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EU FISCAL STANCE VULNERABILITY: ARE THE OLD MEMBERS THE GOLD MEMBERS?#

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Abstract

This paper investigates the effect of aggregate shocks on the fiscal stance of the EU, and of its old (OMS) and new (NMS) member states over a business cycle. The fiscal stance is measured by the government deficit. To study the impact of aggregate shocks, we use impulse responses derived from a pooled structural vector autoregression model estimated on annual panel data. We find that the fiscal deficits of OMS could be vulnerable to discretionary changes in government expenditures and revenues. In contrast, the fiscal stance of NMS shows vulnerability to GDP shocks, because the increase in revenues after a positive GDP shock is often outpaced by greater expenditure increases in NMS. The estimated fiscal vulnerabilities stem from disproportionate policy responses concerning government expenditures and a lacking discipline to control pro-cyclical fiscal spending. Our findings for the EU thus support application of fiscal rules focused on government expenditure rather than other fiscal variables.

Keywords: Macroeconomic Shocks, Fiscal Stance, European Union, Panel Data Analysis, Pooled Structural Vector Autoregression Model.

JEL codes: E62, H68, E37

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Table of Contents

1. Introduction

Responsible and flexible fiscal systems can help countries efficiently respond and cope with aggregate shocks, while fostering fiscal sustainability and preserving fiscal space for main government programs.

The stability and growth pact (SGP) and the Maastricht criteria are the most relevant frameworks concerning fiscal discipline and fiscal stance soundness within the European Union (EU) and the Euro Area (EA) (European Commission, 2010; von Hagen et al., 2001). With the entry to the EU, the new member countries are obliged to keep their fiscal deficits under three percent of GDP within the SGP. As they progress in their integration, the prospective EA members need to satisfy the Maastricht criteria.

EU and EA countries, however, are allowed to exercise national discretion in their fiscal responses to the shocks they face, particularly in cases of large shocks (European Commission, 2010; Orban and Szapary, 2004). The latter could help motivate the country variations in fiscal responses during the recent crisis (Spilimbergo et al., 2008). The rules versus discretion debate, historically related to monetary policy, is equally relevant for fiscal policy. The debate is further set in the context of the different degrees of fiscal stance vulnerability across EU countries concerning budget deficit (flow) and government debt (stock) positions, their composition, and cyclical and structural components (European Commission, 2010; Lane, 2010).

This paper investigates the impacts of aggregate shocks on the fiscal stance of EU countries, including by looking into the differences in the shocks' impacts across the OMS and NMS over a business cycle. The motivation for contrasting the old and new EU members' fiscal stance vulnerability to aggregate shocks comes from numerous observations in the literature that the new, less developed members may have generally worse institutional and governance frameworks, lower fiscal discipline, capacity and technical skills, less effective automatic stabilizers, and greater structural deficits and output volatility (Coricelli, Ercolani, 2002; Orban and Szapary, 2004; Zapal and Schneider, 2006; Cihak and Fonteyne, 2009; EC, 2010; Mara, 2012).

The aggregate shocks of interest include macroeconomic shocks, such as the terms of trade, GDP and CPI inflation shocks; the financial shock, approximated by unexpected changes in the interest rate; and fiscal shocks, namely the discretionary changes in government expenditures and revenues. To analyze the fiscal response to these aggregate shocks, this paper estimates a pooled structural vector autoregression (PSVAR) model encompassing basic macroeconomic, financial and fiscal variables using a data panel for EU countries. The estimated pooled SVAR model is then used to derive impulse response functions (IRFs) and study the dynamic responses of the fiscal variables, such as government expenditures, revenues and the budget deficit, to shocks identified by the model.

We find that the fiscal stance (deficits) of OMS (EA12) could be relatively more vulnerable to government expenditure and revenue shocks compared to new NMS (EU12).[1] Namely, the OMS finance discretionary expenditures by further debt accumulation, instead through revenues, and engage in excessive spending after revenue windfalls. On the other hand, the fiscal stance in NMS shows vulnerability to a GDP shock, because the increase in revenues after positive GDP shock is often outpaced by greater expenditure increases in NMS. The estimated vulnerabilities appear to stem from a disproportionate policy response, mostly on the government expenditure side, and a lacking discipline to diminish pro-cyclical fiscal spending.

Our paper fits into the literature analyzing the cyclicality and effects of fiscal policy in the EU. Recently, probably due to the impact of the financial and economic crisis, the dynamics of government budgets has been intensively analyzed in both academic and policy literature. Since the role of fiscal policy in a monetary union is crucial, a significant bulk of recent research focused on the EA. The contributions by Fatas and Mihov (2003) and Gali and Perotti (2003) are the cornerstones of the contemporary analysis of fiscal policy. In line with our results, Crespo-Cuaresma et al. (2011) show that fiscal deficits is a potential source of idiosyncratic macroeconomic fluctuations in the EU. This is because individual fiscal policies, reflecting national priorities, may become a potential source of asymmetric shocks and hinder the performance of monetary policy in a monetary union, such as the EA.

[1] The EA12 countries include Belgium, Germany, Ireland, Greece, Spain, France, Italy, Luxembourg, Netherlands, Austria, Portugal and Finland. EU12 countries include Bulgaria, The Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia and Slovakia.

Using an estimated DSGE model for the EA, Ratto et al. (2006) find empirical evidence for systematic countercyclical fiscal policy in the EA, and argue that fiscal policy can be effective in stabilizing GDP in the presence of demand and supply shocks. Turrini (2008) analyzes the cyclical behavior of fiscal policy in the EA countries and concludes that the average stance of fiscal policy is expansionary when output is above potential, thus denoting a pro-cyclical bias in good times. This finding supports our empirical evidence on the pro-cyclical character of fiscal policy in the EU, and in the NMS in particular.

The remainder of the paper is organized as follows. Section two describes the employed data and their sources. Section three describes the applied model and estimation methodology. Section four discusses the estimation results for the EU as a whole, and then separately for the pools of the old and new member states. Section five concludes.

2. Data Description

The data series for EU countries employed in our study were obtained from the AMECO database, except for the interest rate series. The latter was taken from the IMF's International Financial Statistic and, for Bulgaria and Romania, supplemented by authors' calculation based on national and IMF country desk information for the years preceding 2000. The frequency of the data series is annual covering the period 1993-2010. The detailed data description and sources are provided in Table 1.

[Table 1 Here]

The real GDP is constructed from the nominal GDP and the GDP deflator. The long-term real interest rate is obtain for most countries from the Eurostat, except for Bulgaria, the Czech Republic and Estonia for which it is taken from IMF IFS; Romania and Slovenia for which it is taken from the ECB database; and Slovakia for which it is taken from the OECD database. For the purpose of estimation, all variables are in logs. Table A1 in the Appendix provides data summary statistics for the employed data series in the panel structure.

3. Model and Estimation Methodology

We use a pooled vector autoregression (PVAR) model to estimate the impact of aggregate shocks on fiscal variables and other main macroeconomic fundamentals within the EU. The PVAR relates the macroeconomic and fiscal variables of interest to their lagged values, similarly as in Melecky and Raddatz (2011), and can be written as:

$$A_0 x_{i,t} = \sum_{j=1}^{q} A_j x_{i,t-j} + \theta_i + \theta_t + \gamma_i t_t + \varepsilon_{it} \quad (1)$$

where $x_{i,t} = (TT_{i,t}, EXP_{i,t}, GDP_{i,t}, INF_{i,t}, R_{i,t}, REV_{i,t})'$, $x_{i,t}$ is the vector of endogenous variables including the percentage change in the terms-of-trade index, the (log of) real government expenditures (EXP), GDP per capita in constant 2000 US dollars (GDP), the inflation rate (INF), nominal interest rate (R), and government revenues (REV).

The main focus of the paper is on budget deficits and EXP and REV, and we include GDP, inflation and interest rates in the vector of endogenous variables as controls for other macroeconomic conditions and to identify macroeconomic and financial shocks of interest. This set of variables includes all the conventional macroeconomic variables typically included in macroeconomic models (see Monacelli (2005), Linde et al (2009), and Adolfson (2001), among others). The parameters θ_i and θ_t are country and year fixed-effects that capture long run differences in all the variables across countries, and the impact of global factors that are common to all countries in the sample and can be understood as the world business cycle. The coefficient g_i captures a country-specific trend. The residual term $\varepsilon_{i,t}$ corresponds to an error term that is assumed to be *i.i.d* ~ (0, σ).

The number of lags, q, is set to two. This is despite the indication of the conventional lag length selection criteria (Akaike and Schwartz information criteria) that one lag could be optimal for the VAR at hand. To ensure a satisfactory diagnostic of the estimated residuals, specifically to reduce their autocorrelation, we find that the VAR(2) specification is more appropriate in our case.[2] The model parameters are contained in matrices A_j, and the

[2] We do not report the results here to save space. However, they are available from the authors upon request. We test the implications of this modeling choice for our baseline estimation results in the robustness analysis.

structural interpretation of the results depends on the identification of the parameters of the contemporaneous matrix A_0. Although we are interested in analyzing the impulse response function for the government deficit, we do not include it explicitly as a variable into the model. The model includes logs of expenditures and revenues, which are by definition always positive. The logged government deficit is constructed based on the dynamics of the two variables and their steady state (average) shares in the deficit in the studied countries.

The main identification assumption imposes a diagonal structure on the A_0 matrix. This implies that the terms of trade respond to other macroeconomic variables only with a lag. This is a conventional assumption implying that all countries in our sample are small open economies and price takers in international trade. Further, output, inflation, interest rates and revenues respond contemporaneously to changes in expenditures, but government expenditures respond to changes in a country's macroeconomic conditions and fiscal revenues only after a year. Similarly, revenues are assumed to respond contemporaneously to changes in expenditures, GDP, inflation, and interest rates, but these variables respond to shocks to revenues only with a one year lag.

The assumptions on the ordering of fiscal variables relative to GDP are similar to those in Blanchard and Perotti (2002) and Ilzetzki et al. (2010), but the use of annual data makes them more controversial. Although one may reasonably argue that expenditures are planned on an annual basis and do not respond to a contemporaneous quarterly innovations in GDP, assuming that they do not respond to innovations to GDP within the calendar year could be more extreme. We will assess this ordering assumption and its implications for our results in the robustness analysis.

The ordering of inflation and interest rates relative to output also follow the standard ordering in the monetary policy literature (Christiano et al., 1998). The identification assumptions translate into the following matrix of contemporaneous relations (A_0),

$$A_0 = \begin{bmatrix} a_{1,1} & 0 & 0 & 0 & 0 & 0 \\ 0 & a_{2,2} & 0 & \cdots & \cdots & 0 \\ 0 & a_{3,2} & a_{3,3} & 0 & \cdots & 0 \\ 0 & a_{4,2} & \vdots & a_{4,4} & 0 & 0 \\ 0 & a_{5,2} & \vdots & \vdots & a_{5,5} & 0 \\ 0 & a_{6,2} & a_{6,3} & a_{6,4} & a_{6,5} & a_{6,6} \end{bmatrix} \quad (2)$$

The model described in equation (1) corresponds to a PVAR, because we assume that the dynamics, represented by the different parameters and matrices, are common across the different cross-sectional units (countries) included in the estimation, which are indexed by i. This is a standard assumption in this literature (see Broda (2004); Uribe and Yue (2006)) because, given the length of the time series dimension of the data (around 20 annual observations), it is not possible to estimate country-specific dynamics unless we reduce importantly the number of exogenous shocks under consideration, the number of lags, or both. However, as noticed by Robertson and Symons (1992), and Pesaran and Smith (1995), this assumption may lead to obtaining coefficients that underestimate (overestimate) the short (long) run impact of exogenous variables if the dynamics differ importantly across countries.

We estimate the parameters of equation (1) by SURE[3], assuming the data series of the PVAR are trend stationary in levels. The performed panel unit root test reported in Table A2 supports this hypothesis. An exception is the possible non-stationary behavior of the GDP series. We address this issue in our robustness analysis by estimating the model including GDP growth. It has to be emphasized, however, that even though we employ the panel data unit root tests, a test of whether a series is stationary still relies on the time-series dimension. Our panel is rather short in this respect, at about 20 observations of annual data on average. Therefore, unit root tests with the null hypothesis of stationarity lack the size to confirm the null, and tests with the null of non-stationarity lack the power to reject the null in such a small time-series sample. Overall, what matters is that the residuals of the estimated PVAR are

[3] The use of SURE is standard for the estimation of the reduced form equation. It is equivalent to estimating the model equation by equation by OLS, but is more efficient because it takes into account contemporaneous correlations among variables. It also directly estimates the variance-covariance matrix of reduced-form residuals. We use only the two-step version of the estimator for reasons of speed, but when iterated until convergence the SURE estimators are equivalent to the maximum likelihood estimators.

stationary and well behaved. The latter is confirmed based on the results reported in Figure A1 in the Appendix.

The estimated PVAR and its parameters are then used to recover the impulse-response functions (IRFs) of the endogenous variables in equation (1) to the structural shocks of interest, using the variance-covariance matrices of reduced form errors derived from these coefficients. The confidence bands for the IRFs come from parametric bootstrapping on the model assuming normally distributed reduced form errors. The constructed IFRs are with respect to shocks of one standard deviation, i.e. shocks of the same probability and not necessarily of the same size.

4. Discussion of Estimation Results

4.1. The EU Estimation Results

Table 2 reports the PVAR reduced-form estimates. All variables show significant positive autocorrelation (persistence), with the GDP one being the highest (0.877), and the one of the government expenditure being the lowest (0.292). Except for inflation and the interest rate, the second autocorrelation is negative for all variables. One may thus reasonably expect that GDP will show the most persistent impulse responses to shocks. In accord with the identification assumption, the terms of trade dynamics, in column one of Table 2, is not influenced by other domestic variables.

Government expenditures and the remaining variables in the system are, in addition to their lagged values, significantly influenced by other variables in the system. Their effects at the first and second lags go often in opposite directions, so it is useful to look at their long-run effect, i.e. when setting the pertinent lag operators to one. Government expenditures are affected by the terms of trade, $TT_{i,t}$, in a negative way as the second lag negative influence dominates in the long run. The long-run effect of inflation on government expenditure is also negative due to the negative second lag coefficient.

GDP is significantly influenced by government expenditure, suggesting a crowding-out effect at the first lag. Also inflation influences GDP with opposite effects at the first and second lag, where the magnitude of the second lag coefficient determines the inflation's negative effect on GDP in the long run. Consistent with a potential crowding-out effect on GDP and thus aggregate demand, government expenditure also affect negatively inflation at the first lag. Also the terms of trade are estimated to have a negative effect on inflation at the second lag. On the other hand, GDP (at the second lag) and government revenues (at the first lag) have positive effects on inflation, as rising aggregate demand pushes inflation up and increases in taxes or tax rates can have a complementing positive cost-push effect on inflation.

Government revenues are, in the long run, positively influenced by the terms of trade, GDP as well as the interest rate. The interest rate is influenced significantly and in a positive manner by the terms of trade. Finally, government revenues are negatively affected by government expenditures and inflation, and positively influenced by GDP, in the long run. Overall, the terms of trade, government expenditure, GDP and inflation appear to be the most significant drivers of the system's dynamics. The PVAR reduced-form estimates predetermine the direction and shape of the impulse response functions (IRFs) that we discuss next.

[Table 2 Here]

Figure 1 shows the estimated impulse response functions (IRFs) of the government deficit, government expenditure and government revenue to shocks that the model identified from data based on its structure and coefficient estimates. The mean IRFs are depicted by a solid line and their corresponding one-standard-deviation confidence intervals by dashed lines. We do not report the IRFs for the remaining endogenous variables for the sake of brevity, but these estimates are available from the authors.

Consider the first row of Figure 1 which shows the IRFs of the government deficit to the terms of trade shock, the government expenditure shock (the discretionary changes in government expenditure), the GDP shock, the CPI inflation, the interest rate shock, and the government revenue shock (the discretionary changes in government revenue). We find that government deficits of the EU countries respond significantly to shocks in the terms of trade, government expenditure, GDP, the interest rate and government revenues. In contrast, the deficit response to the CPI shock is insignificant. We will now discuss the IRFs of government deficits in the EU to each shock of interest in more detail, including by looking into the IRFs of government expenditures and revenues to the shocks. We do so by considering each column of Figure 1 in turn.

[Figure 1 Here]

Consider the first column of Figure 1. A positive terms of trade shock induces increase in government revenues and only an insignificant and short-lived increase in government expenditures. The contained response of the expenditures, on the back of increasing revenues, allows for a decline in the government deficit by about 5 percent from the initial (steady state) level.

The second column of Figure 1 shows that, the discretionary increase in government expenditures (the shock) seems to be to some extent financed by rising government revenues. This revenue financing is not big enough, however, to fully offset the discretionary increase in expenditures. Namely, EU countries accumulate, on average, significant deficits (increasing by about 11 percent) because the increase in their expenditures is about two times bigger than the revenue increase. Discretionary increases in government spending can thus pose a major challenge for sustainable fiscal stance.

A positive GDP shock increases government revenues in EU countries by about 18 percent from their initial levels. This revenue increase is significantly greater than the amount by which EU countries raise their expenditures in boom times. This ensures that the positive GDP shock lowers government deficits in EU countries. Nevertheless, one can observe that the expenditure increase in response to rising revenues is still large, and raises a question about whether more savings for rainy days could be achieved by EU governments when faced with transitory revenue windfalls.

Government revenues decline significantly after an inflationary shock (fourth column of Figure 1) as the input price increase holds back production, and more expensive final consumption could pull back also consumer expenditure. This decline in revenues occurs in spite of the possible positive effect of increasing prices on revenues in EU countries with progressive income tax schemes. Perhaps also in light of this development, EU governments reduce their expenditures after an unexpected increase in inflation, producing an insignificant change in the government deficit.

Consider the second last column of Figure 1. After a positive interest rate shock, government revenues tend to decline with about five year lag but rather insignificantly. Nevertheless, in combination with the estimated significant (transitory) increase in government expenditure, as a result of the increased debt servicing cost, the estimated impact of the interest rate shock on the deficit is significantly positive. Namely, the interest rate shock causes government deficits to increase, on average in the EU, by about ten percent from their initial levels.

Finally, as shown in the last column of Figure 1, a discretionary increase in government revenues raises government revenues, as expected, by about 10 percent from their initial levels. At the same time, EU countries manage to contain their expenditures to rise only temporarily and insignificantly in the medium term. This helps the EU governments achieve lowering of government deficits by about 10 percent.

4.2. Robustness Analysis

When testing the robustness of our baseline results, we first turn to assessing the implications of the possible unit root in the GDP data series. This possibility has been indicated by the results of panel data unit root test in Table A2. For this, we replace the log of GDP level in equation (1) by the first difference of the logarithm. We re-estimate the PVAR and compare the derived IRFs to the baseline ones. The results are reported in Figure A2 in the Appendix.

We find no material implication of using GDP growth instead of GDP level for our baseline results. The only two minor exceptions are: (i) the response of government revenues to the terms of trade shock that changes from significantly positive to insignificant, and (ii) the response of government expenditure to the government revenue shock stays positive but increases in significance. Neither of the two have any implication for the results concerning the estimated responses of government deficit. This finding can be explained by at least three trends being present in the PVAR, including the deterministic time trend, were just one is enough to detrend any left-had side variable that could have a trend included in it. Taking the trend out of the GDP before the PVAR estimation, by differencing, may thus have no implication on what is happening in the model. This interpretation is consistent with our finding.

Second, given that the conventional lag selection criteria indicated optimal choice of one lag for the VAR, we test the robustness of our baseline results based on two lags next. We reestimate the PVAR with one lag and report the resulting IRFs in Figure A3 in the Appendix. The results are not materially different from those obtained with two lags. The only noticeable difference is the short-lived negative impact of the terms of trade on the budget deficit (first column, first row of Figure A3), compared with the significant negative response of the budget deficit to the terms of trade shock in the baseline estimation.

Third, we assess the robustness of our baseline results to the chosen ordering and shock identification structure. Here, we are most concerned with the robustness of our results to different ordering of the government revenues. As discussed in Section 3, the prevailing practice in the literature to order revenues after expenditures and GDP may be questioned in the case of annual data, because changing revenues can influence government expenditure within the fiscal year. This can happen, for instance, if the government experiences significant revenue shortfall in the first half of the year, revises its revenue forecast downwards, and call for a midyear budget revision. Indeed, many countries have this possibility and have followed this procedure in the past.

We thus change the ordering of the variables so that government revenues are ordered before GDP and government expenditures, making it possible for them to influence both GDP and expenditures contemporaneously. We re-estimate the PVAR by SURE and construct the resulting IFRs, which are reported in Figure A4 in the Appendix. There are two material implications of the change in ordering, namely, for the responses of government deficit to the GDP and government revenue shocks: (a) note that the IRF of the government deficit to the GDP shock becomes insignificant by comparing the IRFs plotted in the first row, third column of Figure A4 and of Figure 1. This insignificance arises because, under the alternative ordering of variables, the positive response of government revenues to the GDP shock is much weaker relative to the response of government expenditures to the GDP shock. When investigating origins of the change in the estimation result further, we find that it is the ordering of government revenues before GDP that generates this result.

(b) note that the response of government deficit to the revenue shock changed its direction and became significantly positive, as opposed to significantly negative as in our baseline results. Compare the IRFs plots in the first row, last column of Figure A4 and of Figure 1. While the IRF of government revenue increases about twofold under the alternative ordering, the IRF of government expenditure increases several folds and becomes highly significant. When investigating origins of the change in estimation results, we find that ordering the government revenues before government expenditures drives this change, not the ordering of government revenues before GDP.

Overall, the alternative ordering of government revenues has a material effect on two out of six results of our interest. Note that our finding that the reordering matters gives us some assurance that there is enough information in the data to credibly identify and distinguish our aggregate shocks of interest. Nevertheless, for the two result materially affected by the reordering, we may need to be cautious in our interpretations of the IRFs. Qualifications are thus warranted concerning periods of uncertain revenues and substantial fiscal austerity measures, i.e. typically in severe (abnormal) downturns of the business cycle. We believe that our baseline ordering is still more appropriate for the purpose of our study that is to investigate fiscal responses and stance over a business cycle rather than in times of crises. In other words, we focus on times when countries exercise less fiscal discretion and adhere more to the rules of their fiscal frameworks.

4.3. Comparing the Pools of Old (OMS) and New (NMS) EU Member States

A number of studies in the literature made the observation that the fiscal frameworks of the OMS and NWS still differ significantly despite increased efforts for their harmonization. Some studies refer to the scarcity of technical skills necessary for implementation of advanced fiscal frameworks and issues with budgetary planning as major challenges particularly in some NMS (EC, 2010, p. 104, 114). Other studies refer to lower fiscal discipline, and higher structural deficit and output volatility as the challenges for the NMS in meeting the Maastricht fiscal criterion (Cihak and Fonteyne, 2009, p. 22-23, Coricelli, Ercolani, 2002).

Further, Orban and Szapary (2004) argue that NMS may not be able to rely so much on automatic stabilizers to smooth their budget throughout the cycle. On the other hand, the

OMS have a higher tax burden with progressive income taxation, a high degree of spending because the welfare state is more developed, and also public indebtedness is higher (Mara, 2012). Zapal and Schneider (2006) discuss fiscal policy positions of the NMS and OMS and argue that the two groups of countries differed in the vigor with which they controlled spending programs (notably public employee compensation), indicating that NMSs performed worse comparing to the OMS. This could suggest that the OMS and NMS as groups can have distinct capacity to respond and cope with aggregate shocks using their fiscal policy.

To complement the evidence from the literature on the possible differences across the OMS and NMS, in the areas of public governance and fiscal discipline, we plot the development of government effectiveness from the Worldwide Governance Indicators and the European Commission's Fiscal Rule Index for selected 12 NMS and 12 OMS (see Table A1 on the country selection). Namely, we plot median and the 25^{th} and 75^{th} percentiles of the cross-country distribution for each of the groups over time.

[Figure 2 Here]

Government effectiveness seems to have been generally greater in the OMS than NMS, though significance of this difference has diminished as of 2006. This is owing to the notable decline of the lower (25^{th}) percentile of the OMS's cross-country distribution, as government effectives of the underperformers among the OMS (Greece, Italy, Spain) has further deteriorated. Fiscal discipline has been generally higher in the OMS compared with the NMS, based on the relative development of the fiscal rule index for NMS and OMS. Nevertheless, this difference does not seem to be significant due to the overlap of the overperformers from the NMS and underperformers from the OMS.

Based on the above motivation, we find it interesting to investigate the differences in fiscal response to and coping with aggregate shocks between NMS and OMS. Due to data availability constraints, we focus on the selected groups of EA12 (OMS) and EU12 (NMS) countries, as listed in Table A1 in the Appendix. We reestimate the PVAR model for the EA12 and EU12 groups and derive the resulting IRFs. Figure 3 shows the comparison of IRFs of government deficit, expenditure and revenue to the structural shocks identified by the estimated SPVARs for EA12 and EU12 countries. The impulse responses for EA12 are depicted by the solid lines with their one-standard-deviation confidence intervals described by the associated dashed lines. The IRFs for EU12 are then described by the circle lines where again the solid circle line depicts the mean response and the dashed circle lines show the associated confidence intervals. A significant difference in IRFs occurs when the IRFs, and their confidence intervals for, EA12 and EU12 countries do not overlap.

Consider for instance the first column of Figure 3 which describes the impact of the terms of trade shock on the fiscal variables of interest. Since, in the second and third panel, the bands delineated by the IRF confidence intervals overlap we can concur that there is no significant difference between the EA12 and EU12 in the responses of government expenditures and revenues to terms of trade shocks. However, the responses of EA12 and EU12 deficits to the term of trade shock show a significant difference. While, for the EU12, both the response of government expenditures and revenues to the terms of trade shock is not different from zero, for the EA12, the response of revenues is significantly positive. As a result, after a positive terms of trade shock, the EA12 countries on average reduce their deficits, while the EU12 countries' deficits remain unaltered. From now on we will discuss only the IRFs in Figure 3 for which we find significant differences between the EA12 and EU12.

Consider the second column of Figure 3, namely the last panel in that column, which shows significantly higher response of government revenues in EU12 than in EA12 after a discretionary increase in government expenditure (shock). Consequently the first panel of that column shows greater increase in government deficit in response to the government expenditure shock. This can lead to a conjecture that discretionary increases in government expenditure are financed to a significant extent by increases in government revenues in EU12 countries, whereas, in EA12 countries, they are financed by new borrowings (debt). This could make the EA12 countries' fiscal stance more vulnerable to government expenditure shocks.

The IRFs in the third column suggest that a positive GDP shock increases revenues more prominently in EU12 than in EA12 (last panel). However EU12 tends to raise their government expenditures in view of increasing income while EA12 uses the increased revenues to significantly decrease their fiscal deficits and improve the fiscal stance. This results in a significantly different dynamics of fiscal deficits in the EA12 and EU12 after a positive GDP shock, which makes the EU12 more vulnerable, especially in the medium term.

[Figure 3 Here]

Consider now the fourth column which, in the last panel, shows that the responses of government revenue to an inflation (supply) shock differ significantly across the EA12 and EU12. Namely, as prices increase in the EA12, so do the revenues because the tax base presumably increases as well. On the other hand, in the EU12, the price shock propagates as a negative supply shock, lowering the economy's income, the tax base and government revenues. Despite these contrasting differences in the reaction of revenues, the fiscal deficit does not respond significantly to the shock in either of the two country groups. This is mainly due to a counterbalancing decrease in government expenditures in EU12, and a great uncertainty about the response of government expenditures in EA12.

Since there are no significant differences detected by our estimates in regards to the response of the fiscal variables to an interest rate shock, we proceed with discussing the impact of the government revenue shock. These impacts are described in column six. The corresponding IRFs suggest that, after a discretionary increase in (one-standard deviation shock to) government revenues, the EA12 increase their government expenditure, while EU12 tend to decrease their government expenditures. This results in significantly greater reduction of government deficits in EU12 than in EA12. For the EA12, this positive effect of lowering government deficit is neutralized in the medium term, as the cumulative impact on the fiscal deficit returns to zero. This indicates vulnerability of the fiscal stance in EA12 countries to a positive revenue shock.

Overall, we find that the fiscal stance of EA12 could be relatively more vulnerable to discretionary changes in government expenditures and revenues compared to EU12. This is because of the EA12 inability to finance discretionary expenditure increases by revenues and the excessive expenditure responses after revenue windfalls. On the other hand, the fiscal stance in EU12 could be relatively more vulnerable to a GDP shock. The estimated vulnerabilities could stem from a disproportionate policy response mostly on the government expenditure side and a lacking discipline in regards to containing pro-cyclical fiscal spending. This could provide an argument for advocating fiscal rules focused on government expenditure (IMF, 2009; Kopits, 2004).

5. Conclusion

This paper studied the impact of macroeconomic, financial and fiscal shocks on government revenues, expenditures and deficits of the OMS and NMS of the EU. The study was carried out with the use of estimated pooled SVAR model on EU countries panel data.

We found that government revenues increase after the terms of trade, government expenditure, GDP and government revenue shocks. In contrast, they tend to decline after the price shock. The EU countries get into deficit positions after a discretionary increase in government expenditure despite some financing of this increase from additional government revenues. This is because the increase in their expenditures is about two times bigger than the additionally raised revenues. On aggregate, the EU countries are able to raise more revenues after a positive GDP shock while limiting their expenditures. This ensures that the positive GDP shock lowers government deficits in the EU. Similarly, a discretionary increase in government revenues tends to be accompanied by restrained fiscal expenditures, and this helps lower government deficits. However, after a positive interest rate shock, the combination of an increase in government expenditure with declining revenues in the medium-term makes the deficit grow significantly.

When comparing the responses of fiscal variables for the OMS and the NMS of the EU, we find that the fiscal stance of the OMS could be relatively more vulnerable to government expenditure and revenue shocks compared with the NMS. Further, we find OMS' vulnerability to expenditure shocks. It appears that discretionary increases in government expenditure could be financed by new borrowings (debt) as opposed to additional revenue collection, and this worsens OMS' fiscal stance. Moreover, our results reveal OMS' vulnerability to fiscal revenue shocks. It arises because the OMS increase their government expenditure after a discretionary increase in government revenues.

On the other hand, the fiscal stance in the NMS could be relatively more vulnerable to a GDP shock, as the resulting increase in revenues is often outpaced by greater expenditure increases in the NMS. The estimated vulnerabilities could stem from a disproportionate policy response, mostly on the government expenditure side, and lacking discipline to restrain pro-cyclical fiscal spending. Our findings for the EU thus support application of fiscal rules focused on government expenditure rather than other fiscal variables.

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Tables (Main Text)

Table 1: Employed Data Series and Their Sources

Variable	Source	Notes
Terms of Trade	Terms of trade goods and services	year 2000=100
Government Expenditures	Total expenditure: general government	Mrd EUR; ESA 1995
Government Revenue	Total revenue: general government	Mrd ECU/EUR; ESA 1995
Nominal GDP	Gross domestic product at current market prices	Mrd ECU/EUR
GDP Deflator	Price deflator gross domestic product at market prices	year 2000 = 100
CPI	Harmonised consumer price index (All-items)	year 2005 = 100
Interest Rate	long term real interest rate >5 years, various sources	Eurostat, IMF IFS, Haver Analytics, Bloomberg, ECB, OECD

Source: AMECO, IMF IFS, and authors computation

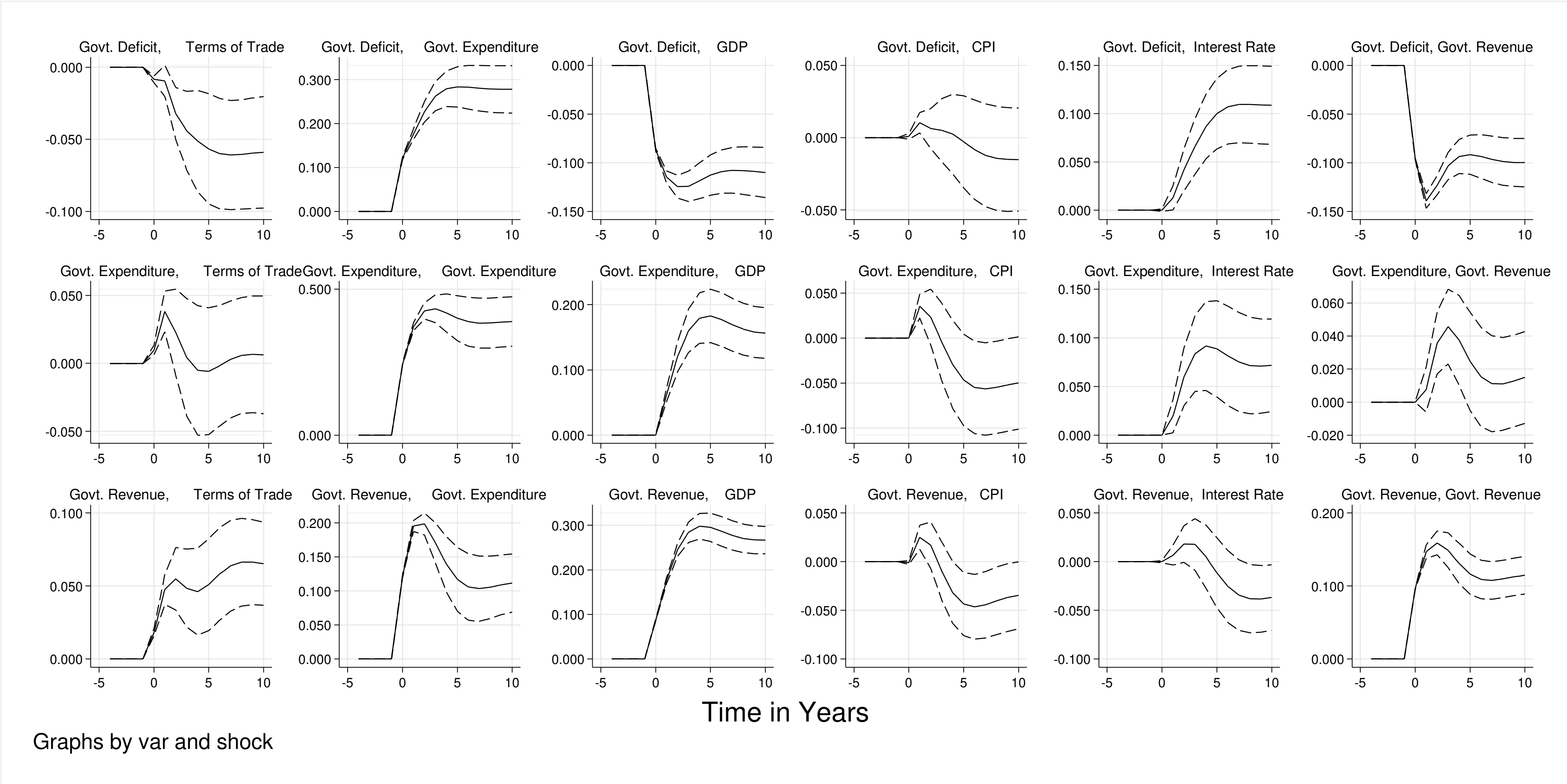
Table 2: Estimated Reduced-Form VAR for the EU

	$TT_{i,t}$	$EXP_{i,t}$	$GDP_{i,t}$	$INF_{i,t}$	$R_{i,t}$	$REV_{i,t}$
$TT_{i,t-1}$	0.554	0.127	-0.037	0.073	7.155	0.108
	(0.050)***	(0.178)	(0.133)	(0.048)	(1.400)***	(0.157)
$EXP_{i,t-1}$	0.000	0.292	-0.179	-0.047	0.441	-0.138
	(0.000)	(0.082)***	(0.060)***	(0.022)**	(0.627)	(0.072)*
$GDP_{i,t-1}$	-0.000	0.413	0.877	-0.033	-0.498	0.397
	(0.000)	(0.123)***	(0.090)***	(0.033)	(0.936)	(0.108)***
$INF_{i,t-1}$	-0.000	0.545	0.241	0.342	-2.007	0.489
	(0.000)	(0.198)***	(0.145)*	(0.053)***	(1.506)	(0.174)***
$R_{i,t-1}$	0.000	0.011	-0.002	0.002	0.335	0.005
	(0.000)	(0.008)	(0.006)	(0.002)	(0.063)***	(0.007)
$REV_{i,t-1}$	0.000	0.066	0.086	0.068	-0.316	0.530
	(0.000)	(0.105)	(0.077)	(0.028)**	(0.798)	(0.092)***
$TT_{i,t-2}$	-0.205	-0.408	-0.021	-0.097	-3.185	-0.217
	(0.053)***	(0.181)**	(0.135)	(0.049)**	(1.423)**	(0.159)
$EXP_{i,t-2}$	-0.000	-0.062	-0.088	-0.014	-0.725	-0.121
	(0.000)	(0.086)	(0.063)	(0.023)	(0.655)	(0.076)
$GDP_{i,t-2}$	0.000	-0.259	-0.094	0.079	1.696	0.027
	(0.000)	(0.129)**	(0.094)	(0.035)**	(0.980)*	(0.113)
$INF_{i,t-2}$	-0.000	-0.645	-0.528	0.004	-0.396	-0.587
	(0.000)	(0.162)***	(0.119)***	(0.044)	(1.236)	(0.143)***
$R_{i,t-2}$	-0.000	0.015	0.001	-0.000	0.093	0.005
	(0.000)	(0.009)*	(0.007)	(0.002)	(0.068)	(0.008)
$REV_{i,t-2}$	-0.000	0.121	-0.094	-0.026	-0.590	-0.211
	(0.000)	(0.108)	(0.080)	(0.029)	(0.826)	(0.095)**

Source: Authors' calculation. Note: * p<0.1; ** p<0.05; *** p<0.01; we do not report the coefficient estimates for cross-section and time-series dummy variables and the constant for brevity.

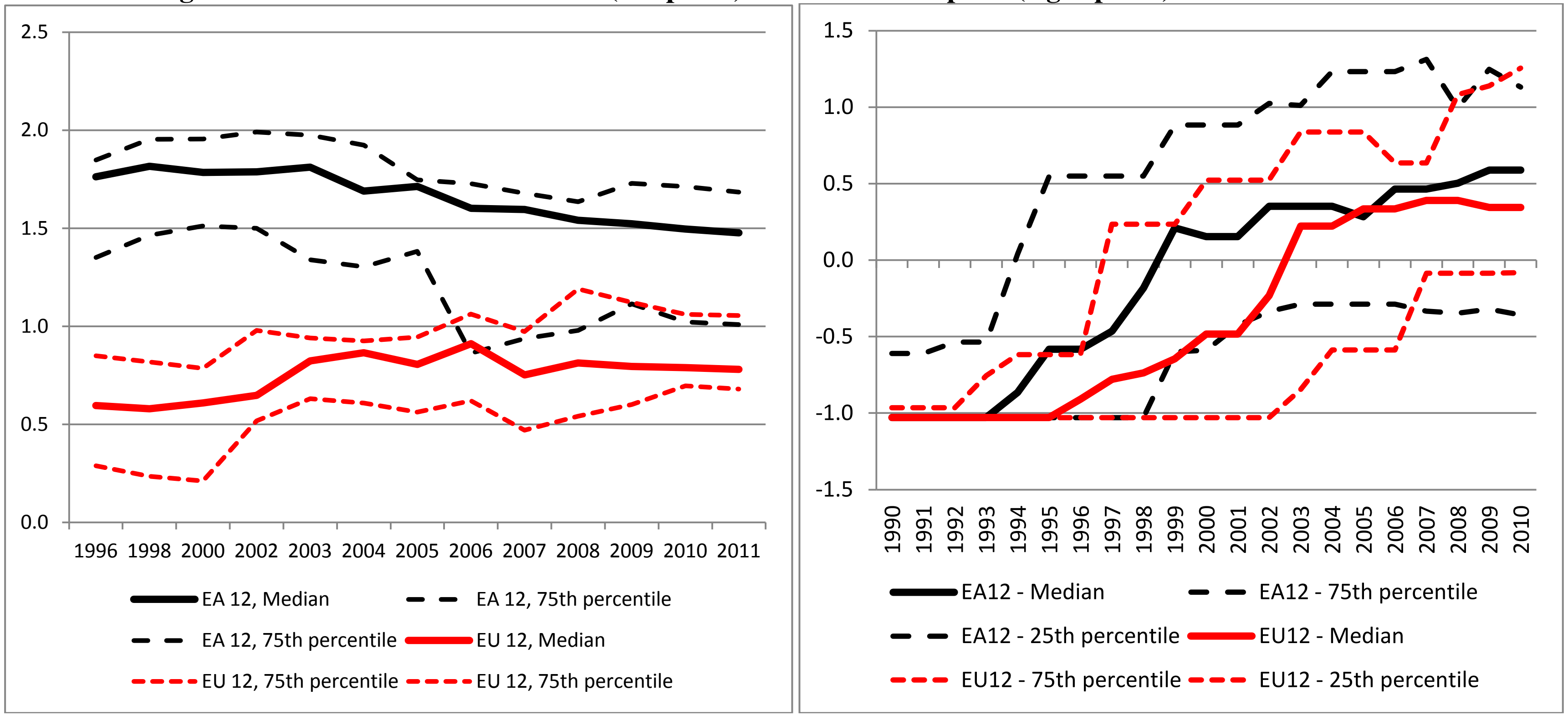
Figures (Main Text)

Figure 1: Cumulative Impulse Responses based on PSVAR Estimated for the EU



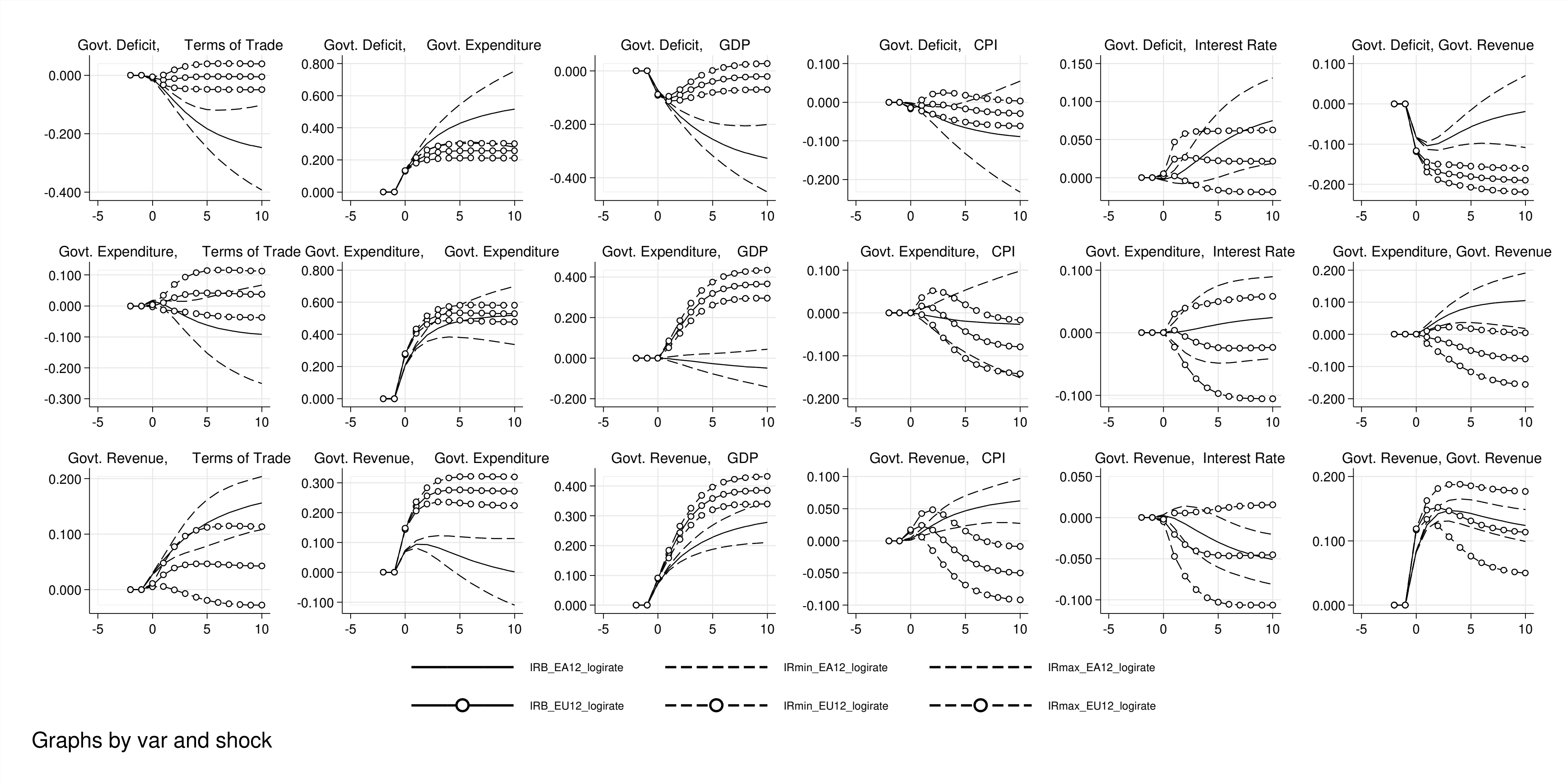
Source: Authors' calculation

Figure 2: Government Effectiveness (left panel) and Fiscal Discipline (right panel) in EU12 and EA12



Source: Government Effectiveness, Worldwide Governance Indicators, 2012 Update (left panel); European Commission's Fiscal Rule Index, 2010.

Figure 3: Comparison of Cumulative IRFs for the Old and New EU Member Groups



Source: Authors' calculation

Appendix

Table A1: Summary Statistics of Employed Data Series Across Countries

	Averages					EU Membership	
Country	GDP per capita	Revenues to GDP	Expenditures to GDP	Deficit to GDP	Number of observations	EA 12	EU 12
Austria	14854	0.49	0.52	-0.03	22	•	
Belgium	14516	0.47	0.52	-0.05	20	•	
Bulgaria	2443	0.38	0.39	-0.01	14		•
Cyprus	8046	0.37	0.40	-0.03	14		•
Czech Rep	7810	0.40	0.45	-0.05	13		•
Denmark	18733	0.53	0.53	0.00	22		
Estonia	6689	0.39	0.38	0.01	15		•
Finland	15155	0.51	0.50	0.02	22	•	
France	14218	0.49	0.52	-0.03	21	•	
Germany	15202	0.44	0.46	-0.02	16	•	
Greece	7832	0.37	0.46	-0.08	17	•	
Hungary	5067	0.44	0.50	-0.05	14		•
Ireland	13722	0.38	0.42	-0.04	17	•	
Italy	11908	0.43	0.50	-0.07	22	•	
Latvia	4784	0.35	0.37	-0.02	12		•
Lithuania	4863	0.34	0.38	-0.04	12		•
Luxembourg	28758	0.42	0.40	0.02	16	•	
Malta	5678	0.38	0.43	-0.05	14		•
Netherlands	15295	0.48	0.51	-0.03	22	•	
Poland	4246	0.40	0.45	-0.05	14		•
Portugal	6392	0.35	0.40	-0.05	22	•	
Romania	2742	0.33	0.36	-0.04	8		•
Slovakia	6704	0.38	0.45	-0.07	16		•
Slovenia	12070	0.43	0.47	-0.03	11		•
Spain	9162	0.38	0.41	-0.03	16	•	
Sweden	17710	0.56	0.57	-0.01	18		
UK	13185	0.41	0.45	-0.04	22		

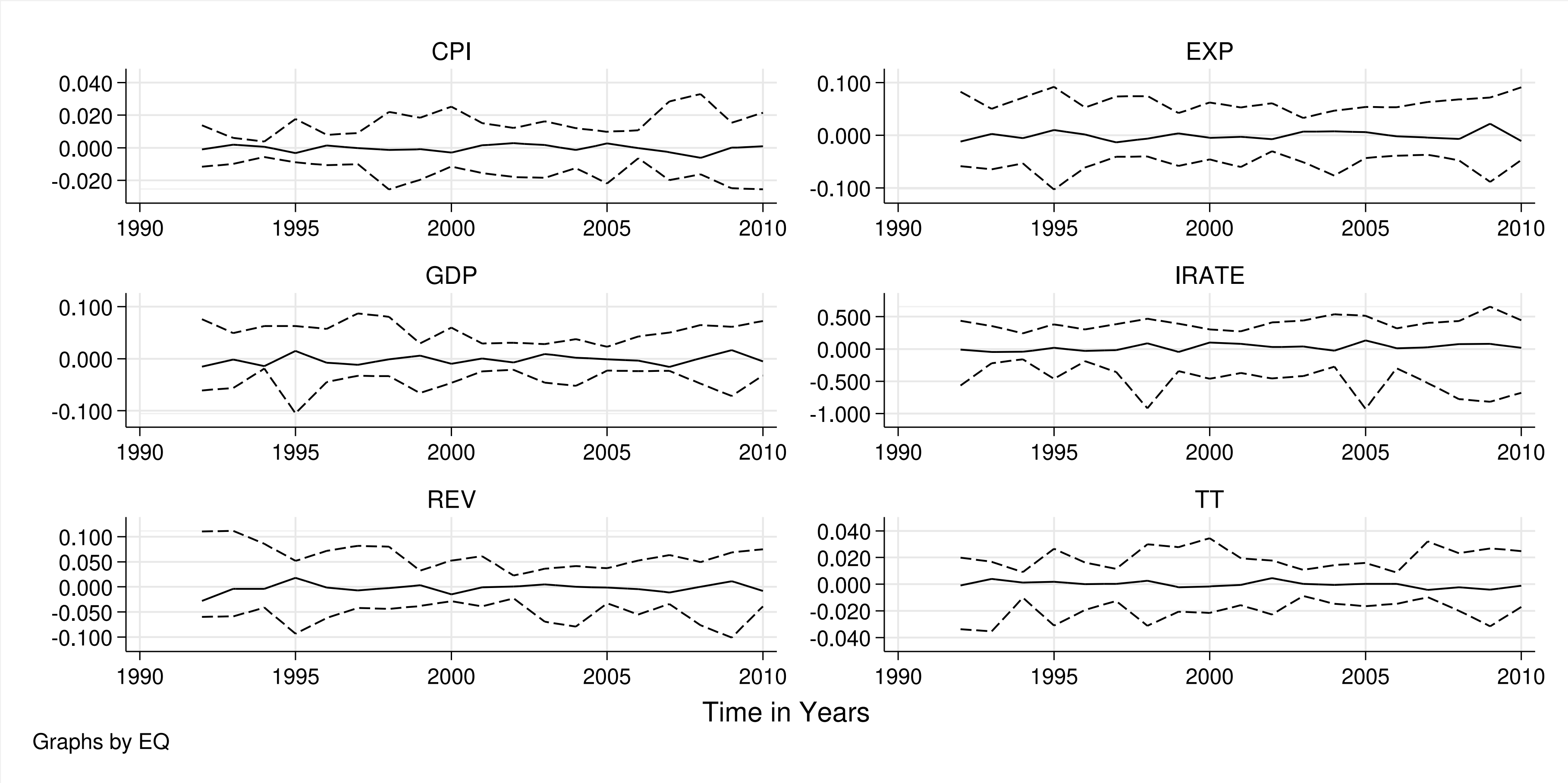
Source: Authors' Calculations

Table A2: Results of Panel Unit Root Tests

	Im-Pesaran-Shin				Dickey Fuller				Perron		
	r(N)	r(Z)	r(p_Z)		r(N)	r(Z)	r(p_Z)		r(N)	r(Z)	r(p_Z)
$GDP_{i,t}$	1030	-1.53	0.06		1057	1.79	0.96		1057	-0.36	0.36
$EXP_{i,t}$	704	-5.06	0.00		731	-4.50	0.00		731	-4.47	0.00
$REV_{i,t}$	704	-2.95	0.00		731	-3.24	0.00		731	-0.79	0.22
$INF_{i,t}$	515	-4.47	0.00		542	-4.18	0.00		542	-8.56	0.00
$R_{i,t}$	704	-4.55	0.00		734	2.38	0.99		734	-2.59	0.00
$TT_{i,t}$	1014	-4.61	0.00		1041	-2.27	0.01		1041	-1.79	0.04
$\Delta GDP_{i,t}$	1003	-13.92	0.00		1030	-19.96	0.00		1030	-19.96	0.00
$\Delta EXP_{i,t}$	677	-11.93	0.00		704	-17.85	0.00		704	-17.85	0.00
$\Delta REV_{i,t}$	677	-10.55	0.00		704	-14.23	0.00		704	-14.23	0.00
$\Delta INF_{i,t}$	488	-8.38	0.00		515	-12.81	0.00		515	-12.81	0.00
$\Delta R_{i,t}$	677	-13.53	0.00		668	-23.04	0.00		668	-23.04	0.00
$\Delta TT_{i,t}$	987	-17.78	0.00		1014	-26.90	0.00		1014	-26.90	0.00

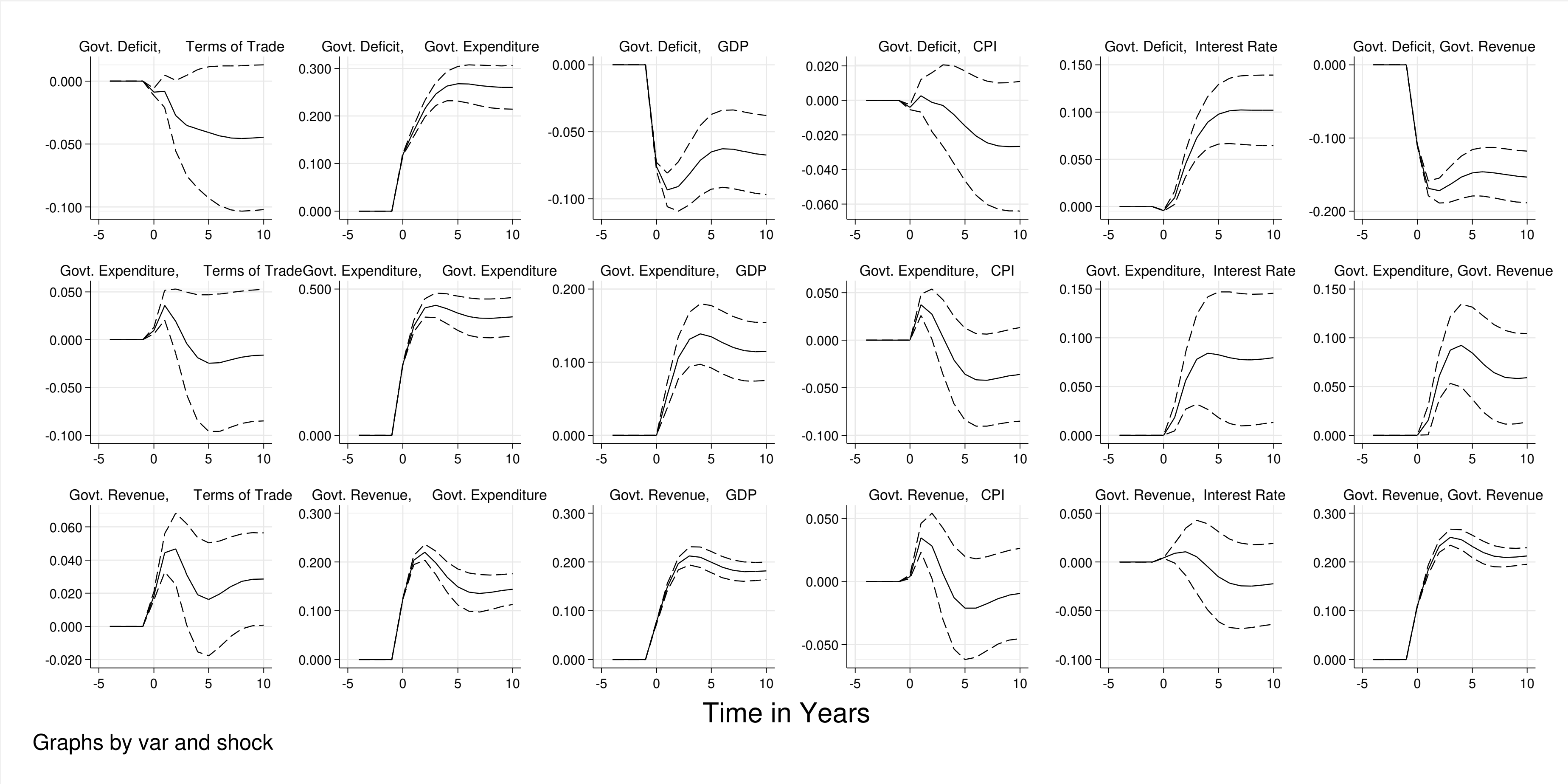
Source: authors' computation

Figure A1: Plotted Cross-Country Percentiles of Residuals from the Pooled VAR Estimation by SURE



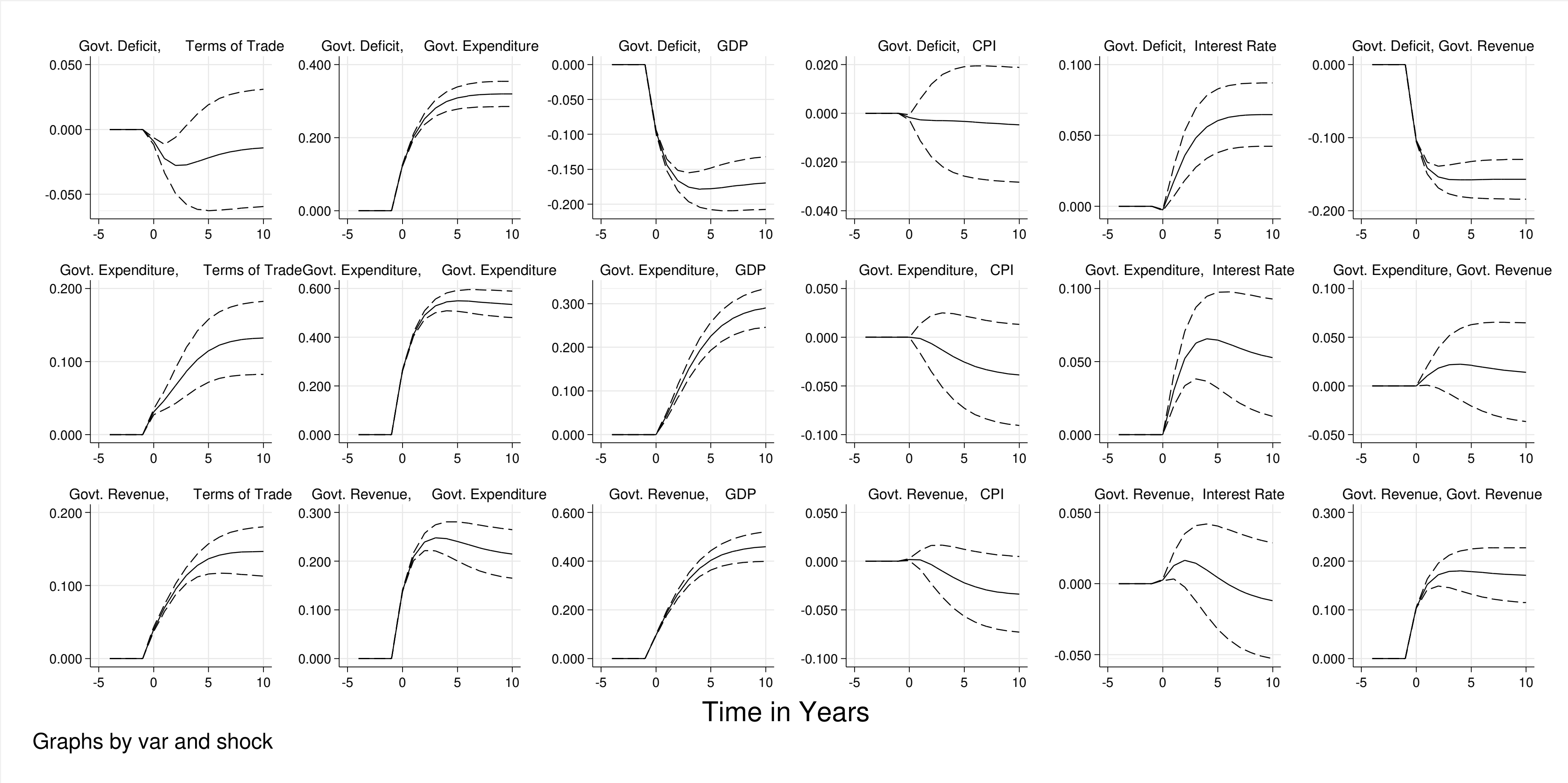
Source: Authors' calculation; Note: Plots of residuals by PVAR equation using 5, 50 and 95 cross-country percentiles over time.

Figure A2: Robustness Analysis of Baseline Results Using Real GDP Growth Instead of GDP Level.



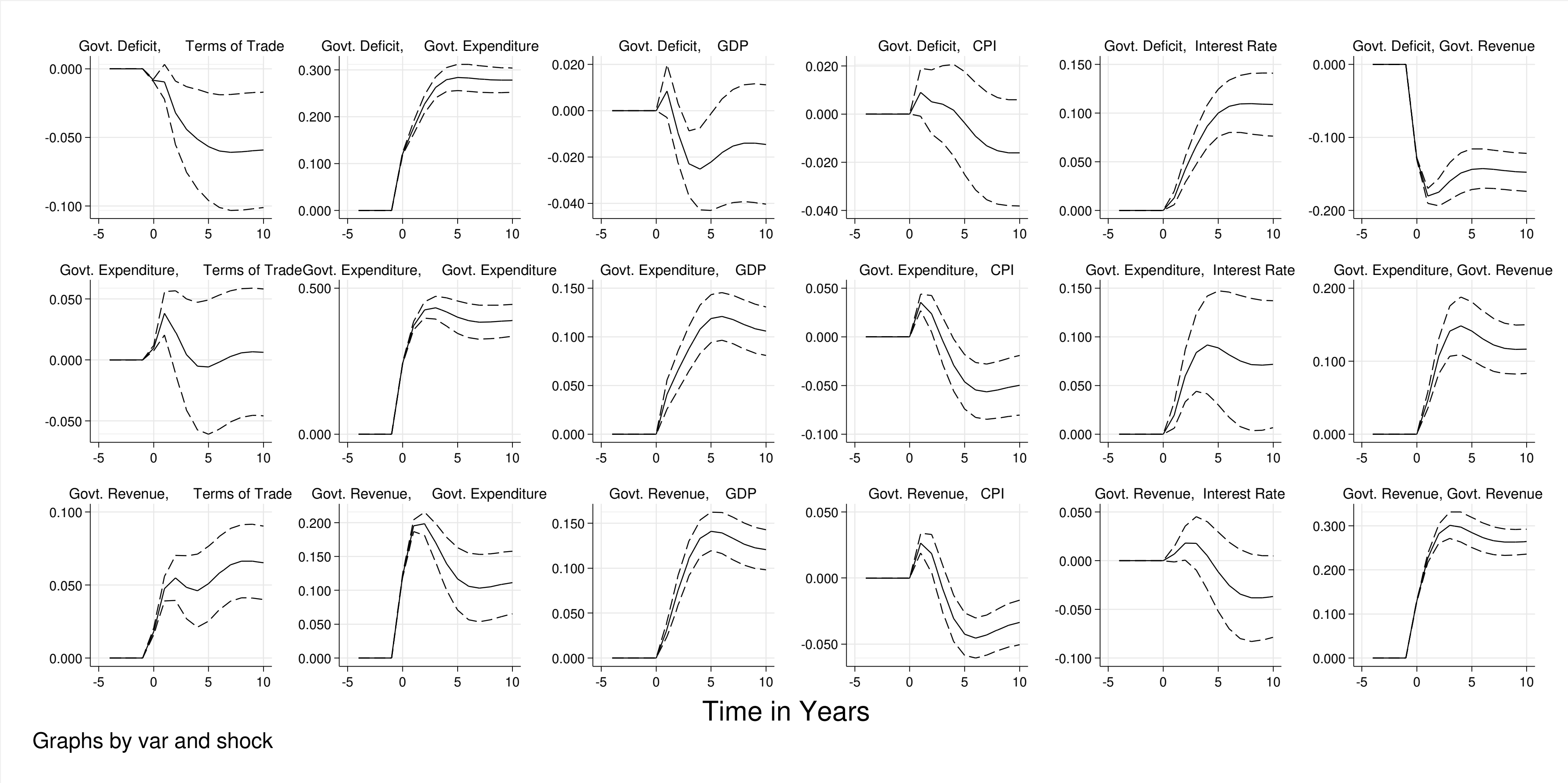
Source: Authors' calculation

Figure A3: Robustness Analysis of the Applied Lag Length of the PVAR – Using One Lag Instead of Two



Source: Authors' calculation

Figure A4: Robustness Analysis of Shock Identification Assumption -- Government Revenue Ordered Before GDP and Expenditure.



Source: Authors' calculation