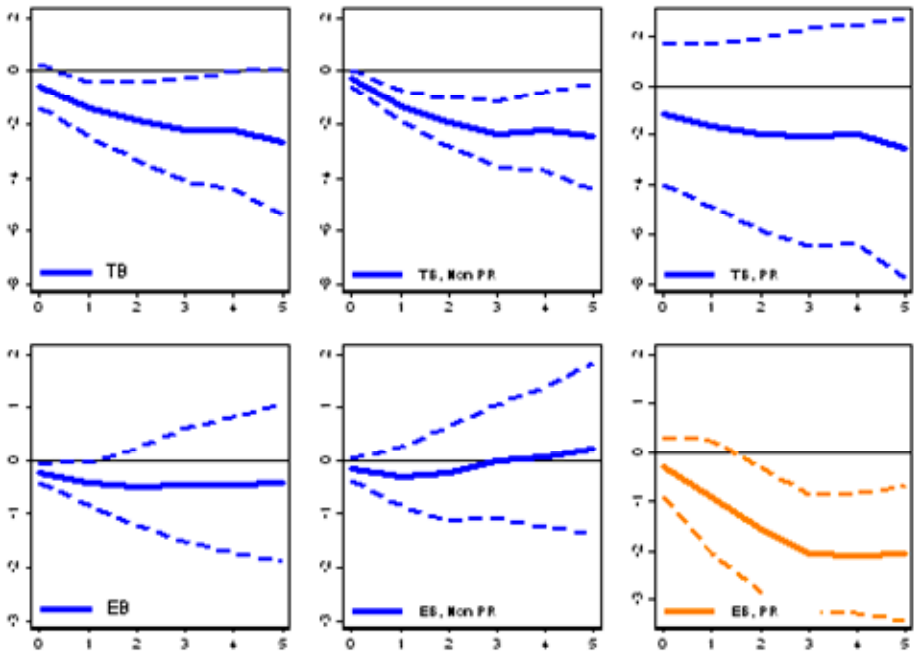
Note: $t = 0$ denotes the initial year of the fiscal consolidation. Ninety-five percent confidence intervals are displayed. *All* denotes all episodes of fiscal consolidations; *EB* denotes expenditure-based consolidations and *TB* denotes tax-based consolidations.

Figure 2. Asymmetric Effects of Fiscal Consolidations on Real GDP



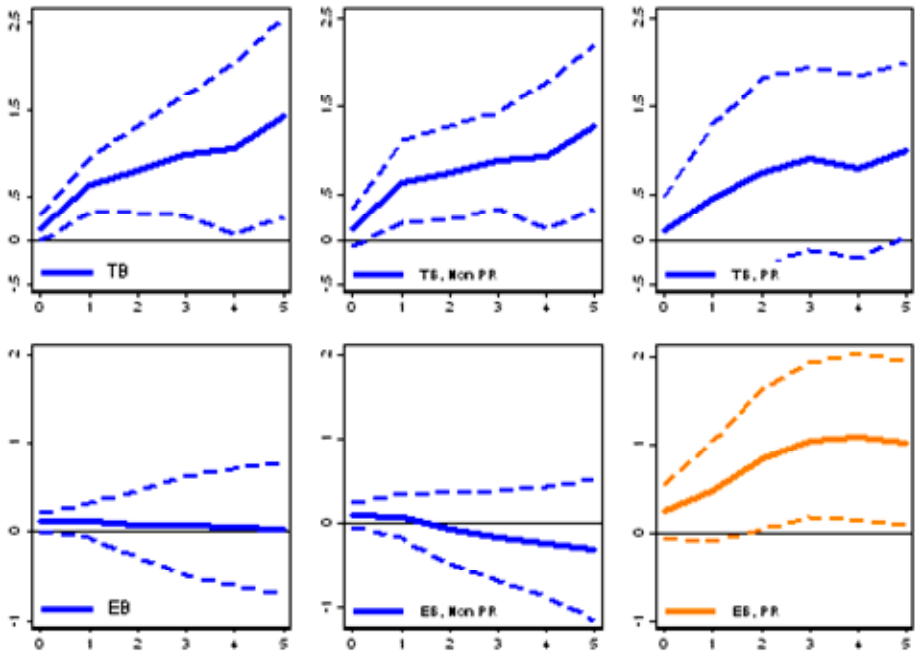
Note: $t = 0$ denotes the initial year of the fiscal consolidation. Ninety-five percent confidence intervals are displayed. *EB* denotes expenditure-based consolidations and *TB* denotes tax-based consolidations. *PR* denotes episodes of protracted recession and *non-PR* all other episodes. See text for explanation on identification of PR episodes.

Figure 3. Asymmetric Effects of Fiscal Consolidations on Employment



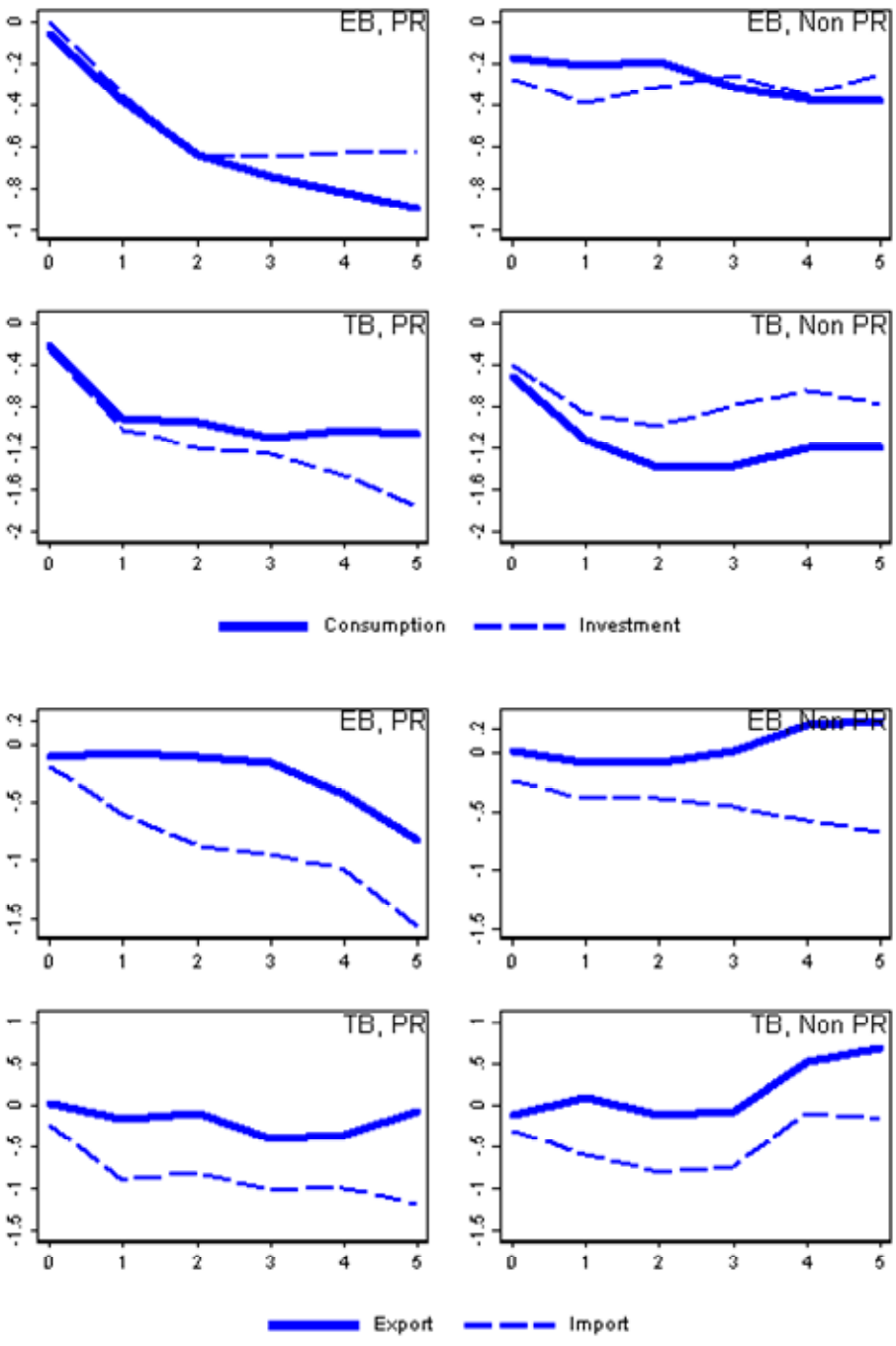
Note: $t = 0$ denotes the initial year of the fiscal consolidation. Ninety-five percent confidence intervals are displayed. *EB* denotes expenditure-based consolidations and *TB* denotes tax-based consolidations. *PR* denotes episodes of protracted recession and *non-PR* all other episodes. See text for explanation on identification of PR episodes.

Figure 4. Asymmetric Effects of Fiscal Consolidations on Unemployment



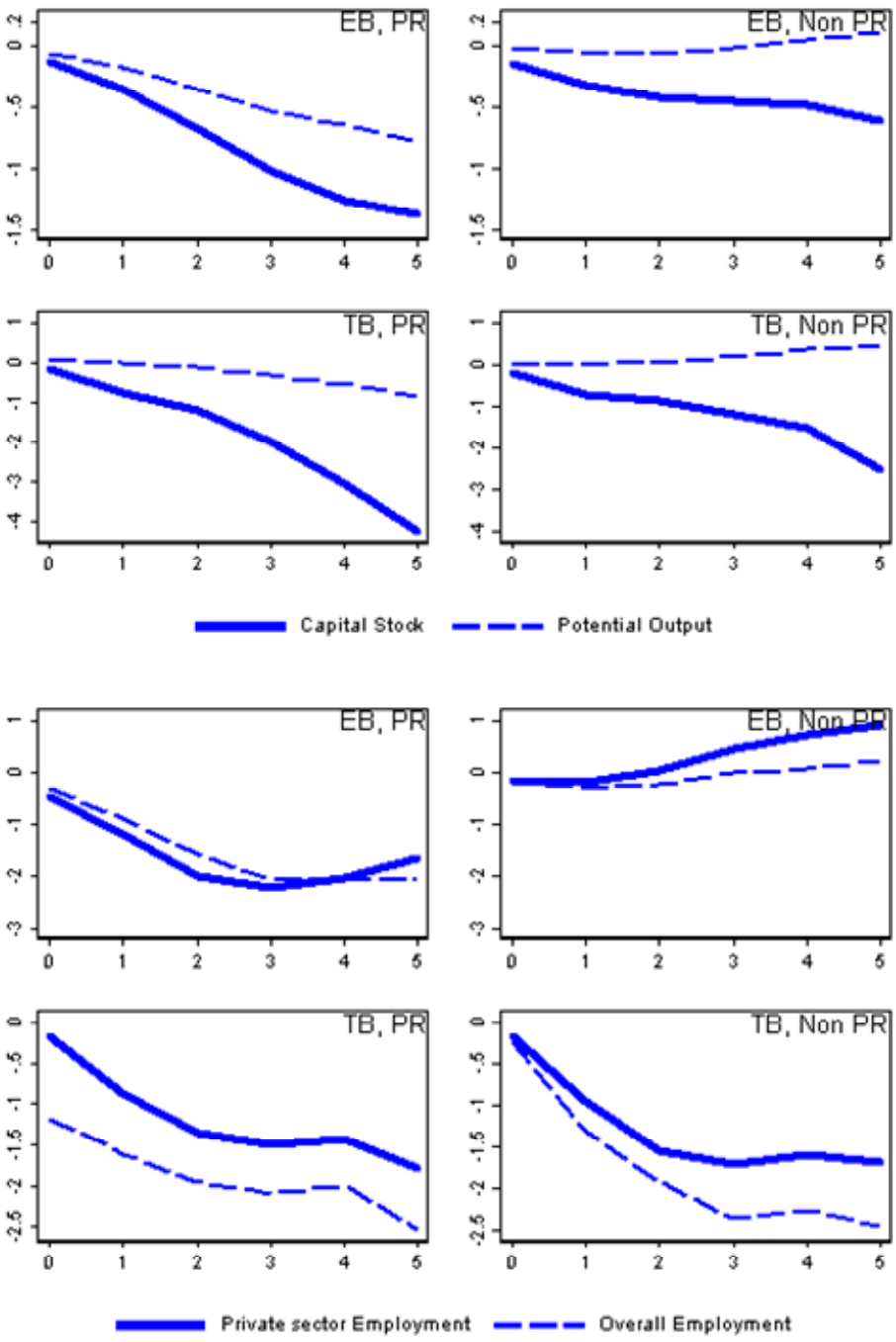
Note: $t = 0$ denotes the initial year of the fiscal consolidation. Ninety-five percent confidence intervals are displayed. *EB* denotes expenditure-based consolidations and *TB* denotes tax-based consolidations. *PR* denotes episodes of protracted recession and *non-PR* all other episodes. See text for explanation on identification of PR episodes.

Figure 5. Transmission Channels of Fiscal Consolidations



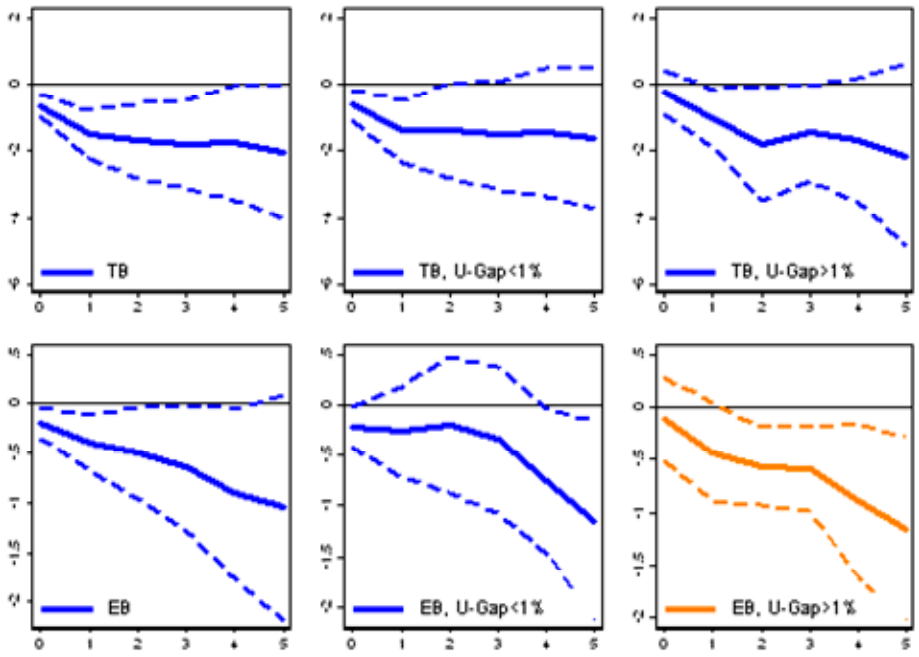
Note: $t = 0$ denotes the initial year of the fiscal consolidation. Ninety-five percent confidence intervals are displayed. *EB* denotes expenditure-based consolidations and *TB* denotes tax-based consolidations. *PR* denotes episodes of protracted recession and *non-PR* all other episodes. See text for explanation on identification of PR episodes.

Figure 5. Transmission Channels of Fiscal Consolidations (concl'd)



Note: $t = 0$ denotes the initial year of the fiscal consolidation. Ninety-five percent confidence intervals are displayed. *EB* denotes expenditure-based consolidations and *TB* denotes tax-based consolidations. *PR* denotes episodes of protracted recession and *non-PR* all other episodes. See text for explanation on identification of PR episodes.

Figure 6. Effects of Fiscal Consolidations on Real GDP



Note: $t = 0$ denotes the initial year of the fiscal consolidation. Ninety-five percent confidence intervals are displayed. *All* denotes all episodes of fiscal consolidations; *EB* denotes expenditure-based consolidations and *TB* denotes tax-based consolidations. U-Gap>1% denotes episodes of unemployment gap above 1% and U-Gap<1% all other episodes. See text for explanation on identification of unemployment gap.

APPENDIX I. Table 1A. DATA SOURCES

Variable	Description	Source
Capital Stock		OECD
Consolidation	Fiscal Consolidations from the Narrative Approach	DeVries et al. (2011)
Contractionary Episodes	Turning points in the Composite Leading Indicators (CLI) series constructed by the OECD	FRED
Employment ratio		OECD
Inflation	Annual Rate of Inflation	OECD
NAIRU	Non-Accelerating Inflation Rate of Unemployment	OECD
Output Gap	(GDP-Potential GDP)/Potential GDP	OECD
Potential Output		OECD
Private employment	Employment in the Private Sector	Haver
Real Consumption		OECD
Real Export		OECD
Real GDP		OECD
Real Import		OECD
Real Investment		OECD
Short rate	3-Month Money Market Rate	OECD
Unemployment Gap	(Unemployment-Trend Unemployment)	Authors'Calculation
Unemployment Rate		OECD

Note: OECD refers to OECD Economic Outlook No. 93, June 2013.