# The output effects of fiscal adjustment plans: disaggregating taxes and spending *

Alberto Alesina, Omar Barbiero, Carlo Favero,
Francesco Giavazzi and Matteo Paradisi

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## 1 Introduction

Many countries are struggling with the question of how to reduce public debts. A large literature (see Alesina Giavazzi and Favero (2014) for a recent assessment and new results) has shown that in general, expenditure based fiscal adjustments (i.e. deficit reduction policies achieved by means of spending cuts) are less costly in terms of short run output losses than tax based adjustments. Depending on various methodological approaches and estimation methods, the differences between the two may be found as very large, with spending cuts on average almost costless, and tax hikes creating deep and long lasting recessions, while following other approaches the differences between the two is less extreme. Different reaction of monetary policy to the two types of fiscal adjustments cannot explain these different output effects. In addition, spending based fiscal adjustments, by stopping the growth of entitlements and other automatic increases in government outlays may also be more effective at stabilizing the debt/GDP ratio in the medium run.

This literature however has not gone beyond a discussion of spending cuts versus tax hikes. There has been no disaggregation of which type spending cuts or which tax increases have been more or less effective at reducing deficits at lower output costs. We want to investigate this critical policy implication regarding the composition of fiscal adjustments (different types of spending cuts, e.g. infrastructure vs. public sector wages or different type of tax hikes, e.g. direct versus indirect taxes). By providing a new disaggregated data set of fiscal consolidations and beginning to analyze it, we believe that this paper will achieve two goals. One is to provide some answers regarding the short term costs (if any) in terms of output losses of different types of fiscal adjustments

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in a panel of countries, overcoming the limits coming from a simple distinction between taxes and spending. The second is that we will provide the data necessary to analyze other issues, such as distributional consequences of different types of fiscal adjustments, the political determinants of the choice of which type of adjustment to choose, long term effects over the debt/GDP ratio of different compositions of fiscal adjustments and the labor market effects of different types of fiscal consolidations.

This paper further develops the narrative approach pioneered by Romer and Romer (2010) by disaggregating the aggregate "plans" of fiscal adjustments identified by Devries et al. (2011) and breaking down various components of spending and revenues for the panel of 17 OECD countries (13 of which within the EU) and study their output effect. We focus both on spending and revenue measures because it is crucial to consider the whole structure of government budget movements in order to avoid any omitted variable bias.

Given the importance of the intertemporal design of fiscal plans, we would exploit the econometric framework of Alesina, Favero and Giavazzi (2014) to allow for different effects of past, current and planned fiscal adjustments. We would then examine how the composition of fiscal adjustments is related to their success in terms of stabilizing the debt over GDP ratio and how costly they are in terms of generating downturns or possibly, in some cases, expansions. For example: are fiscal adjustments based upon raising income taxes more or less costly than those based upon raising indirect taxes? How about direct taxes? On the spending side is it more costly to cut public investments or transfers?

Thus far the literature has addressed the issue of composition by simply looking at revenues versus spending in the aggregate. However, recent works by Mertens and Ravn (2013), Romer and Romer (2014) and Perotti (2014) are valuable exceptions. They however focus only on the US. This proposed paper would be the first one to present a disaggregated version of fiscal adjustment plans from an international perspective and assessing the effect of all the components of fiscal adjustments at once. We consider four different components of the government budget: consumption and investments, transfers, direct and indirect taxes. From a theoretical point of view each one of these components should have effect on GDP growth through different channels. Consumption and investments cuts will impact GDP depending on the level of government productivity in producing public goods and services. In addition these cuts generate expectations of lower taxes in the future and change the marginal utility of consumption assuming that private and public good consumption are substitutes. Transfers cuts are not directly distortionary on labor supply, but reduces the available resources for households, reducing in turn their consumption level. Like consumption and investments, transfers cuts generate room for tax reductions in the future. The main difference among direct and indirect taxes lies in their distortionary effect. An increase in the former change the marginal rate of substitution between consumption and labor, reducing labor supply. On the other hand, indirect taxes have no impact on the marginal rate of substitution, but implicitly increase the price of consumption.

The paper is structured as follows. In the first section we illustrate the concept of

fiscal plan and its importance to understand the output effect of fiscal stabilization, in the second section we illustrate the construction of the data-set, in the third section we concentrate on the econometric model, the fourth section reports empirical results and the last section concludes.

# 2 Fiscal Stabilization Plans

The analysis of the output effects of economic policy requires – for the correct estimation of the relevant parameters – identifying policy shifts that are exogenous. In this paper we concentrate on the output effect of fiscal stabilization measures, i.e. fiscal measures aimed at reducing the deficit and the debt. Exogeneity of the shifts in fiscal policy for the estimation of their output effect requires that they are not correlated with news on output growth.

The traditional steps to identify such exogenous shifts were to first estimate a joint dynamic model for the structure of the economy and the variables controlled by the policy-makers (typically estimating a VAR). The residuals in the estimated equation for the policy variables approximate deviations of policy from the rule. Such deviations, however, do not yet measure exogenous shifts in policy because a part of them represents a reaction to contemporaneous information on the state of economy. In order to recover structural shocks from VAR innovations some restrictions are required. In the case of monetary policy identification can be achieved exploiting the fact that central banks take their policy decisions at regular intervals (e.g. there are eight FOMC meetings every year) and there is consensus on the fact that it takes at least one period between two meetings before the economy reacts to such decisions. This triangular structure – innovations in the monetary policy variable reflect both monetary policy and macroeconomic shocks, but macroeconomic variables are not contemporaneously affected by monetary policy shocks – is sufficient for identification.

Fiscal policy is different, in the sense that it is conducted through rare decisions and is typically implemented through multi-year plans. A fiscal plan typically contains three components: (i) unexpected shifts in fiscal variables (announced upon implementation at time t), (ii) shifts implemented at time t but announced in previous years, and (iii) shifts announced at time t, to be implemented in future years. Considering, for simplicity, the case in which the horizon of the plan is only one year with reference to a specific country i, these are corrections announced at time t for implementation at time t+1:

$$f_{i,t} = e^u_{i,t} + e^a_{i,t,0} + e^a_{i,t,1}$$

These features of fiscal policy generate "fiscal foresight": agents learn in advance future announced measures. The consequence of fiscal foresight is that the number of shocks to be mapped out of the VAR innovations is too high to achieve identification: technically the Moving Average representation of the VAR becomes non-invertible.

As a consequence of this specific feature of fiscal policy, after some initial effort of adapting the identification scheme used for monetary policy, attempts at mapping VAR innovations into fiscal shocks have become less successful, and an alternative strategy has been preferred, which is based on a non-econometric, direct identification of the shifts in fiscal variables. These are then plugged directly into an econometric specification capable of delivering the impulse response functions that describe the output effect of fiscal adjustments. In this "narrative" (Romer and Romer 2010) identification scheme a time-series of exogenous shifts in taxes or government is constructed using parliamentary reports and similar documents to identify the size, timing, and principal motivation for all major fiscal policy actions. Legislated tax and expenditure changes are classified into endogenous (induced by short-run countercyclical concerns) and exogenous (responses to an inherited budget deficit, or to concerns about long-run economic growth or politically motivated). In this paper we concentrate on fiscal measures designed to deal with inherited budget deficits. Therefore we concentrate on the effect of a subset of the exogenous adjustments.

Starting from narratively-identified shifts in fiscal variables we then build fiscal plans, recognizing that fiscal plans generate inter-temporal and intra-temporal correlations among changes in spending and revenues and disaggregating fiscal adjustments plans into their components . The inter-temporal correlation is the one between the announced (future) and the unanticipated (current) components of a plan – what we shall call the "style" of a plan. The intra-temporal correlation is that between the changes in revenues and spending that determines the composition of a plan. Finally, expenditure and revenues are disaggregated into four components:consumption and investment, transfers, direct taxes and indirect taxes. disaggregation will allow us to define four type of adjustments and evaluate the heterogeneity in their macroeconomic effect. As argued by Ramey (2011a, b) distinguishing between announced and unanticipated shifts in fiscal variables, and allowing them to have different effects on output, is crucial for evaluating fiscal multipliers. This approach, introduced in AFG, is an advance on the literature which so far had studied (see e.g. Mertens and Ravn 2011) the different effects of anticipated and unanticipated shifts in fiscal variables assuming that they are orthogonal.

A fiscal plan is specified by making explicit the relation between the unpredictable component of the plan and the other two components:

$$\begin{aligned} e^a_{i,t,1} &= \phi_{1,i} e^u_{i,t} + v_{1,i,t} \\ e^a_{i,t+1,0} &= e^a_{i,t,1} \end{aligned}$$

The first equation is a behavioral relation that captures the style with which fiscal policy is implemented. Countries that typically implement "permanent" plans will feature a positive $\phi_{1,i}$, while temporary plans (in which a country announces that an initial fiscal action will be reversed, at least partially, in the future) will feature a negative $\phi_{1,i}$. The second equation allows to connect announcement with implementation. Note

that in the case an announced implementation at time t is only partially implemented at time t+1 and no new further measures are adopted we shall have

$$f_{i,t+1} = e^u_{i,t+1} + e^a_{i,t,1}$$

where $e^u_{i,t+1}$ will capture the difference between the actual fiscal adjustment at time t+1 and that announced at time t.

Finally, by tracking the different components of plans we will label them according to their composition. Plans will be distinguished into consumption and investment-based (CB), transfer-based (TRB), direct taxation -based (DB) and indirect taxation-based (IB), depending on the components that dominates the adjustment.

# 3 The construction of the data set

The paper focuses on exogenous fiscal shifts, meaning episodes primarily implemented to keep public deficits and debts, on a sustainable path and not dependent on current or perspective growth. The episodes capture the change in policy having effect in the current year, compared to a baseline scenario of no policy change with respect to the previous year. In order to measure the size of the fiscal shifts, we look exclusively on contemporaneous government documents, as both Devries et al. (2011) and Romer and Romer (2010) do. We do this for two reasons. First of all because retrospective figures are rarely available and second because statements about the expected effects of a policy change are less likely to be distorted by contemporaneous cyclical factors. All the fiscal measures are scaled in percent of GDP. Data always refer to the general government.

In order to disaggregate the fiscal data provided by Devries et al. (2011) we need to classify fiscal measures in different components. In doing our classification we take into consideration the role of fiscal components in influencing economic decisions and we do not follow a mere accounting classification. In particular, we take into account the potential distortionary effects that some components may have on the labor supply. The fiscal components are: government consumption and investments, transfers, direct taxes and indirect taxes. We provide here a description of every single component with specific examples of the main measures it includes.

## 3.1 Spending Components

We distinguish among two different components in order to classify the measures included in the spending side by Devries et al. (2011). They are government consumption and investments and transfers. Indeed, the latter is often considered as a negative tax and thus should not be lumped together with the rest of spending measures. In the current paper we try to assess whether there exist different effects of transfers and the remainder of spending measures on our dependent variables. A discussion of our spending components follows.

### 3.1.1 Government Consumption and Investments

We include in the category current expenditures for both individual consumption goods and services and collective consumption services (including compensation of employees). We also include public sector salaries and social insurance contributions and the managing cost of state provided services such as education (public schools and universities but also training for unemployed workers) and health. Public investments lump together all the expenditures made by the government with the expectation of having a positive return. The category includes all government gross fixed capital formation expenditures (e.g. land improvements, fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, and commercial and industrial buildings). We lump together consumption and investments since we consider them to be the core part of government activity: they represent the expenditures faced when producing public goods and services. We should consider this component as everything which is not a direct resource transfer to people or corporations.

### 3.1.2 Transfers

We define transfer every money provision made by the government without expecting a direct economic gain. The main feature of transfers is their neutral effect on the marginal rate of substitution between consumption and labor. We include among transfers subsidies, grants, and other social benefits. For instance, they contain all non-repayable transfers on current account to private and public enterprises; grants to foreign governments, international organizations, and other government units; social security, social assistance benefits, and employer social benefits in cash and in kind. We also include in the category tax credits, tax deductions and taxes on emissions registered as negative subsidies.[1]

## 3.2 Tax Components

Revenues are classified in two components: direct and indirect taxes. The fundamental difference between the two is their distortionary effect on labor supply. Indeed, direct taxes are distortionary in the sense that an increase in direct taxation leads to a reduction in the number of hours worked, while indirect taxes do not change the marginal rate of substitution between consumption and labor. We discuss the two components in details below.

### 3.2.1 Direct taxes

We define direct every tax imposed on a person or a property that does not involve a transaction. We include in this component income, profits, capital gains and property

[1] These credits and deductions, being independent of the number of hours worked and the wage, have no distortionary effects on the labor supply and therefore should not be treated as direct taxes.

taxes. In particular we classify direct all taxes levied on the actual or presumptive net income of individuals, on the profits of corporations and enterprises, and on capital gains, whether realized or not, on land, securities, and other assets plus all taxes on individual and corporate properties.

### 3.2.2 Indirect Taxes

Indirect taxes are those imposed on certain transactions, goods or events. Examples include VAT, sales tax, selective excise duties on goods, stamp duty, services tax, registration duty, transaction tax, turnover selective taxes on services, taxes on the use of goods or property, taxes on extraction and production of minerals and profits of fiscal monopolies.

## 3.3 Labelling of Plans

Given the narrative identification of the four components of fiscal adjustments we proceed to label plans according to two alternative classification: a four-component case and a three component case. In the four component case we distinguish plans in consumption and investment-based (CB), transfer-based (TRB), direct taxation - based (DB) and indirect taxation-based (IB). In the three component case we focus on identifying the potential specific role for transfers by classifying plans in Tax-Based (TB) without distinguishing between direct and indirect taxation, consumption and investment-based (CB), and transfer-based (TRB). We report in the two following tables the classification of episodes using the two alternative schemes. Note that in each classification we have a residual category,the "not classified" category, that includes all the cases in which we could not classify a considerable part of the adjustment according to these 4 categories. The not classified episodes are dropped out when the relevant empirical model is estimated.

| | Direct | Indirect | Consumption | Transfers | Not yet classified |
|---|---|---|---|---|---|
| AUS | 3 | 0 | 0 | 8 | 0 |
| AUT | 0 | 1 | 0 | 6 | 0 |
| BEL | 2 | 0 | 1 | 6 | 3 |
| CAN | 4 | 0 | 5 | 6 | 0 |
| DEU | 1 | 4 | 0 | 9 | 5 |
| DNK | 0 | 0 | 0 | 2 | 3 |
| ESP | 3 | 2 | 4 | 0 | 1 |
| FRA | 1 | 2 | 3 | 4 | 2 |
| GBR | 3 | 7 | 1 | 0 | 0 |
| IRL | 0 | 5 | 2 | 0 | 0 |
| ITA | 2 | 0 | 6 | 3 | 1 |
| JPN | 4 | 3 | 5 | 0 | 0 |
| PRT | 0 | 1 | 3 | 0 | 2 |
| USA | 10 | 0 | 3 | 6 | 0 |
| **Tot.** | **33** | **25** | **33** | **50** | **17** |

Table 1: Classification of fiscal plans by country - Hierarchical dummies, 4 components

# 4 The Econometric Specification

We shall illustrate out econometric approach by constructing the final specification in several steps, in each step one more layer of generality will be added and discussed.

The first step is the baseline specification adopted in early narrative studies that concentrate on shocks rather than plans. The benchmark paper here is Romer and Romer (2010). This approach considers a moving representation relating the stationary variable of interest (for the generic country i) to a distributed lag of narratively identified fiscal shocks:

$$\Delta z_{i,t} = \alpha + B(L) f_{i,t} + \lambda_i + \chi_t + u_{i,t} \tag{1}$$

where $\lambda_i$ and $\chi_t$ capture respectively a fixed-effect and a time-effect.

There are different ways to interpret this regression.

Favero-Giavazzi(2012) intepret (1) as a truncated moving average representation from a macro VAR model. The MA is truncated in two ways, all non fiscal shocks are omitted and the MA is finite rather infinite. The first truncation does not cause any inconsistency of the estimates as, in the case the identification strategy is successful, the omitted structural non-fiscal shocks are orthogonal to the included variables of interest. The second truncation is unlikely to be relevant unless the dependent variable is very persistent.

Jordà-Taylor (2013) interpret (1) as an attempt to tease causal effects from observational data. They observe that $f_{i,t}$ are predictable and they seek to achieve identification of causal effects with new propensity-score based methods for time series data.

We intepret the evidence of predictability provided by Jorda-Taylor as a consequence of the fact that in the traditional approach the $f_{i,t}$ are not properly decomposed into plans and therefore predictability emerges as a consequence of the fact that announced corrections are effectively implemented.

In the light of this evidence more articulation in the specification of the empirical model is in order. We therefore take the following second step:

$$\begin{aligned} \Delta z_{i,t} &= \alpha + B_1(L)e^u_{i,t} + B_2(L)e^a_{i,t,0} + \\ &\quad +\gamma_1 e^a_{i,t,1} + \lambda_i + \chi_t + u_{i,t} \\ e^a_{i,t,1} &= \varphi_{i,1} e^u_{i,t} + v_{1,i,t} \\ e^a_{t,0} &= e^a_{t-1,1} \end{aligned} \tag{2}$$

In (2) not only plans are fully tracked, but also different elasticities are allowed for unanticipated and anticipated corrections and between implemented and announced corrections. Note also that no distributed lag for the effect of future announced plans is introduced because the effect in time of announced adjustment is followed through the plan. The specification of plans makes clear that a number of restrictions are imposed when plans are collapsed into one-period adjustment without explicit recognition of their intertemporal nature. Guajardo et al (*forthcoming*) address the question of the output effect of fiscal adjustment by using specification (1) where "shocks" are defined (we shall call them *"IMF shocks"*, $e^{IMF}_t$, based on the common institution of these authors) as the sum of the unexpected adjustments that occur in year $t$ and the past announced adjustments also implemented in year $t$ : they thus correspond to (a fraction of) the shifts in fiscal variables reported in the national accounts for year $t$. $f^{IMF}_t$ are thus defined:

$$f^{IMF}_t = e^u_t + e^a_{t,0}$$

Note that using $f^{IMF}_t$ in (1) can be reinterpreted as a restricted version of (2) , where the restrictions imposed are $B_1(L) = B_2(L), \gamma_1 = 0$.Also a relevant consequence of collapsing plans into single period "shocks" is that they become predictable when $\varphi_{i,1} \neq 0$. Such a predictability, noted by Hernandez da Cos and Moral(2012) and Jorda-Taylor(2013), has generated a relevant debate in the literature.

The third step in the specification allows us to take the into account the composition of the adjustment distinguishing between tax-based and expenditure-based adjustments. A quasi-panel is estimated allowing for two types of heterogeneity: within-country heterogeneity in the effects of TB and EB plans on the left-hand-side variable, and between-country heterogeneity in the style of a plan

$$
\begin{aligned}
\Delta z_{i,t} &= \alpha + B_1(L)e^u_{i,t} * TB_{i,t} + B_2(L)e^a_{i,t,0} * TB_{i,t} + \\
&\quad C_1(L)e^u_{i,t} * EB_{i,t} + C_2(L)e^a_{i,t,0} * EB_{i,t} + \\
&\quad + \sum_{j=1}^{3} \gamma_j e^a_{i,t,j} * EB_{i,t} + \sum_{j=1}^{3} \delta_j e^a_{i,t,j} * TB_{i,t} + \lambda_i + \chi_t + u_{i,t}
\end{aligned} \tag{3}
$$

$$
\begin{aligned}
e^a_{i,t,1} &= \varphi_{1,i}\ e^u_{i,t} + v_{1,i,t} \\
e^a_{i,t,2} &= \varphi_{2,i}\ e^u_{i,t} + v_{2,i,t} \\
e^a_{i,t,3} &= \varphi_{3,i}\ e^u_{i,t} + v_{3,i,t} \\
e^a_{i,t,0} &= e^a_{i,t-1,1} \\
e^a_{i,t,j} &= e^a_{i,t-1,j+1} + \left(e^a_{i,t,j} - e^a_{i,t-1,j+1}\right)\ j \geqslant 1
\end{aligned}
$$

$$
\begin{aligned}
if \quad \left(\tau^u_t + \tau^a_{t,0} + \sum_{j=1}^{horiz} \tau^a_{t,j}\right) &> \left(g^u_t + g^a_{t,0} + \sum_{j=1}^{horiz} g^a_{t,j}\right) \\
then\ TB_t &= 1\ and\ \ EB_t = 0, \\
else\ TB_t &= 0\ \ and\ \ EB_t = 1, \forall\ t
\end{aligned}
$$

where $\lambda_i$ and $\chi_t$ are country and time fixed effects. (3) is the specification that we put at work to simulate the output effect of average fiscal adjustment plans (i.e. to compute impulse responses with respect to adjustment plans).By their nature impulse responses would be different across countries because of the different styles of fiscal policy (as captured by the different $\varphi_{i,1}$) and within countries as a consequence of the heterogenous effects of plans as determined by their composition. Our moving average representation is truncated because the length of the $B(L)$ and $C(L)$ polynomials is limited to three-years. The moving-average representation is specified to allow for different effects of unanticipated and anticipated adjustments. Also different coefficients are allowed for adjustment announced in the past and implemented at time t and adjustments announced at time t for the future. To avoid double counting we exclude lags of future of $e^a_{i,t,j}$, as their dynamic effect is captured by $e^a_{i,t+j,0}$. The parameters $\varphi_{1,i}$, are estimated on a country by country basis on the time series of the narrative fiscal shocks.

A final step allows us to consider the disaggregation of Taxation and Expenditure in their components.

In the four components model total expenditure is decomposed in government consumption and investment and transfers, while total receipts are disaggregated in indirect

and direct taxes. We therefore adopt the following specification:

$$\begin{aligned}
\Delta z_{i,t} &= \alpha + \sum_{j=1}^{2} B_{1,j}(L) e^{u}_{i,t} * TB_{i,t} * D^{TB}_{i,j,t} + \sum_{j=1}^{2} B_{2,j}(L) e^{a}_{i,t,0} * TB_{i,t} * D^{TB}_{i,j,t} + \qquad (4)\\
&\sum_{j} C_{1,j}(L) e^{u}_{i,t} * EB_{i,t} * D^{EB}_{i,j,t} + \sum_{j} C_{2,j}(L) e^{a}_{i,t,0} * EB_{i,t} * D^{EB}_{i,j,t} +\\
&+ \sum_{j=1}^{2} \gamma_j \left( \sum_{k=1}^{3} e^{a}_{i,t,k} \right) * EB_{i,t} * D^{EB}_{i,j,t} + \sum_{j=1}^{2} \delta_j \left( \sum_{k=1}^{3} e^{a}_{i,t,k} \right) * TB_{i,t} * D^{TB}_{i,j,t} + \lambda_i + \chi_t + u_{i,t}\\
e^{a}_{i,t,1} &= \varphi_{i,1}\, e^{u}_{i,t} + v_{i,t,1}, e^{a}_{i,t,2} = \varphi_{2,i}\, e^{u}_{i,t} + v_{2,i,t}, e^{a}_{i,t,3} = \varphi_{3,i}\, e^{u}_{i,t} + v_{3,i,t}\\
e^{a}_{i,t,0} &= e^{a}_{i,t-1,1}, e^{a}_{i,t,j} = e^{a}_{i,t-1,j+1} + \left( e^{a}_{i,t,j} - e^{a}_{i,t-1,j+1} \right) \;\; j \geqslant 1\\
e^{u}_{i,t} &= \tau d^{u}_{i,t} + \tau i^{u}_{i,t} + gci^{u}_{i,t} + tr^{u}_{i,t},\;\; e^{a}_{i,t,0} = \tau d^{a}_{i,t,0} + \tau i^{a}_{i,t,0} + gci^{a}_{i,t,0} + tr^{a}_{i,t,0}
\end{aligned}$$

$$if \max\left[ \left( \tau d^{u}_{t} + \tau d^{a}_{t,0} + \sum_{j=1}^{horiz} \tau d^{a}_{t,j} \right), \left( \tau i^{u}_{t} + \tau i^{a}_{t,0} + \sum_{j=1}^{horiz} \tau i^{a}_{t,j} \right) \right] = \left( \tau d^{u}_{t} + \tau d^{a}_{t,0} + \sum_{j=1}^{horiz} \tau d^{a}_{t,j} \right) \Longrightarrow$$

$D^{TB}_{i,1,t} = 1$, otherwise $D^{TB}_{i,1,t} = 0, D^{TB}_{i,2,t} = 1 - D^{TB}_{i,1,t}$

$$if \max\left[ \left( gci^{u}_{t} + gci^{a}_{t,0} + \sum_{j=1}^{horiz} gci^{a}_{t,j} \right), \left( tr^{u}_{t} + tr^{a}_{t,0} + \sum_{j=1}^{horiz} tr^{a}_{t,j} \right) \right] = \left( \tau i^{u}_{t} + \tau i^{a}_{t,0} + \sum_{j=1}^{horiz} ti^{a}_{t,j} \right) \Longrightarrow$$

$D^{EB}_{i,1,t} = 1$, otherwise $D^{EB}_{i,1,t} = 0, D^{EB}_{i,2,t} = 1 - D^{EB}_{i,1,t}$

The construction of the dummies for the type of plan allows for a hierarchical organizations: the nature of plans as TB and EB is decided in a first stage. In a second stage TB plans are allocated between those based on direct taxation and those based on indirect taxation, likewise EB based plans are allocated between those based on Transfers and those based on Government Consumption and Investment.

# 5 Empirical Results

We put the model at work by simulating the effect of the different type of fiscal adjustments on output growth, consumption growth, fixed capital formation growth, ESI consumer's confidence and ESI business confidence for 14 OECD countries on the sample 1978-2009.

Table 2 reports the estimated styles of fiscal adjustments across different countries.

Styles of plans

| | $AU$ | $OE$ | $BG$ | $CA$ | $DK$ | $DEU$ | $FR$ |
|---|---|---|---|---|---|---|---|
| $\varphi_{1,i}$ | 0.39 (0.16) | 0.36 (0.08) | 0.04 (0.19) | 1.3 (0.18) | 0.49 (0.1) | −0.11 (0.14) | 0.38 (0.12) |
| $\varphi_{2,i}$ | −0.27 (0.14) | 0 | 0 | 0.513 (0.12) | 0 | −0.01 (0.09) | −0.08 (0.05) |
| $\varphi_{3,i}$ | −0.02 (0.01) | 0 | 0 | 0.19 (0.09) | 0 | 0.04 (0.03) | −0.04 (0.04) |

| | $IR$ | $IT$ | $JP$ | $PT$ | $SP$ | $UK$ | $US$ |
|---|---|---|---|---|---|---|---|
| $\varphi_{1,i}$ | 0 | −0.24 (0.04) | 0.26 (0.03) | 0.33 (0.16) | 0.06 (0.06) | 0.37 (0.09) | 0.43 (0.36) |
| $\varphi_{2,i}$ | 0 | 0 | −0.0005 (0.003) | 0 | 0 | 0.1 (0.05) | 0.32 (0.28) |
| $\varphi_{3,i}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0.17 (0.24) |

Table 2: the style of fiscal adjustments across different countries

The heterogeneity in styles implies that an initial correction of one per cent of GDP will generate plans of different size across countries. For comparability of results we compute impulse responses to a plan of the size of one-per cent of GDP, while traditional impulse responses are computed with respect to a shock of one per cent of GDP. Equal size of the plans across countries are paired with initial shocks of different size.

In fact, by imposing equal size of the plans we have that for each country,

$$e^u_{i,t} + e^a_{i,t,1} + e^a_{i,t,2} = 1$$

As a consequence of the heterogeneity in the styles of adjustment across different countries we have:

$$\hat{e^a_{i,t,,j}} = \hat{\varphi_{j,i}} e^u_{i,t} \quad j = 1, 2$$

Therefore we can write

$$e^u_{i,t} + \hat{\varphi_{1,i}} e^u_{i,t} + \hat{\varphi_{2,i}} e^u_{i,t} = 1$$

To obtain a country specific size of the adjustments in each period do that the total adjustment is one per cernt of GDP

$$\begin{aligned} e^u_{i,t} &= \frac{1}{1 + \hat{\varphi_{1,i}} + \hat{\varphi_{2,i}}} \\ e^a_{i,t,1} &= \hat{\varphi_{1,i}} e^u_{i,t} \\ e^a_{i,t,2} &= \hat{\varphi_{2,i}} e^u_{i,t} \end{aligned}$$

As an example, in the case of Italy, for which $\hat{\varphi_1} = -0.24$ and $\hat{\varphi_2} = 0$, we simulate $e^u_t = 1.32$, $e^a_{t,1} = -0.32$ and $e^a_{t,2} = 0$.

Table 3 reports the results of the estimation of the multicountry quasi-panel. There are two version of the model: the unrestricted version in which the effect of four different type of plans is considered and a restricted version in which the coefficients on the effect of direct taxation based and indirect taxation based plans are restricted to be same and the coefficients on Transfers based plans and Consumption and Investment based plans are also restricted to be same. The restricted version of the model allows the within country heterogeneity only for Expenditure based plans and Taxation based plans.The restrictions that delivers the TB and EB model are rejected illustrating the importance of allowing for four components based plans.

We report ten set of impulse responses for the restricted and unrestricted model in Figures 1-10[2]. The evidence from the restricted model confirms the confirms the available evidence that expenditure based adjustments are less costly than tax based adjustments but the disaggregation of taxes and expenditure in their components provides further important insights. The four-components disaggregation indicates that while there is no evidence of a common pattern of significant statistical difference for different components on the revenue side, on the expenditure side transfers seem to be different form consumption and investment. In fact, the effect of a transfer cut is more similar to that of an increase in taxation than to that of a cut in expenditure. This results is better understood looking at consumption growth, fixed capital formation growth, consumers' confidence and business confidence. Cuts in government consumption and investment have definitely no contractionary effect on consumption growth and there is in fact some evidence of non-keynesian effects, while the effects of transfer cut on consumption is closer to that of an increase in taxation. The similarity of these two effects becomes striking in the case of consumers confidence. The impact of transfers cuts and cuts to government consumption and investment on fixed capital formation growth and business confidence are more similar and lead to an overall impact on output growth in which the transfer effect is clearly in between that of a tax increase and a government expenditure cut.

[2]When the four components disaggregation is considered some of the adjustments were never observed for some of the countries in our sample as a consequence in some cases we have less than four impulse responses.

Coefficients estimated in the 4-component specification - On output growth

| | | 4-components | EB-TB restrictions |
|---|---|---|---|
| $e^u_{i,t} * TB_{i,t}$ | $D^{TB}_{Dir,i,t}$ | -0.261559 | -0.897938*** |
| | | (0.225133) | (0.134728) |
| | $D^{TB}_{Ind,i,t}$ | -0.983833*** | |
| | | (0.166884) | |
| $e^u_{i,t} * EB_{i,t}$ | $D^{EB}_{C\&I,i,t}$ | 0.095967 | 0.002661 |
| | | (0.128555) | (0.070012) |
| | $D^{EB}_{Tr,i,t}$ | -0.272925** | |
| | | (0.122041) | |
| $e^a_{i,t,0} * TB_{i,t}$ | $D^{TB}_{Dir,i,t}$ | -2.011456*** | -1.275992*** |
| | | (0.532086) | (0.380488) |
| | $D^{TB}_{Ind,i,t}$ | 0.189110 | |
| | | (0.641736) | |
| $e^a_{i,t,0} * EB_{i,t}$ | $D^{EB}_{C\&I,i,t}$ | 1.071817*** | 0.029106 |
| | | (0.283756) | (0.123102) |
| | $D^{EB}_{Tr,i,t}$ | -0.178687 | |
| | | (0.162777) | |
| $e^u_{i,t-1} * TB_{i,t-1}$ | $D^{TB}_{Dir,i,t-1}$ | -0.756467*** | -0.645010*** |
| | | (0.229593) | (0.136866) |
| | $D^{TB}_{Ind,i,t-1}$ | -0.583473*** | |
| | | (0.166435) | |
| $e^u_{i,t-1} * EB_{i,t-1}$ | $D^{EB}_{C\&I,i,t-1}$ | -0.360233** | -0.423153*** |
| | | (0.165541) | (0.080739) |
| | $D^{EB}_{Tr,i,t-1}$ | -0.461729*** | |
| | | (0.123560) | |
| $e^a_{i,t-1} * TB_{i,t-1}$ | $D^{TB}_{Dir,i,t-1}$ | -2.194177*** | -1.040280*** |
| | | (0.478463) | (0.375686) |
| | $D^{TB}_{Ind,i,t-1}$ | -0.427380 | |
| | | (0.645996) | |
| $e^a_{i,t-1} * EB_{i,t-1}$ | $D^{EB}_{C\&I,i,t-1}$ | -0.808363** | -0.146312 |
| | | (0.321306) | (0.126870) |
| | $D^{EB}_{Tr,i,t-1}$ | -0.299516* | |
| | | (0.155354) | |
| $e^u_{i,t-2} * TB_{i,t-2}$ | $D^{TB}_{Dir,i,t-2}$ | -0.061143 | -0.115552 |
| | | (0.219279) | (0.133174) |
| | $D^{TB}_{Ind,i,t-2}$ | -0.165438 | |
| | | (0.165031) | |
| $e^u_{i,t-2} * EB_{i,t-2}$ | $D^{EB}_{C\&I,i,t-2}$ | 0.682425*** | 0.283873*** |
| | | (0.208453) | (0.083403) |
| | $D^{EB}_{Tr,i,t-2}$ | 0.173423 | |
| | | (0.108244) | |
| $e^a_{i,t-2} * TB_{i,t-2}$ | $D^{TB}_{Dir,i,t-2}$ | -0.306378 | 0.156894 |
| | | (0.521586) | (0.380858) |
| | $D^{TB}_{Ind,i,t-2}$ | 0.920485 | |
| | | (0.622753) | |
| $e^a_{i,t-2} * EB_{i,t-2}$ | $D^{EB}_{C\&I,i,t-2}$ | 1.026348*** | -0.180936 |
| | | (0.331779) | (0.126432) |
| | $D^{EB}_{Tr,i,t-2}$ | -0.447274*** | |
| | | (0.143539) | |
| $e^u_{i,t-3} * TB_{i,t-3}$ | $D^{TB}_{Dir,i,t-3}$ | -0.333299 | -0.451444*** |
| | | (0.251976) | (0.139449) |
| | $D^{TB}_{Ind,i,t-3}$ | -0.591195*** | |
| | | (0.166576) | |
| $e^u_{i,t-3} * EB_{i,t-3}$ | $D^{EB}_{C\&I,i,t-3}$ | -0.153085 | -0.130904* |

| | | | |
|---|---|---|---|
| | | (0.183400) | (0.071611) |
| | $D^{EB}_{Tr,\,i,t-3}$ | -0.048873 | |
| | | (0.096615) | |
| $e^{a}_{i,t-3} * TB_{i,t-3}$ | $D^{TB}_{Dir,i,t-3}$ | -0.027362 | -0.210313 |
| | | (0.511016) | (0.374242) |
| | $D^{TB}_{Ind,i,t-3}$ | -0.257414 | |
| | | (0.617773) | |
| $e^{a}_{i,t-3} * EB_{i,t-3}$ | $D^{EB}_{C\&I,i,t-3}$ | 0.743463** | 0.061798 |
| | | (0.327371) | (0.127926) |
| | $D^{EB}_{Tr,\,i,t-3}$ | -0.289028** | |
| | | (0.145376) | |
| $e^{a}_{i,t,1} * TB_{i,t} + e^{a}_{i,t,2} * TB_{i,t}$ | $D^{TB}_{Dir,i,t}$ | -0.402583 | -0.471005* |
| | | (0.342437) | (0.257378) |
| | $D^{TB}_{Ind,i,t}$ | -0.307856 | |
| | | (0.416988) | |
| $e^{a}_{i,t,1} * EB_{i,t} + e^{a}_{i,t,2} * EB_{i,t}$ | $D^{EB}_{C\&I,i,t}$ | -0.624626** | -0.148321 |
| | | (0.266297) | (0.118040) |
| | $D^{EB}_{Tr,\,i,t}$ | 0.130986 | |
| | | (0.152676) | |
| Wald test -Chi-square: | 100.3429 | p-value: | 0 |

SE in parentheses. p<0.1, ** p<0.05, *** p<0.01

## 5.1 The Effect of Fiscal Adjustment Plans on Financial Markets

To better understand the channels of transmission that determine the observed asymmetries in the macroeconomic effect of fiscal stabilization plans we have examined the impact of our four type of plans on asset prices. In particular, we have considered the effect of fiscal adjustments on monetary policy rates, yields on 10-year government bonds nominal effective exchange rates and annual stock market returns. The results are reported in Figures 11-14.

The response of monetary policy rates show a somewhat more restrictive stance adopted in occasion of Direct Taxes based adjustments but the level of observed heterogeneity seems to be small to explain entirely the sizeable level of heterogeneity in the response of output, and its components. The pattern of response of policy rates is mirrored by long-term yields, indicating a moderate effect of fiscal adjustment plans on risk premia. Also exchange rates show a tendency to appreciate in presence of Tax based plans paired with a tendency to depreciate in presence of Expenditure based plans. However, the variable that shows a level of heterogeneity in impulse resposnes comparable with the one observed in the effect on macroeconomic variables is stock market returns, in which case a very remarkable level of asymmetry is observed here between direct Tax based adjustment plans and Government Consumption and Investment based plans.

# 6 Conclusions

This paper has analyzed the disaggregated components of fiscal adjustments plans in many OECD countries. Our data span from the eighties to 2012 and will include both Euro area countries and non euro area ones. The main objective of this paper was to investigate further the empirical evidence of the importance of the composition of fiscal adjustment for the evaluation of their macroeconomic consequences. To this end we have constructed a new database of fiscal adjustment plans that disaggregates adjustment on the expenditure side into adjustment in government consumption and investment and adjustment in transfers, likewise we disaggregates total revenue in revenue due to direct and indirect taxation. The disaggregated analysis confirms the differential effect of tax based and expenditure based plans and allows to identify potential non-keynesian effects of reduction in government consumption and expenditure while the effect of a reduction in transfer is closer to than an increase in taxation.

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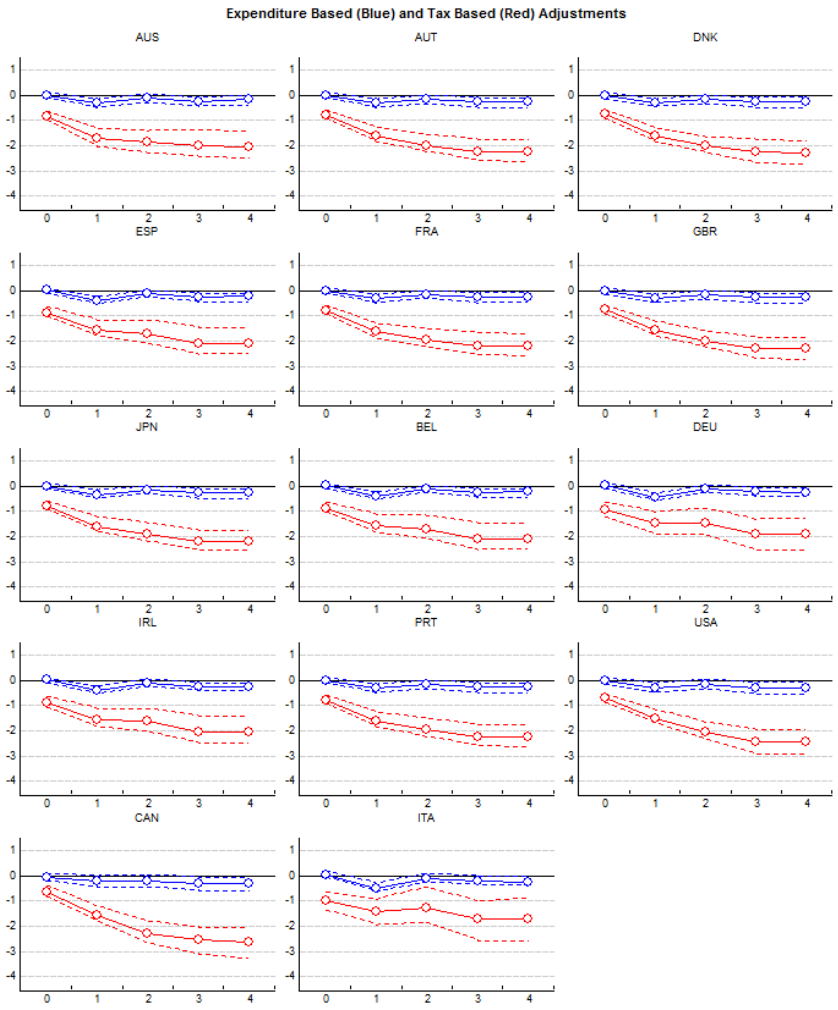


Figure 1: The effect of EB and TB adjustments on output growth

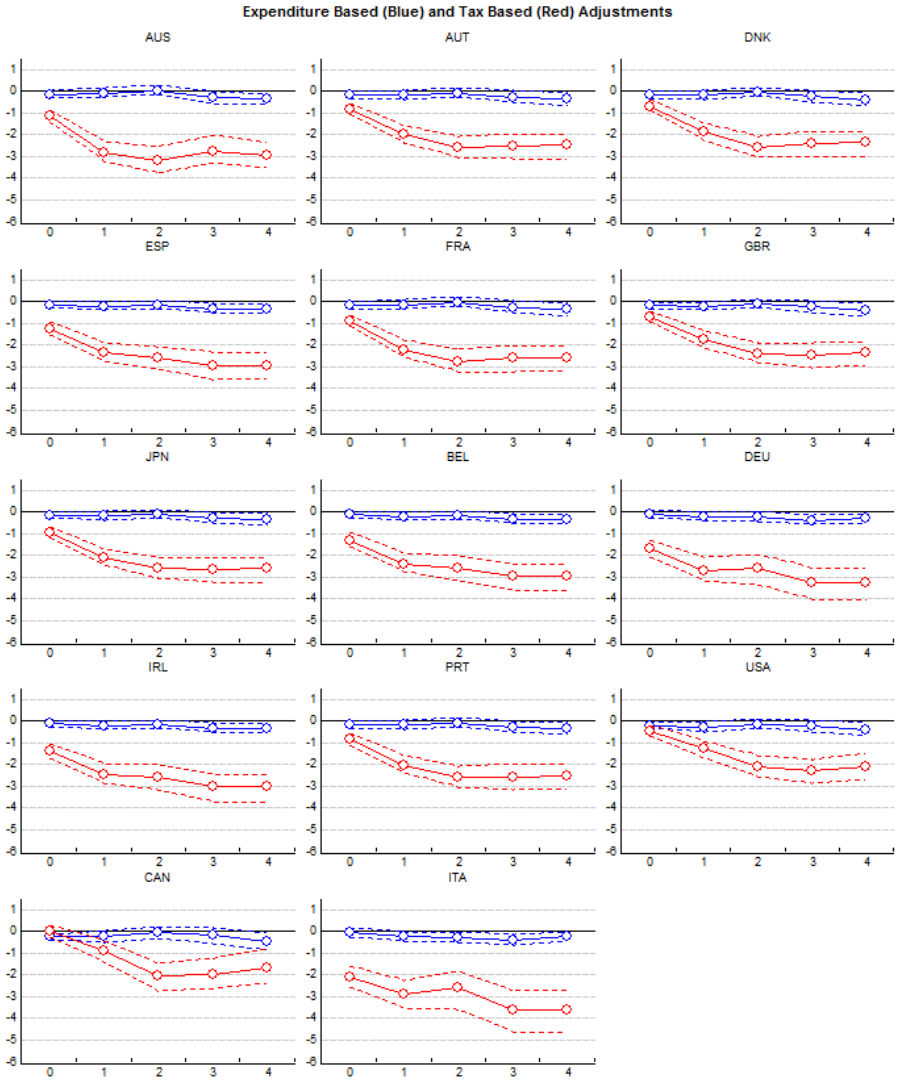


Figure 2: The effect of EB and TB adjustments on consumption growth

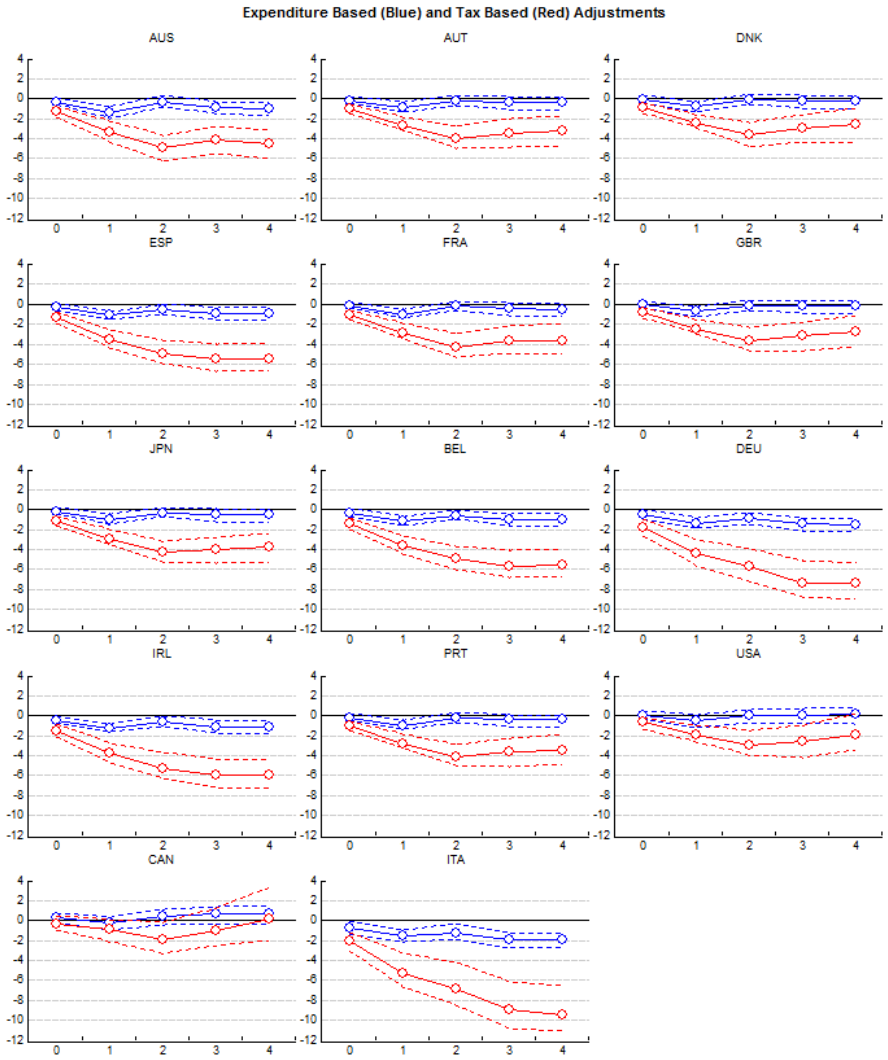


Figure 3: The effect of EB and TB adjustments on capital formation growth

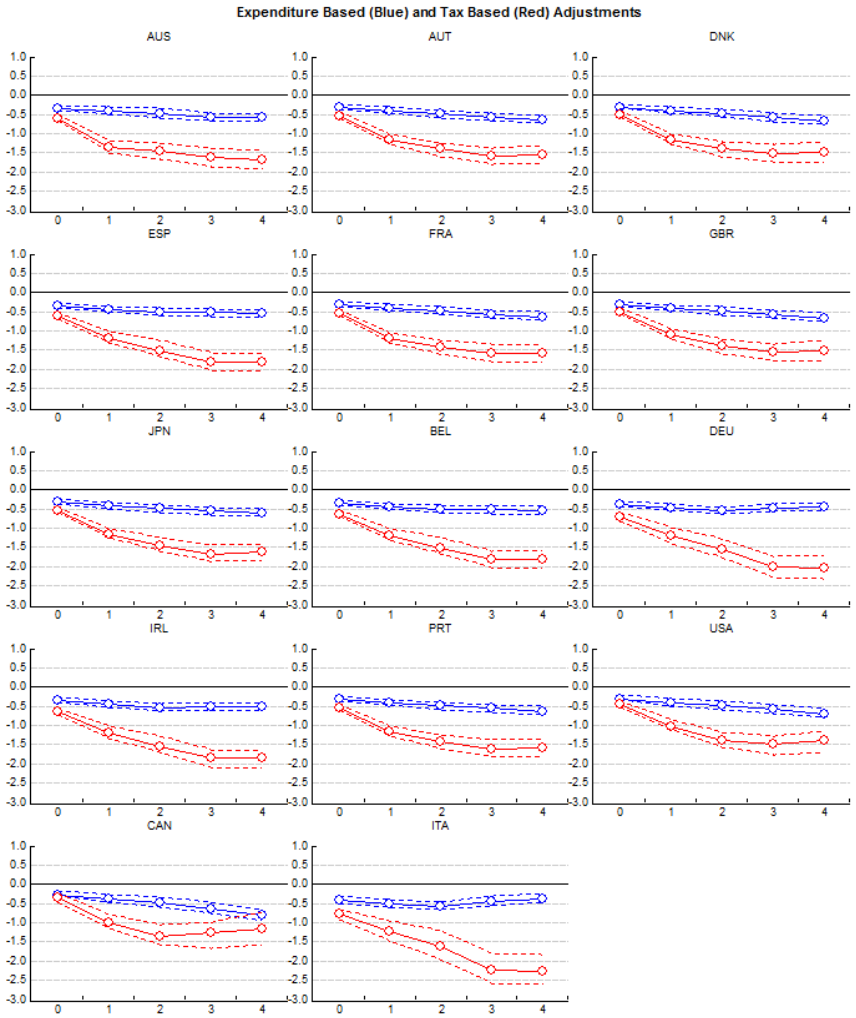


Figure 4: The effect of EB and TB adjustments on ESI Consumer confidence

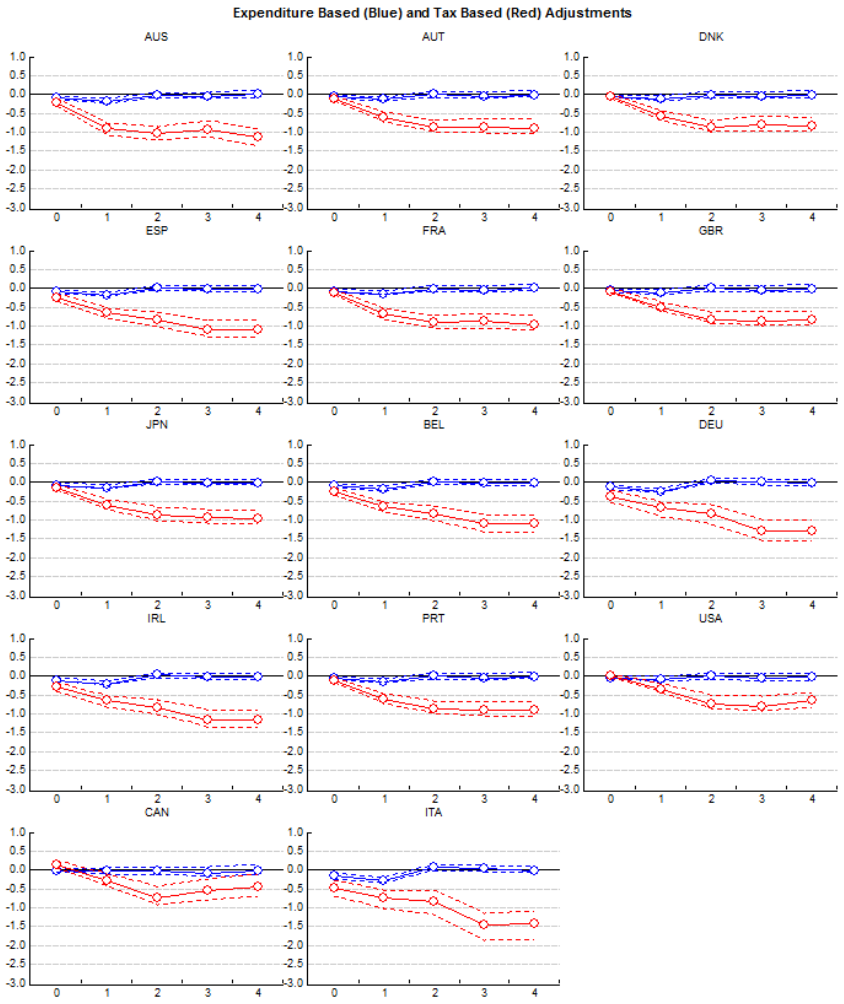


Figure 5: The effect of EB and TB adjustments on ESI Business confidence

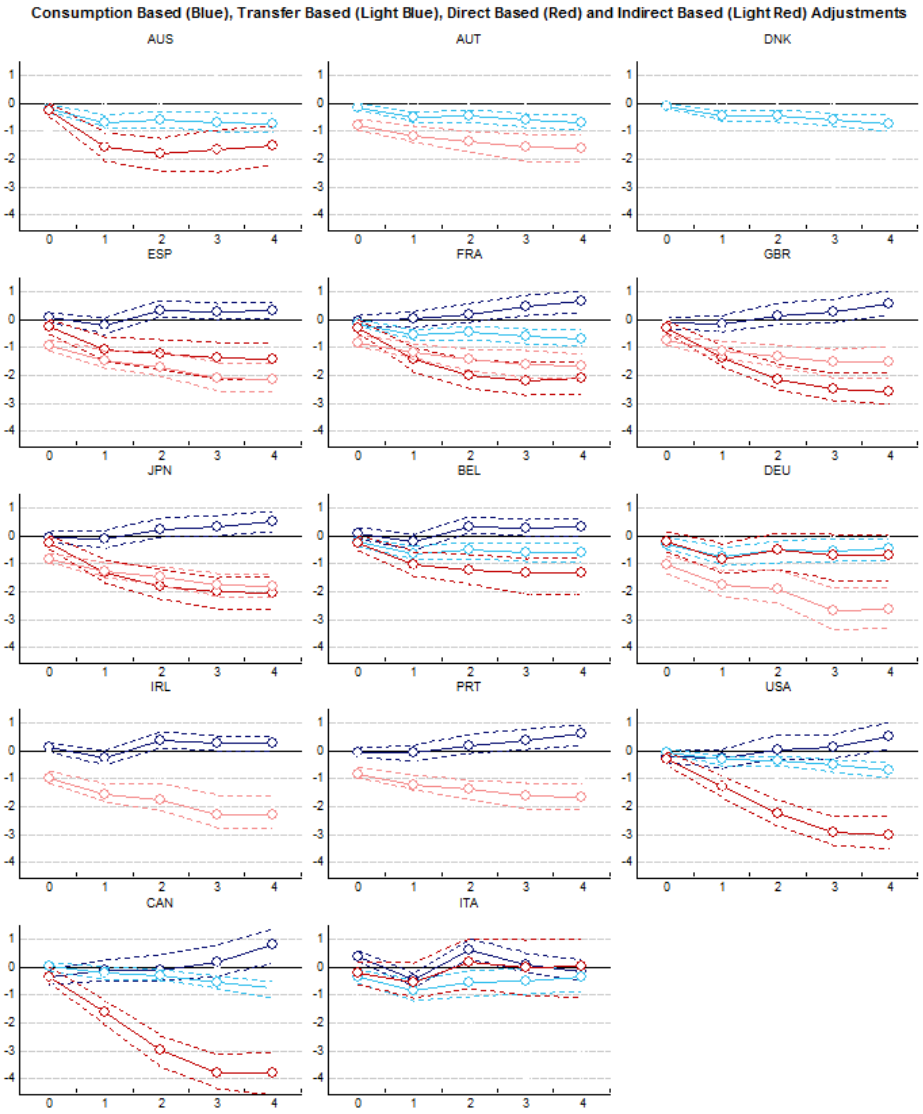


Figure 6: The effect of CB, TRB, DB and IB adjustmens on output growth

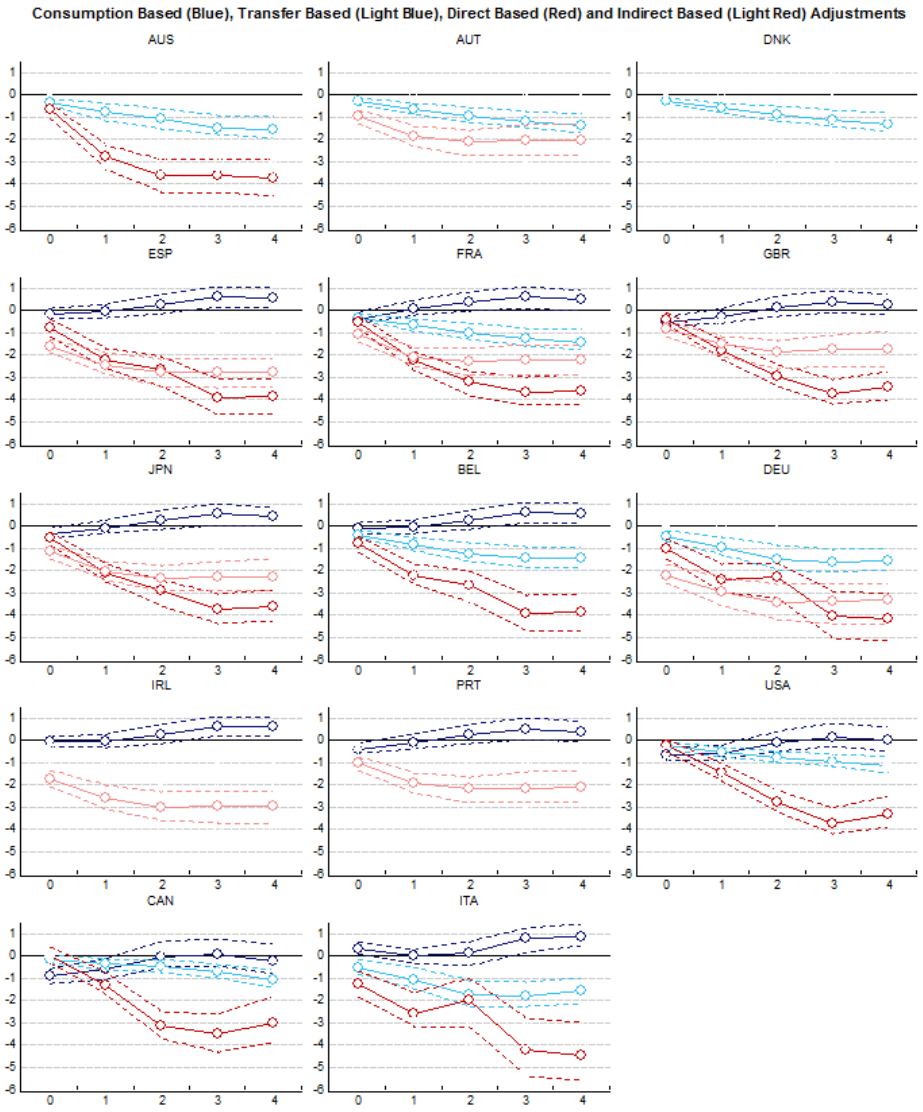


Figure 7: The effect of CB, TRB, DB and IB adjustmens on consumption growth

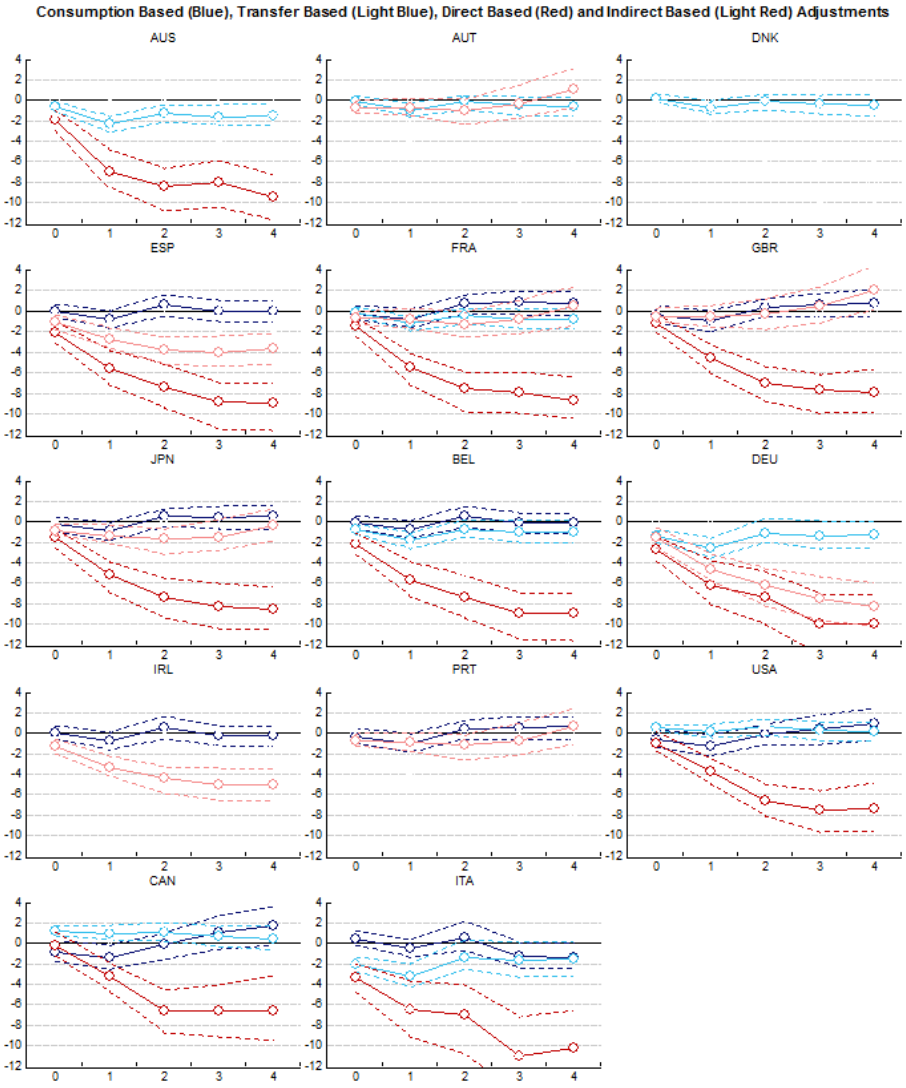


Figure 8: The effect of CB, TRB, DB and IB adjustmens on capital formation growth

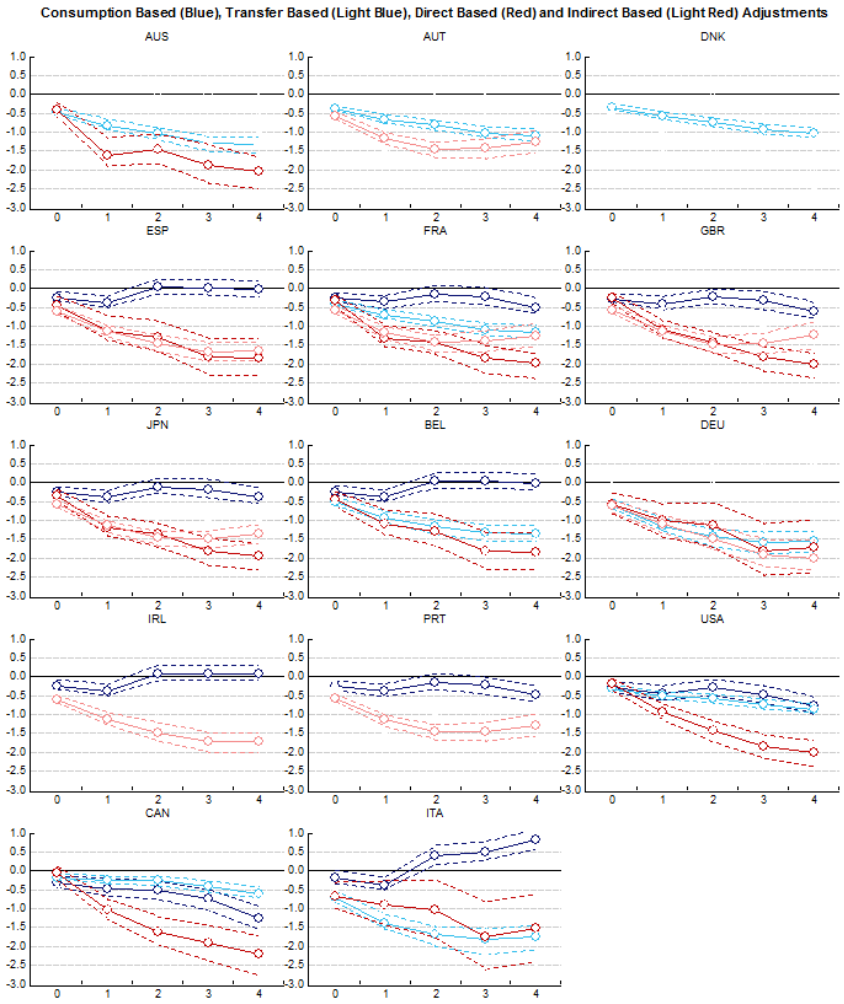


Figure 9: The effect of CB, TRB, DB and IB adjustmens on ESI Consumer confidence

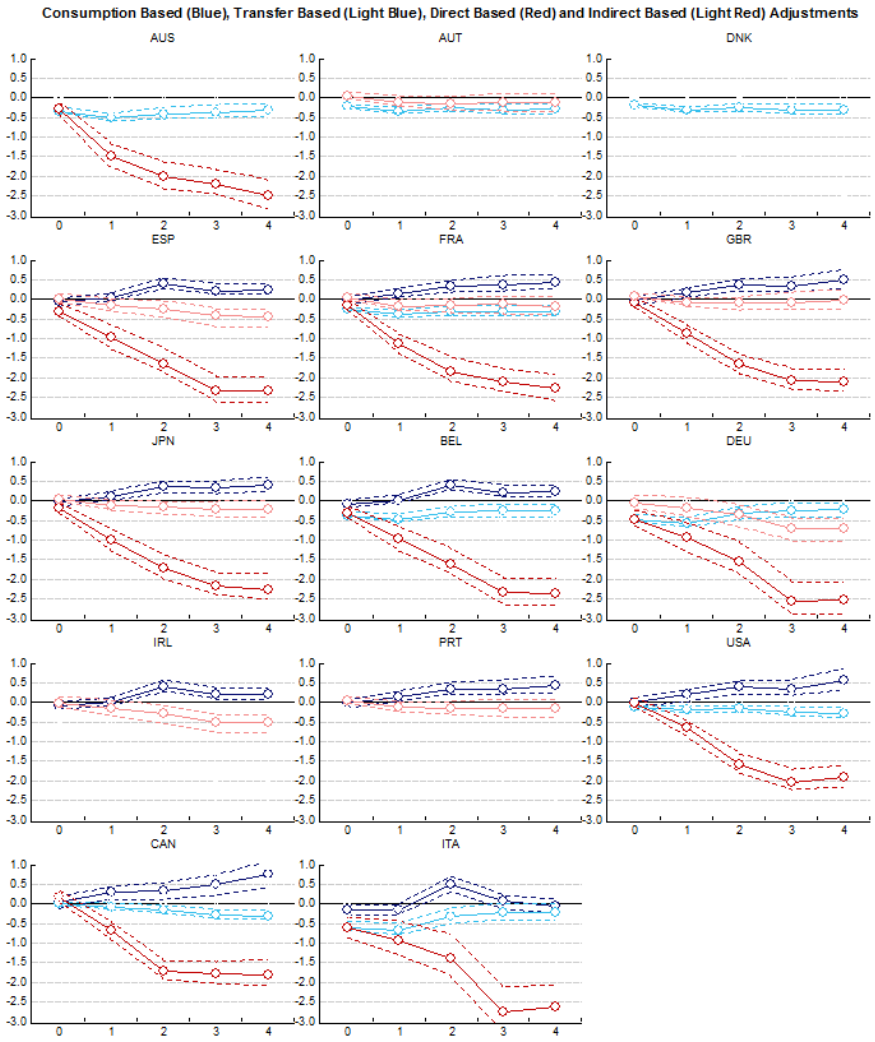


Figure 10: The effect of CB, TRB, DB and IB adjustmens on ESI Business Confidence

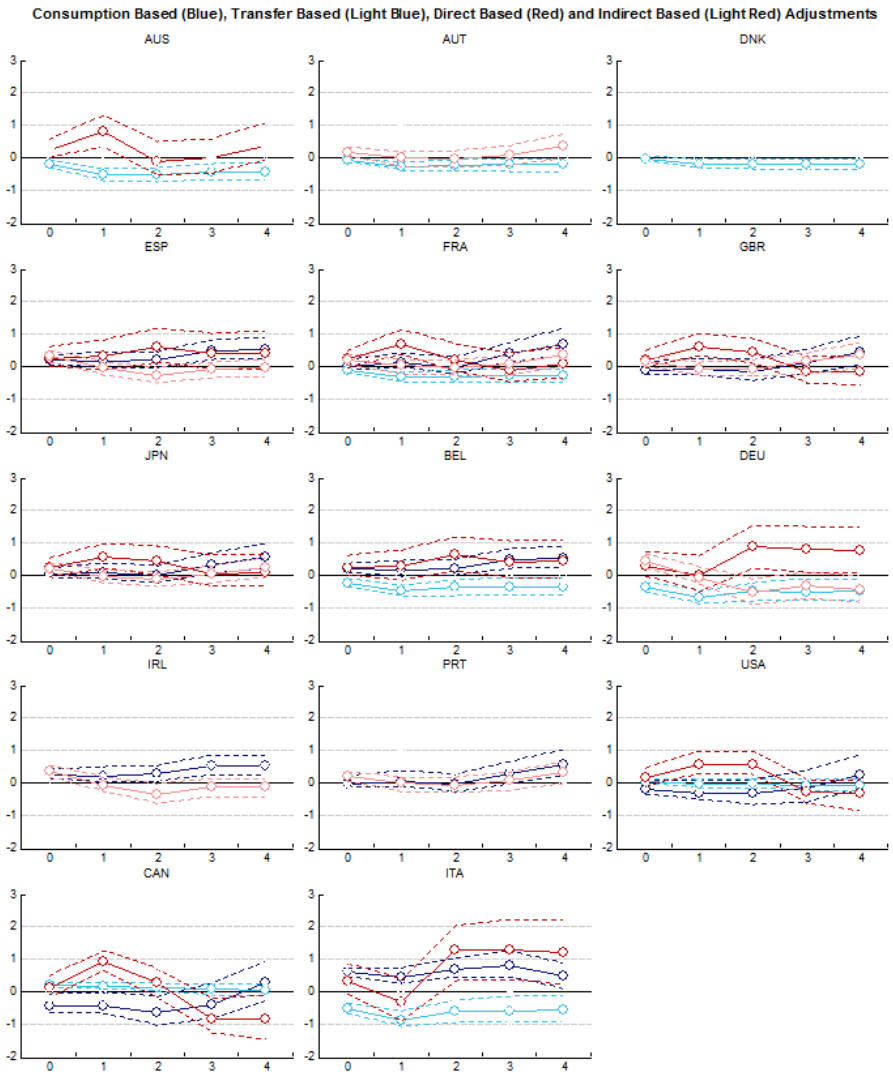


Figure 11: The effect of CB, TRB, DB and IB adjustments on monetary policy (change in the 3M TBills Rates)

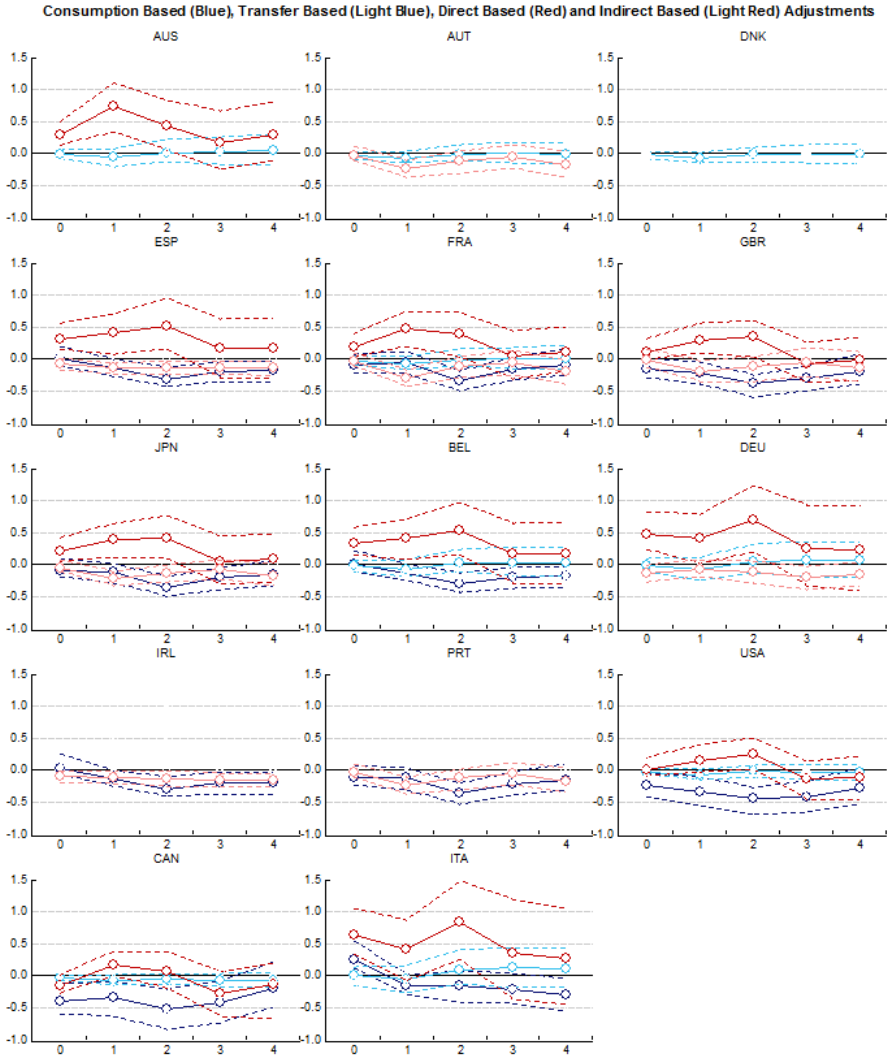


Figure 12: The effect of CB, TRB, DB and IB adjustments on long term interest rate on government bonds

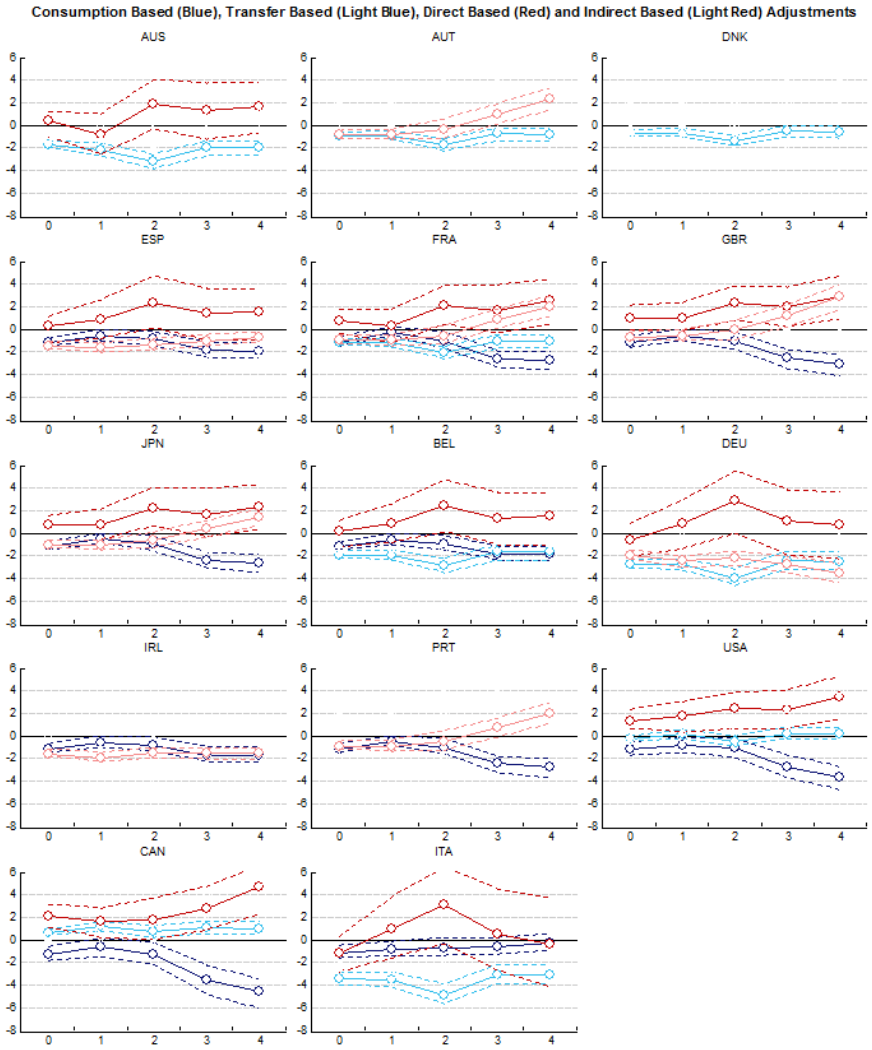


Figure 13: The effect of CB, TRB, DB and IB adjustments on nominal effective exchange rate (percent change)

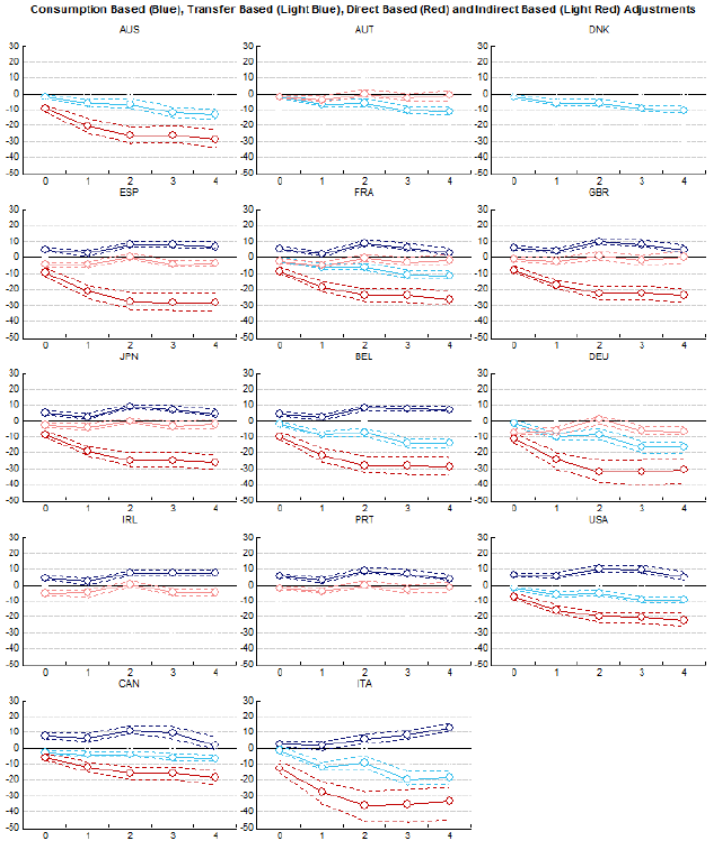


Figure 14: The effect of CB, TRB, DB and IB adjustments on annual total stock market returns