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Changes in the Response of Fiscal Policy to Monetary Policy in the EMU

by

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Changes in the Response of Fiscal Policy to Monetary Policy in the EMU*

Sanchit Arora[†], Claire Reicher[‡]

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Abstract

We study the evolution of the response of fiscal policy to monetary policy shocks in the EMU in the light of two important events: the signing of the Maastricht treaty in 1992 and the introduction of the EMU in 1999. Based on impulse responses from a panel VAR, we find that fiscal and monetary policy acted neutrally toward each other before the Maastricht Treaty; fiscal and monetary policy acted as substitutes immediately after the Maastricht Treaty; and fiscal and monetary policy acted as complements after the introduction of the EMU. These results holds for a set of 11 non-EMU countries as well, which indicates that the evolution of the fiscal response to monetary shocks within the EMU has broadly mirrored global developments. One example of such a global development is the global shift toward lower interest rates and tighter fiscal policy during the 1990s.

Keywords: monetary policy, fiscal policy, panel VAR, Maastricht Treaty, EMU

JEL Classification: E52, E62, E65

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1 Introduction

The signing of the Maastricht Treaty and the introduction of the EMU brought about changes in the way that fiscal policy is conducted in the EMU. These changes include, among other things, the restrictions imposed by the Stability and Growth Pact. Motivated by these changes, a number of econometric studies have pointed toward changes in the behavior of fiscal aggregates. We find additional evidence that fiscal policy within the EMU has changed over time, based on a panel VAR analysis for a set of 11 EMU countries from 1980 through 2007. In particular, the response of the primary surplus to a contractionary monetary policy shock has gone from neutral before the Maastricht Treaty, to negative after the Maastricht Treaty, and then positive after the introduction of the EMU. Furthermore, based on a sample of 11 non-EMU countries, we argue that these changes within the EMU have tracked global developments–in particular, a global transition toward lower interest rates and larger primary balances during the 1990s. Altogether, it looks like the behavior of fiscal policy in the EMU has changed over time, but some of these changes may have been driven by global developments rather than by developments specific to the EMU.

It is reasonable to believe that the Maastricht Treaty and the introduction of the EMU may have changed the response of fiscal policy to monetary policy shocks, since the Maastricht treaty has constrained the use of fiscal policy in general through mechanisms such as the Stability and Growth Pact. The policy literature has pointed toward a possible effect of these mechanisms on the behavior of primary surpluses. For instance, Fatas and Mihov (2003), Ballabriga and Martinez-Mongay (2002), Galí and Perotti (2003), Marinheiro (2005), Candelon et al. (2010), and Benetrix and Lane (2013) argue that the Maastricht Treaty and the introduction of the EMU have resulted in changes to the cyclical behavior of the primary surplus. Our results are in line with these earlier results, insofar as our results also point toward a change in the conduct of fiscal policy over time. However, our results are also in line with those of Galí and Perotti (2003) in that we find that developments within Europe mirror developments outside of Europe. Therefore, we hesitate to attribute changes in the

behavior of monetary and fiscal policy within Europe solely to the Maastricht Treaty and the introduction of the EMU, but rather to global changes in the conduct of monetary and fiscal policy.

While previous studies put more emphasis on the cyclicality and consolidation behavior of fiscal policy, we focus on changes in the fiscal response to monetary policy shocks within the EMU, which is an area of ongoing research. This topic is of practical significance, since the response of fiscal policy may either dampen or amplify the effects of monetary policy shocks, depending on whether fiscal and monetary policy are substitutes or complements.[1] Within the G7, Muscatelli et al. (2002) find that fiscal and monetary policy have increasingly behaved as complements, which is what we find for a broader set of countries as well. Within the EMU, van Aarle et al. (2003) find that fiscal and monetary policy appear to behave as complements at the EMU level, while country-specific behavior is quite heterogenous. Meanwhile, Semmler and Zhang (2004) find that fiscal and monetary policy appear to have behaved as substitutes and not as complements for France and Germany, and Weyerstrass et al. (2006) find the same for the EMU. With respect to changes over time within the EMU, Jones (2009) finds that fiscal and monetary policy acted as substitutes before the EMU but that no interaction seems to exist after the EMU. We argue that our results help to make sense of these differing results found in the previous literature. Our results seem to indicate that the period between the Maastricht Treaty and the EMU represented a global transition toward lower interest rates and tighter fiscal policy, which makes it appear as though fiscal and monetary policy were substitutes during that period.

To deal with the short sample (28 years), we base our results on two 11-country panels, with data extending from 1980 though 2007 for the entire sample. We split this sample into a pre-Maastricht period, a post-Maastricht period, and a post-EMU period. This is the approach followed by Benetríx and Lane (2013) in estimating fiscal reaction functions

[1] We follow the terminology of Muscatelli et al. (2004). If a contractionary monetary policy shock is followed by contractionary fiscal policy, then fiscal and monetary policy behave as complements. If a contractionary monetary policy shock is followed by expansionary fiscal policy, then fiscal and monetary policy behave as substitutes.

based on a panel IV approach, although we base our results instead on a set of impulse responses from a panel VAR. Based on a comparative impulse response analysis using data from 11 EMU countries which represent a treatment group and 11 non-EMU countries which represent a control group, we conclude that the fiscal and monetary policy in both groups, in response to a monetary policy shock, has gone from ambiguous or neutral, to appearing to act as substitutes, to appearing to act as a complements. These shifts seem to have been driven by global factors, to the extent that the difference between impulse responses across both country groups is statistically and economically close to zero across all time periods. Based on the similarities between these country groups, we argue that changes in the fiscal response to monetary policy within the EMU seems to have been driven by global conditions rather than by changes caused by the EMU itself.

2 Data

Our analysis is based on a panel dataset, drawn from a variety of sources. Table 1 lists these sources along with short descriptions of each series. We start off by borrowing three variables from the dataset used by Benetrix and Lane (2013).[2] These variables are the public debt at the end of each period as a percentage of GDP (originally obtained from Abbas et al. (2010)), the cyclically-adjusted primary balance as a percentage of GDP (originally obtained from the OECD's Economic Outlook 88), and the output gap (equal to log real GDP detrended by a quadratic trend).[3] To this dataset we add two additional indicators: the CPI inflation rate (obtained from the OECD's Economic Outlook 88), and the nominal short-term interest rate (money market rate obtained from the IMF's International Financial Statistics Database). For robustness, following Galí and Perotti (2003), we also construct a variable intended to capture the monetary policy stance –the Taylor rule deviation–which equals that part of the

[2]We thank Benetrix and Lane (2013) for graciously providing this dataset.

[3]For robustness, we also use HP-filtered GDP as a proxy for the output gap, and cyclically-adjusted primary balance NOT as a percentage of GDP to negate any affect of GDP on the ratio, the results do not change and point toward the similar conclusion.

nominal interest rate not captured by the Taylor rule.[4] Our combined dataset extends from 1980 through 2007 which leaves out the 2008 crisis period, and our dataset contains data for 11 EMU countries and 11 non-EMU countries.[5]

Within Figure 1, Panels 1a and 1b plot the evolution of short-term interest rates in the EMU as well as in the non-EMU countries for the period 1980-2007. Both panels point toward an average downward trend in interest rates. Alongside this downward trend, in the EMU countries, interest rates converged in 1999 upon the formation of the EMU and introduction of Euro. Within Figure 2, Panels 2a and 2b show an upward trend in the structural primary balance as a percentage of GDP. Both of these trends can be seen more clearly within Figure 3, in Panels 3a and 3b. These panels plot the average interest rate and average cyclically adjusted primary balance in the EMU and non-EMU countries. In the EMU countries, the average interest rate went down from an average of 11.68% for the period from 1980 through 1991 to an average of 7.35% for the period from 1992 through 1998 and then further down to 3.23% for the period from 1999 through 2007. A similar pattern is observed in the non-EMU countries as well, where the average interest rate fell from 11.45% to 5.73%, and then to 4.36%. As interest rates fell, the fiscal balance increased over time for both country groups; however, the increase was much more pronounced in the EMU countries, which have consistently run a cyclically adjusted primary surplus since 1996. The increase in the trend primary balance for the non-EMU countries, meanwhile, appears to be less pronounced.

3 Methodology

Based on the panel dataset, our objective is to understand the changing dynamics of fiscal-monetary policy interactions in the EMU countries. These changes may have been driven by two important events: the Maastricht Treaty in 1992 and the formal introduction of the

[4]This Taylor rule deviation is calculated using coefficients on output and inflation of 0.5 and 1.5, respectively, assuming constant trends in inflation and the real interest rate.

[5]The EMU countries are Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain; and the non-EMU countries are Australia, Canada, Denmark, Iceland, Japan, New Zealand, Norway, Sweden, Switzerland, United Kingdom, United States.

EMU in 1999. To understand the effects of these events, we split our sample into three subsamples in order to capture the evolution of these interactions. These subsamples are the pre-Maastrict subsample (1980-1991), the Maastricht subsample (1992-1998), and the EMU subsample (1999-2007). However, any change in fiscal-monetary interactions may have been driven by global events rather than by events purely within the EMU. To account for this possible source of changes in fiscal-monetary interactions over time, we conduct the same analysis for the 11 non-EMU countries over the same set of subsamples, and then we take the difference in impulse responses between the EMU country group and the non-EMU country group. The non-EMU countries act as a control group, and the presence of this control group allows us to see to what degree changes in fiscal-monetary interactions over time are driven by global factors rather than factors specific to the EMU.

To estimate these interactions, we estimate a one-lag panel VAR which allows for country-specific fixed effects.[6] We do this since the subsamples are too small to carry out individual-country VARs, while a panel VAR provides for more degrees of freedom. The panel VAR follows the law of motion:

$$y_{it} = \Gamma_0 + \Gamma_1 y_{it-1} + \alpha_i + e_{it},$$

where i indexes each individual country and t indexes the time period. The vector y_{it} is a vector of four endogenous variables: the monetary policy indicator (which is the nominal interest rate in the baseline specification), the output gap, the debt-GDP ratio, and the fiscal balance. Within the error term, α_i controls for unobserved time-invariant country-specific fixed effects and e_{it} is the vector of disturbances. To calculate the coefficients and impulse responses for the panel VAR using GMM, we use the code provided by Love and Zicchino (2006). One detail of their approach is worth noting. We use lags of the dependent variables in our analysis, and the country-specific fixed effects would be correlated with these lags. To solve this problem, the approach of Love and Zicchino (2006) applies forward mean-differencing (the Helmert transformation) to de-meaned data. The Helmert transformation ensures that the transformed variables and lagged regressors are orthogonal, and that

[6] Based on a likelihood ratio test for lag length selection, we include one lag in the specification.

consequently we can use the latter as instruments in the GMM procedure.

To derive impulse responses in response to a monetary policy shock, we use conventional short-run restrictions, where we assume a Cholesky structure to the contemporaneous errors. We order the monetary policy shock first in this Cholesky ordering. This is equivalent to assuming that a monetary policy shock affects the output gap, the debt-GDP ratio, and the primary balance in the same year, while shocks to these objects do not affect the monetary policy indicator in the same year.[7] We impose the same ordering across the different subsamples. This ordering is justified by a particular set of institutional features in the European economy. For the post-1999 period, putting monetary policy first in the ordering is justified given that the ECB reacts to conditions within the Euro area and not to conditions within particular countries. For the pre-1999 period, we rely on the findings of Ballabriga and Martinez-Mongay (2002). These authors find that between 1979 and 1998, monetary policies in the EMU countries can be characterized as following the lead of the Deutsche Bundesbank. Taken together, both periods can be reasonably characterized as periods where the behavior of monetary authorities with respect to interest rates did not on the whole respond strongly to country-specific conditions.

4 Changes in fiscal-monetary interactions over time

4.1 Baseline results

Figure 4 presents the estimated response of the cyclically-adjusted primary balance to a unit (1%) monetary policy (or interest rate) shock under the baseline specification. The top row presents impulse responses for the EMU countries; the middle row presents impulse responses for the non-EMU countries; and the bottom row plots the difference between impulse responses for the EMU and non-EMU countries. The impulse responses (or differences in impulse responses) are accompanied by 95% confidence bands. These bands are calculated

[7] It is worth noting that the estimated effects of a monetary policy shock are invariant to the ordering of the three other variables, so long as they come after the monetary policy shock in the ordering.

using impulse responses derived from 500 Monte Carlo simulations of the PVAR(1) model, from its asymptotic distribution evaluated at its GMM estimates.

In the case of the EMU countries, the fiscal response to monetary policy appears to vary substantially over time. Before the Maastricht treaty, a monetary policy shock seems to lead to little change in the cyclically adjusted primary balance. This response turns negative upon the implementation of the Maastricht treaty, while this response turns positive upon the implementation of the EMU. Based on these responses, fiscal and monetary policy shifted from acting neutrally toward one another, toward acting as substitutes, and then toward acting as complements. As other studies have found with respect to cyclicality, fiscal policy in the EMU appears to have varied substantially over time.

At first glance, these results would seem to imply that the Maastricht Treaty and the EMU had large, contradictory effects upon European fiscal policy. The estimates from the non-EMU countries, however, deliver a similar pattern. This similarity lends credence to the possibility that global factors, rather than the integration process, caused European fiscal policymakers to change their behavior in different directions after the Maastricht Treaty and after the EMU. Before the Maastricht treaty, a monetary policy shock in the non-EMU countries seems to lead to a slight decline in the cyclically primary balance. This response turns further negative upon the implementation of the Maastricht treaty, while this response turns strongly positive upon the implementation of the EMU. This is the same basic pattern exhibited by the EMU. In fact, the differences between the impulse responses indicate that the EMU countries and non-EMU countries move somewhat in tandem over these three periods. In all three periods, the difference between the impulse responses for these country groups is relatively small and statistically indistinguishable from zero for the first few years following a monetary policy shock.

A look at the country-group averages in Figure 3 reveals what might have driven the observed negative comovement between monetary policy and the primary balance during the post-Maastricht, pre-EMU period. In both country groups, the trends in interest rates and

fiscal balances moved in opposite directions. The 1990s were a transition period between the high-interest-rate environment of the 1980s and the low-interest-rate environment of the 2000s, both inside and outside the EMU. Furthermore, the 1990s saw a degree of incremental fiscal consolidation in both country groups. This particular set of global events may have resulted in a temporary negative relationship between interest rates and the cyclically adjusted primary balance, which does not hold more generally.

4.2 Results from alternative specifications

The baseline estimates presented in Figure 4 point toward changes in the fiscal response to monetary shocks over time in both the EMU and non-EMU country groups. These basic patterns are robust to the consideration of a possible unit root in the debt-GDP ratio as well as to the consideration of an alternative monetary policy indicator.[8] To deal with these issues, Figures 5 and 6 plot the figures obtained from taking the debt-GDP ratio in first differences and from taking the Taylor rule deviation (ordered first) as a monetary policy indicator, respectively.

The results from taking the debt-GDP ratio in first differences as depicted in Figure 5 point toward a similar evolution in the fiscal response to monetary policy for the EMU countries as when taking the debt-GDP ratio in levels. Importantly, the difference between these responses for both country groups remains near the zero line for all three time periods. While some estimates change when taking the debt-GDP ratio in first differences, the main conclusions from the baseline specification hold.

Furthermore, the results from taking the Taylor rule deviation as a monetary policy indicator as depicted in Figure 6 substantially mirror those from the baseline specification, although fiscal and monetary policy in the non-EMU countries before 1992 may show a slight degree of complementarity with a lag. The substantial similarity between Figures 6 and 4 indicates

[8] Based on a set of unit root tests, we are unable to reject the null hypothesis of a unit root in debt-GDP ratio for at least one of the countries. However, unit root tests have very low power, and it is important not to confuse not rejecting a null hypothesis with accepting a null hypothesis.

that our choice of a particular monetary policy indicator does not seem to have driven our results. Altogether, the results from the alternative specifications lend support to the idea that past changes in the fiscal response to monetary policy within the EMU are to a large degree driven by global developments rather than by developments purely originating within the EMU.

5 Conclusion

European fiscal policy appears to have varied over time. In particular, estimates from a panel VAR point toward changes in the response of fiscal policy to monetary policy shocks in the EMU. Fiscal and monetary policy appear to have gone from acting neutrally in response to monetary policy shocks before the Maastricht treaty, to acting as substitutes after the Maastricht treaty, to acting as complements following the introduction of the EMU. The evolution of this set of responses broadly mirrors developments outside the EMU, which suggests that global factors may have been an important factor underlying this evolution. In fact, a glance at the data suggests that for both country groups, the post-Maastricht, pre-EMU period represented a transition period toward a lower-interest-rate regime accompanied by systematically tighter fiscal policy. Whether or not this transition reflects changes in economic fundamentals or changes in global policy objectives is an interesting research question which deserves further exploration.

These results point toward a possible pitfall when attempting to analyze the stability of fiscal policy in the EMU which has been noted by some other authors, in that European fiscal policy is not conducted independently from other global developments. An analysis which only looks at changes in European fiscal policy may ascribe these changes to shifts in European governance, when they are instead driven by what appear to be broader shifts in either economic fundamentals or policy objectives. The fall in global trend interest rates during the 1990s would be one example of such a shift. Altogether, it is important to take these shifts into account when analyzing the historic behavior of European (or non-European)

fiscal policy.

Appendix

We subject the series to a set of panel root tests. Table 2 presents the results of these tests. The tests indicates that except for debt, it is possible to reject the null hypothesis that any given variable exhibits a unit root for all countries. It is important to note that these tests have low power, and it is also important to avoid treating a non-rejection of the null hypothesis as an acceptance of the null hypothesis. To sidestep this set of concerns, we run our analysis with debt in levels as well as debt in first differences.

References

Abbas, S., Belhocine, N., ElGanainy, A., Horton, M., Nov. 2010. A Historical Public Debt Database. IMF Working Papers 10/245, International Monetary Fund.

Ballabriga, F., Martinez-Mongay, C., Feb. 2002. Has EMU shifted policy? European Economy - Economic Papers 166, Directorate General Economic and Monetary Affairs (DG ECFIN), European Commission.

Benetríx, A. S., Lane, P. R., 2013. Fiscal Cyclicality and EMU. Journal of International Money and Finance 34 (C), 164–176.

Candelon, B., Muysken, J., Vermeulen, R., April 2010. Fiscal Policy and Monetary Integration in Europe: An Update. Oxford Economic Papers 62 (2), 323–349.

Fatas, A., Mihov, I., 2003. On Constraining Fiscal Policy Discretion in EMU. Oxford Review of Economic Policy, 1–28.

Galí, Perotti, October 2003. Fiscal policy and Monetary Integration in Europe. Economic Policy 18 (37), 533–572.

Jones, J., 2009. Monetary and Fiscal Policy Interaction: The Consequences of Joining a Monetary Union. Furman University, Greenville (SC), Mimeo.

Love, I., Zicchino, L., May 2006. Financial Development and Dynamic Investment Behavior: Evidence from Panel VAR. The Quarterly Review of Economics and Finance 46 (2), 190–210.

Marinheiro, C. J. F., Dec. 2005. Has the Stability and Growth Pact Stabilised? Evidence from a Panel of 12 European Countries and some Implications for the Reform of the Pact. Working Papers de Economia (Economics Working Papers) 31, Departamento de Economia, Gestão e Engenharia Industrial, Universidade de Aveiro.

Muscatelli, Tirelli, Trecroci, June 2004. Fiscal and Monetary Policy Interactions: Empirical Evidence and Optimal Policy using a Structural New-Keynesian model. Journal of Macroeconomics 26 (2), 257–280.

Muscatelli, A., Tirelli, P., Trecroci, C., 2002. Monetary and Fiscal Policy Interactions over the Cycle: Some Empirical Evidence. CESifo Working Paper Series 817, CESifo Group Munich.

Semmler, W., Zhang, W., June 2004. Monetary and Fiscal Policy Interactions in the Euro Area. Economic Change and Restructuring 31 (2), 205–227.

van Aarle, B., Garretsen, H., Gobbin, N., 2003. Monetary and Fiscal Policy Transmission in the Euro-area: Evidence from a Structural VAR Analysis. Journal of Economics and Business 55 (5-6), 609–638.

Weyerstrass, K., Jaenicke, J., Neck, R., Haber, G., van Aarle, B., Schoors, K., Gobbin, N., Claeys, P., Mar. 2006. Economic spillover and policy coordination in the Euro area. European Economy - Economic Papers 246, Directorate General Economic and Monetary Affairs (DG ECFIN), European Commission.

Table 1: Data: Description and sources

Variables	Description	Source
Debt	Debt as a percentage of GDP, end-of-period	Benetríx and Lane (2013), originally Abbas et al. (2010)
Fiscal balance	Cyclically adjusted primary balance as a percentage of GDP	Benetríx and Lane (2013), OECD Economic Outlook 88
Output gap	Log GDP minus its quadratic trend	Benetríx and Lane (2013), GDP data originally from World Bank Development Indicators
Inflation rate	Consumer price index inflation	OECD statistics database
Interest rate	Nominal short-term money market rate	IMF-IFS (code ...60B..ZF...)

Table 2: Unit root test: Fisher-type test based on augmented Dickey-Fuller test

Variables	Inverse chi-square	Inverse normal	Inverse logit	Modified inverse chi-square
Debt	22.28 (0.44)	0.90 (0.81)	0.90 (0.81)	0.04 (0.48)
Fiscal balance	36.12 (0.03)	-1.54 (0.06)	-1.71 (0.05)	2.72 (0.02)
Output gap	38.82 (0.01)	-2.18 (0.01)	-2.17 (0.02)	2.53 (0.01)
Interest rate	199.43 (0.00)	-10.09 (0.00)	-16.54 (0.00)	26.74 (0.00)

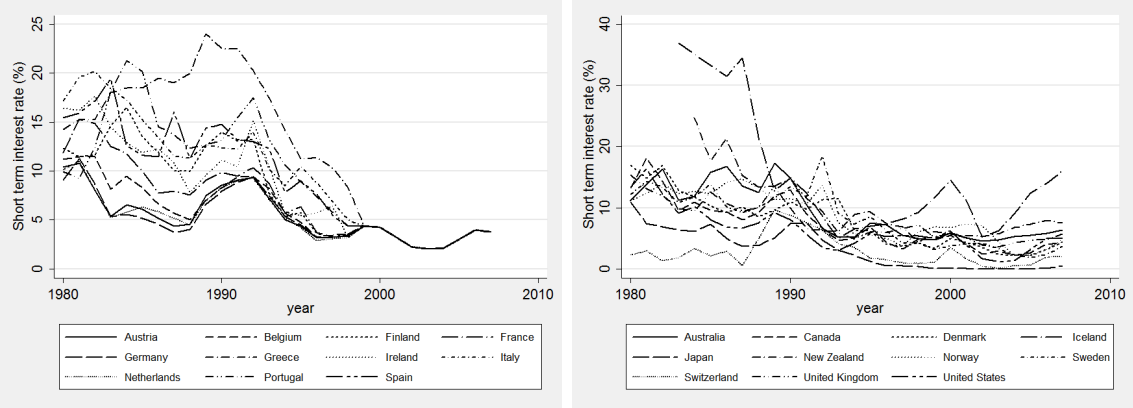
Note:

a. Tests are conducted with a lag length of one.

b. The test includes a panel mean and time trend. Cross-sectional means are removed to control for cross-sectional heterogeneity.

c. Values without parentheses represent test statistics.
Values in parentheses are p-values for a particular test statistic.
Null hypothesis: a given variable exhibits a unit root for all countries.
Alternative hypothesis: a given variable exhibits a stable root for at least one country.

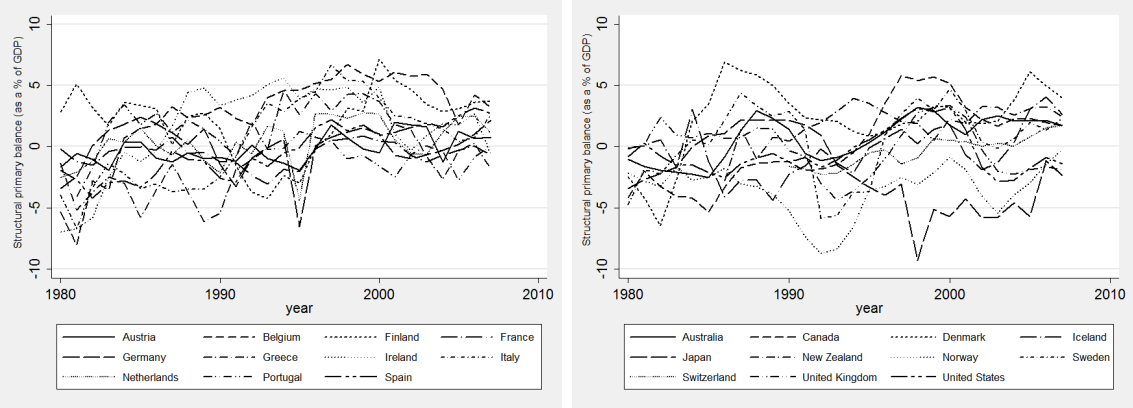
Figure 1: Short-term interest rates in EMU and non-EMU countries for the period 1980-2007.



(a) EMU countries (b) Non-EMU countries

Source: IMF-IFS (code ...60B..ZF...).

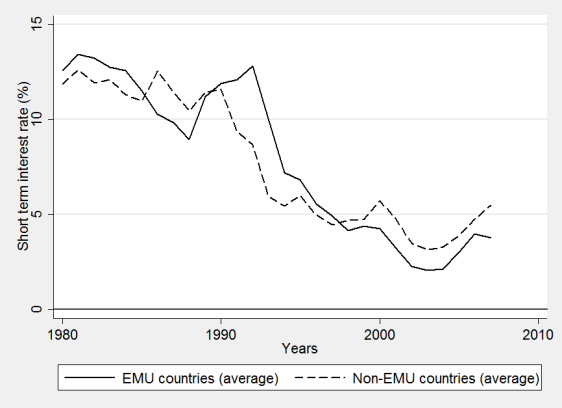
Figure 2: Cyclically adjusted primary balance (as a % of GDP) in EMU and non-EMU countries for the period 1980-2007.



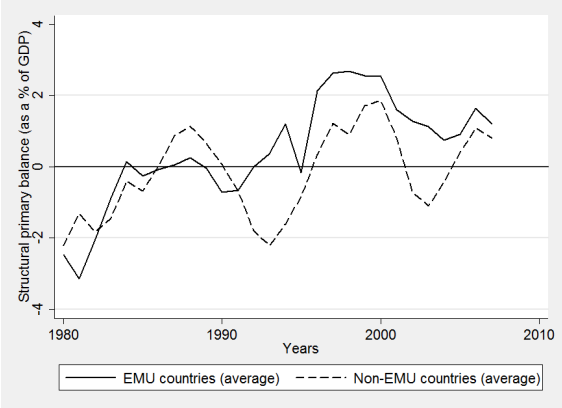
(a) EMU countries (b) Non-EMU countries

Source: Benetrix and Lane (2013), OECD Economic Outlook 88.

Figure 3: Average interest rates and average cyclically adjusted primary balance (as a % of GDP) in EMU and non-EMU country groups for the period 1980-2007.



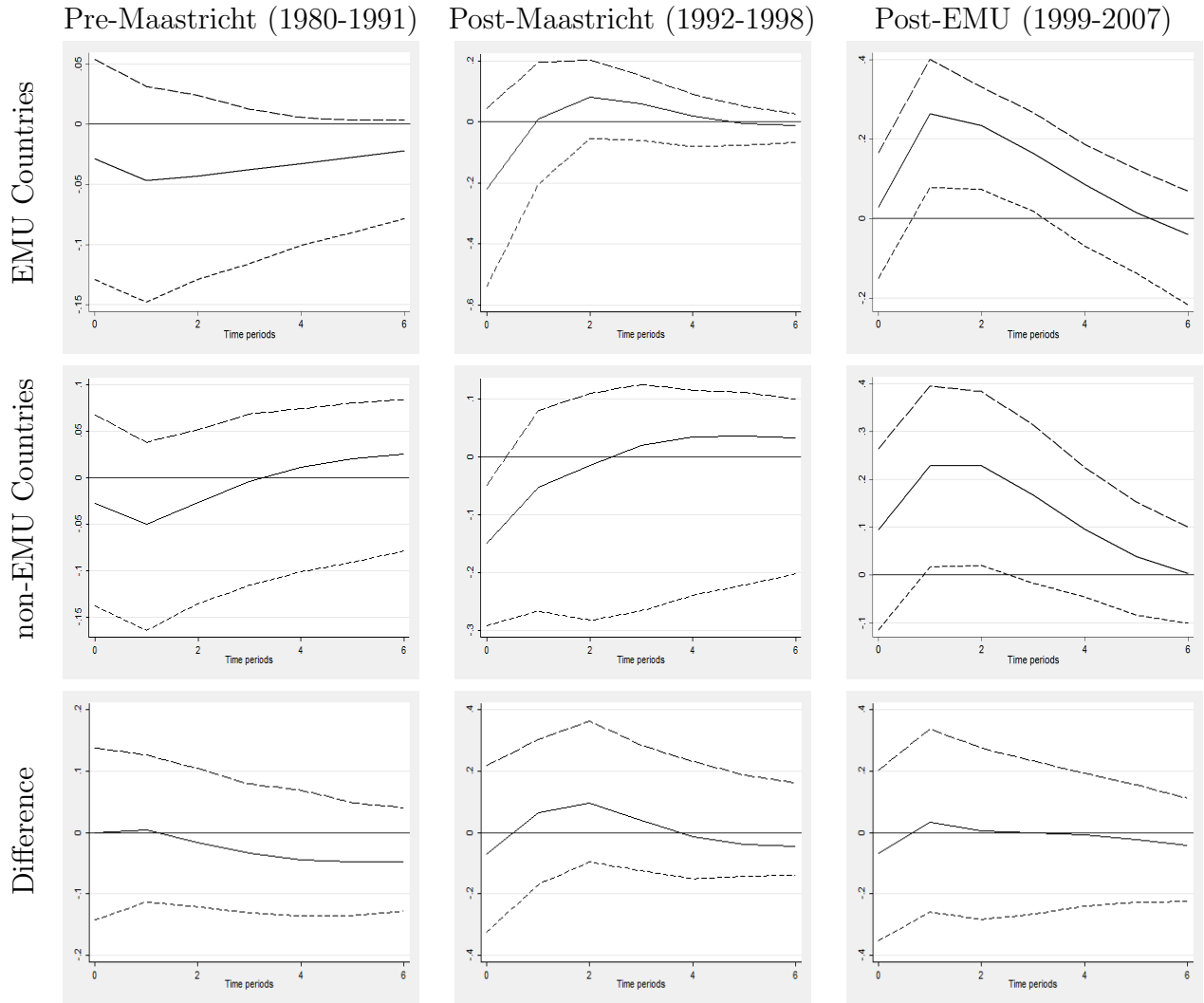
(a) EMU countries



(b) Non-EMU countries

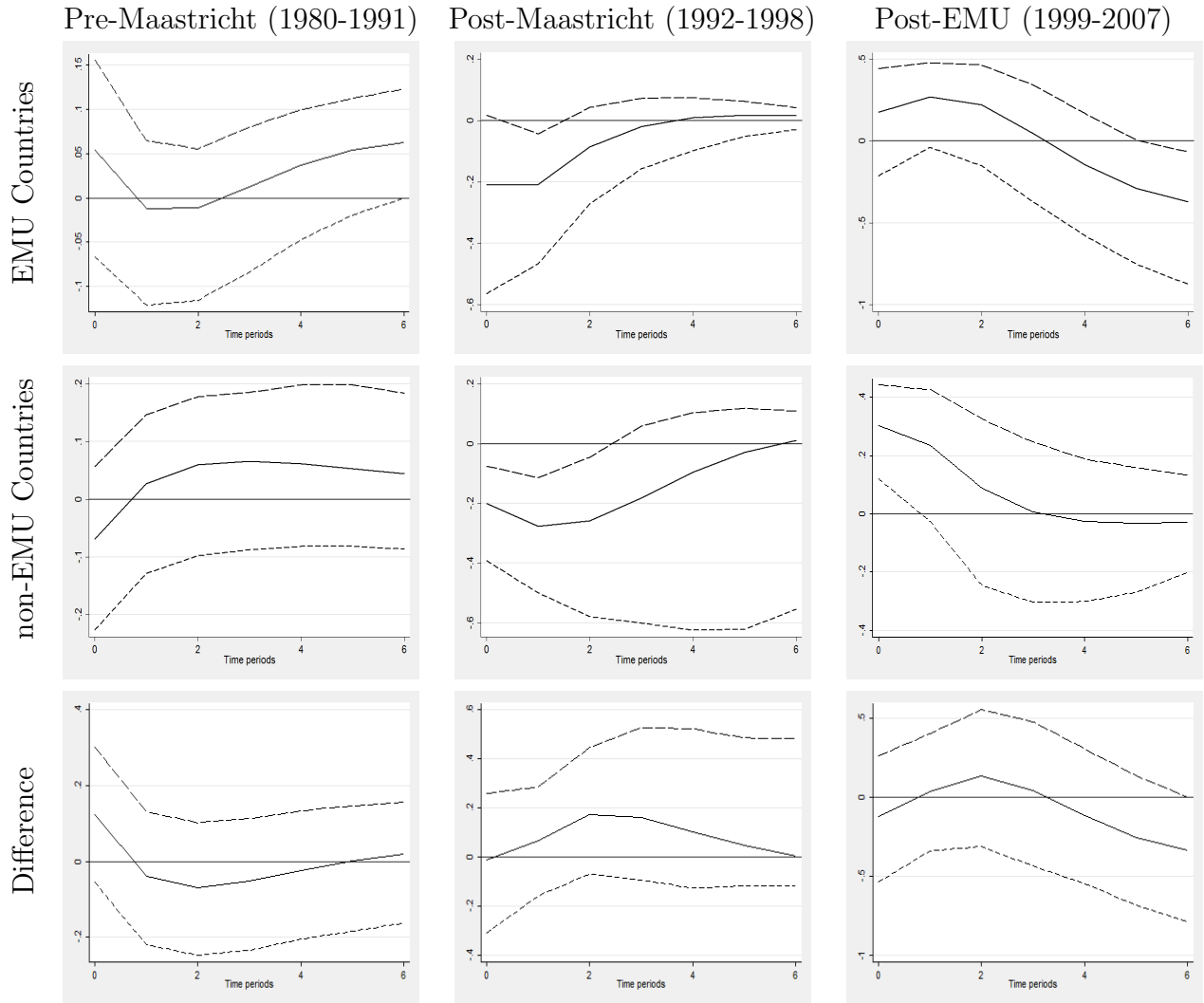
Source: See Figures 1 and 2, and authors' calculations.

Figure 4: Response of the cyclically adjusted primary balance as a share of GDP, to a unit monetary policy shock (shock to the interest rate).



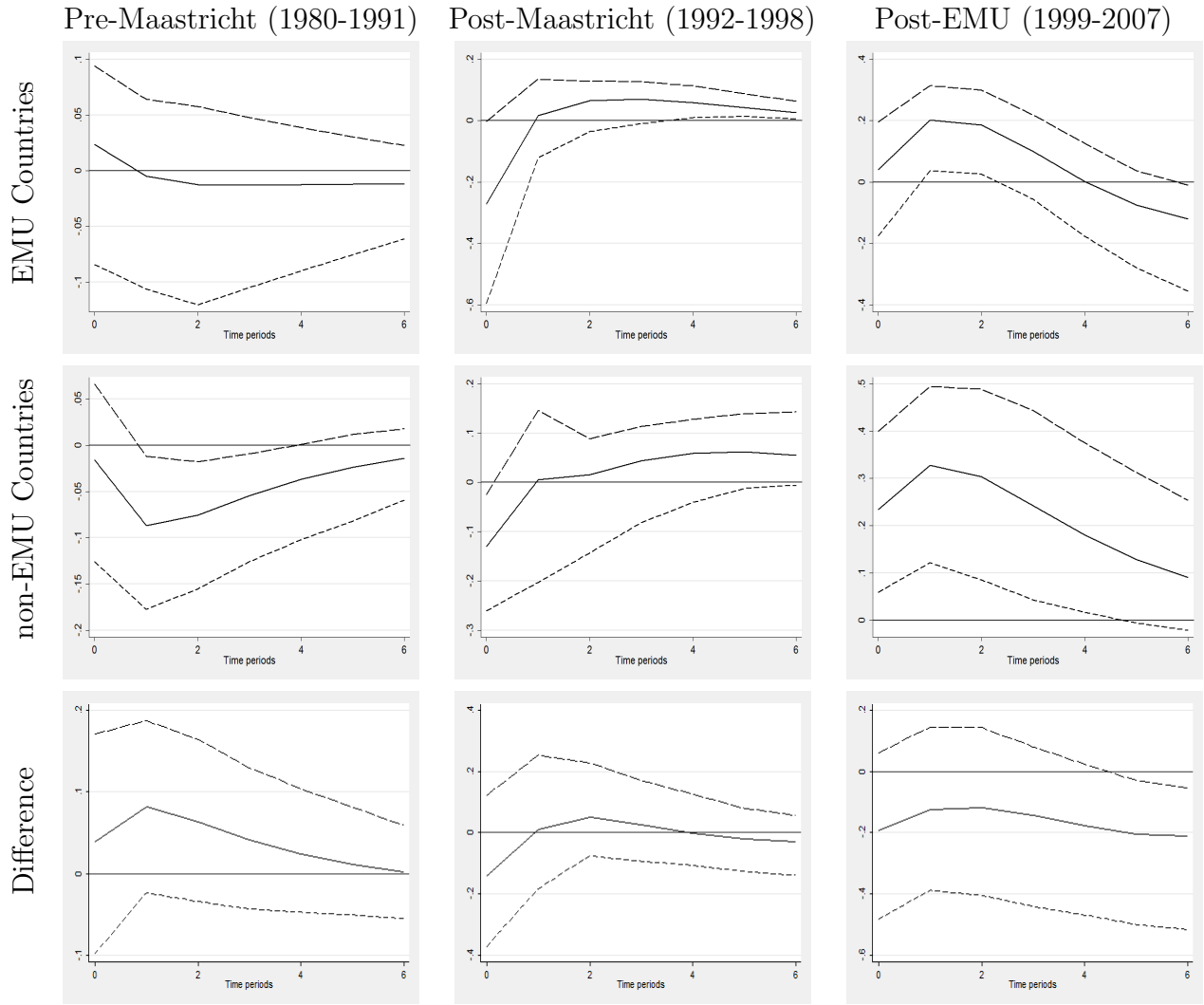
Dashed (- -) lines represent 95% confidence intervals based on 500 Monte-Carlo simulations of the PVAR(1) model. The ordering of variables is as follows: Interest rate, output gap, debt-GDP ratio, and cyclically-adjusted primary balance as a share of GDP. The first row of impulse responses corresponds to the EMU countries; the second row corresponds to the non-EMU countries; and the third row captures the difference in the impulse responses between the EMU and non-EMU countries.

Figure 5: Response of the cyclically adjusted primary balance as a share of GDP, to a unit monetary policy shock (shock to the interest rate).



Dashed (- -) lines represent 95% confidence intervals based on 500 Monte-Carlo simulations of the PVAR(1) model. The ordering of variables is as follows: Interest rate, output gap, the change in the debt-GDP ratio, and cyclically-adjusted primary balance as a share of GDP. The first row of impulse responses corresponds to the EMU countries; the second row corresponds to the non-EMU countries; and the third row captures the difference in the impulse responses between the EMU and non-EMU countries.

Figure 6: Response of the cyclically adjusted primary balance as a share of GDP, to a unit monetary policy shock (shock to the Taylor rule deviation).



Dashed (- -) lines represent 95% confidence intervals based on 500 Monte-Carlo simulations of the PVAR(1) model. The ordering of variables is as follows: Taylor rule deviation, output gap, debt-GDP ratio, and cyclically-adjusted primary balance as a share of GDP. The first row of impulse responses corresponds to the EMU countries; the second row corresponds to the non-EMU countries; and the third row captures the difference in the impulse responses between the EMU and non-EMU countries.