# Can Uncertainty Explain the Heterogeneous Output Effects of Fiscal Adjustments?

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**Abstract**

Recent empirical evidence suggests that fiscal consolidations mainly based on tax hikes have a more recessionary impact on economic growth relative to those based on expenditure cuts. This paper evaluates the output effects of fiscal adjustment plans identified through the narrative approach. Plans are different from shocks that are usually considered in the literature, since fiscal plans track more closely the dynamics of fiscal policy. I incorporate fiscal plans into a vector autoregression model to investigate the channels of transmission of fiscal consolidations. In addition to a direct effect of fiscal adjustment plans on output I explore two indirect effects. In particular, I investigate whether monetary policy or uncertainty could explain the heterogeneous output effects of fiscal adjustment plans. The evidence indicates that uncertainty increases following tax-based fiscal plans and decreases following expenditure-based fiscal plans. Monetary policy cannot fully explain this difference. Closing the monetary policy and uncertainty channels, allows to measure how much of difference in output effects of fiscal adjustment plans is due to each particular channel. It appears, that uncertainty channel is more important among the two.

**Keywords:** fiscal plans, output, risk, uncertainty, monetary policy

In this paper I analyze possible explanations of the heterogeneous output effects of fiscal adjustment plans. To reach this goal several steps are needed. The first step is the measurement of fiscal consolidations. In practice, fiscal consolidations are usually implemented through a set of multi-year actions. This set of actions generates interactions between the spending and revenue components as well as between the unexpected component (announced upon implementation at time t) and the expected component of a plan (implemented at time t but announced in previous years or/and announced at time

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t to be implemented in the future). Therefore, I start by constructing a database of fiscal plans for the U.S. using quarterly data.

Next, I incorporate fiscal plans into a vector autoregression model to track dynamics and interdependencies between the variables of interest, to capture expectational effects and, most importantly, to explain the heterogeneity of the output effects of fiscal adjustments.

I consider three ways in which a fiscal consolidation that is mainly implemented through tax hikes can affect output differently from one that is mainly based on expenditure cuts. The first way is by reducing or increasing the amount of distortions in the economy; the second way is by inducing a response of monetary policy that in turn effects output; the third way is by changing the level of uncertainty in the economy, which in turn affects output. The first way captures a direct effect of fiscal adjustment plans on output, while the second and third capture indirect effects. The direct effect can be measured simply by projecting the output growth on the current and past values of the exogenous fiscal adjustments[1]. To measure the indirect effects one needs to consider the other endogenous variables such as the monetary policy variables and the uncertainty variables.

It appears that uncertainty plays an important role in explaining the difference between the output effects of fiscal adjustment plans while monetary policy cannot fully explain this difference. By closing the monetary policy and uncertainty channels one at a time, I measure how much the difference in output effects of fiscal adjustment plans are due to each particular channel.

The intuition for the direct effect goes as follows: taking into account the fact that tax-based policies are distortionary, an increase in distortionary taxes produces negative effect on output growth. Expenditure-based policy, per se, does not create an effect. This can be due to the fact that more than sixty percent of U.S. expenditure cuts are reduction in transfers and the other forty percent are reduction in government consumption and investment, see Alesina et al. (2015). There could be two effects working in the opposite directions. For example, cutting large transfer payments to working-age people may encourage working, that in turn will increase output growth. On the other hand, cutting government investment in research and development will discourage innovation, and in turn decrease output growth. However, through the government intertemporal budget constraint a reduction in government spending eventually produces a corresponding reduction in taxation, producing positive effect on output growth.

The question then becomes, through which mechanism should monetary policy and uncertainty explain the difference between the output effects of fiscal consolidations?

The intuition in the case of monetary policy is rather straightforward. The difference between the output effects of tax-based fiscal adjustments and expenditure-based

[1]It is worth noticing that while the direct effect works through two channels, a wealth and a substitution effect, I do not distinguish between them.

fiscal adjustments could be due to a more contractionary monetary policy in the case of tax-based plans and less contractionary or expansionary monetary policy in the case of expenditure-based plans.

The intuition for uncertainty goes as follows: after applying tax-based fiscal adjustment plans, higher uncertainty leads to an increase of the risk premium, which causes an increase in the cost of financing. Higher cost of financing of firms leads to a reduction in investment and, consequently, to a decrease in output growth. Following the previous logic, expenditure-based policy, per se, does not create an effect, however, through the government budget constraint expenditure cuts today might be considered as a future decrease in taxes.

In this study I am interested in two types of uncertainty. First type is economic policy uncertainty that makes an economy to be unresponsive, creating a so-called "caution effect" and "wait-and-see effect". Importantly, Bloom (2009) shows that due to investment irreversibility, in periods of higher uncertainty firms take the "wait-and-see" position, which decreases investment and, in turn, output growth. Moreover, Baker, Bloom and Davis (2015), by constructing the economic policy uncertainty measure, show that the drop and recovery in production are due to economic policy uncertainty.

The second type of uncertainty reflects financial market distortions. According to Gilchrist, Sim and Zakrajšek (2014), increases in uncertainty lead to a significant widening of credit spreads and a decline in output through a drop in the investment component of aggregate demand. Moreover, Gomes and Schmid (2010), within a general equilibrium framework with heterogeneous firms and an endogenous default, show that credit risk premium plays an important role in the cost of capital and it appears to be a link between credit, equity markets and macroeconomic aggregates; moreover, credit risk premium movements provide an amplification mechanism for macroeconomic fluctuations. Further, I call the first type of uncertainty a traditional uncertainty and the second type - financial market uncertainty.

To analyze the output effect of fiscal policy several requirements need to be satisfied. First of all, correct estimation of the parameters requires identified fiscal policy shocks to be exogenous. There are several different ways of policy shock identification commonly used in the literature, see Ramey (2016). A traditional approach is to identify fiscal shocks using a structural vector autoregression with the help of either economic theory or exogenous estimates to restrict the parameters, see Blanchard and Perotti (2002). The second is a narrative approach, which involves constructing shocks from historical documents by identifying the motivation and timing and the quantities, as in Romer and Romer (2009) and Devries et al. (2011). The third method of fiscal adjustment identification is a proxy structural vector autoregression, offered by Mertens and Ravn (2014). This approach handles the measurement error problem by using the narrative shocks as instrumental variables to identify the structural shocks.

The fact that fiscal adjustments are implemented through multi-year plans leads to the "fiscal foresight" problem documented in Leeper (2010), Leeper, Walker and Yang (2013), with the agent knowing the future announced measures in advance. Leeper, Walker and Yang (2013) show that the moving average representation of the VAR becomes non-invertible because fiscal foresight causes the number of shocks to be mapped out of the VAR innovations too high to achieve identification. Narrative identification of fiscal adjustment plans explicitly allow for the fiscal foresight, since one of the components of the plan is an announced component. Therefore, simulation of the fiscal adjustment plans narratively identified in VAR allow avoidance of the "fiscal foresight" problem.

This paper uses fiscal adjustments identified through a narrative approach as exogenous variables in the vector autoregression framework. A narrative approach allows us to identify exogenous fiscal adjustments independent of the current state of the economy, serving to stabilize deficit. I construct an original dataset (described below), which is another contribution of this paper. I use fiscal plans rather than separate shocks, similar to Alesina, Favero and Giavazzi (2015). It makes sense to use fiscal plans rather than separate shocks in the empirical world, since fiscal policy is a complicated set of actions that are taken at some point and then applied over the course of several years. Fiscal plans allow us to consider several dimensions. First, it allows us to take into account both anticipated and unanticipated components of fiscal plans, so as to disentangle expected and unexpected components. Second, it allows us to take into account so-called intratemporal dimension, tax-based versus expenditure-based, which is very important since the empirical literature shows that the effect of expenditure-based policy on real output is less recessional than that of the tax-based policy.

To produce a database of exogenous fiscal plans for the U.S. at quarterly frequency I combine the narrative databases of Romer and Romer (2009) and Devries et al. (2011). Reconsidering these two databases I construct a quarterly time series of exogenous fiscal stabilization plans for the U.S. economy. In practice, I extend the deficit-driven quarterly dataset of tax adjustment produced by Romer and Romer (2009) to include a quarterly measure of the deficit-driven expenditure adjustments proposed by Devries et al. (2011). By taking for granted the exogeneity of the episodes identified by these authors I simply reclassify them to trace precisely fiscal plans. Quarterly data allows us to avoid any inconveniences with timing distinguishing between unanticipated and anticipated components of the plans. Moreover, monetary policy and uncertainty react within three months or better, so having annual data may cause imprecision in estimation. However, the downside of quarterly fiscal plans' data is having a lot of zeros in the data and having variables with low variation on the right hand side of the system. The extension is important because it includes recent crisis as well as fiscal cliff and zero lower bound. The current paper uses quarterly observations for the 1978 - 2012 sample period.

Ramey (2016) gave a crucial remark by pointing out the importance of dynamics, general equilibrium effects and expectations for macroeconomic questions in general. In fact, to explain heterogeneous output effects of fiscal adjustment plans, one needs to take into account expectations, since the effect of anticipated and unanticipated components of the plan can be rather different. Moreover, interdependencies between the variables of interest are crucial for defining the transmission channel. Since truncated moving average, which is a commonly used methodology to derive the dynamic effect of the exogenous fiscal policy on the variable of interest, simply projects these variables on current and past values of the shocks without capturing dynamics between the variables, it is not valid for investigating the transmission mechanism. Instead, the vector autoregression model satisfies all the interdependencies between the variables. Moreover, a vector autoregression model with exogenous fiscal plans allows me to close the channels, first one at a time and then all together to measure how much of a difference in output effects of fiscal adjustment plans is due to a particular channel.

To disentangle between the monetary policy channel and the uncertainty channel I consider vector autoregression with exogenous fiscal plans and two channels. Output growth captures economic activity and business cycle variation. Three months T-bill rate and inflation are proxies for monetary policy. To disentangle between the two types of uncertainty I incorporate both types into the model at the same time. The main proxy for traditional uncertainty is the economic policy uncertainty index constructed by Baker, Bloom and Davis (2015); and the main proxy for financial market uncertainty is BAA - AAA corporate bond spread.

The main empirical findings of the paper go as follow. Estimation of the baseline specification confirms that there is a heterogeneous response of output depending on the policy applied. In particular, output drops after using tax-based fiscal adjustment plan and close to zero in the case of expenditure-based plan. Moreover, baseline specification suggests no significant difference in responses of monetary policy variables no matter which type of plan was used. However, there is a strong heterogeneity in responses of both uncertainty proxies: increase in uncertainty after tax-based plan and decrease or no change of uncertainty after expenditure-based plan. Between the two competing channels (monetary policy and uncertainty), uncertainty is the one that may explain the heterogeneity. To see how much of the effect is due to a particular channel, I use the methodology of the counterfactual experiment that allows to isolate different indirect effects. Without indirect monetary policy channel the output response to both tax-based and expenditure-based fiscal adjustment plans is similar to the baseline specification. The same happens with economic policy uncertainty proxy. In contrast, without indirect financial uncertainty effect the response of output to tax-based fiscal adjustment plans is much smaller. These results suggest that going deeper and distinguishing between the two types of uncertainty, the one that matters more is the financial market uncertainty (proxied by the BAA - AAA corporate bond spread).

This paper is related to a growing literature examining the transmission mechanism linking policy and the real economy. Bekaert, Hoerova and Duca (2013) provide the first dynamic model of links between risk, uncertainty and monetary policy, using a simple vector-autoregressive framework. I differ from these articles in many aspects. Most importantly, I focus on fiscal policy, precisely on fiscal consolidation, while Bekaert, Hoerova and Duca (2013) examine the effects of monetary policy on economic performance. Moreover, I link fiscal policy and economic activity as in Bachmann and Sims (2012). While these researches focus only on the government expenditure side of fiscal policy, abstracting from the revenue side, my work explicitly considers both expenditure and tax components of fiscal policy. Bachmann and Sims (2012), using a non-linear framework, stress consumer and business confidence as main transmission channels. In contrast, the current study focuses on uncertainty as a main transmission channel.

The rest of paper is organized as follows: Section 2 - fiscal plans database construction and description of channels and economic variables, Section 3 - simulation of fiscal plans in VARX model, Section 4 - estimation and results.

# 1 Data

## 1.1 Construction of fiscal adjustment plans

Measuring the output effect of fiscal consolidations requires a sample of exogenous shifts in fiscal stance. Fiscal foresight does not allow us to treat exogenous shifts in fiscal policy as unobservable and to identify them by imposing restrictions on reduced form dynamic specifications of macroeconomic and fiscal variables. The narrative method allows us instead to construct a time-series of the relevant shocks without the need to estimate a model. Romer and Romer (2009) refer to presidential speeches and Congressional reports, to identify the size, timing, and principal motivation for all major post-war tax policy actions. Next they classify legislated changes into endogenous (those induced by short-run countercyclical concerns and those taken because of change in government spending) and exogenous (those that are responses to the state of government debt or to concerns about long-run economic growth).

Similarly, Devries et al. (2011) produce a data set that documents exogenous shifts in fiscal policy (both tax and expenditure) by applying the narrative approach to a set of seventeen OECD countries. Among all fiscal actions, these authors have selected those that were designed to reduce a budget deficit and/or to put the public debt on a sustainable path.

In this paper I reconsider these two databases to construct a quarterly time-series of exogenous fiscal stabilization episodes for the U.S. economy. In practice, I extend the deficit-driven quarterly dataset of tax adjustment produced by Romer and Romer (2009) to include a quarterly measure of the deficit-driven expenditure adjustments proposed by Devries et al. (2011). By taking for granted the exogeneity of the episodes identified by these authors I simply reclassify them to precisely trace fiscal plans.

When fiscal policy is conducted through multi-year plans, narrative exogenous fiscal adjustments in each year are made of three components: the unexpected adjustments (announced upon implementation at time t); the past announced adjustments (implemented at time t but announced in the previous years) and the future announced corrections.

Plans are sequences of fiscal corrections announced at time $t$ to be implemented between time $t$ and time $t+k$; where $k$ is the anticipation horizon. The unanticipated fiscal shocks at time $t$ is the surprise change in the primary surplus at time $t$:

$$e_t^u = \tau_t^u + g_t^u \tag{1}$$

where $\tau_t^u$ is the surprise increase in taxes announced at time $t$ and implemented in the same quarter, and $g_t^u$ is the surprise reduction in government expenditure also announced at time $t$ and implemented in the same quarter. $\tau_{t,j}^a$and $g_{t,j}^a$ are instead the tax and expenditure changes announced by the fiscal authorities at date $t$ with an anticipation horizon of $j$ quarters (*i.e.* to be implemented in quarter $t+j$). In the Devries et al.

(2011) dataset fiscal plans almost never extend beyond a 3-year horizon; thus $j = 12$ is the maximum anticipation horizon [2]. Therefore, I define the observed anticipated shocks in period $t$ as follows:

$$\begin{aligned}
&\tau^a_{t,0} = \tau^a_{t-1,1} \\
&\tau^a_{t,j} = \tau^a_{t-1,j+1} + \left(\tau^a_{t,j} - \tau^a_{t-1,j+1}\right) \;\; j \geqslant 1 \\
&g^a_{t,0} = g^a_{t-1,1} \\
&g^a_{t,j} = g^a_{t-1,j+1} + \left(g^a_{t,j} - g^a_{t-1,j+1}\right) \;\; j \geqslant 1 \\
&e^a_{t,j} = \tau^a_{t,j} + g^a_{t,j}
\end{aligned} \tag{2}$$

Implementing fiscal policy through plans means that fiscal corrections can be written as follows:

$$f_t = e^u_t + e^a_{t,t} + \sum_{j=1}^{horz} e^a_{t,t+j} \tag{3}$$

An extensive description of how I constructed the database building on the work by Romer and Romer (2009) is in the appendix.

To illustrate the procedure, consider the case of 1990 *OBRA (Omnibus Budget Reconciliation Act) - 1990, which is considered by Romer and Romer (2009) and Devries et al. (2011) as exclusively motivated by* a deficit reduction motive and therefore exogenous for the estimation of the output effect of fiscal corrections.

**Insert Table 1 (example OBRA - 90, part 1)**

Table 1 illustrates how Devries et al. (2011) and Romer and Romer (2009), using different sources, reclassify the plan. OBRA - 1990 plans fiscal adjustment both on revenue and expenditure side over the period 1991-1995. Romer and Romer (2009) concentrate only on the revenue adjustment and "lump" in the first quarter of 1991 all the relevant adjustments (that therefore add up adjustment to be implemented in 1991 and 1992). The post-1992 adjustments are not included because of their small size. *"... almost all the revenue provisions were effective January 1, 1991. Thus, the first full fiscal year the changes were scheduled to be in effect were in fiscal 1992. We therefore use the estimated revenue effect from the budget for that year as our revenue estimate. That is, we estimate that there was a tax increase of $35.2 billion in 1991Q1..."* Devries et al. (2011) take a different source (CBO (1990), The 1990 Budget Agreement: An Interim Assessment (Table 2, p. 6)) and, after the reclassification from fiscal to calendar year, use the implementation rather than the announcement as a criterion to attribute shocks

[2] In the sample there are a few occurrences of policy shifts anticipated four and five years ahead. Their number is too small to allow us to include them in our estimation.

to each period[3].

Table 2 is a reclassification of the OBRA 90, along with the snapshots from the series of the shocks constructed by Romer and Romer (2009) and Devries et al. (2011). In this example, I set anticipated horizon to six quarters.

**Insert Table 2 (example OBRA - 90, part 2)**

Following the approach illustrated for the OBRA plan, I have reconstructed a quarterly database of exogenous adjustments in the U.S. by reclassifying and disaggregating at the quarterly frequency the Devries et al. (2011) series for expenditure adjustments and revenue adjustments. Plans are labeled as tax-based or expenditure-based by adopting the following rule:

$$\begin{aligned} if \quad \left(\tau_t^u + \tau_{t,t}^a + \sum_{j=1}^{horz} \tau_{t,t+j}^a\right) > \left(g_t^u + g_{t,t}^a + \sum_{j=1}^{horz} g_{t,t+j}^a\right) \\ then\ TB_t = 1\ and\ \ EB_t = 0, \\ else\ TB_t = 0\ \ and\ \ EB_t = 1, \forall\ t \end{aligned} \tag{4}$$

The Data appendix provides a detailed description of the series and their construction. In total, I have 53 observations with non-zero adjustment for a total of 20 plans divided into EB and TB (21 quarters of adjustment are labeled TB and 32 are labeled EB). Mean, standard deviation and number of observations are in Table 3. The means of TB plans are 0.166 and 0.123 both for unanticipated and anticipated components of the plan respectively, and it is lower than that of EB plans than stands at 0.304 and 0.323.

**Insert Table 3 (descriptive statistics)**

A number of comments about narrative plans are in order.

First, as illustrated in Table 4, there is significant evidence of both intertemporal and intratemporal correlations among the different dimensions of plans:

**Insert Table 4 (correlation)**

The unanticipated tax $\tau_t^u$ and spending $g_t^u$ adjustments are strongly correlated with $\rho = 0.56$. By simply regressing $\tau_t^u$ on $g_t^u$, the coefficient is highly significant and equal to 0.42 with $std.err = 0.05$ and $R\hat{}2 = 0.31$. With anticipated shocks we observe the same

[3]Following Devries et al. 2013, I concentrate on those deficit-driven exogenous adjustments, which are not offset by the long-run adjustments in the R&R terminology. Moreover, R&R propose several measures of the tax adjustments, generated respectively by including or not the retroactive components of the measures. There are no cases of retroactive components in deficit-driven adjustments, and the retroactive components of a long run do not affect my measure of revenue adjustments.

pattern: $\rho = 0.60$; the coefficient is 0.63 with $std.err = 0.07$ and $R\hat{}2 = 0.4$. Correlation between the unanticipated component of the plans at date t and those announced previously and executed at date t is very low.

A simple orthogonality check supports the idea of using plans instead of shocks. Considering separately anticipated and unanticipated parts of a plan, I estimate two systems: in the first one I include both components, while in the second one only a surprise component[4]. As one would expect, taking into account the correlation between the plans' components, estimated coefficients vary depending on the specification I use. So, once again, this evidence supports an idea of using the plans.

Second, as there is potential measurement error in narrative episodes (see, for example, Mertens and Ravn (2014)), it is interesting to see how these constructed variables are related to observed fiscal variables constructed using NIPA tables.

**Insert Figures 1,2**

Figure 1 shows the time series of expenditure and tax variables from NIPA tables[5]. Figure 2 plots changes in both expenditure and tax variables (left and right column respectively), together with expenditure and tax adjustments (first row) and EB and TB fiscal plans (last row). Narrative variables include both components anticipated and unanticipated. Shocks in the upper panel are constructed in such a way that all adjustments are recorded as positive (therefore a positive adjustment in expenditure is a spending cut).

The sample period is from 1978 till 2012, covering the recent crisis. It is quarterly data for the United States.

## 1.2 Exogeneity and predictability of fiscal plans

One important and necessary condition for the correct estimation and simulation of the effect of fiscal plans on output growth is the exogeneity of the plans. There is no consensus in the literature on the fact that narrative approach per se is responsible for holding the exogeneity condition Ramey (2016). So, several additional checks will help to make sure that the fiscal plans are exogenous to growth of output, that is they are not predictable by past values of output growth. Moreover, it is important to check that fiscal plans are not predictable by potential transmission or channel variables. Furthermore, it is important to show that the choice of being a tax-based or expenditure-based plan is independent of the business cycle.

The first set of checks can be conducted simply by the OLS regressions including constant. As a dependent variable first, I use the unanticipated component of the plan:

$$e_t^u = \tau_t^u + g_t^u \tag{5}$$

[4]Estimated coefficients are not reported here; however, they can be available upon request.

[5]Expenditure variable is calculated as (total expenditure - interest payment)/nominal gdp and tax variable is calculated as (total receipts - interest receipts)/nominal gdp. Total expenditure, interest payment, total receipts, interest receipts are from NIPA 3.2. Nominal GDP is from NIPA 1.1.5.

next, I take the executed anticipated component of the fiscal plan, so:

$$e^a_{t,0} = \tau^a_{t,.0} + g^a_{t,.0} \quad (6)$$

I run several regressions, changing the independent variables, both the first and the second lags, choosing from the following list: an output growth, financial market uncertainty proxied by corporate BAA-AAA bond spread, high–information content credit spread index (from Gilchrist and Zakrajšek (2012)), excess bond premium (from Gilchrist and Zakrajšek (2012)), economic policy uncertainty (Baker, Bloom and Davis (2015) proxy), and short term interest rate. Importantly, in the regressions with output growth as well as spread, Gilchrist and Zakrajšek (2012) proxies, and interest rate none of the coefficients are significant, so their lagged values do not affect the fiscal plan's components, while in the regressions with economic policy uncertainty the coefficients are significant. However, this result is driven only by one observation, precisely by 1988q1. That is why after inclusion the dummy 1988q1 into the regression both of the coefficients become insignificant. So, fiscal plans are not predictable by the variables of my interest.

To address the question of independency of fiscal plans from the business cycle one can do a binary choice logit (probit) regression. I take the dummies TB and EB as choice variables and regress it on a cycle measure separately. Cycle measure is constructed as a deviation of the GDP from the Hodrick-Prescot (hp) trend. After conducting the regression, I find no evidence of the relations between choice of doing expenditure-based (EB) fiscal plan or not and the cycle. The coefficient in front of the cycle variable is - 0.2, while the standard error is 0.25 and the p-value is 0.4, McFadden R-squared is 0.004. On the contrary, there is evidence of applying tax-based (TB) fiscal policy in times of booms. Even though the positive coefficient in front of cycle variable is 1.23 (standard error 0.35, p-value is 0.0006, McFadden R-squared is 0.112) tells us that increase of independent variable (so times of boom) leads to a higher probability of choosing TB policy, which contradicts the results and makes them even more difficult to obtain.

Additionally, with a binary choice logit (probit) regression I have checked the independency of the choice between TB and EB from the potential transmission channels. The results confirm the independency of a fiscal plan choice, since none of the coefficient is significant[6].

## 1.3 The proxies for Uncertainty and Monetary Policy

There is a large stream of literature that focuses on the relationship between uncertainty and real economy. There are several important concepts to notice. Uncertainty is a variable that is hard to measure. According to Bloom (2009), today's volatility could be a proxy for uncertainty about tomorrow. For example, uncertainty of the S&P 500 tomorrow is today's volatility of the S&P 500. Moreover, macroeconomic uncertainty

[6]Estimated regressions are not reported in the current paper and can be available upon request.

could be measured as stock return volatility, forecaster disagreement, economic policy uncertainty index, as offered by Baker, Bloom and Davis (2015) and by news-mentioned uncertainty.

I use mainly two proxies for uncertainty. The first uncertainty proxy is the news-based index, which captures the "traditional wait-and-see" effect. Baker, Bloom and Davis (2015) extend the news-based index of policy uncertainty back to 1900, using a panel of six newspapers: The New York Times, The Boston Globe, The Wall Street Journal, The LA Times, The Chicago Tribune, and The Washington Post[7]. The second proxy of uncertainty is a BAA - AAA corporate bond spread, which captures financial market distortions. According to the Gilchrist and Zakrajšek (2012) spread index could be decomposed into predicted default risk and unpredictable excess bond premium. So as additional proxies I take the Gilchrist and Zakrajšek (2012) spread index as well as their excess bond premium[8]. Data for corporate bond spread are from the FRED website and the source is Board of Governors of the Federal Reserve System, while data for high–information content credit spread index and excess bond premium are from Gilchrist and Zakrajšek (2012)[9].

For the robustness I use additional proxy of uncertainty, offered by Bloom (2009), which is the combination of VXO (implied volatility) and realized volatility[10]. I take monthly U.S. stock market volatility from the Chicago Board of Options Exchange. VXO index of percentage implied volatility is available from 1986 onward. Following Bloom (2009), I count pre-1986 the VXO index as "actual monthly returns volatilities which are calculated as the monthly standard deviation of the daily S&P500 index normalized to the same mean and variance as the VXO index when they overlap from 1986 onward." Realized and implied volatility are correlated at 0.874 over this period[11].

I take the change in 3 months tbill rate from FRED as a proxy for monetary policy. Inflation is a log ratio of personal consumption expenditures (PCE) from NIPA 2.3.4. Output is growth rate of the quantity index for real GDP (NIPA 1.1.3).

# 2 Simulation of fiscal adjustment plans in a VARX setting

After their identification, fiscal adjustment plans are considered to be the correct experiment and can be used in empirical models to measure policy effect. Empirical reduced form models are needed to be simulated by keeping all parameters constant, and only the

[7] Thanks to professor STEVEN J. DAVIS for sending me this data.

[8] Results can be available upon request.

[9] Data for a high–information content credit spread index and excess bond premium are from Gilchrist, Zakrajsek, (2012) : http://people.bu.edu/sgilchri/Data/data.htm

[10] Results can be available upon request.

[11] To make it comparable proxy for uncertainty is scaled by the following formula: $unc = log(mvol\hat{}2/12)$

simulation of fiscal adjustment plans allows this. For the valid experiments with reduced form model two requirements must be satisfied: simulate exogenous policy actions and consider experiments that do not change the correlation in the data used to estimate the parameters in the empirical model.

Importantly, simulation of the fiscal adjustment plans narratively identified in VAR allows avoidance of the "fiscal foresight" problem. Fiscal policy is based on rare decisions and is implemented through multi-year plans. These features of fiscal policy generate "fiscal foresight" ( Leeper (2010), Leeper, Walker and Yang (2013)), agent know in advance future announced, measures. Ramey (2011) argues that distinguishing between announced and unanticipated shifts in fiscal variables, and allowing them to have different effects on output, is crucial for evaluating fiscal multipliers. Leeper, Walker and Yang (2013) show that the moving average representation of the VAR becomes non-invertible because fiscal foresight makes the number of shocks to be mapped out of the VAR innovations too high to achieve identification. In other words, misalignment between the information set used by the econometrician in a VAR and that available to economic agents causes a failure of a unique recovery from VAR innovations of an exogenous combination of unanticipated and announced fiscal corrections that characterizes a plan. Narrative identification of fiscal adjustment plans explicitly allow for the fiscal foresight.

Simulation of fiscal adjustment plans in the VAR model allows me not only to avoid the fiscal foresight problem and correctly simulate exogenous policy actions, but also, most importantly, it allows me to track interdependencies between the variables of interest. The main question of this paper is the question of the transmission mechanism, which stands behind the heterogeneous output effects of fiscal adjustment plans and is related to the set of macroeconomic questions, for which dynamics and expectations are all-important. The truncated moving average which is commonly used in the literature for deriving the dynamic effect of the exogenous fiscal policy on the variables of interest by simply projecting these variables on current and past values of the shocks does not allow the capture of dynamics between the variables of interest. Therefore, it is not valid for investigating the transmission mechanism.

Ideally, one would like to consider a general model, which covers different sectors of the economy to see the full set of interdependencies. Since fiscal policy is based on rare decisions this will cause a model to be over-parameterized, not having a sufficient number of degrees of freedom to be estimated. Since current study focuses on uncertainty and monetary policy transmission channels and considers only U.S. economy, the set of endogenous variables can be limited to the following set of domestic macro variables: real GDP growth, inflation, three months t-bill rate and proxy for uncertainty.

U.S. debt dynamics have never deviated from stability and therefore on the one hand, one should not worry about an inclusion of identity driving the debt dynamics into the model. However, Leeper (2010) stresses the importance of avoiding analyses of "unsustainable fiscal policies." To ensure that the policy does not lay on an unsustainable path, to pin down explicitly the debt stabilization motive in the fiscal reaction function and the impact of debt in the macro dynamics, I do an additional check for the robustness by the endogenization of the debt-deficit dynamics[12]. This precisely allows us to see that impulse response functions are not computed by diverging paths for fiscal fundamentals.

Furthermore, VARX with fiscal adjustment plans allows us to do a counterfactual model check. This is useful for defining the effect not only from a qualitative perspective but also a quantitative one.

After correct identification, estimation and simulation of the fiscal adjustment plans, the impulse responses can be computed as the difference between two forecasts. Once impulse responses are available, multipliers can be calculated as the ratio of the integral of the output response and the integral of taxes or expenditure responses (see Mountford and Uhlig (2009), Uhlig (2010)).

To give a sense of how simulation of the fiscal adjustment plans is done in the VARX framework, consider a simplified example with just two endogenous variables: variable of interest $y_t$ and transmission channel $z_t$. Consider a reduced form VARX(1) model with exogenous fiscal adjustment plans. There are no lags on unanticipated components, anticipated executed components and anticipated future components. The anticipation horizon is equal to one. There is not a constant and trend for simplicity. Then, the model is as follows:

$$\begin{pmatrix} y_t \\ z_t \end{pmatrix} = A * \begin{pmatrix} y_{t-1} \\ z_{t-1} \end{pmatrix} + B * \begin{pmatrix} \tau_t^u \\ \tau_{t,t}^a \\ \tau_{t,t+1}^a \end{pmatrix} + \tag{7}$$

$$+ C * \begin{pmatrix} g_t^u \\ g_{t,t}^a \\ g_{t,t+1}^a \end{pmatrix} + \begin{pmatrix} \epsilon_t^y \\ \epsilon_t^z \end{pmatrix} \tag{8}$$

$$\begin{aligned} \tau_{t,t+1}^a &= d_1^\tau \tau_t^u + \epsilon_{t+1}^\tau \\ g_{t,t+1}^a &= d_1^g g_t^u + \epsilon_{t+i}^g \end{aligned} \tag{9}$$

$$\begin{aligned} \tau_{t,t}^a &= \tau_{t-1,t}^a \\ g_{t,t}^a &= g_{t-1,t}^a \end{aligned} \tag{10}$$

[12] Results can be available upon request.

where $\begin{pmatrix} y_t \\ z_t \end{pmatrix}$ - is vector of endogenous variables, while $\begin{pmatrix} \tau_t^u \\ \tau_{t,t}^a \\ \tau_{t,t+1}^a \end{pmatrix}$ - is vector of exogenous tax hikes ($\tau_t^u$ - is unanticipated tax adjustment, $\tau_{t,t}^a$ - anticipated tax adjustment executed in quarter $t$, $\tau_{t,t+1}^a$ - anticipated tax adjustment which is announced in quarter $t$ and will be executed in quarter $t+1$) and $\begin{pmatrix} g_t^u \\ g_{t,t}^a \\ g_{t,t+1}^a \end{pmatrix}$ - is vector of exogenous expenditure cuts ($g_t^u$ - is unanticipated expenditure adjustment, $g_{t,t}^a$ - anticipated expenditure adjustment executed in quarter $t$, $g_{t,t+1}^a$ - anticipated expenditure adjustment which is announced in quarter $t$ and will be executed in quarter $t+1$). Matrices $A = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}$, $B = \begin{pmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \end{pmatrix}$, $C = \begin{pmatrix} c_{11} & c_{12} & c_{13} \\ c_{21} & c_{22} & c_{23} \end{pmatrix}$ are coefficients needed to be estimated. Equations (9) capture correlation between the anticipated future component and the unanticipated one. This example is very much simplified since it is also assumes zero correlation between the tax and expenditure components, which is not true in reality. In the real world, correlation between revenue and expenditure sides of fiscal plans are not zero and the interpretation of the effect of simulated shocks are not immediate: an initial correction to expenditure might generate a plan that is much more tax-based than expenditure-based.

I am interested in the effect of exogenous variables on endogenous. After a correct estimation of the coefficients of the matrices $A, B, C$ as well as $d_1^\tau, d_1^g$ the simulation of the plans is possible. Taking in to account the assumption of this simplified example about zero correlation between tax and expenditure components of the plans, one can define separately the effects of a pure tax-based plan or an expenditure-based plan. Importantly, there are two effects of the fiscal adjustment plans on endogenous variables. One is direct and goes through the estimated coefficient of the matrices $B, C$ as well as $d_1^\tau, d_1^g$. The other effect is an indirect one, which propagates through the interdependencies of endogenous variables.

Consider the simulation of the tax-based plan in this example: at time $t$ you give a shock to $\tau_t^u$, then using equations (9) obtain $\tau_{t,t+1}^a$. As a next step, using equations (10) get $\tau_{t+1,t+1}^a$. Since there are no lags of unanticipated and anticipated components of the fiscal adjustment plans, and moreover, the anticipation horizon is equal to one, further propagation goes through the coefficient of matrix $A$, in other words, it goes through the endogenous variables.

# 3 Estimation and Results

This section presents the estimation technique and the results in the form of impulse response functions. The model I use for estimation is a vector autoregression model with exogenous variables (VARX). The logic of this section proceeds as follows:

First, I do a baseline model, where I compare two channels: monetary policy and uncertainty. Then a counterfactual model check confirms results not only qualitatively but also quantitatively.

## 3.1 VARX - Baseline model with fiscal plans

I do a time series analysis of fiscal plans in the U.S. The baseline model considered in this study is VAR with exogenous fiscal plans (VARX). As was mentioned above it would be great to have a general model, covering different sectors of the economy to see the full set of interdependencies. However, taking into account the feasibility one needs to make a choice. The set of endogenous variables I consider in the baseline model can be limited to the following set of domestic macro variables: real GDP growth, inflation growth, change in three months t-bill rate and proxy for uncertainty: change in BAA-AAA corporate bond spread and change in Economic Policy Uncertainty index. I also estimate a bigger system, appending real consumption growth, real investment growth, results are virtually the same. The behavior of investment growth and output growth very similar. And there is no heterogeneity in response of consumption growth.

My basic specification is:

$$\begin{aligned}\Delta x_t = \widetilde{\alpha_0} + \widetilde{\alpha_1} t + \widetilde{B_0(L)}\Delta x_{t-1} + \widetilde{B_1(L)}(\tau_t^u + g_t^u) * EB_t + \\ + \widetilde{B_2(L)}(\tau_t^u + g_t^u) * TB_t + \widetilde{C_1(L)}(\tau_{t,t}^a + g_{t,t}^a) * EB_t + \\ + \widetilde{C_2(L)}(\tau_{t,t}^a + g_{t,t}^a) * TB_t + \sum_{i=1}^{horz}\widetilde{D_i} * (\tau_{t,i+t}^a + g_{t,i+t}^a) * EB_t + \\ + \sum_{i=1}^{horz}\widetilde{E_i} * (\tau_{t,i+t}^a + g_{t,i+t}^a) * TB_t + \epsilon_t\end{aligned} \tag{11}$$

$$\begin{aligned}(\tau_{t,t+i}^a + g_{t,t+i}^a) * TB_t = \widetilde{\delta_i^{TB}}(\tau_t^u + g_t^u) * TB_t + \epsilon_{t+i}^1,\ for\ i = \overline{1, horz} \\ (\tau_{t,t+i}^a + g_{t,t+i}^a) * EB_t = \widetilde{\delta_i^{EB}}(\tau_t^u + g_t^u) * EB_t + \epsilon_{t+i}^2,\ for\ i = \overline{1, horz}\end{aligned} \tag{12}$$

where $x_t$ - is a vector of endogenous variables. In the baseline model vector $x_t$ is:

$$x_t = [GDP_t, MP, UNC]$$

$$MP = [INFL_t, Tbill] \tag{13}$$

$$UNC = [SPREAD, EPU] \tag{14}$$

$\tau_t^u$ - is unanticipated tax adjustment, $g_t^u$ - is unanticipated expenditure adjustment,

$\tau^a_{t,t}$ - anticipated tax adjustment executed in quarter $t$, $g^a_{t,t}$ - anticipated expenditure adjustment executed in quarter $t$, $\tau^a_{t,i+t}$ - anticipated tax adjustment which is announced in year $t$ and will be executed in year $t+i$, $g^a_{t,i+t}$ - anticipated expenditure adjustment which is announced in quarter $t$ and will be executed in quarter $t+i$.

I set anticipated horizon to six quarters, since it is a median implementation lag, while the length of lag polynomials is three, so in total I consider four quarters because of two reasons: the number of parameters to be estimated and the possibility of error in timing.

This parsimonious specification allows us to identify separately the output effect of tax-based corrections from that of expenditure-based. This is important since the interpretation of the effect of simulating separate shock is not trivial. For example, fiscal adjustment plan, which initially has an expenditure correction in the end may appears to be more tax-based than expenditure-based.

Before estimating the system several preliminary tests must be performed. VAR satisfies the stability condition and no root lies outside of the unit circle. By Hannan-Quinn information criterion and Schwarz information criterion the number of lags is set to one.

Results are in the form of impulse response functions. Bootstrap confidence intervals are obtained by 1000 replications with one standard deviation (68%). I restrict the length of the block to four in order to take into account serial correlation in residuals. Initial shock to TB (EB) plans is set in such a way that the total size of the plan is equal to one percent of GDP, that is in TB case - 0.36, while in EB case - 0.79.

The full sample covers 1978q1–2012q4 period. It includes the period of the Paul Volcker's era or the inflation targeting. The inflation has a peak in 1980q1 and the interest rate (three months tbill rate) has a peak in 1981q3. This time is considered to be a well-known structural break. To avoid the results being affected by this break, I cut the sample to the following one: 1983q1 - 2012q4. Moreover, zero low bound, which is also covered by the sample may have an effect on the results either, So, I do a second cut and test the following sample: 1983q1 - 2006q4. The baseline result does not change depending on the sample. Results shown in the paper are for sample period 1983q1 2012q4, all other results are available upon request. Figure 3 shows the impulse response functions of the baseline model.

**Insert figure 3**

Graphs on the left (right) panel of figure 3 demonstrate by how many percent or basis points output, inflation, interest rate, BAA -AAA corporate bond spread and Economic policy uncertainty index will change over time when tax-based (expenditure-based) fiscal adjustment plan is increased (cut) by one percent of GDP.

The confidence bounds are greater for impulse response functions to a tax-based plans than for those of expenditure-based plans, because of the smaller number of observations (21 quarters of tax-based adjustments versus 32 quarters of expenditure-based adjustments). In spite of wide bounds, the responses in tax-based case and expenditure-based case are quite different.

Output declines in response to tax-based plan and is close to zero in response to expenditure-based plan. This evidence goes in the opposite direction of the Keynesian view, under which one would expect a positive reaction of output in response to an increase in spending.

There is no heterogeneity in responses of the monetary variables depending on fiscal plans. In particular confidence bounds of inflation and interest rate impulse response to expenditure-based plans are fully included into confidence bounds of impulse response for those of tax-based plans. However, looking at the point estimates, in the case of tax-based fiscal plan there is an increase of both inflation and interest rate in the short-run, while in the long run they become insignificant. As for expenditure-based plans interest rate goes up, while inflation is close to zero.

Putting this result into the literature perspective, first thing to notice there is no consensus across the empirical evidence about the role of monetary policy in explaining the difference in responses of output to tax-based and expenditure-based fiscal consolidation. Interestingly, neither explanation of Guajardo, Leigh and Pescatori (2014) nor Jalil (2012) fits findings of the current paper. In particular, Guajardo, Leigh and Pescatori (2014) conclude that observed difference in output responses is due to the fact that central bank is favoring more expenditure-based fiscal adjustments by using expansionary monetary policy and in order to fight raising inflation is amplifying a negative output response of tax-based fiscal adjustments by contractionary monetary policy, which is not the case, since the point estimates of interest rate shows a contractionary response in both tax-based and expenditure-based cases. My evidence also goes in the opposite direction to explanation of Jalil (2012), that the explanation is more likely to be a cushioning the negative effects of fiscal consolidation, which mean if central bank has a room for using expansionary policy it will do so to offset negative effect of fiscal consolidation. However, it goes to the direction of Alesina, Favero and Giavazzi (2015), who finds that the difference in output response is quite large and cannot be explained by a different response of monetary policy. It is important to understand that the experiment of the current paper is different from above - mentioned studies in several aspects. First, I focus on US while the rest of studies focus on the multi - country sample. Next, I use fiscal adjustment plans as in Alesina, Favero and Giavazzi (2015), while Guajardo, Leigh and Pescatori (2014) and Jalil (2012) use separate shocks. Finally, unlike previous studies, I incorporate monetary policy into the VAR model, which allows to capture an endogenous response of monetary policy to fiscal adjustment plans and track interdependencies with other variables of interest.

Both proxies of uncertainty produce a strong heterogeneity in results depending on the fiscal adjustment plans used. There is an increase in BAA-AAA corporate bond spread as well as Economic policy uncertainty index in the medium and long-run after the tax-based plan is introduced, while mild decrease of BAA-AAA corporate bond spread as well as Economic policy uncertainty follows the expenditure-based plan. A decline in output after increase in both proxies of uncertainty in the case of tax-based consolidation is consistent with explanation of the large stream of literature showing a negative impact of high uncertainty on economy (Bloom (2009), Gilchrist and Zakrajšek (2012), Gilchrist, Sim and Zakrajšek (2014), etc.). However, the interesting question is why would tax-based and expenditure-based fiscal adjustment plans affect uncertainty differently? One may think, that government apply tax-based consolidation always in the high uncertainty periods. However, preliminary tests, which I conduct in Section I (B) exclude the possibility that the choice of being tax-based plan is systematically correlated with the highly uncertain environment and the choice of being expenditure-based plan with low uncertainty environment.

## 3.2 VARX - closing one channel at a time

To address the question of how much of the effect is actually going through the variables of interest, I use a counterfactual experiment. To better understand the logic that stands behind the experiment, I first bring an example of the basic methodology of the counterfactual model and then conduct an empirical experiment with the data. The idea of a counterfactual experiment is as follows: one assumes that the full model (without any restrictions) is a true one, counterfactual is an artificial model, *something that has not happened but could, would, or might under differing conditions.*

Bachmann and Sims (2012), for a baseline approach of the counterfactual experiment, fix the economic environment and investigate the hypothetical shock combinations. In other words, first, one needs to place identifying restrictions on the impact matrix, fixing the contemporaneous relations between the variables, after recovering the matrix substitute the structural model with the reduced form by inverting the impact matrix and, finally, putting restrictions in place to create specific statistical shock combinations. However, Bachmann and Sims (2012) show that an alternative approach, which considers two different economies (restricted versus unrestricted) and structurally prevents one variable from responding to another, produces an equivalent result to the baseline model. Considering the method of using the reduced form specification, in the current paper I choose an alternative approach.

Consider simple reduced form VAR(1) model with exogenous variables:

$$\begin{pmatrix} x_t^c \\ y_t^c \\ z_t^c \end{pmatrix} = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix} * \begin{pmatrix} x_{t-1}^c \\ y_{t-1}^c \\ z_{t-1}^c \end{pmatrix} + \begin{pmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{pmatrix} * \begin{pmatrix} \lambda_t^c \\ \mu_t^c \\ \nu_t^c \end{pmatrix} + \begin{pmatrix} \epsilon_t^{x^c} \\ \epsilon_t^{y^c} \\ \epsilon_t^{z^c} \end{pmatrix} \tag{15}$$

where $\begin{pmatrix} x_t^c \\ y_t^c \\ z_t^c \end{pmatrix}$ - is vector of endogenous variables, while $\begin{pmatrix} \lambda_t^c \\ \mu_t^c \\ \nu_t^c \end{pmatrix}$ - is vector of exogenous variables. We are interested in the effect of exogenous variables on endogenous. Assume that one needs to isolate the effect of exogenous variables on $x^c$ and $y^c$, which goes through $z^c$. There are several ways of doing so. First, I could simply take away $z^c$ at all horizons from the $x^c$ and $y^c$ equations. But this method is quite restrictive in the sense that if another power exists there, different from the vector of exogenous variables that affect $x^c$ and $y^c$ equations, then by doing so I eliminate this effect as well. For example, vector of exogenous variables is fiscal policy, but there is also monetary policy, which is not considered in the model and so hides in residuals. Eliminating $z^c$ at all horizons from the $x^c$ and $y^c$ equations misspecifies the system and loses the indirect effect of the monetary policy, that goes through $z^c$ and affects $x^c$ and $y^c$.

Another way of isolating the effect (the one I use) contains two steps. The first is to make $z^c$ - unresponsive to any exogenous variables, so in the matrix $B$, put to zero coefficients $b_{31} = 0$, $b_{32} = 0$ and $b_{33} = 0$. One may decide to stop after the first step, since this type of counterfactual model is less subjected to Lucas critique, because only the contemporaneous response of the $z^c$ variable to the exogenous variables is shut down. The economic structure is barely affected by this type of one period change, since it takes time for agents to learn.

$$\begin{pmatrix} x_t^c \\ y_t^c \\ z_t^c \end{pmatrix} = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix} * \begin{pmatrix} x_{t-1}^c \\ y_{t-1}^c \\ z_{t-1}^c \end{pmatrix} + \begin{pmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ 0 & 0 & 0 \end{pmatrix} * \begin{pmatrix} \lambda_t^c \\ \mu_t^c \\ \nu_t^c \end{pmatrix} + \begin{pmatrix} \epsilon_t^{x^c} \\ \epsilon_t^{y^c} \\ \epsilon_t^{z^c} \end{pmatrix} \tag{16}$$

Another option is to continue and move to a more restrictive case. By the first step I only eliminate the effect at the horizon one, while still the effect could go at different horizons through $x^c$ and $y^c$. So I need also to put zero coefficient on matrix $A : a_{31} = 0$ and $a_{32} = 0$. Now the system looks as:

$$\begin{pmatrix} x_t^c \\ y_t^c \\ z_t^c \end{pmatrix} = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ 0 & 0 & a_{33} \end{pmatrix} * \begin{pmatrix} x_{t-1}^c \\ y_{t-1}^c \\ z_{t-1}^c \end{pmatrix} + \begin{pmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ 0 & 0 & 0 \end{pmatrix} * \begin{pmatrix} \lambda_t^c \\ \mu_t^c \\ \nu_t^c \end{pmatrix} + \begin{pmatrix} \epsilon_t^{x^c} \\ \epsilon_t^{y^c} \\ \epsilon_t^{z^c} \end{pmatrix} \tag{17}$$

So on the one hand I isolate the effect of the exogenous variables on $x^c$ and $y^c$ which goes through $z^c$, on the other I still maintain the possibility that there is another power that affect $x^c$ and $y^c$ through $z^c$, since I keep $z^c$ variable in the $x^c$ and $y^c$ equations.

Applying this methodology to the data I compare the effects, using two specifications. The first one keeps channel of uncertainty and risk open, while the second one shuts the channel down. By doing so it is possible to understand how important one channel is from another. I do this exercise for all proxies. The results for both specifications then are plotted in the same graph.

Step one and step two produce virtually the same set of results. So what matters, is an isolation of the channel's variable from exogenous variables. I report in the paper the results from the first step only[13].

Figures **4, 5** demonstrate the effect of fiscal adjustment plans in case the channels of uncertainty are shut down. Once corporate bond spread channels is closed, the heterogeneity of results disappears. Closing economic policy uncertainty does not influence response of output to fiscal adjustment plans. Therefore, between the two, consistently with Gilchrist, Sim and Zakrajšek (2014) uncertainty reflecting financial market distortions plays more important role for the heterogeneity of the results.

**Insert figures 4,5**

Closing monetary policy channel does not change the response of output. This suggests that monetary policy cannot be fully responsible for the heterogenous output effects of fiscal adjustment plans.

**Insert figure 6**

Next, I close all the channels at the same time and the result is similar to the one, when I close the spread channel only[14]. This result suggests that in addition to the direct effect of fiscal adjustment plans, an indirect effect that goes through uncertainty reflecting financial market distortions plays an important role.

# 4 Conclusion

I investigate two potential channels of the heterogeneous output effects of fiscal adjustment plans: uncertainty and monetary policy. I find that uncertainty proxied by corporate bond spread increase significantly as a reaction to the tax-based fiscal adjustment plans. Moreover, uncertainty decreases in the case of expenditure-based fiscal adjustment plans. The baseline model I use is a vector autoregression with exogenous variables (VARX). Fiscal adjustment plans are identified through a narrative approach. The use of plans creates more realistic conditions for estimating fiscal policy effects. I also study the quantitative side of the effects by running a counterfactual experiment.

[13] Results from the second step can be available upon request.
[14] Result can be available upon request.

Table 1: United States: Budgetary Impact of OBRA-90 (Billions of U.S. dollars)

| By Fiscal Year (October-September) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Original Data | | CBO:The 1990 Budget Agreement | | | | | | | 1992 Budget of the US Government | | | | | |
| | | 1991 | 1992 | 1993 | 1994 | 1995 | 1991-1995 | | 1991 | 1992 | 1993 | 1994 | 1995 | 1991-1995 |
| CUMULATIVE CHANGE | | | | | | | | | | | | | | |
| Tax | | 18 | 33 | 32 | 37 | 39 | 159 | | 22.5 | 35.2 | 32.7 | 37.5 | 38.6 | 166.5 |
| Spending | | 17 | 35 | 49 | 79 | 97 | 277 | | | | | | | |
| CHANGES | | | | | | | | | | | | | | |
| Tax | | 18 | 15 | -1 | 5 | 2 | 39 | | 22.5 | 12.7 | 0 | 0 | 0 | 35.2 |
| Spending | | 17 | 18 | 14 | 30 | 18 | 97 | | | | | | | |
| Reclassification by Calendar Year (January-December) | | | | | | | | | | | | | | |
| | DeVries et al. | | | | | | | Romer&Romer | | | | | | |
| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1990-1995 | 1990 | 1991Q1 | 1992 | 1993 | 1994 | 1995 | 1990-1995 |
| CHANGES | | | | | | | | | | | | | | |
| Tax | 4.5 | 17.25 | 11 | 0.5 | 4.25 | 1.5 | 39 | | 35.2 | | | | | |
| Spending | 4.25 | 17.25 | 17 | 18 | 27 | 13.5 | 97 | | | | | | | |
| Change in percent of GDP | | | | | | | | | | | | | | |
| Tax | 0.08 | 0.29 | 0.17 | 0.01 | 0.06 | 0.02 | 0.63 | | 0.59 | | | | | |
| Spending | 0.07 | 0.29 | 0.27 | 0.27 | 0.38 | 0.18 | 1.48 | | | | | | | |
| | 0.15 | 0.58 | 0.45 | 0.28 | 0.45 | 0.20 | 2.11 | | | | | | | |
| Nominal GDP | 5757 | 5947 | 6287 | 6604 | 7018 | 7342 | | | 5888 | | | | | |

Table 2: Reclassification: US OBRA-90

| | Revenue adjustments | | | | | | | | | | Expenditure adjustments | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R&R | IMF | $\tau^u_t$ | $\tau^a_{t,0}$ | $\tau^a_{t,1}$ | $\tau^a_{t,2}$ | $\tau^a_{t,3}$ | $\tau^a_{t,4}$ | $\tau^a_{t,5}$ | $\tau^a_{t,6}$ | IMF | $g^u_t$ | $g^a_{t,0}$ | $g^a_{t,1}$ | $g^a_{t,2}$ | $g^a_{t,3}$ | $g^a_{t,4}$ | $g^a_{t,5}$ | $g^a_{t,6}$ |
| 1990q4 | 0.00 | 0.08 | 0.08 | 0.00 | 0.29 | 0.00 | 0.00 | 0.00 | 0.17 | 0.00 | 0.07 | 0.07 | 0.00 | 0.29 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 |
| 1991q1 | 0.59 | 0.29 | 0.00 | 0.29 | 0.00 | 0.00 | 0.00 | 0.17 | 0.00 | 0.00 | 0.29 | 0.00 | 0.29 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 |
| 1991q2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.00 |
| 1991q3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.17 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.00 | 0.27 |
| 1991q4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.17 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 |
| 1992q1 | 0.00 | 0.17 | 0.00 | 0.17 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.27 | 0.00 | 0.27 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 |
| 1992q2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.00 |
| 1992q3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1992q4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1993q1 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Table 3: Descriptive statistics of fiscal plans, sample 1978q1 2012q4

| | $\tau_t^u$ | $g_t^u$ | $\tau_t^a$ | $g_t^a$ | $(\tau_t^u + g_t^u)TB_t$ | $(\tau_t^u + g_t^u)EB_t$ | $(\tau_t^a + g_t^a)TB_t$ | $(\tau_t^a + g_t^a)EB_t$ |
|---|---|---|---|---|---|---|---|---|
| $\neq 0$ *mean* | 0.124 | 0.195 | 0.137 | 0.180 | 0.166 | 0.304 | 0.123 | 0.323 |
| $\neq 0$ *std deviation* | 0.119 | 0.160 | 0.107 | 0.107 | 0.050 | 0.273 | 0.078 | 0.156 |
| # *observations* | 10 | 8 | 11 | 8 | 4 | 7 | 3 | 8 |

Table 4: Correlation between components of fiscal plans,sample 1978q1 2012q4

| | $\tau_t^u$ | $g_t^u$ | $\tau_{t,t}^a$ | $g_{t,t}^a$ |
|---|---|---|---|---|
| $\tau_t^u$ | 1.00 | 0.56 | 0.12 | -0.02 |
| $g_t^u$ | 0.56 | 1.00 | 0.46 | 0.07 |
| $\tau_{t,t}^a$ | 0.12 | 0.46 | 1.00 | 0.60 |
| $g_{t,t}^a$ | -0.02 | 0.07 | 0.60 | 1.00 |

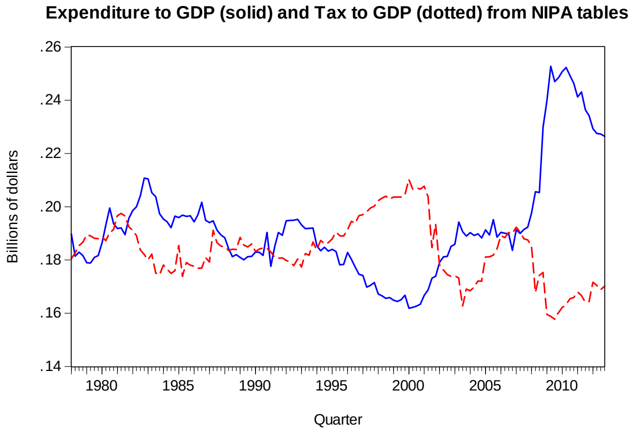


Figure 1: NIPA variables

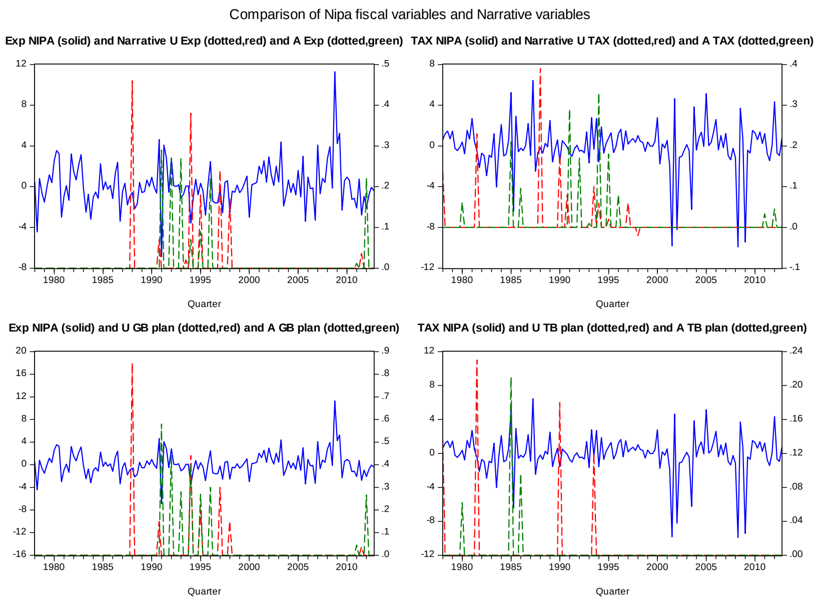


Figure 2: NIPA variables (in difference) and Narrative adjustments

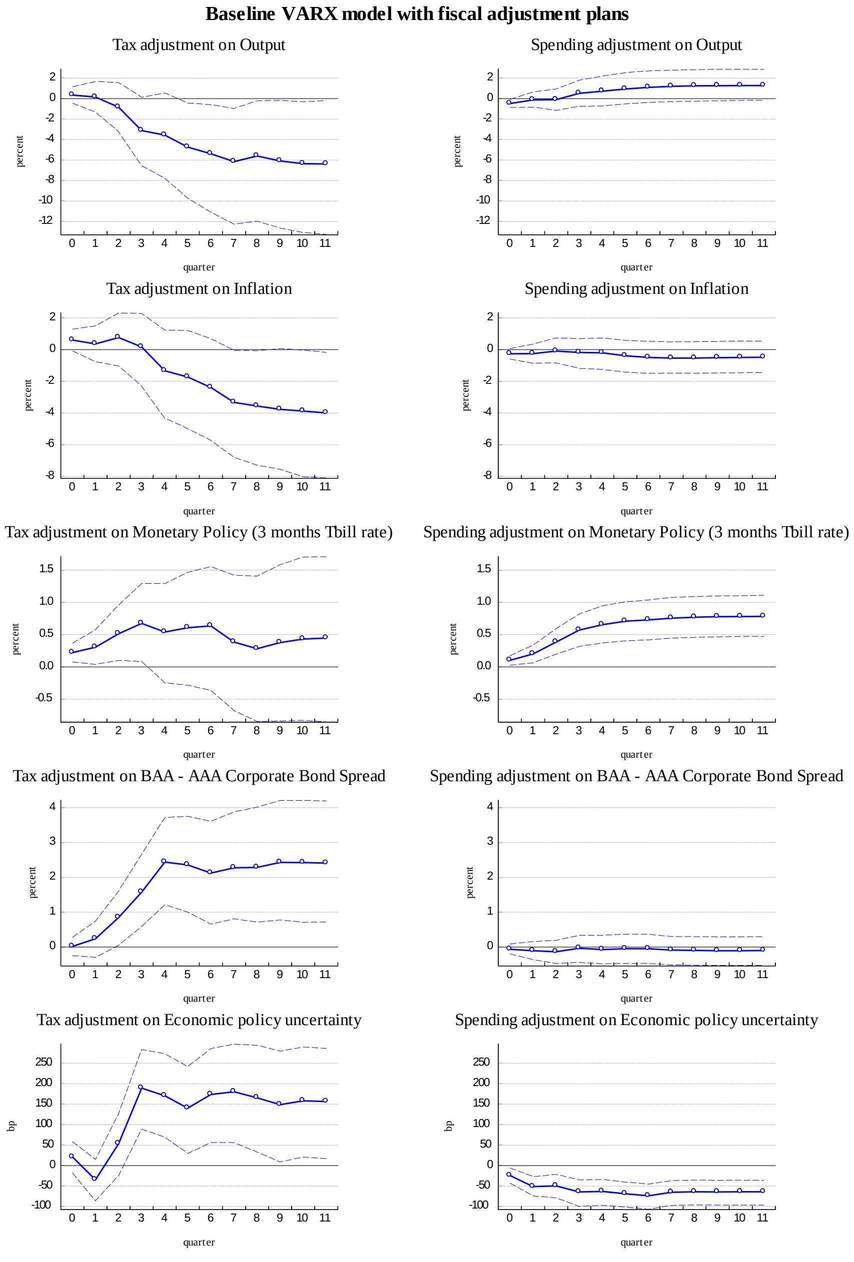


Figure 3: Baseline VARX model with fiscal adjustment plans, sample period 1983q1 - 2012q4

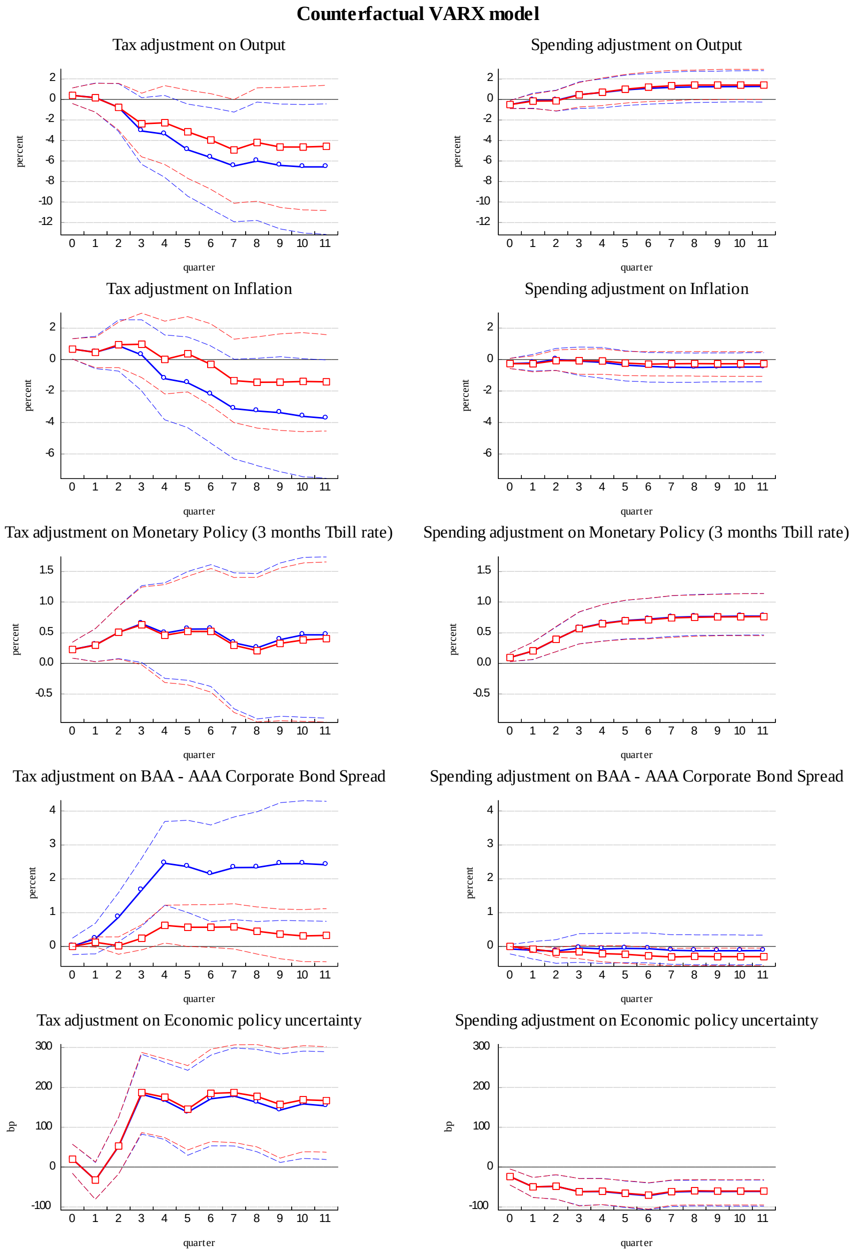


Figure 4: Counterfactual VARX model, closing Corporate bond spread, sample period 1983q1 - 2012q4

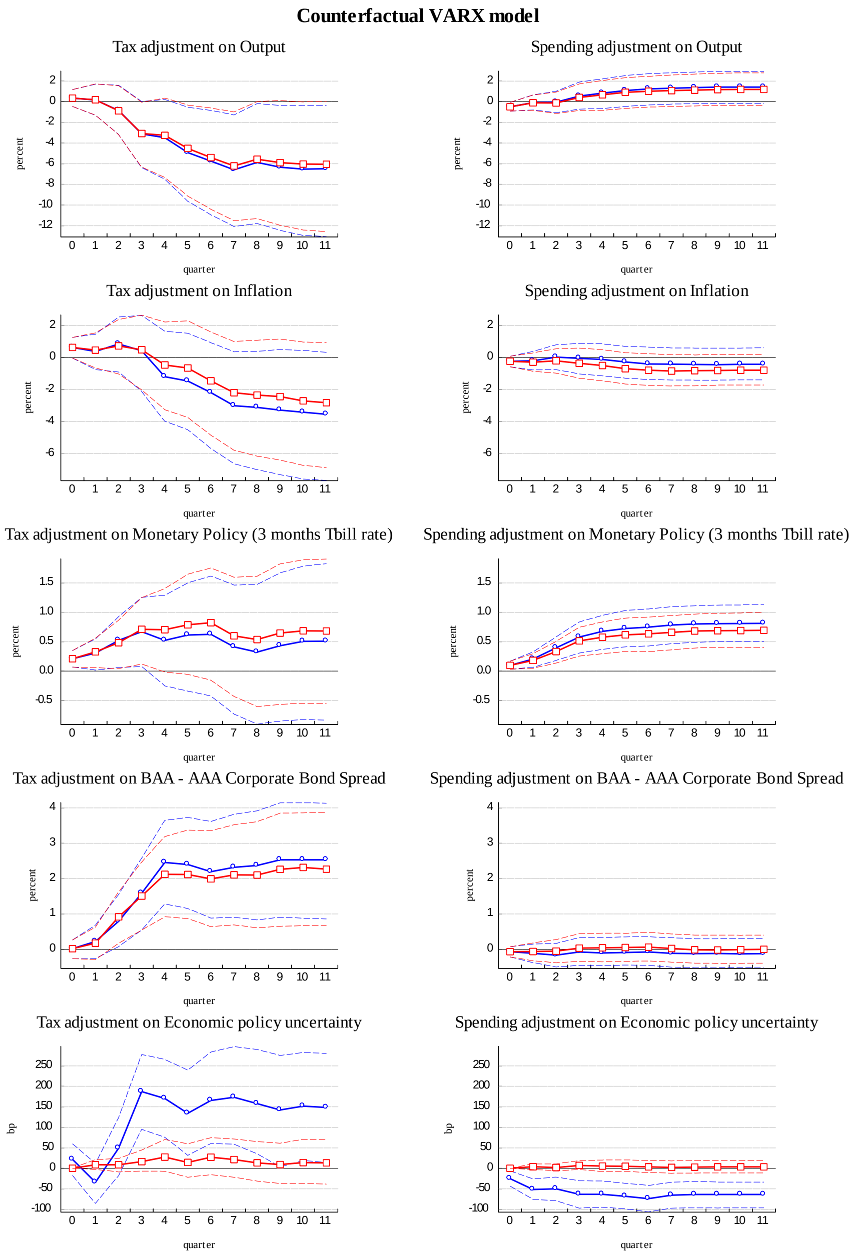


Figure 5: Counterfactual VARX model, closing Economic policy uncertainty, sample period 1983q1 - 2012q4

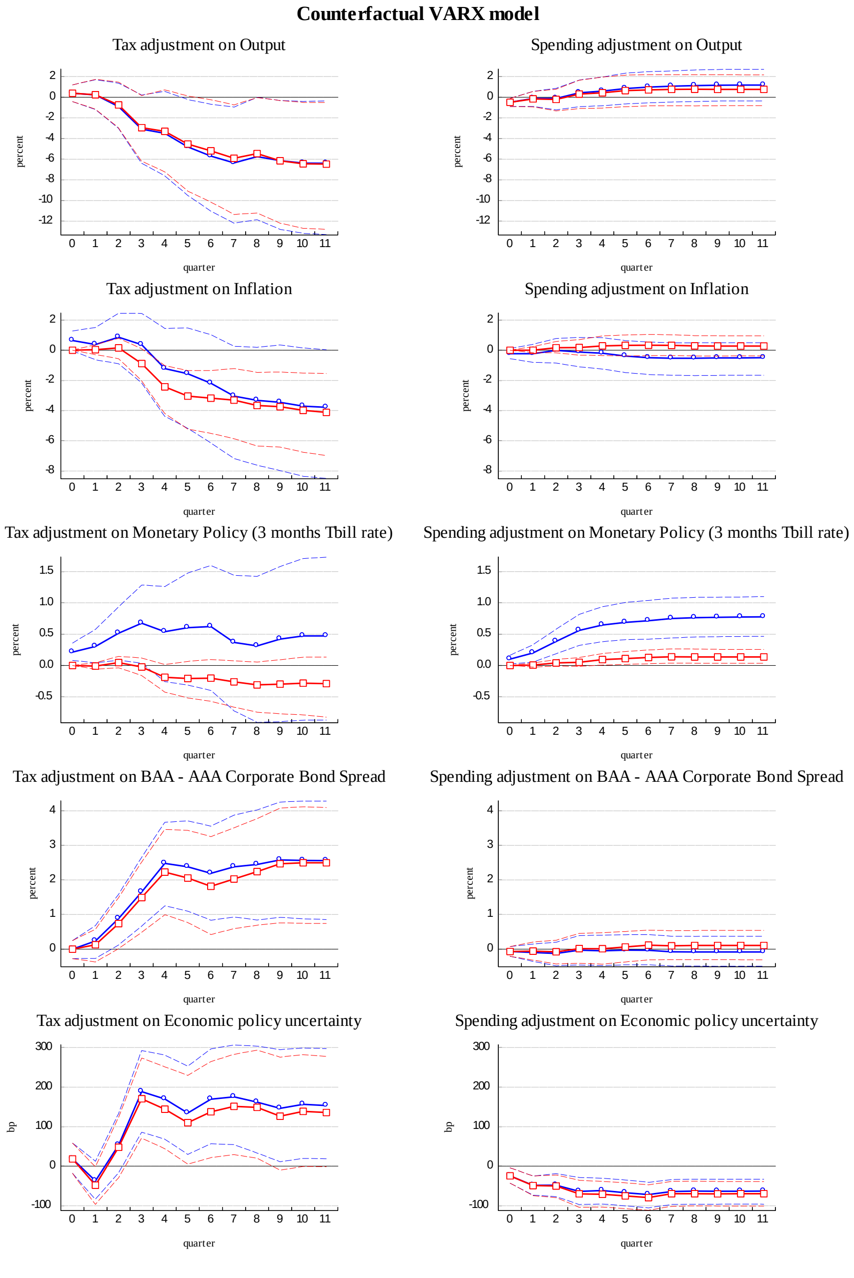


Figure 6: Counterfactual VARX model, closing Monetary policy, sample period 1983q1 - 2012q4

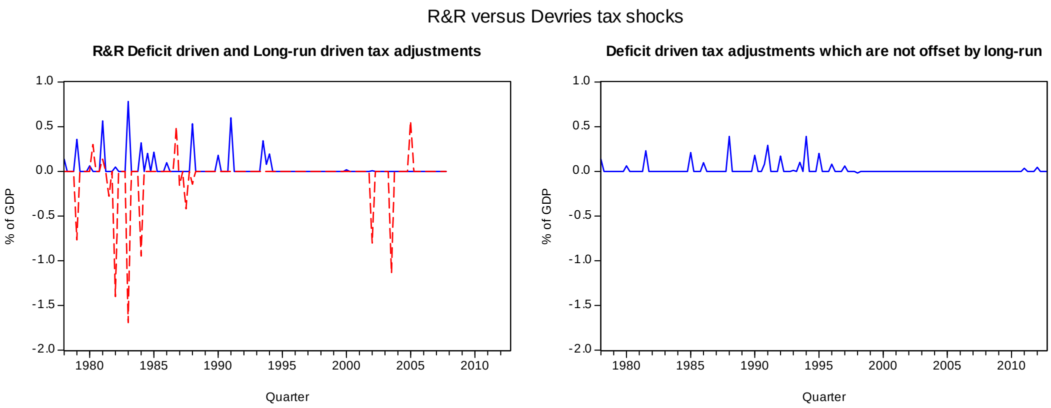


Figure 7: Romer&Romer versus DeVries et al.

# References

**Alesina, Alberto, Carlo Favero, and Francesco Giavazzi.** 2015. "The output effect of fiscal consolidation plans." *Journal of International Economics*, 96: S19–S42.

**Alesina, Alberto, Omar Barbiero, Carlo Favero, Francesco Giavazzi, and Matteo Paradisi.** 2015. "Austerity in 2009–13." *Economic Policy*, 30(83): 383–437.

**Bachmann, Rüdiger, and Eric R Sims.** 2012. "Confidence and the transmission of government spending shocks." *Journal of Monetary Economics*, 59(3): 235–249.

**Baker, Scott R, Nicholas Bloom, and Steven J Davis.** 2015. "Measuring economic policy uncertainty." National Bureau of Economic Research, No. w21633.

**Bekaert, Geert, Marie Hoerova, and Marco Lo Duca.** 2013. "Risk, uncertainty and monetary policy." *Journal of Monetary Economics*, 60(7): 771–788.

**Blanchard, Olivier, and Roberto Perotti.** 2002. "An empirical characterization of the dynamic effects of changes in government spending and taxes on output." *The Quarterly Journal of Economics*, 117(4): 1329–1368.

**Bloom, Nicholas.** 2009. "The impact of uncertainty shocks." *Econometrica*, 77(3): 623–685.

**Devries, Pete, Jaime Guajardo, Daniel Leigh, and Andrea Pescatori.** 2011. "A new action-based dataset of fiscal consolidation." *IMF Working Papers, No. 11/128*, 1–90.

**Gilchrist, Simon, and Egon Zakrajšek.** 2012. "Credit Spreads and Business Cycle Fluctuations." *American Economic Review*, 102(4): 1692–1720.

**Gilchrist, Simon, Jae W Sim, and Egon Zakrajšek.** 2014. "Uncertainty, financial frictions, and investment dynamics." National Bureau of Economic Research, No. w20038.

**Gomes, Joao F, and Lukas Schmid.** 2010. "Equilibrium credit spreads and the macroeconomy." The Wharton School Research Paper, 42.

**Guajardo, Jaime, Daniel Leigh, and Andrea Pescatori.** 2014. "Expansionary austerity? International evidence." *Journal of the European Economic Association*, 12(4): 949–968.

**Jalil, Andrew.** 2012. "Comparing Tax and Spending Multipliers: It's All About Controlling for Monetary Policy." *Available at SSRN 2139855.*

**Leeper, Eric M.** 2010. "Monetary Science, Fiscal Alchemy." National Bureau of Economic Research, No. w16510.

**Leeper, Eric M, Todd B Walker, and Shu-Chun Susan Yang.** 2013. "Fiscal foresight and information flows." *Econometrica*, 81(3): 1115–1145.

**Mertens, Karel, and Morten O Ravn.** 2014. "A reconciliation of SVAR and narrative estimates of tax multipliers." *Journal of Monetary Economics*, 68: S1–S19.

**Mountford, Andrew, and Harald Uhlig.** 2009. "What are the effects of fiscal policy shocks?" *Journal of Applied Econometrics*, 24(6): 960–992.

**Ramey, Valerie A.** 2011. "Identifying Government Spending Shocks: It's all in the Timing." *The Quarterly Journal of Economics*, 126(1): 1–50.

**Ramey, Valerie A.** 2016. "Macroeconomic shocks and their propagation." National Bureau of Economic Research, No. w21978.

**Romer, Christina D, and David H Romer.** 2009. "A narrative analysis of postwar tax changes." *manuscript, University of California, Berkeley.*

**Uhlig, Harald.** 2010. "Some fiscal calculus." *The American Economic Review*, 100(2): 30–34.

# A Appendix Construction of the database of fiscal plans

I constructed database by reclassifying into plans the information on fiscal corrections exogenous for the estimation of their output effect originally constructed by Romer and Romer (2009) and Devries et al. (2011).

These papers examine policymakers' intentions and actions described in contemporaneous policy documents, and they identify exogenous measures of the actions. As Romer and Romer (2009) explain, such fiscal actions represent a response to past decisions and economic conditions rather than to prospective conditions. As a result, they are not systematically correlated with other developments affecting output in the short term, and so are valid for estimating the output effects of fiscal consolidation.

While Romer and Romer (2009) look only at the tax fiscal adjustments, Devries et al. (2011) concentrate on both revenue and expenditure side. Devries et al. (2011) include into the dataset only fiscal actions primarily motivated by the desire to reduce the budget deficit, while Romer and Romer (2009) consider both deficit driven and long-run driven adjustments. If a fiscal consolidation is offset by fiscal actions motivated by long-run adjustment, Devries et al. (2011) compute the sum of the measures and consider the episode only if the combination of the two measures generated an overall budget surplus. Moreover Romer and Romer (2009) use the announcement as a criterion for attributing shocks to the relevant periods, while Devries et al. (2011) use the implementation. Figure **7** illustrate the differences between the two datasets.

**Insert Figure 7**

The left panel of figure **7** displays long - run driven and deficit driven Romer and Romer (2009) shocks, while the right panel shows a quarterly measure of the deficit - driven shocks, obtained by applying the Devries et al. (2011) methodology. Note that the Romer and Romer (2009) spike in 1983, the largest deficit driven tax increase, proposed in the Tax Equity and Fiscal Responsibility Tax Act of 1982, does not appear in the deficit-driven series of Devries et al. (2011) as it is fully offset by the long-run expansionary measures. Note also that for Romer and Romer (2009) the OBRA-90 will be just two numbers 0.18 in 1990q1 and 0.598 in 1991q1 as the entire plan is attributed to the announcement date, while for Devries et al. (2011) OBRA-90 will be the sequence of adjustments going through the several years during which they are implemented.

Starting from these original series I have reclassified data into plans and I have extended the database up to the last quarter of 2012. Following Devries et al. (2011) I consider deficit driven plans that are not offset by the long-run growth component. I follow Romer and Romer (2009) criterion to date quarterly adjustments: *"if the effective date is on or before the midpoint of the quarter, it is assigned to that quarter; if it is after the midpoint of the quarter, it is assigned to the subsequent quarter"*.

## A.1 The extension of the database up to 2012

To extend the database up to 2012 I have used the following sources:

1) The data on nominal GDP are from the National Income and Product Accounts, Table 1.1.5 (www.bea.gov,downloaded 9/16/06).

2) Economic Reports of the President (http://www.presidency.ucsb.edu/economic_reports.php)

3) Budget of the US Government (http://www.gpo.gov/), FRASER - Federal Reserve Archive: http://fraser.stlouisfed.org/

4) CBO (http://www.cbo.gov/)

I have excluded the **American Recovery and Reinvestment Act of 2009 (ARRA)**, signed in February 17, estimated cost of which is $787 billion, the largest countercyclical fiscal action in American history. It provides tax cuts and increases in government spending equivalent to roughly 2 percent of GDP in 2009 and 2 percent of GDP in 2010. That cannot be considered as exogenous with respect to output fluctuations. But we include measure taken afterwards with the objective of debt stabilization. The Economic Report Of The President (Feb. 2010, To Rescue, Rebalance, and Rebuild, p.32) illustrates that: *"The single most important step that can be taken to reduce future deficits is to adopt health care reform that slows the growth rate of costs without compromising the quality of* *care. In addition, the President's fiscal 2011 budget includes other significant measures, such as allowing President Bush's tax cuts for the highest-income earners to expire, reforming international tax rules to discourage tax avoidance and encourage investment in the United States, and imposing a three-year freeze in nonsecurity discretionary spending".* Measures taken are comprehensive health care reform, and expenditure cuts. As consequences of this plans new reforms were introduced in the Economic Report Of The President (feb 2011): **Patient Protection and Affordable Care Act (HR3590), Statutory Pay-As-You-Go Act (February 2010), The Health Care and Education Reconciliation Act (HCeRA) (March 2010)**. In the document (Economic Report Of The President (Feb. 2011) p.111) the term "Affordable Care Act" is used to mean the Patient Protection and Affordable Care Act (P.L. 111-148, enacted March 23, 2010) and the provisions of the Health Care and Education Reconciliation Act of 2010 (P.L. 111-152, enacted March 30, 2010) that are related to health care. The **reform aims to make health care more affordable, and improve the quality of care**, moreover the Affordable Care Act is also **fiscally responsible**. The Congressional Budget Office has estimated that the law **will reduce projected deficits by $230 billion during 2012–21 and by more than $1 trillion in the subsequent decade** (Economic Report Of The President (Feb. 2011), p.25). The Health Care and Education Reconciliation Act (HCERA), signed in March 2010, helps build a more reliable and effective financial aid system by making all federal loans—Stafford loans, PLUS loans, and consolidation loans—available directly to students, ending subsidies once paid to third party administrators. By saving $68 billion in subsidies over the next 11 years, the **direct loan program allows for deficit reduction and for greater investments in college affordability**.

Moreover, as a consequence of the economic risks associated with increased budget deficits, the Administration and Congress agreed on a $1 trillion deficit reduction package in the **Budget Control Act of 2011 (enacted August 2, 2011)** — with an additional $1.2 trillion to $1.5 trillion in further reductions scheduled to follow - Economic Report Of The President, Feb. 2012, p 30.

Estimated Budgetary Impact of the Legislation CBO and JCT estimate that enacting both pieces of legislation—H.R. 3590 and the reconciliation proposal—would produce a net reduction in federal deficits of $143 billion over the 2010–2019 period as result of changes in direct spending and revenues. That comprises $124 billion in net reductions deriving from the health care and revenue provisions and $19 billion in net reductions deriving from the education provisions. Approximately $114 billion of the total reduction would be on budget; other effects related to Social Security revenues and spending as well as spending by the U.S. Postal Service are classified as off-budget. Additional details on the budgetary effects of the reconciliation proposal and H.R. 3590 one can find in Tables 2-7 attached to the document - CBO H.R. 4872, Reconciliation Act of 2010 (Final Health Care Legislation) (March 20, 2010). The next table represents the "Estimate of Changes in Direct Spending (outlays) and Revenue Effects of the Reconciliation Proposal

Combined with Patient Protection and Affordable Care Act H.R. 3590 as Passed by the Senate March 20, 2010".

Table 5: Estimate of Changes in Direct Spending and Revenue Effects of the PPACA H.R. 3590 and RA

| By Fiscal Year (October-September), in Billions of Dollars | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2010-2019 |
| CUMULATIVE CHANGES IN | | | | | | | | | | | |
| Spending | 4 | 5 | -5 | -28 | 6 | 44 | 86 | 92 | 90 | 90 | 382 |
| Revenues | -3 | 3 | 5 | 27 | 57 | 65 | 83 | 89 | 95 | 104 | 525 |
| Deficit | 7 | 2 | -10 | -55 | -51 | -21 | 3 | 3 | -5 | -14 | -143 |
| CHANGES IN | | | | | | | | | | | |
| Spending | 4 | 1 | -10 | -23 | 34 | 38 | 42 | 6 | -2 | 0 | 90 |
| Revenues | -3 | 6 | 2 | 22 | 30 | 8 | 18 | 6 | 6 | 9 | 104 |
| By Calendar Year (January - December), in Billions of Dollars | | | | | | | | | | | |
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2010-2019 |
| CHANGES IN | | | | | | | | | | | |
| Spending | 4.25 | -1.75 | -13.25 | -8.75 | 35 | 39 | 33 | 4 | -1.5 | 0 | 90 |
| Revenues | -1.5 | 5 | 7 | 24 | 24.5 | 10.5 | 15 | 6 | 6.75 | 6.75 | 104 |
| Deficit | 5.75 | -6.75 | -20.25 | -32.75 | 10.5 | 28.5 | 18 | -2 | -8.25 | -6.75 | -14 |
| Nominal GDP | 14498.9 | 15075.7 | 15676 | | | | | | | | |
| Change in percent of GDP | | | | | | | | | | | |
| Spending | 0.029 | -0.012 | -0.085 | | | | | | | | |
| Revenues | -0.010 | 0.033 | 0.045 | | | | | | | | |

First three lines contain the data taken from the CBO document - H.R. 4872, Reconciliation Act of 2010 (Final Health Care Legislation), March 20, 2010 (table 2). The remaining lines are transformations that we do to get the numbers that we can use in the dataset. In particular, first from the change with respect to the announcement year we get an incremental change with respect previous year. Then we move from fiscal to calendar year. Finally, we get a number as a percentage of gdp, relative to the year the change is scheduled to be implemented. Importantly, positive numbers in the row for deficit indicate increases in the deficit, and negative numbers indicate reductions in the deficit. Since in our database positive numbers means increase in taxes and reduction in spending, we keep the revenue sign and change the expenditure sign. So the estimates we get are:

- Revenue: -0.010 in 2010; 0.033 in 2011; 0.045 in 2012
- Spending: -0.029 in 2010; 0,012 in 2011; 0,085 in 2012

In The Budget and Economic Outlook: An Update (August, 2011) it is suggested for an analysis of the Budget Control Act of 2011, to look at the Congressional Budget Office, letter to the Honorable John A. Boehner and the Honorable Harry Reid estimating the impact on the deficit of the Budget Control Act of 2011(August 1, 2011). In total, if appropriations in the next 10 years are equal to the caps on discretionary spending and the maximum amount of funding is provided for the program integrity initiatives, CBO estimates that the legislation—apart from the provisions related to the joint select committee—would reduce budget deficits by $917 billion between 2012 and 2021 ($741 billion from Discretionary Spending, $20 billion from Mandatory Spending and $156 from the Debt Service). In addition, legislation originating with the joint select committee, or the automatic reductions in spending that would occur in the absence of such legislation, would reduce deficits by at least $1.2 trillion over the 10-year period. Therefore, the deficit reduction, stemming from this legislation, would be in total at least $2.1 trillion over the 2012-2021 period (see Table 3). Those amounts are relative to CBO's March 2011 baseline adjusted for subsequent appropriation action (Source CBO Analysis of August 1 Budget Control Act (August 01, 2011)). Table 6 represents the "Effect on the Deficit of the Budget Control Act of 2011, as Posted on the Web Site of the House Committee on Rules on August 1, 2011, Relative to CBO's March 2011 Baseline, Adjusted to Reflect Enactment of 2011 Appropriations".

Table 6: Effect on the Deficit of the Budget Control Act of 2011

| | By Fiscal Year (October-September), in Billions of Dollars | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2012-2021 |
| Total Spending | | -22 | -41 | -56 | -69 | -77 | -83 | -91 | -100 | -108 | -116 | -761 |
| Change in Total Spending | | -22 | -19 | -15 | -13 | -8 | -6 | -8 | -9 | -8 | -8 | -116 |
| | By Calendar Year (January - December), in Billions of Dollars | | | | | | | | | | | |
| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2011-2021 |
| CHANGES IN SPENDING | -5.5 | -21.25 | -18 | -14.5 | -11.75 | -7.5 | -6.5 | -8.25 | -8.75 | -8 | -6 | -116 |
| Nominal GDP | 15075.7 | 15676 | | | | | | | | | | |
| Change in percent of GDP SPENDING | -0.036 | -0.136 | | | | | | | | | | |

The first line is taken from the document (see table 3 of the CBO Analysis of August 1 Budget Control Act 2011), as a sum of discretionary and mandatory spending. We do not include debt service into the total spending, since *"CBO's cost estimates for legislation do not ordinarily include effects on debt service costs, but CBO provides such estimates, when requested, for broad budget plans"*. Afterwords following the procedure described above we move towards the numbers, which can be used in our dataset. Importantly we take spending cuts as a positive number:

- Spending: 0,036 in 2011; 0,136 in 2012

So combining two sources we obtain the following adjustments:

- Revenue: -0.010 in 2010; 0.033 in 2011; 0.045 in 2012
- Spending: -0.029 in 2010; 0,048 in 2011; 0,221 in 2012

Importantly, one of the main motivation for the Patient Protection and Affordable Care Act (HR3590) with Reconciliation Act (Health Care and Education Reconciliation Act) and Budget Control Act is a deficit reduction. Following adopted methodology we put in our dataset the deficit driven adjustments, which are not offset by the long-run adjustments, or in other words summing up both motivation (deficit with long-run), we put the sum, if and only if it is not negative. So we do not include negative adjustments for year 2010 in our dataset, but we do include measures for 2011 and 2012.

## A.2 The reclassification of the shocks into plans

Beside extending the database I have disaggregated the annual database provided by Devries et al. (2011) into quarters and I have classified them into plans by explicitly separating the unanticipated, announced and implemented adjustments.

I consider a maximum horizon of three years (12 quarters), however in the empirical model maximum anticipation horizon is six quarters. I track plans in the way illustrated by Table 7 in the case of the OBRA 90 plan.

Table 7: Example of the data construction

| Date | $\tau^{u}_{i,t}$ | $\tau^{a}_{i,t,0}$ | $\tau^{a}_{i,t,1}$ | $\tau^{a}_{i,t,2}$ | $\tau^{a}_{i,t,3}$ | $\tau^{a}_{i,t,4}$ | $\tau^{a}_{i,t,5}$ | $\tau^{a}_{i,t,6}$ |
|---|---|---|---|---|---|---|---|---|
| 1990q4 | 0.26 | 0.00 | 0.29 | 0.00 | 0.00 | 0.00 | 0.17 | 0.000 |
| 1991q1 | 0.00 | 0.29 | 0.00 | 0.00 | 0.00 | 0.17 | 0.00 | 0.000 |
| 1991q2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.17 | 0.00 | 0.00 | 0.000 |
| 1991q3 | 0.00 | 0.00 | 0.00 | 0.17 | 0.00 | 0.00 | 0.00 | 0.010 |
| 1991q4 | 0.00 | 0.00 | 0.17 | 0.00 | 0.00 | 0.00 | 0.010 | 0.000 |
| 1992q1 | 0.00 | 0.17 | 0.00 | 0.00 | 0.00 | 0.010 | 0.00 | 0.000 |

OBRA was announced in 1990 with the immediate implementation of a tax adjustment of 0.08 of GDP. I consider 0.26 of GDP as an unexpected adjustment instead, because 0.18 comes from the Social Security Amendment (20.04.1983), and since it took more than three years after announcement we consider it as a surprise. Further adjustments of 0.29 of Gdp in 1991, of 0.17 of GDP in 1992, of 0.01 of GDP in 1993, etc. were announced all in year 1990 and they are considered as announced and implemented components.

## A.3 Labelling of plans

Finally, to distinguish between tax-based adjustments and expenditure-based adjustments I label plans as TB or EB by adopting the following rule

$$\begin{aligned} if \quad \left(\tau_t^u + \tau_{t,t}^a + \sum_{i=1}^{horz} \tau_{t,t+i}^a\right) &> \left(g_t^u + g_{t,t}^a + \sum_{i=1}^{horz} g_{t,t+i}^a\right) \\ then\ TB_t = 1\ and\ \ EB_t &= 0, \\ else\ TB_t = 0\ \ and\ \ EB_t &= 1, \forall\ t \end{aligned} \tag{18}$$

If the sum of unanticipated and anticipated tax component of fiscal plan in period $t$ is larger (smaller) than the sum of unanticipated and anticipated spending component, then we consider it as a tax-based plan (expenditure-based plan).

I report in Table 8 the entire series of our narrative fiscal adjustment plans

# Table 8: Classification of Fiscal Adjustments for US

a

| Date | Tax | | | | | | | | Spending | | | | | | | | Dummy | | Total | IMF | | | | RR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $\tau^u_{i,t}$ | $\tau^a_{i,t,0}$ | $\tau^a_{i,t,1}$ | $\tau^a_{i,t,2}$ | $\tau^a_{i,t,3}$ | $\tau^a_{i,t,4}$ | $\tau^a_{i,t,5}$ | $\tau^a_{i,t,6}$ | $g^u_{i,t}$ | $g^a_{i,t,0}$ | $g^a_{i,t,1}$ | $g^a_{i,t,2}$ | $g^a_{i,t,3}$ | $g^a_{i,t,4}$ | $g^a_{i,t,5}$ | $g^a_{i,t,6}$ | TB | EB | | $\tau$ | $g$ | TB | EB | $\tau_d$ | $\tau_{lr}$ |
| 1978q1 | 0.135 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.135 | 0.135 | 0.000 | 1 | 0 | 0.135 | 0.000 |
| 1978q3 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.062 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1978q4 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.062 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1979q1 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.062 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.357 | -0.767 |
| 1979q2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.062 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1979q3 | 0.000 | 0.000 | 0.000 | 0.062 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1979q4 | 0.000 | 0.000 | 0.062 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1980q1 | 0.000 | 0.062 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.062 | 0.062 | 0.000 | 1 | 0 | 0.062 | 0.000 |
| 1980q2 | | | | | | | | | | | | | | | | | | | | | | | | 0.000 | 0.300 |
| 1981q1 | | | | | | | | | | | | | | | | | | | | | | | | 0.563 | 0.134 |
| 1981q3 | 0.230 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.230 | 0.230 | 0.000 | 1 | 0 | 0.000 | -0.280 |
| 1982q1 | | | | | | | | | | | | | | | | | | | | | | | | 0.047 | -1.403 |
| 1983q1 | | | | | | | | | | | | | | | | | | | | | | | | 0.780 | -1.694 |
| 1983q3 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.210 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1983q4 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.210 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1984q1 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.210 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.318 | -0.948 |
| 1984q2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.210 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1984q3 | 0.000 | 0.000 | 0.000 | 0.210 | 0.000 | 0.000 | 0.000 | 0.096 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.201 | 0.000 |
| 1984q4 | 0.000 | 0.000 | 0.210 | 0.000 | 0.000 | 0.000 | 0.096 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1985q1 | 0.000 | 0.210 | 0.000 | 0.000 | 0.000 | 0.096 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.210 | 0.210 | 0.000 | 1 | 0 | 0.214 | 0.000 |
| 1985q2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.096 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1985q3 | 0.000 | 0.000 | 0.000 | 0.096 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1985q4 | 0.000 | 0.000 | 0.096 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1986q1 | 0.000 | 0.096 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.096 | 0.096 | 0.000 | 1 | 0 | 0.096 | 0.000 |
| 1986q4 | | | | | | | | | | | | | | | | | | | | | | | | 0.000 | 0.499 |
| 1987q1 | | | | | | | | | | | | | | | | | | | | | | | | 0.000 | -0.156 |
| 1987q3 | | | | | | | | | | | | | | | | | | | | | | | | 0.000 | -0.419 |
| 1988q1 | 0.390 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.460 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.850 | 0.390 | 0.460 | 0 | 1 | 0.531 | -0.145 |
| 1990q1 | 0.180 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 | 0 | 0.180 | 0.180 | 0.000 | 1 | 0 | 0.180 | 0.000 |
| 1990q4 | 0.080 | 0.000 | 0.290 | 0.000 | 0.000 | 0.000 | 0.170 | 0.000 | 0.070 | 0.000 | 0.290 | 0.000 | 0.000 | 0.000 | 0.270 | 0.000 | 0 | 1 | 0.150 | 0.080 | 0.070 | 1 | 0 | 0.000 | 0.000 |
| 1991q1 | 0.000 | 0.290 | 0.000 | 0.000 | 0.000 | 0.170 | 0.000 | 0.000 | 0.000 | 0.290 | 0.000 | 0.000 | 0.000 | 0.270 | 0.000 | 0.000 | 0 | 1 | 0.580 | 0.290 | 0.290 | 1 | 0 | 0.598 | 0.000 |
| 1991q2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.170 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.270 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1991q3 | 0.000 | 0.000 | 0.000 | 0.170 | 0.000 | 0.000 | 0.000 | 0.010 | 0.000 | 0.000 | 0.000 | 0.270 | 0.000 | 0.000 | 0.000 | 0.270 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1991q4 | 0.000 | 0.000 | 0.170 | 0.000 | 0.000 | 0.000 | 0.010 | 0.000 | 0.000 | 0.000 | 0.270 | 0.000 | 0.000 | 0.000 | 0.270 | 0.000 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1992q1 | 0.000 | 0.170 | 0.000 | 0.000 | 0.000 | 0.010 | 0.000 | 0.000 | 0.000 | 0.270 | 0.000 | 0.000 | 0.000 | 0.270 | 0.000 | 0.000 | 0 | 1 | 0.440 | 0.170 | 0.270 | 0 | 1 | 0.000 | 0.000 |
| 1992q2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.010 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.270 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1992q3 | 0.000 | 0.000 | 0.000 | 0.010 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.270 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1992q4 | 0.000 | 0.000 | 0.010 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.270 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1993q1 | 0.000 | 0.010 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.270 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.280 | 0.010 | 0.270 | 0 | 1 | 0.000 | 0.000 |
| 1993q3 | 0.100 | 0.000 | 0.000 | 0.330 | 0.000 | 0.000 | 0.000 | 0.180 | 0.020 | 0.000 | 0.000 | 0.070 | 0.000 | 0.000 | 0.000 | 0.090 | 1 | 0 | 0.120 | 0.100 | 0.020 | 1 | 0 | 0.342 | 0.000 |
| 1993q4 | 0.000 | 0.000 | 0.330 | 0.000 | 0.000 | 0.000 | 0.180 | 0.000 | 0.000 | 0.000 | 0.070 | 0.000 | 0.000 | 0.000 | 0.090 | 0.000 | 1 | 0 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.078 | 0.000 |
| 1994q1 | 0.060 | 0.330 | 0.000 | 0.000 | 0.000 | 0.180 | 0.000 | 0.000 | 0.380 | 0.070 | 0.000 | 0.000 | 0.000 | 0.090 | 0.000 | 0.000 | 0 | 1 | 0.840 | 0.390 | 0.450 | 0 | 1 | 0.194 | 0.000 |
| 1994q2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.180 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.090 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1994q3 | 0.000 | 0.000 | 0.000 | 0.180 | 0.000 | 0.000 | 0.000 | 0.080 | 0.000 | 0.000 | 0.000 | 0.090 | 0.000 | 0.000 | 0.000 | 0.220 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1994q4 | 0.000 | 0.000 | 0.180 | 0.000 | 0.000 | 0.000 | 0.080 | 0.000 | 0.000 | 0.000 | 0.090 | 0.000 | 0.000 | 0.000 | 0.220 | 0.000 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1995q1 | 0.020 | 0.180 | 0.000 | 0.000 | 0.000 | 0.080 | 0.000 | 0.000 | 0.180 | 0.090 | 0.000 | 0.000 | 0.000 | 0.220 | 0.000 | 0.000 | 0 | 1 | 0.470 | 0.200 | 0.270 | 0 | 1 | 0.000 | 0.000 |
| 1995q2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.080 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.220 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1995q3 | 0.000 | 0.000 | 0.000 | 0.080 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.220 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1995q4 | 0.000 | 0.000 | 0.080 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.220 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 1996q1 | 0.000 | 0.080 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.220 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.300 | 0.080 | 0.220 | 0 | 1 | 0.000 | 0.000 |
| 1997q1 | 0.060 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.240 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.300 | 0.060 | 0.240 | 0 | 1 | 0.000 | 0.000 |
| 1998q1 | -0.020 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.170 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.150 | -0.020 | 0.170 | 0 | 1 | 0.000 | 0.000 |
| 2000q1 | | | | | | | | | | | | | | | | | | | | | | | | 0.018 | 0.000 |
| 2002q1 | | | | | | | | | | | | | | | | | | | | | | | | 0.006 | -0.803 |
| 2003q3 | | | | | | | | | | | | | | | | | | | | | | | | 0.000 | -1.140 |
| 2005q1 | | | | | | | | | | | | | | | | | | | | | | | | 0.000 | 0.560 |
| 2010q2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.033 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.012 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | | |
| 2010q3 | 0.000 | 0.000 | 0.000 | 0.033 | 0.000 | 0.000 | 0.000 | 0.045 | 0.000 | 0.000 | 0.000 | 0.012 | 0.000 | 0.000 | 0.000 | 0.085 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | | |
| 2010q4 | 0.000 | 0.000 | 0.033 | 0.000 | 0.000 | 0.000 | 0.045 | 0.000 | 0.000 | 0.000 | 0.012 | 0.000 | 0.000 | 0.000 | 0.085 | 0.000 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | | |
| 2011q1 | 0.000 | 0.033 | 0.000 | 0.000 | 0.000 | 0.045 | 0.000 | 0.000 | 0.000 | 0.012 | 0.000 | 0.000 | 0.000 | 0.085 | 0.000 | 0.000 | 0 | 1 | 0.045 | 0.033 | 0.012 | 1 | 0 | | |
| 2011q2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.045 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.085 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | | |
| 2011q3 | 0.000 | 0.000 | 0.000 | 0.045 | 0.000 | 0.000 | 0.000 | 0.000 | 0.036 | 0.000 | 0.000 | 0.221 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.036 | 0.000 | 0.036 | 0 | 1 | | |
| 2011q4 | 0.000 | 0.000 | 0.045 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.221 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.000 | 0.000 | 0.000 | 0 | 0 | | |
| 2012q1 | 0.000 | 0.045 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.221 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 1 | 0.266 | 0.045 | 0.221 | 0 | 1 | | |

[a] Unanticipated adjustments, anticipated adjustments executed in quarter t,, anticipated adjustments to be executed in the quarter t+i; table does not include anticipated adjustments up to 12 quarters, since in the empirical model we choose horizon of implementation lag equal to 6, extended table is available upon the request