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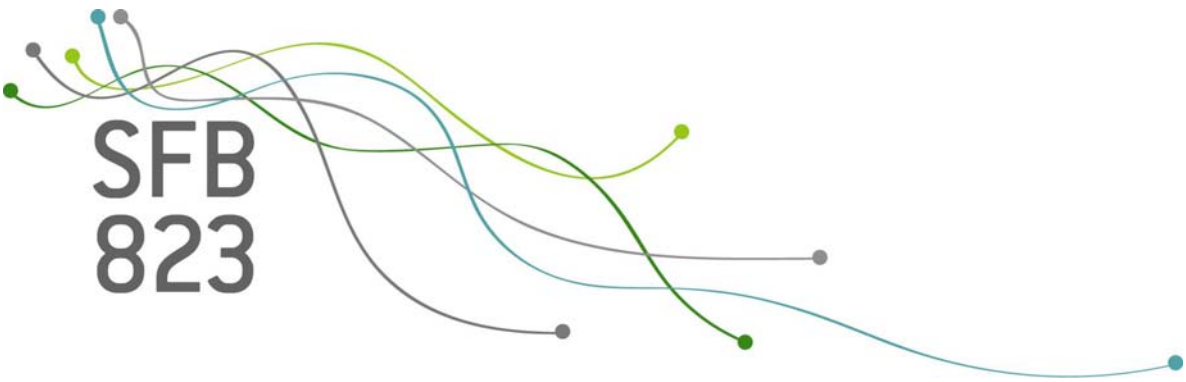

Government spending and unemployment in the OECD: Evidence from an annual panel VAR

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Abstract

We use a panel VAR to assess the dynamic effects of government spending on unemployment rates in OECD countries. We first present Monte Carlo evidence that the Hahn and Kuersteiner (2002) estimator produces almost unbiased estimates of impulse responses in an annual macro panel VAR. In the application, we find that positive shocks to government spending – identified either through a Cholesky decomposition or by sign restrictions – tend to lower the unemployment rate in the short run, though significance depends on identification assumptions.

Keywords: Panel Vector Autoregressions, Fiscal Policy Effects, Unemployment, Sign Restrictions, Simulation

JEL classification: E62, C33, C13

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1 Introduction

VAR studies on the effects of fiscal spending shocks often focus on a limited set of countries for which quarterly fiscal data are available. Annual data are available for many more countries, but the resulting short sample sizes require panel techniques. While the traditional fixed effects estimator is known to suffer from potential bias in dynamic panel models (Nickell, 1981), available alternatives are rarely used in panel VAR studies and their properties in the context of macro applications with the typical $T > N$ situation (time dimension larger than cross section) is largely unexplored.[4]

This paper contributes as follows. We estimate the effects of government spending in an annual panel VAR of 18 OECD countries from 1970 to 2008 using a bias-corrected fixed-effects estimator due to Hahn and Kuersteiner (2002). We conduct a brief Monte Carlo study to check the performance of this estimator and find that it produces almost unbiased estimates of the impulse response functions (arguably the relevant performance measure for applied work).

We use the estimator to provide estimates on an empirical question which is highly relevant for policy issues: do increases in government spending lower the unemployment rate? In previous work, Monacelli et al. (2010) have found a decreasing effect for the US, whereas Brückner and Pappa (2011) find that higher government spending generally raises unemployment in the countries where quarterly fiscal variables are available[5], although possibly decreasing it in the US when pre-1960s sample information is used. Using an annual panel data set, we provide evidence on the average unemployment response in a much wider range of countries.

Our main result is that we generally find evidence of decreasing unemployment rates in response to increases in fiscal spending in the short run and some evidence of rising unemployment over the longer run; whether the initial unemployment decline is significant or not depends on the identifying assumptions (discussed below).

The paper is organized as follows. Section 2 introduces data, model specification, and discusses identification. In Section 3, we investigate the properties of the estimator employed. The empirical results are presented in Section 4. The last section concludes.

2 Data and specification

Our baseline specification uses annual observations on the 18 OECD countries for which the required fiscal variables are available. The time period is 1970-2008. We use a panel VAR with two lags (controlling for fixed effects and time-specific effects) in real government consumption g_t, real GDP y_t, real private consumption c_t, tax revenues relative to GDP τ_t, the nominal government bond interest rate r_t, the rate of inflation of the GDP deflator π_t, government debt as a fraction of GDP d_t, and the unemployment rate u_t. The spending

[4] Monte Carlo evidence is provided by e.g. Judson and Owen (1999).

[5] Their main results pertain to Australia, Canada, Japan, the UK and the US.

variables are expressed in logarithmic per capita terms and are detrended using a linear country-specific trend as in Beetsma et al. (2006, 2008), while the rates enter linearly. Data sources, variable definitions and a list of countries included in the analysis can be found in a web appendix.[6] When we drop r_t and τ_t from the VAR, the set of countries can be extended to 22; we checked that the results with respect to the impulse response of unemployment are very similar for this specification (results are available on request).

The standard identifying restriction in the quarterly VAR literature (Blanchard and Perotti, 2002, Perotti, 2007) is that government spending is predetermined within a period due to implementation lags, and can therefore be ordered first in a recursive identification. This might be seen as less compelling in annual data.[7] Therefore, we also report evidence where the standard predeterminedness assumption is not imposed, but instead sign restrictions are used to identify fiscal shocks, as in Canova and Pappa (2007), Pappa (2009), or Mountford and Uhlig (2009).

3 Econometric issues

Using annual instead of quarterly data has the obvious drawback that the number of time periods is relatively small. The standard fixed effects estimator is known to suffer from a negative bias in dynamic models when T is small, see Nickell (1981). We take serious potential estimation biases in the panel VAR and use a bias-corrected version of the simple fixed effects estimator developed by Hahn and Kuersteiner (2002). To check how successful this estimator is in coping with the Nickell-bias in panel VARs having the dimension of the dataset at hand, we conduct a brief Monte Carlo study that complements previous simulation studies in several ways. First, we consider the practically relevant case of several lags and several equations in the panel VAR with $T > N$ (8 equations, 2 lags, 18 countries, 38 years).[8] Second, we assess the performance of the estimator in terms of the implied impulse responses, which are the objects of interest for applied VAR studies.

Our simulation setup follows Binder et al. (2005) and is described in more detail in the web appendix. There, we also describe how the Hahn and Kuersteiner (2002) estimator can be implemented for models with higher order VAR dynamics by imposing blockwise zero and identity restrictions on the slope coefficients. Our Monte Carlo study shows that the Hahn and Kuersteiner (2002) estimator provides almost unbiased estimates of

[6] http://www.wiso.tu-dortmund.de/wiso/mak/Medienpool/de/profile/Pub-MAK-FAJU/index.html

[7] However, the issue is largely unsettled: first, Beetsma et al. (2009) as well as Born and Müller (2012) argue that this problem seems empirically negligible when comparing results from VARs on countries where both quarterly and annual data are available. Second, Beetsma et al. (2006, 2008) point out that budget decisions are taken mostly once a year, such that annual data provide a more natural interpretation of estimated fiscal shocks. Third, Ramey (2011) argues that annual data mitigate the potential problem of anticipation of fiscal policy changes.

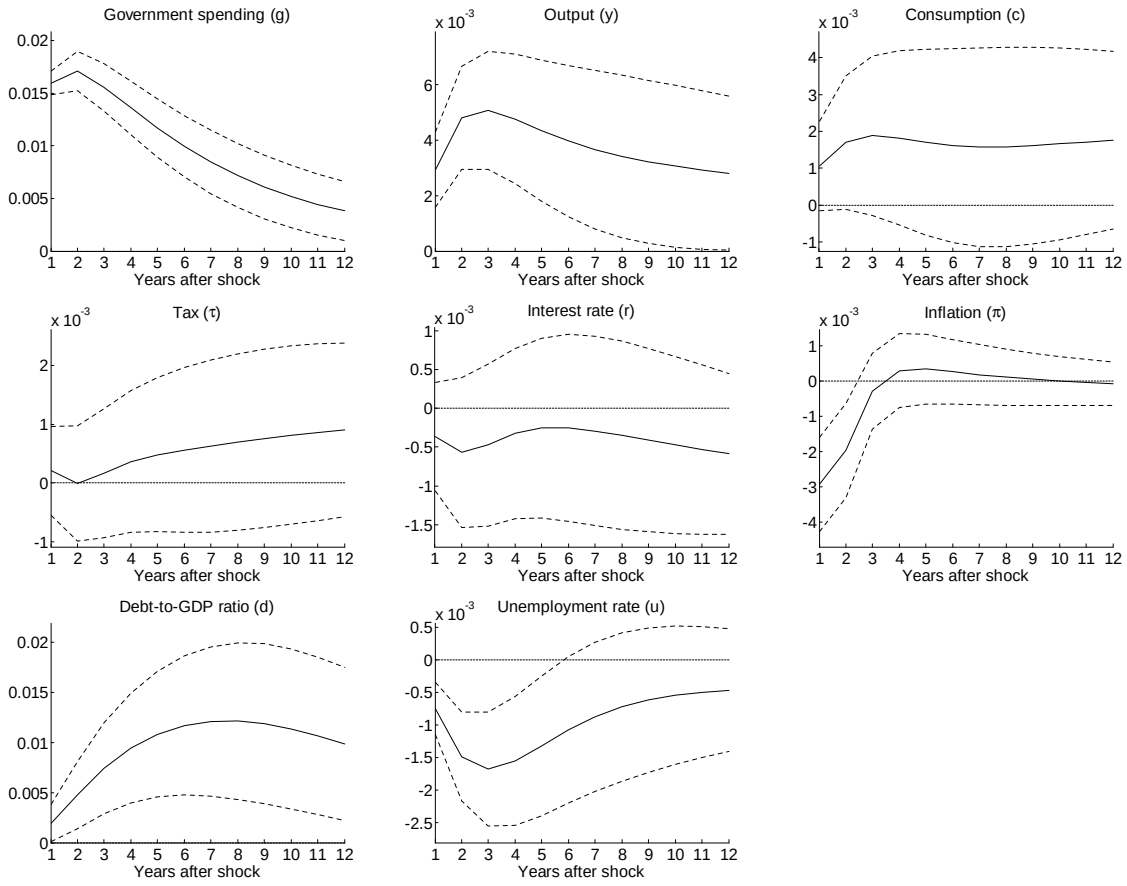
[8] Binder et al. (2005) also provide Monte Carlo evidence for panel VAR estimators, but do not consider bias-corrected fixed effects techniques due to their focus on short panels with T = 3 or 10 and N being large. Moreover, they restrict their attention to a two-variable first-order VAR. Judson and Owen (1999) consider long panels but focus on single-equation models with one lag.

the impulse responses and is therefore most suitable for our analysis of fiscal shocks, see Figure 1 in the web appendix.

4 Results

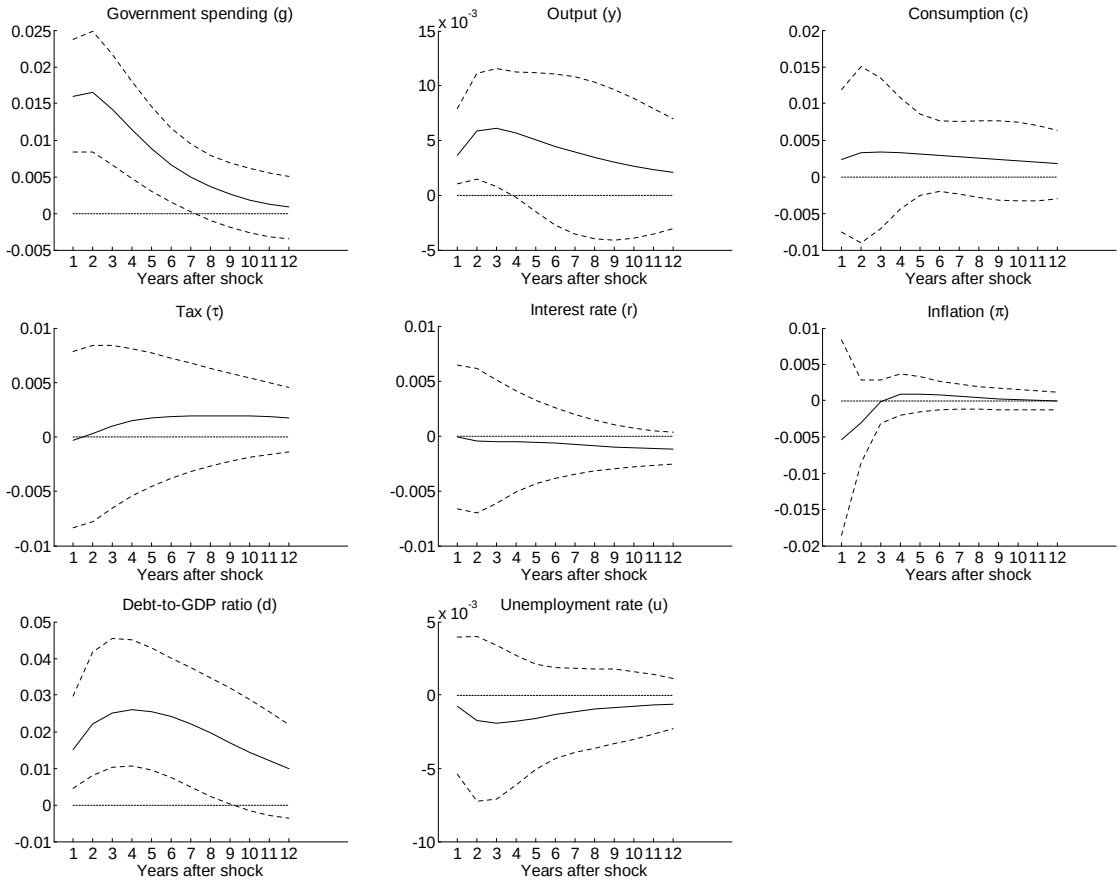
Figure 1 displays the impulse responses (with bootstrapped 90% confidence bands) to a one standard deviation shock to government spending for the baseline specification with government spending ordered first in a recursive identification.

Figure 1: Impulse responses to a one standard deviation shock to government spending (recursive identification assuming government spending ordered first)



The figure shows a hump-shaped decline in the unemployment rate in response to an increase in government consumption. Output and private consumption react positively, as expected from previous studies. The other responses appear mostly insignificant, the exception being inflation which shows a temporary decline. The peak of the unemployment decline is reached two years after the shock. To assess the quantitative impact (note that government spending is in logs, while the unemployment rate is linear and a decimal

Figure 2: Impulse response functions obtained using sign restrictions



number), we evaluate the decline at the overall sample mean of the ratio of government spending to GDP of 0.2076. An unexpected increase in government spending of 1% of GDP translates into a maximum decrease in the unemployment rate of roughly half a percentage point. This estimate is smaller but in the same range as the one reported by Monacelli et al. (2010) obtained using quarterly US data.

These results are based on the identifying assumption that government spending does not endogenously react to other variables within a period, which might be overly restrictive in annual data. Figure 2 therefore, as a robustness check, provides impulse responses based on an alternative identification that does not impose recursivity assumptions, but uses sign restrictions (see Fry and Pagan, 2011, for a review).

We identify a government spending shock as in Canova and Pappa (2007) or Pappa (2009) by imposing the sign restrictions that it should raise government spending, government debt, and output on impact. These restrictions are in line with most general equilibrium models of fiscal policy, as these imply a positive response of spending and

Figure 3: Impulse response functions to a one standard deviation shock in government spending (recursive identification assuming government spending ordered first).

(a) Only Australia, Canada, Japan, the UK, and the US

(b) Subperiod 1980-2008

output in the short run (e.g. Pappa, 2009), and we assume that there are no balanced-budget spending shocks, such that government debt temporarily increases.[9]

As can be seen from Figure 2, the median responses under sign restrictions to a one standard deviation government spending shock are qualitatively similar to the ones obtained under the recursive identification. Most importantly, we again find a temporary decrease in the unemployment rate. To illustrate the magnitude of the spread of the responses, the dashed lines show the 16th and 84th percentiles of the accepted responses.[10] These bands are very wide, however, so that the response appears altogether insignificant.

Brückner and Pappa (2011) found mostly positive or inconclusive unemployment responses in Australia, Canada, Japan, the UK, and the US. If we include only these countries in our sample, the unemployment response (shown in panel (a) of Figure 3) is initially almost flat, before turning positive later.[11] Thus, the negative short-run effect that we find in the whole sample is driven by the other countries in our sample. As Brückner and Pappa (2011) also find differences with respect to the sample period, we reestimate the model for the full sample starting only in 1980. In this specification, the unemployment response is initially still negative, though smaller than for the longer sample, and possibly turns positive after a few years, see panel (b) of Figure 3. Taken together, the results suggest that the effect of higher government spending seems to be slightly negative or negligible in the short-run, with some indication that there may be a delayed positive effect; we do not find evidence of marked increases in unemployment after a spending shock.

[9] In addition, to rule out some implausible responses, we restrict the short-run 'fiscal multiplier', i.e. the percentage output response to a fiscal shock of size one percent of GDP, to be less than three, as universally found in the fiscal VAR literature (e.g. Perotti, 2007).

[10] These intervals do not take into account the estimation uncertainty in the reduced-form coefficients.

[11] The responses in Figure 3 are based on the recursive ordering. Medians of the sign restricted model responses convey the same message.

5 Conclusion

We have used a bias-corrected panel VAR estimator due to Hahn and Kuersteiner (2002) to assess the dynamic effects of government spending on unemployment rates in OECD countries. A Monte Carlo study has shown that the estimator performs well in the situation at hand, which suggests that it should be viewed as a useful tool for typical macro panel VARs with relatively large time and small cross-sectional dimensions. We have found that positive shocks to government spending (identified either in a recursive way or through sign restrictions) seem to lower the unemployment rate in the short-run, though significance depends on the identification assumptions as well as on details with respect to the set of included countries and the sample length.

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