RUHR
ECONOMIC PAPERS

Jens Klose

Political Business Cycles and Monetary Policy Revisited

An Application of a Two-Dimensional Asymmetric Taylor Reaction Function

UNIVERSITÄT DUISBURG ESSEN

#286

Imprint

Ruhr Economic Papers

Published by

Ruhr-Universität Bochum (RUB), Department of Economics
Universitätsstr. 150, 44801 Bochum, Germany

Technische Universität Dortmund, Department of Economic and Social Sciences
Vogelpothsweg 87, 44227 Dortmund, Germany

Universität Duisburg-Essen, Department of Economics
Universitätsstr. 12, 45117 Essen, Germany

Rheinisch-Westfälisches Institut für Wirtschaftsforschung (RWI)
Hohenzollernstr. 1-3, 45128 Essen, Germany

Editors

Editorial Office

Ruhr Economic Papers #286

Responsible Editor: Volker Clausen

ISSN 1864-4872 (online) – ISBN 978-3-86788-332-0

Ruhr Economic Papers #286

Jens Klose

Political Business Cycles and Monetary Policy Revisited

An Application of a Two-Dimensional Asymmetric Taylor Reaction Function

UNIVERSITÄT DUISBURG ESSEN

Bibliografische Informationen der Deutschen Nationalbibliothek

Die Deutsche Bibliothek verzeichnet diese Publikation in der deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über: *http://dnb.d-nb.de* abrufbar.

ISSN 1864-4872 (online)
ISBN 978-3-86788-332-0

Jens Klose[1]

Political Business Cycles and Monetary Policy Revisited – An Application of a Two-Dimensional Asymmetric Taylor Reaction Function

Abstract

This paper uses two-dimensional asymmetric Taylor reaction functions for 16 OECD-countries to account for different reactions to the inflation rate and output by central banks before or after an election of the fiscal authorities in the respective country. Important for such an investigation is not only the period before or after an election takes place but also whether the inflation rate and output are below or above their target or potential value because this information shows whether the central bank systematically deviates from the Taylor rule. Using a Panel-GMM we observe that in the OECD-countries there are political business cycles in monetary policy with respect to the inflation and output response. However, the supporting time horizon differs between both exogenous indicators and state of variables.

JEL Classification: E32, E43, E52, E58

Keywords: Political business cycle; monetary policy; Taylor rule; asymmetries; Panel-GMM

October 2011

1 German Council of Economic Experts and University of Duisburg-Essen. – The views expressed in this paper are my personal views and do not necessarily coincide with those of the German Council of Economic Experts. – All correspondence to Jens Klose, German Council of Economic Experts, Gustav-Stresemann-Ring 11, 65180 Wiesbaden, Germany, E-Mail: Jens.Klose@destatis.de.

1. Introduction

The connection between fiscal and monetary policy has been investigated extensively so far. The standard AS-AD-Model suggests that short term output expansions can be achieved by either an increase in governmental consumption or by raising money supply on the cost of higher inflation rates in the long term. This short term benefits which lead to long term costs are especially interesting for governments before an election because they signal a good performance at the voting day, thus are likely to capture votes. This feature has become popular as the political business cycle (Nordhaus 1975, Tufte 1978). However, not only directly influencing output and employment by increasing governmental consumption or reducing taxes is an option but also forcing the central bank to expand money supply, thus reducing the interest rate. This is only possible if central banks are to some degree dependent on the government. This has led to a large strand of literature concerning central bank independence (Alesina and Summers 1993, Eijffinger and de Haan 1996, Fuhrer 1997, Hayo 1997, Eijffinger et al. 1998, Kaddour et al. 1998, Drazen 2000, Berger et al. 2001, Sturm and de Haan 2001, Maloney et al. 2003, Hayo and Hefeker 2008, Klomp and de Haan 2010 or Hielscher and Markwardt 2011 among others). These studies develop or test determinants of central bank independence and come (mainly) to the result that more independent central banks have lower rates of inflation.[1] In our study we will not explicitly use a measure of central bank independence but we will show indirectly that central banks in OECD-countries are not completely independent by verifying that there are political business cycles in monetary policy. So we can account for asymmetries within the reaction of central banks before and after elections. Moreover, we can test whether there are significant differences in

[1] To build an aggregate measure of central bank independence a point score is introduced which captures different dimensions of independence as e.g. who appoints the members of the board of the central bank, the budgetary role of central banks or the objective of the central bank (see Bade and Parkin 1988, Grilli et al. 1991 or Eijffinger and Schaling 1995 among others).

the reaction to macroeconomic variables in both situations. This can be done using different periods before and after elections to see the evolution of the response coefficients over time.

The framework used to account for different policies of central banks is the Taylor reaction function which signals the interest rate reaction of central banks to deviations of inflation and output from target and potential. Since central banks react to these two variables, it is possible that the reaction is asymmetric with respect to one variable while it is symmetric in the other case. We will perform the analysis for a large set of OECD-countries to arrive at robust estimates for this homogeneous group.

The paper is organized as follows: Section 2 reviews the literature on the political business cycle and monetary policy and distinguishes the political business cycle from the (often simultaneously investigated) partisan theory developed by Hibbs (1977) and Alesina (1987), while section 3 explains special features of our dataset and estimation procedure which is used in the estimations of section 4. Section 5 concludes.

2. Political Business Cycles and Monetary Policy

The theory of political business cycles is all but new. In 1975 William Nordhaus developed a model relying on the Phillips-curve relationship, thus a trade-off between inflation and the unemployment rate. The analysis was conducted with respect to fiscal authorities, who want to be reelected, and the results imply that before elections the incentive to reduce the unemployment rate on the cost of higher inflation rates is substantially higher than in times of no elections to come.

Since low inflation rates and low unemployment (expressed as high levels of economic growth) are the two objectives of most central banks in developed countries, there has been several studies whether the central bank can help the incumbent to stay in office by an expansionary monetary policy before elections. This is more likely the more dependent the central bank is on the political authorities. However, at least as far as appointment of the president or the members of the executive council of the central banks is the task of the government in all developed countries, each central bank is to some degree dependent.

While searching for political business cycles in monetary policy there has often been a second aspect of political economics investigated simultaneously, the partisan theory. This theory, pioneered by Hibbs (1977) and Alesina (1987), integrates the macroeconomic performance and the orientation of the governing party. The predictions are that parties at the left of the policy spectrum put a larger weight on reducing the unemployment rate while parties on the right side take a closer look at the inflation rate. Since the political business cycle and partisan theory both take the Phillips curve as its starting point, it seems natural to analyze both simultaneously with respect to monetary policy, even more as the election dates, which are the driving forces of political business cycles, are also possible breakpoints in the partisan theory. However, we will only look at the political business cycles theory and do not account for the different orientation of the leading parties in the countries. This is rational because of two aspects: First, we will estimate if there are significant differences in the reaction to inflation and the output gap given there is a pre- or post-election period. Therefore, in the pre-election period the political objectives of right side parties should converge to those of the leftist, since low rates of unemployment and high economic growth rates should catch votes. The other way around, in the post-election phase the focus should be on holding the inflation rate on track since there is no immediate need to promote economic growth, but because of high monetary stimulus before the elections threats to price stability are likely to emerge. So in a post-election period the leftist policy converges to those of the rightist. Second, monetary policy is more inertial than fiscal policy. While a change in the fiscal authorities can lead to substantially higher or lower rate of fiscal stimulus, the same event has only minor influence on central bank policy. This is because the mandate of the central bankers does usually not coincide with the election dates. And even if the central bankers are changed immediately after another party gets into power, a sharp reversal of monetary policy objectives would be at risk to sacrifice the central banks credibility. Therefore, the partisan theory is only of minor importance when investigating the relationship between political business cycles and monetary policy.

The effect of partisan theory on monetary policy is by far more tested than the political business cycle hypothesis.[2] Nevertheless there are a few studies that also come up with tests of the political business cycle in monetary policy. Gamber and Hakes (1997), Abrams and Iossifov (2006) and Galbraith et al. (2007) investigated this issue with respect to the US Federal Reserve. All studies can only identify a political business cycle when additionally the party in charge (democratic or republican) is taken into account. Berger and Woitek (2001) could indeed find a political business cycle in monetary policy for the German Bundesbank.

In contrast to the studies mentioned above which do identify a political business cycle via some kind of dummy variable, we do explicitly account for variations in the inflation rate and the output gap in pre- and post election periods. Therefore, we find a political business cycle in monetary policy if there are significant differences in the response to these two variables depending on whether the election is still coming or has just past. Moreover, our analysis covers a broader set of 16 OECD-countries and gives thus a more concrete look on the theory on political business cycles and monetary policy in this group of quiet homogeneous countries.

[2] Belke and Potrafke (2009) give an excellent overview over the studies in this field so far.

3. Data issues and estimation strategy

In this section we will develop our econometric framework to analyze whether there is a political business cycle in monetary policy or not. But before that we explain some issues of our dataset.

3.1 Data

As a starting point we considered the group of all OECD-countries to be part of our sample. However, due to missing data or a too short history we have to drop 17 out of 33 countries.[3] So we end up with a sample of 16 OECD-countries which are: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom and USA. For these countries we were able to become data on the election dates, interest rate, inflation rate and output back to 1975M9 which is the starting point of our sample period. The sample ends in 2010M6. In contrast to other studies we use monthly instead of quarterly or even yearly data. The reason for this choice is that monetary policy is conducted at least in a monthly frequency[4] so aggregating data to quarterly or even lower frequencies would make us lose some information important for central bankers at the time they had to make their decision.

Therefore, we have to proxy GDP by industrial production which is a common feature when estimating Taylor reaction functions on a monthly frequency (see e.g. Sauer and Sturm 2007 or Belke and Polleit 2007). Data on inflation and the interest rate are available on a monthly frequency and need not be proxied or adjusted. As the relevant interest rate we choose the intraday interbank rate of the respective country. All data are taken directly from the OECD

[3] These countries are: Chile, Czech Republic, Finland, Greece, Hungary, Iceland, Ireland, Israel, Luxembourg, Mexico, New Zealand, Poland, Portugal, Slovenia, Slovak Republic, South Korea and Turkey.
[4] Within the recent financial crisis it was observed that interest rate cuts or implementation of "unconventional" policy measures were executed at even higher than monthly frequencies.

or IMF statistical database and were in some cases adjusted by consistent data from national sources. As the election dates we always choose the month where the election took place irrespectively if it was at the beginning/ in the end of the month or in between. As the relevant election we use those of the general government, which in some countries coincides with presidential or other elections. However, the legislative period is not equal in all countries. In most of them it is between four to five years but in the US it is e.g. only two years. We will come back to this issue in section 4.2.2 when we show additional robustness results of our estimates.

Unfortunately, we were unable to conduct our analysis with real-time data as Orphanides (2001) suggests it since this would have reduced our cross-section and time dimension considerably. However, Gerdesmeier and Roffia (2005) or Belke and Klose (2009) showed that differences between ex-post revised and real-time data can be substantial. This topic is not in the focus of this article but it is certainly worth to be investigated with respect to political business cycles. We leave this for future research.

3.2 Estimation procedure

The approach used to investigate whether there is a political business cycle in monetary policy is the standard Taylor reaction function. In 1993 John B. Taylor proposed a new reaction function which arguably covers the interest rate setting behavior of the Fed during the period 1987-1992 quite well. According to his rule the Fed reacts to deviations of the inflation rate from its target and to deviations of the output from its potential, the so-called output gap. This rule was shown to cover not only the Fed monetary policy quite well but also those of a wide range of other central banks. Hence, we can write the Taylor reaction function as follows:

(1) $i_{it}^{T} = \bar{\imath}_{it} + a_{\pi}(\pi_{it} - \pi^{*}) + a_{y}(y_{it} - \bar{y}_{it}) + \varepsilon_{it}$,

where i_{it}^{T} is the Taylor rate set by the respective central bank in period t, $\bar{\iota}_{it}$ is the equilibrium nominal interest rate, π_{it} and $\pi^{*}$are the inflation rate and its target, y_{it} is the output measure (in our case industrial production), $\bar{y}_{it}$ is the potential output level and a_{π}, a_{y} are the reaction coefficients to inflation and the output gap respectively. In his seminal paper, John B. Taylor set the equilibrium real interest rate and the inflation target both equal to two and the reaction coefficients equal to 0.5 each. With this, he was able to mimic the interest rate setting of the Fed in the above mentioned period.

A common practice to estimate the potential output and with this the output gap is to apply the Hodrick-Prescott Filter (Hodrick and Prescott 1997) on the output series. We use a smoothing parameter of 14.400 as it is commonly done for monthly data.

Assuming the Fisher equation with static expectations to hold so that $\bar{\iota}_{it} = \bar{r}_{it} + \pi_{it}$ equation (1) changes to:

(2) $i_{it}^{T} = \bar{r}_{it} + (1 - \alpha_{\pi})\pi^{*} + \alpha_{\pi}\pi_{it} + a_{y}(y_{it} - \bar{y}_{it}) + \varepsilon_{it},$

with $\alpha_{\pi} = (1 + a_{\pi})$. Here the so-called Taylor-principle becomes evident. The coefficient α_{π} has to be larger than unity to fulfill this principle in order to increase the interest rate by more than the inflation rate resulting in a rise the real interest rate which is the decisive variable for investment decisions. Assuming a constant equilibrium real interest rate and inflation target, these two can be added to one constant (c) in Taylor rule estimations.[5]

(3) $i_{it}^{T} = c + \alpha_{\pi}\pi_{it} + a_{y}(y_{it} - \bar{y}_{it}) + \varepsilon_{it}$

[5] The assumption of a constant inflation target is challenged by Leigh (2008). There are also several studies estimating a time varying equilibrium real interest rate (see e.g. Laubach and Williams 2003, Cuaresma et al. 2004, Clark and Kotzicki 2005, Arestis and Chortareas 2007, Mésonnier and Renne 2007 or Garnier and Wilhelmsen 2009). Belke and Klose (2010) investigate this issue in a Taylor rule framework.

Equation (3) is the starting point for our analysis. In order to account for different reactions depending on the political business cycle we introduce a heaviside indicator to (3) depending on whether we are before or after an election.[6]

$$(4)\ i_{it}^{T} = \begin{Bmatrix} \left[c_B + \alpha_{\pi_B}\pi_{it} + a_{y_B}(y_{it} - \bar{y}_{it})\right]^{[j-k,j-1]} \\ \left[c_A + \alpha_{\pi_A}\pi_{it} + a_{y_A}(y_{it} - \bar{y}_{it})\right]^{[j+1,j+k]} \end{Bmatrix} + \varepsilon_{it}$$

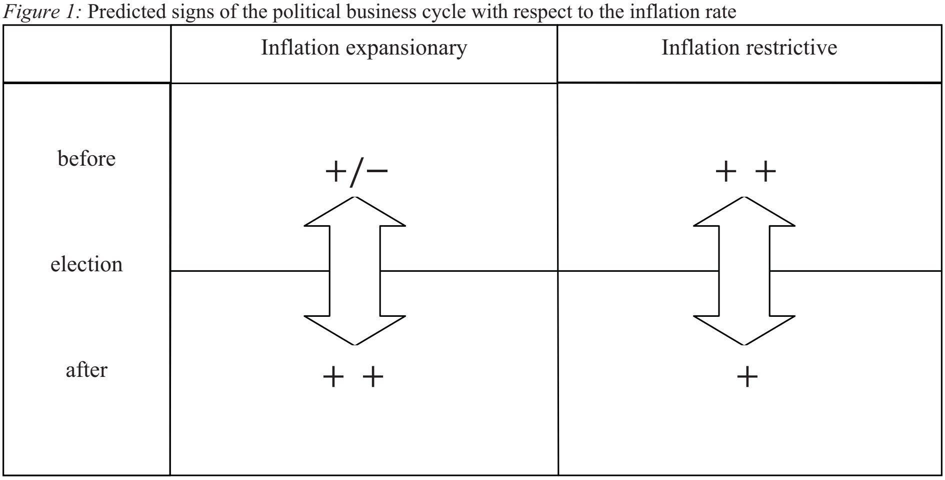
The indices B and A are defining the state before and after an election takes place. The interval introduced with the two different states, signal that before the election (which is in period j) there are k months where the central bank can help the incumbent to stay in office by an appropriate monetary policy. Accordingly, there are also k months after an election in which there is no need to further help the incumbent, thus the central bank can fully concentrate on its mandate. Note, that we do not include the month of the election in either of the states. This is because the election days vary considerably within the months either between but also within the countries. Since we do not know when the central banks are supposed to change their policy in order to help the fiscal authorities, we use different time horizons, i.e. different k. Our choice ranges from $k = 3, \ldots, 12$, so it is supposed that the central banks do not start helping before one year of the respective election month. The choice of 3 month as the shortest period of help is chosen since monetary policy decisions are affecting the real economy with a considerable lag, so a help just one month before the election day should have a negligible effect on the economy and thus on the voters choice. We decide to rely here on a symmetric specification (in the sense of an equal k before and after elections) in order to detect significant differences between the pre- and post-election phases since in this case we have an (almost)[7] equal number observations in both states. In cases

[6] Such an approach is also used by Bec et al. (2002) or Bunzel and Enders (2010) to estimate asymmetric Taylor reaction functions if inflation and output are above or below some target value. Klose (2011) merges both studies and shows that there are asymmetries in the ECB reaction depending on a combination of inflation and output asymmetries.

[7] The number of observations can differ if the election day is at the beginning or end of the sample period, so that there are not enough data points before or after. But these differences are in our context negligible.

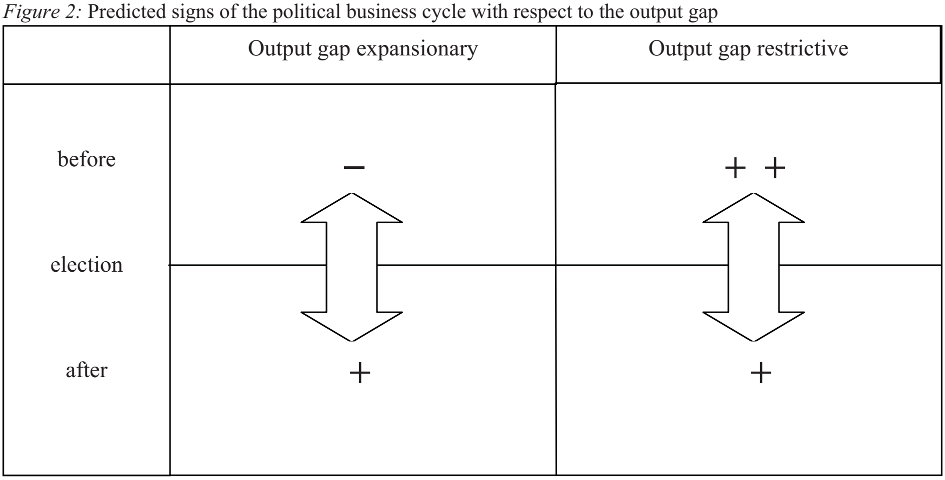
where two or more elections take place in two years time we decided to use only the data before the first election and after the last election in order to avoid an overlapping of both states.

Figure 1: Predicted signs of the political business cycle with respect to the inflation rate



However, equation (4) does not tell us whether there is really a political business cycle in monetary policy but just whether central banks try to adjust the interest rate to bring the inflation rate and/ or the output level back to its target or potential value. This is because we can observe in either state an over- or undershooting of the inflation rate from its target or the output from its potential value.

Figure 2: Predicted signs of the political business cycle with respect to the output gap



Therefore, Figure 1 and 2 introduce a second dimension which is necessary to judge upon the presence of such a phenomenon. To identify a political business cycle in monetary policy the interest rate should be lowered irrespectively whether output is above or below potential in the pre-election phase as figure 2 shows. So we would expect a negative coefficient for the output gap in the former case, while in the latter case the reaction should be positive and even stronger than in “normal” times as signaled by the ++ in figure 2. After the election we suspect no over- or under-reaction concerning the output response so the traditional Taylor coefficient of 0.5 can be applied. But since there are differences before elections depending on the state of the output gap, we want to verify whether all of our predictions are fulfilled, whether there is only one state of the output gap where we observe political business cycle or whether there is no dependence of central banks at all. All in all our testable equation is:

$$(5)\ i_{it}^{T} = \begin{Bmatrix} \left[c_{BE} + \alpha_{\pi_{BE}}\pi_{it} + a_{y_{BE}}(y_{it} - \bar{y}_{it})\right]^{[j-k,j-1]\,\wedge\, y_{it}>\bar{y}_{it}} \\ \left[c_{AE} + \alpha_{\pi_{AE}}\pi_{it} + a_{y_{AE}}(y_{it} - \bar{y}_{it})\right]^{[j+1,j+k]\wedge\, y_{it}>\bar{y}_{it}} \\ \left[c_{BR} + \alpha_{\pi_{BR}}\pi_{it} + a_{y_{BR}}(y_{it} - \bar{y}_{it})\right]^{[j-k,j-1]\,\wedge\, y_{it}<\bar{y}_{it}} \\ \left[c_{AR} + \alpha_{\pi_{AR}}\pi_{it} + a_{y_{AR}}(y_{it} - \bar{y}_{it})\right]^{[j+1,j+k]\wedge\, y_{it}<\bar{y}_{it}} \end{Bmatrix} + \varepsilon_{it}$$

Here the indices E and R stand for an expansive or restrictive development of the output gap, thus a state above or below target and potential.

Although there is only an indirect connection between the response to inflation and elections via the Phillips curve relationship, we suspect that even in this variable there are substantial differences before and after elections which as in the case of the output reaction depend on the whether the inflation rate is above or below some target value (see figure 1).[8] In contrast to Taylor (1993) we do not rely on a constant inflation target of two percent as it is commonly done when estimating Taylor reaction functions. We do so since especially in the beginning of

[8] Note that six of the sixteen countries in this sample have introduced inflation targeting in the last years. So they should only react to this measure. However, tackling the output gap is also reasonable for these countries since the output gap is a good indicator of future inflationary pressures that these central banks need to account for besides the current inflation rate.

our sample inflation rates were considerably above this target in many countries for quite a long time, so that it seems unreasonable to assume that central banks had in these times an inflation target of two percent. Moreover, even today not all central banks have announced an explicit inflation target. This leads us to employ the Hodrick-Prescott filter (with a smoothing coefficient of 14.400) as it was done to find the potential output also for the inflation rate. The series we get from this procedure is our proxy for the inflation target where by definition long periods of over- or undershooting of the target are impossible. However, the result of this procedure implies that the implicit inflation targets for inflation targeting countries are in all cases quite close to the announced target which is clear evidence for the firm anchoring of inflation targets once they are established.

So what coefficient signs do we expect for the inflation reaction? If we are in a situation where inflation is above target, which would call for a rise in the interest rate, the reaction should be significantly reduced, possibly even negative, before the election. The reason is simple: Since inflation rates would suggest increasing interest rates in the traditional Taylor rule there is a conflict between inflation stabilization and supporting the incumbent. Verifying a political business cycle in monetary policy would mean in this setting that temporary higher inflation rates are tolerated to help the government. However, after an election the inflation reaction should be positive and possibly even larger than the proposed 1.5 to bring inflation rates back on track again.

In a situation of inflation rates below the target level, the reaction coefficient should be positive irrespectively of the election date, meaning that interest rates should be increased. Since before the election there is now no longer a trade-off between inflation and supporting reaction but a complementary relationship, we suspect the reaction to inflation to be stronger in the pre-election phase. The testable equation becomes:

$$(6)\ i_{it}^{T}=\begin{Bmatrix} \left[c_{BE}+\alpha_{\pi_{BE}}\pi_{it}+a_{y_{BE}}(y_{it}-\bar{y}_{it})\right]^{[j-k,j-1]\,\wedge\,\pi_{it}>\pi_{it}^{*}} \\ \left[c_{AE}+\alpha_{\pi_{AE}}\pi_{it}+a_{y_{AE}}(y_{it}-\bar{y}_{it})\right]^{[j+1,j+k]\wedge\,\pi_{it}>\pi_{it}^{*}} \\ \left[c_{BR}+\alpha_{\pi_{BR}}\pi_{it}+a_{y_{BR}}(y_{it}-\bar{y}_{it})\right]^{[j-k,j-1]\,\wedge\,\pi_{it}<\pi_{it}^{*}} \\ \left[c_{AR}+\alpha_{\pi_{AR}}\pi_{it}+a_{y_{AR}}(y_{it}-\bar{y}_{it})\right]^{[j+1,j+k]\wedge\,\pi_{it}<\pi_{it}^{*}} \end{Bmatrix}+\varepsilon_{it}$$

We end up with two scenarios with always four possible states. However, it is not observed empirically that central banks adjust their interest rate in large steps as the Taylor rule would suggest it. Moreover, they smooth the interest rate adjustment. That is why for example Clarida et al. (1998) added an interest rate smoothing term to their Taylor rule specification. So the Taylor rate (i_t^T) enters the equation in the following way:

$$(7)\ i_{it}=\rho i_{it-1}+(1-\rho)i_{it}^{T}$$

Since i_{it}^{T} is given by equation (5) or (6) this yields:

$$(8)\ i_{it}=\rho i_{it-1}+(1-\rho)\begin{Bmatrix} \left[c_{BE}+\alpha_{\pi_{BE}}\pi_{it}+a_{y_{BE}}(y_{it}-\bar{y}_{it})\right]^{[j-k,j-1]\,\wedge\,y_{it}>\bar{y}_{it}} \\ \left[c_{AE}+\alpha_{\pi_{AE}}\pi_{it}+a_{y_{AE}}(y_{it}-\bar{y}_{it})\right]^{[j+1,j+k]\wedge\,y_{it}>\bar{y}_{it}} \\ \left[c_{BR}+\alpha_{\pi_{BR}}\pi_{it}+a_{y_{BR}}(y_{it}-\bar{y}_{it})\right]^{[j-k,j-1]\,\wedge\,y_{it}<\bar{y}_{it}} \\ \left[c_{AR}+\alpha_{\pi_{AR}}\pi_{it}+a_{y_{AR}}(y_{it}-\bar{y}_{it})\right]^{[j+1,j+k]\wedge\,y_{it}<\bar{y}_{it}} \end{Bmatrix}+\varepsilon_{it}$$

$$(9)\ i_{it}=\rho i_{it-1}+(1-\rho)\begin{Bmatrix} \left[c_{BE}+\alpha_{\pi_{BE}}\pi_{it}+a_{y_{BE}}(y_{it}-\bar{y}_{it})\right]^{[j-k,j-1]\,\wedge\,\pi_{it}>\pi_{it}^{*}} \\ \left[c_{AE}+\alpha_{\pi_{AE}}\pi_{it}+a_{y_{AE}}(y_{it}-\bar{y}_{it})\right]^{[j+1,j+k]\wedge\,\pi_{it}>\pi_{it}^{*}} \\ \left[c_{BR}+\alpha_{\pi_{BR}}\pi_{it}+a_{y_{BR}}(y_{it}-\bar{y}_{it})\right]^{[j-k,j-1]\,\wedge\,\pi_{it}<\pi_{it}^{*}} \\ \left[c_{AR}+\alpha_{\pi_{AR}}\pi_{it}+a_{y_{AR}}(y_{it}-\bar{y}_{it})\right]^{[j+1,j+k]\wedge\,\pi_{it}<\pi_{it}^{*}} \end{Bmatrix}+\varepsilon_{it}$$

We decided to use only one smoothing parameter that covers all states since estimations with a smoothing parameter for each state revealed that there is no significant difference between all of them. But using an individual smoothing parameter for each state has the drawback that the coefficients of inflation rate and the output gap are not directly comparable, due to the nonlinear structure of such an equation. However, using equations (8) and (9) the nonlinearity of the equation applies to all states equally, which enables us to test whether there are significant differences in the reaction coefficients.

4. Estimations

Before turning to the estimation results it is important to show that we have enough data points in each state. This is done in table 1.

Table 1: Number of observations in different states

k	12	11	10	9	8	7	6	5	4	3
All	3485	3214	2924	2636	2345	2054	1762	1470	1177	884
Before	1727	1586	1445	1304	1162	1019	875	731	586	441
After	1776	1628	1479	1332	1183	1035	887	739	591	443
Before Inflation E	820	743	673	601	533	469	401	338	271	201
After Inflation E	808	730	659	588	522	458	391	321	256	192
Before Inflation R	907	843	772	703	629	550	474	393	315	240
After Inflation R	968	898	820	744	661	577	496	418	335	251
Before Output E	805	734	664	605	546	478	420	348	278	207
After Output E	903	834	755	684	602	528	448	370	294	217
Before Output R	922	852	781	699	616	541	455	383	308	234
After Output R	873	794	724	648	581	507	439	369	297	226

Notes: Sample period 1976M9-2010M6 for 16 OECD-countries.

This table shows that the number pre- and post-election periods is almost the same, which is not surprising since there can only be differences between both if the election was executed at the beginning or end of the sample period so that there are less observations left. When we additionally allow for asymmetries depending on whether inflation and output are above or below target and potential, we also find enough data for every possible permutation. This is somehow surprising if we look at period after an election took place because a political business cycle of monetary policy would imply that the output gap as well as the inflation rate is mainly above potential and target. However, this is not the case in our sample. Moreover, with respect to asymmetries to the inflation rate even the reverse is true.

4.1 Results

But a final judgment upon this phenomenon can only be achieved when estimating the reaction coefficients. We will do this using a Panel-GMM where we choose the instruments to make us pass the J-test of their appropriateness. Therefore, we relied on a constant and with this comparable set of instruments within each estimation. As instruments we use only lagged variables of the inflation rate, the output gap, the exchange rate of the local currency vis-à-vis the US-Dollar[9], year on year stock price growth, the inflation gap (measured as the deviation of the inflation rate from its target) and a constant. In our specification we use always up to 24 lags of the variables. This makes us pass the J-test in all specifications but reduces the sample period by two years, thus it starts at 1977M9.

Before we identify empirically whether there is a relationship between political business cycles and monetary policy, we look at the simple asymmetries before and after an election to see whether the response differs, i.e. whether the central banks try to bring the inflation rate and output back to its equilibrium values or not. In order to test this we insert equation (4) in (7). The results of the reaction coefficients can be seen in Table 2.

Table 2 reveals that interest rate smoothing is generally quite high with values consistently above 0.9. But we also find the inflation rate and the output gap to have a significant influence in the interest rate setting of central banks for most of the time dimensions chosen. With respect to the inflation response before and after elections we find the quite surprising result that before elections the coefficient is reduced for shorter time horizons, while the opposite is

[9] Since the US-Dollar and US-Dollar exchange rate is constant we use year-on-year money growth for the US instead of an exchange rate.

true after elections. This leads to a significant change of the interpretations for different k. If we e.g. take $k = 12$ than the reaction before elections is stronger than after, which is consistent with a political business cycle in monetary policy if the reactions to inflation rates below target dominate. But if $k = 3$ the reverse is true, thus in this case a stronger reaction to inflation rates above the target would support theory.

Table 2: Asymmetries before and after elections

k	12	11	10	9	8	7	6	5	4	3
ρ	0.92***	0.91***	0.92***	0.92***	0.92***	0.94***	0.93***	0.92***	0.92***	0.92***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
c_B	0.54	1.85	2.44	3.67**	2.74*	3.17*	2.83*	2.55*	2.29*	2.32*
	(1.53)	(1.33)	(1.55)	(1.62)	(1.54)	(1.81)	(1.56)	(1.35)	(1.32)	(1.35)
α_{π_B}	2.04***	1.64***	1.43***	1.45***	1.24***	0.96***	0.91***	0.88***	1.01***	0.53**
	(0.31)	(0.25)	(0.27)	(0.27)	(0.25)	(0.29)	(0.26)	(0.24)	(0.25)	(0.26)
a_{y_B}	1.21***	1.19***	1.23***	1.15***	0.46	0.82**	0.84***	0.58**	0.50*	0.44
	(0.38)	(0.31)	(0.33)	(0.33)	(0.28)	(0.33)	(0.30)	(0.26)	(0.28)	(0.30)
c_A	4.05***	2.86**	2.34	1.60	1.85	1.65	2.48*	2.16*	2.45*	2.63**
	(1.39)	(1.22)	(1.44)	(1.51)	(1.44)	(1.71)	(1.47)	(1.28)	(1.26)	(1.31)
α_{π_A}	0.16	0.52**	0.77***	0.57**	0.95***	1.24***	1.10***	1.24***	1.05***	1.42***
	(0.27)	(0.23)	(0.24)	(0.25)	(0.23)	(0.28)	(0.25)	(0.23)	(0.24)	(0.25)
a_{y_A}	-0.27	-0.42	-0.53*	-0.36	0.10	-0.04	-0.23	-0.10	-0.23	-0.13
	(0.35)	(0.28)	(0.30)	(0.31)	(0.30)	(0.36)	(0.33)	(0.32)	(0.33)	(0.32)
$\alpha_{\pi_B} = \alpha_{\pi_A}$	11.16***	5.96**	1.71	3.08*	0.41	0.30	0.16	0.66	0.01	3.99**
	(0.00)	(0.01)	(0.19)	(0.08)	(0.52)	(0.59)	(0.69)	(0.42)	(0.93)	(0.05)
$a_{y_B} = a_{y_A}$	4.86**	8.61***	9.42***	6.90***	0.49	2.07	3.90**	1.93	1.99	1.22
	(0.03)	(0.00)	(0.00)	(0.01)	(0.48)	(0.15)	(0.05)	(0.16)	(0.16)	(0.27)
$\bar{R}^2$	0.93	0.94	0.94	0.94	0.95	0.95	0.96	0.96	0.95	0.95
J-Stat	0.03	0.04	0.04	0.04	0.04	0.05	0.06	0.07	0.08	0.08
	(0.93)	(0.36)	(0.47)	(0.98)	(1.00)	(0.99)	(0.97)	(1.00)	(1.00)	(1.00)
N	3359	3094	2812	2531	2249	1968	1687	1406	1125	844

Notes: Sample-period 1977M9-2010M6, GMM estimates, */**/*** denote significance at the 10%/5%/1% level, standard errors in parentheses, for significant differences in α_{π_x} and a_{y_x} the standard Wald test is used, here corresponding p-values in parentheses, $\bar{R}^2$ is the adjusted R^2 as a measure of the goodness of fit, N = Number of observations.

The reaction to output before an election is found to be consistently higher than after elections. However, the coefficient decreases with the time horizon in the former case so that we can only identify significant asymmetries for $k = 12$ to 9 and 6. This finding would only support the political business cycle in monetary policy if the reaction to negative output gaps dominates these to positive ones.

So the results of table 2 can be interpreted that there may be a political business cycle in monetary policy. However, final evidence upon this issue can only be achieved if we additionally take the second dimension of asymmetries, namely inflation rates and output above or below target/ potential into account. Table 3 does that with respect to the inflation response.

Table 3: Asymmetries before and after elections given inflation above or below target

k	12	11	10	9	8	7	6	5	4	3
ρ	0.91*** (0.01)	0.90*** (0.01)	0.91*** (0.01)	0.91*** (0.01)	0.92*** (0.01)	0.93*** (0.01)	0.92*** (0.01)	0.91*** (0.01)	0.91*** (0.01)	0.90*** (0.01)
c_{BE}	2.70 (3.29)	4.26 (2.77)	4.67 (3.04)	8.58*** (3.16)	8.13*** (3.07)	6.11* (3.28)	6.32** (3.09)	3.01 (2.79)	3.44 (2.89)	2.19 (2.69)
$\alpha_{\pi_{BE}}$	1.56*** (0.47)	1.18*** (0.39)	0.93** (0.41)	0.85** (0.42)	0.79** (0.40)	0.76* (0.44)	1.04** (0.40)	1.31*** (0.37)	1.20*** (0.40)	0.56 (0.39)
$a_{y_{BE}}$	0.40 (0.62)	0.60 (0.54)	1.03* (0.59)	1.36** (0.58)	0.28 (0.51)	0.88* (0.53)	0.82 (0.50)	0.55 (0.43)	0.22 (0.55)	0.09 (0.45)
c_{AE}	-0.49 (3.16)	-2.27 (2.76)	-3.12 (3.10)	-4.26 (3.24)	-5.43* (3.22)	-7.82** (3.80)	-7.26* (3.77)	-3.33 (3.49)	-3.28 (3.40)	-3.00 (2.94)
$\alpha_{\pi_{AE}}$	0.83** (0.41)	1.28*** (0.36)	1.77*** (0.44)	1.08** (0.47)	1.42*** (0.46)	2.27*** (0.53)	1.40*** (0.50)	1.09** (0.61)	1.11** (0.48)	2.06*** (0.43)
$a_{y_{AE}}$	-0.61 (0.56)	-0.97** (0.48)	-1.59*** (0.53)	-0.67 (0.57)	-0.57 (0.54)	-1.47** (0.66)	-0.97 (0.64)	-0.89 (0.61)	-1.19* (0.69)	-0.13 (0.56)
c_{BR}	-0.72 (2.46)	0.12 (2.18)	0.03 (2.52)	-0.29 (2.70)	-0.03 (2.68)	2.52 (2.96)	5.30** (2.56)	5.72*** (2.15)	4.26** (2.15)	3.67* (2.00)
$\alpha_{\pi_{BR}}$	2.62*** (0.55)	2.25*** (0.48)	2.10*** (0.56)	2.22*** (0.59)	1.51*** (0.56)	1.03 (0.64)	0.27 (0.58)	0.18 (0.48)	0.67 (0.50)	0.50 (0.46)
$a_{y_{BR}}$	1.52*** (0.54)	1.26*** (0.47)	0.93* (0.50)	0.62 (0.50)	0.59 (0.48)	0.84 (0.51)	1.12** (0.45)	0.92** (0.39)	0.95** (0.39)	0.76* (0.41)
c_{AR}	7.91*** (1.98)	7.33*** (1.72)	7.73*** (1.93)	6.07*** (1.99)	6.93*** (1.97)	7.98*** (2.29)	5.35*** (1.88)	3.51** (1.62)	4.74*** (1.78)	5.10*** (1.69)
$\alpha_{\pi_{AR}}$	-0.49 (0.42)	-0.22 (0.35)	-0.14 (0.39)	0.17 (0.38)	0.70** (0.34)	0.48 (0.40)	1.28*** (0.36)	1.56*** (0.33)	1.17*** (0.34)	1.07*** (0.32)
$a_{y_{AR}}$	0.75 (0.52)	0.81* (0.44)	1.12** (0.49)	0.61 (0.48)	1.14** (0.48)	1.54*** (0.57)	0.81 (0.50)	0.67 (0.43)	0.65 (0.44)	0.32 (0.40)
$\alpha_{\pi_{BE}} = \alpha_{\pi_{AE}}$	0.84 (0.35)	0.03 (0.87)	1.24 (0.27)	0.09 (0.77)	0.75 (0.39)	3.44* (0.06)	0.24 (0.63)	0.10 (0.76)	0.02 (0.90)	4.76** (0.03)
$\alpha_{\pi_{BR}} = \alpha_{\pi_{AR}}$	12.65*** (0.00)	10.92*** (0.00)	6.91*** (0.01)	5.76** (0.02)	1.12 (0.29)	0.38 (0.54)	1.70 (0.19)	4.44** (0.04)	0.53 (0.47)	0.78 (0.38)
$\bar{R}^2$	0.93	0.94	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.95
J-Stat	0.03 (0.95)	0.04 (0.51)	0.04 (0.64)	0.04 (1.00)	0.04 (1.00)	0.04 (1.00)	0.04 (1.00)	0.05 (1.00)	0.07 (1.00)	0.08 (1.00)
N	3359	3094	2812	2531	2249	1968	1687	1406	1125	844

Notes: Sample-period 1977M9-2010M6, GMM estimates, */**/*** denote significance at the 10%/5%/1% level, standard errors in parentheses, for significant differences in $\alpha_{\pi_{XE}}$ and $\alpha_{\pi_{XR}}$ the standard Wald test is used, here corresponding p-values in parentheses, $\bar{R}^2$ is the adjusted R^2 as a measure of the goodness of fit, N = Number of observations.

With respect to asymmetries in the inflation reaction we find that for $k = 12, 11, 10, 9, 7, 5$ and 3 there are significant difference in the pre- and post-election phase. It is important to note that for no k significant differences for both comparisons, thus an inflation rate above and below target, can be found. So our results derived in table 2 are always driven by only one of the states of the inflation rate. A closer inspection of the results reveals that in cases where we find significant differences given an inflation rate above target the reaction coefficient is significantly lower before elections, which is in line with our assumptions. When looking at states below the target level then the response coefficient is significantly larger before the election takes place for high levels of k, thus for this long time horizon there is an political business cycle in monetary policy in contrast to a dimension of $k = 5$ where there is no evidence for such a theory. This fact is due to a clear trend in the reaction coefficients $\alpha_{\pi_{BR}}$ and $\alpha_{\pi_{AR}}$. While the prior is decreasing with lower k the latter in increasing. That is why we feel legitimized to conclude from this analysis that for large k, thus long periods before elections, there is a political business cycle in monetary policy only for inflation rates below target. The reverse is true for low levels of k where only states above target support the theory.

Testing the hypothesis of asymmetries in the output response that could confirm political business cycles in monetary policy leads to the results presented in table 4. Consistent with our predictions we find in all specifications a negative reaction coefficient before elections if output is above potential. This is against the intuition of the standard Taylor rule which proposes a positive reaction independent of the current state of the variable or elections to come. The negative reaction in this state leads also to a significant different reaction coefficient before and after elections if the output gap is positive for $k = 8 - 5$. Here the reaction is significantly higher after elections, thus we verified that there is a political business cycle in monetary policy given output above potential. In the states with a negative output gap there are for $k = 12 - 9$, 6 and 5 significant differences. All of them point to a significantly lower response coefficient after elections which is consistent with our assumption of a political business cycle in monetary policy. Note, that we find for $k = 6$ and 5 highly significant differences given output below and above target, which was not present at these significance levels taking only asymmetries before and after elections into account (table 2). This is simply due to the opposing directions of the strength of the response coefficients as given in figure 2. This is further evidence that the second dimension of asymmetries (output above or below potential) is needed to judge if there is a political business cycle in monetary policy.

Table 4: Asymmetries before and after elections given output above or below potential

k	12	11	10	9	8	7	6	5	4	3
ρ	0.91*** (0.01)	0.90*** (0.01)	0.91*** (0.01)	0.92*** (0.01)	0.92*** (0.01)	0.93*** (0.01)	0.92*** (0.01)	0.91*** (0.01)	0.91*** (0.01)	0.91*** (0.01)
c_{BE}	9.28** (3.93)	10.07*** (3.29)	7.90** (3.55)	6.70* (3.77)	10.93*** (3.67)	10.38** (4.18)	9.12** (3.81)	6.89** (3.45)	4.08 (3.62)	-0.25 (3.79)
$\alpha_{\pi_{BE}}$	1.67*** (0.60)	1.17** (0.49)	2.04*** (0.54)	1.90*** (0.56)	0.86* (0.52)	1.12* (0.60)	1.29** (0.56)	1.74*** (0.50)	2.29*** (0.54)	2.21*** (0.58)
$a_{y_{BE}}$	-2.95** (1.45)	-2.13* (1.25)	-2.33* (1.32)	-0.58 (1.37)	-2.10* (1.26)	-2.24 (1.44)	-1.65 (1.26)	-1.58 (1.14)	-1.28 (1.21)	-0.88 (1.16)
c_{AE}	4.87 (3.31)	4.20 (2.75)	5.27* (3.08)	1.74 (3.39)	1.02 (3.28)	0.81 (3.58)	-1.48 (3.37)	-2.19 (3.20)	1.57 (3.07)	7.48** (3.37)
$\alpha_{\pi_{AE}}$	0.36 (0.33)	0.54* (0.28)	0.54* (0.31)	0.61* (0.33)	0.75** (0.31)	0.78** (0.36)	0.50 (3.37)	0.74** (0.32)	0.12 (0.37)	-0.35 (0.47)
$a_{y_{AE}}$	-0.30 (0.93)	-0.42 (0.74)	-0.82 (0.79)	-0.31 (0.86)	0.77 (0.80)	1.08 (0.88)	2.07** (0.88)	2.07** (0.85)	1.27 (0.77)	0.77 (0.80)
c_{BR}	1.44 (2.60)	0.47 (2.19)	3.47 (2.46)	5.10* (2.65)	0.66 (2.53)	2.58 (2.92)	2.38 (2.55)	3.27 (2.17)	2.68 (2.12)	4.29* (2.32)
$\alpha_{\pi_{BR}}$	2.13*** (0.43)	1.82*** (0.35)	0.92** (0.38)	1.08*** (0.40)	1.28*** (0.37)	0.57 (0.43)	0.14 (0.39)	-0.12 (0.36)	-0.16 (0.37)	-0.32 (0.38)
$a_{y_{BR}}$	1.63** (0.64)	0.93* (0.49)	0.84 (0.51)	0.97* (0.51)	0.01 (0.44)	0.39 (0.49)	0.29 (0.43)	0.06 (0.36)	-0.11 (0.39)	-0.02 (0.45)
c_{AR}	-0.02 (3.11)	-0.69 (2.57)	-3.97 (3.01)	-3.92 (3.40)	-2.62 (3.21)	-5.27 (3.78)	-5.89* (3.52)	-5.07* (3.03)	-3.20 (2.89)	-4.18 (2.96)
$\alpha_{\pi_{AR}}$	-0.04 (0.43)	0.57 (0.35)	1.28*** (0.38)	0.68 (0.42)	1.50*** (0.41)	2.41*** (0.52)	2.90*** (0.49)	2.58*** (0.40)	2.59*** (0.40)	2.98*** (0.46)
$a_{y_{AR}}$	-1.54* (0.83)	-1.26* (0.66)	-1.50** (0.75)	-1.78** (0.88)	-0.87 (0.81)	-1.34 (0.93)	-2.02** (0.93)	-1.83** (0.81)	-1.03 (0.78)	-0.58 (0.69)
$a_{y_{BE}} = a_{y_{AE}}$	1.66 (0.20)	0.98 (0.32)	0.73 (0.39)	0.02 (0.89)	2.78* (0.10)	2.86* (0.09)	4.30** (0.04)	4.78** (0.03)	2.38 (0.12)	1.10 (0.29)
$a_{y_{BR}} = a_{y_{AR}}$	6.82*** (0.01)	5.47** (0.02)	5.36** (0.02)	6.10** (0.01)	0.79 (0.37)	2.37 (0.12)	4.50** (0.03)	4.31** (0.04)	1.10 (0.30)	0.47 (0.49)
$\bar{R}^2$	0.93	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.94	0.94
J-Stat	0.03 (0.96)	0.04 (0.39)	0.04 (0.61)	0.04 (0.99)	0.04 (1.00)	0.05 (1.00)	0.04 (1.00)	0.05 (1.00)	0.06 (1.00)	0.06 (1.00)
N	3359	3094	2812	2531	2249	1968	1687	1406	1125	844

Notes: Sample-period 1977M9-2010M6, GMM estimates, */**/*** denote significance at the 10%/5%/1% level, standard errors in parentheses, for significant differences in $a_{y_{XE}}$ and $a_{y_{XR}}$ the standard Wald test is used, here corresponding p-values in parentheses, $\bar{R}^2$ is the adjusted R^2 as a measure of the goodness of fit, N = Number of observations.

All in all our analysis confirms that there are tendencies towards a political business cycle in monetary policy. But whether the effects are significant depends crucially on the length of the time horizon chosen. Given that the indicator variables are below target potential the time horizon seems to be rather long which is reasonable since in this situation the prediction of the Taylor rule and political business cycle theory point in the same direction, meaning lowering rates. Due to the well-known time lag of the effectiveness of monetary policy it is thus reasonable to start quite early with supporting the incumbent. In contrast to this for inflation and output above target/potential the political business cycle theory in monetary policy can only be verified for low levels of k, possibly because of the contradicting signs the Taylor rule and the political business cycle theory reveal. So central banks try to observe whether this conflict vanishes as time goes by and do only stick to the political business cycle theory shortly before elections if this is not the case.

4.2 Robustness Checks

In our baseline dataset we have used all data before and after a governmental election for the different time dimension k and countries. We did not yet account for differences in the time between two elections in one country or for a monetary union that might bias our results. Therefore, we check whether the exclusion of the euro area has an effect on our results, while a second analysis adjusts the US elections to be not every two but only every four years when additionally the president is elected.

4.2.1 Exclusion of the euro area

Seven out of sixteen countries in our sample are founding members of the euro area and with this have no central bank that is solely responsible for national purposes since the introduction of the ECB in 1999.[10] Since the ECB conducts monetary policy for now seventeen countries,[11] it is very unlikely that they respond differently before and after elections in the individual countries, even more since election dates are not coordinated across euro area countries and so a period after an election in one country can correspond to a pre-election phase in another. So including the euro area is likely to bias our results to find no support for

[10] These countries are: Austria, Belgium, France, Germany, Italy, Netherlands, Spain.
[11] In January 2011 Estonia became the seventeenth member of the euro area.

the political business cycle theory of monetary policy. We suppose that excluding makes us find even more significant differences that support theory.

To account for this, we excluded the years 1999-2010 for the six members of the euro area in our sample and repeat our analysis of 4.1 using this smaller sample. To see whether there are now differences in bringing back the inflation rate and output to target and equilibrium values, we add Table 5.

Table 5: Asymmetries before and after elections without euro area

k	12	11	10	9	8	7	6	5	4	3
ρ	0.91***	0.90***	0.91***	0.91***	0.92***	0.93***	0.92***	0.92***	0.91***	0.91***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
c_B	0.61	1.31	1.47	2.78*	1.15	1.61	2.02	2.46*	2.47*	2.49*
	(1.53)	(1.33)	(1.55)	(1.61)	(1.59)	(1.87)	(1.62)	(1.44)	(1.41)	(1.42)
α_{π_B}	1.82***	1.54***	1.35***	1.34***	1.22***	0.92***	0.86***	0.83***	0.93***	0.55**
	(0.28)	(0.23)	(0.25)	(0.25)	(0.24)	(0.28)	(0.25)	(0.24)	(0.25)	(0.25)
a_{y_B}	1.12***	1.08***	1.06***	1.00***	0.29	0.66*	0.76**	0.56**	0.49*	0.49
	(0.37)	(0.32)	(0.34)	(0.34)	(0.31)	(0.35)	(0.31)	(0.28)	(0.29)	(0.32)
c_A	4.77***	4.12***	4.03***	3.20**	4.09***	3.93**	4.02***	2.98**	3.00**	3.18**
	(1.36)	(1.19)	(1.39)	(1.45)	(1.44)	(1.71)	(1.49)	(1.33)	(1.31)	(1.34)
α_{π_A}	0.29	0.55***	0.78***	0.61***	0.90***	1.20***	1.08***	1.22***	1.07***	1.35***
	(0.25)	(0.21)	(0.23)	(0.23)	(0.22)	(0.26)	(0.24)	(0.23)	(0.24)	(0.24)
a_{y_A}	-0.28	-0.40	-0.45	-0.26	0.16	0.07	-0.12	0.01	-0.10	-0.05
	(0.34)	(0.28)	(0.30)	(0.30)	(0.29)	(0.35)	(0.32)	(0.31)	(0.32)	(0.30)
$\alpha_{\pi_B} = \alpha_{\pi_A}$	9.07***	5.57**	1.55	2.56	0.56	0.29	0.25	0.81	0.09	3.44*
	(0.00)	(0.02)	(0.21)	(0.11)	(0.45)	(0.59)	(0.62)	(0.37)	(0.76)	(0.06)
$a_{y_B} = a_{y_A}$	4.70**	7.60***	7.09***	4.98**	0.07	0.96	2.69	1.27	1.35	1.17
	(0.03)	(0.01)	(0.01)	(0.03)	(0.80)	(0.33)	(0.10)	(0.26)	(0.25)	(0.28)
$\bar{R}^2$	0.93	0.93	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.94
J-Stat	0.04	0.04	0.05	0.05	0.05	0.05	0.06	0.07	0.09	0.09
	(0.98)	(0.63)	(0.72)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)
N	2915	2685	2439	2194	1950	1707	1463	1219	976	733

Notes: Sample-period 1977M9-2010M6, GMM estimates, */**/*** denote significance at the 10%/5%/1% level, standard errors in parentheses, for significant differences in α_{π_x} and a_{y_x} the standard Wald test is used, here corresponding p-values in parentheses, $\bar{R}^2$ is the adjusted R^2 as a measure of the goodness of fit, N = Number of observations.

Excluding the euro area does not change our results at all. We find almost the same degree of interest rate smoothing and also equivalent significant differences in the inflation and output gap response before and after an election. The only change that emerges is that the output gap response coefficient for $k = 6$ is now significant and in line with those of other time dimensions, namely that the response is stronger before elections.

When adding asymmetries with respect to the inflation rate (table 6) we can identify the same tendencies as for estimates of the whole sample. In fact only the significant differences if inflation is above target and $k = 7$ vanishes. This means that only for $k = 3$ there is a statistically difference in the reaction coefficient to inflation above target. As in table 3 we also find in table 6 a significant difference that contradicts theory if inflation is below target and $k = 5$. But for large k we again find support for our theory.

Table 6: Asymmetries before and after elections given inflation above or below target without euro area

k	12	11	10	9	8	7	6	5	4	3
ρ	0.91*** (0.01)	0.90*** (0.01)	0.91*** (0.01)	0.91*** (0.01)	0.91*** (0.01)	0.92*** (0.01)	0.92*** (0.01)	0.91*** (0.01)	0.91*** (0.01)	0.90*** (0.02)
c_{BE}	-0.66 (3.52)	1.09 (2.98)	1.20 (3.32)	5.46 (3.33)	5.10 (3.30)	4.01 (3.48)	3.31 (3.12)	0.70 (2.88)	1.19 (2.92)	1.63 (2.75)
$\alpha_{\pi_{BE}}$	1.77*** (0.48)	1.39*** (0.40)	1.16*** (0.44)	0.99** (0.42)	0.87** (0.41)	0.72 (0.45)	1.03*** (0.39)	1.30*** (0.37)	1.23*** (0.39)	0.62 (0.38)
$a_{y_{BE}}$	0.40 (0.62)	0.54 (0.53)	0.80 (0.57)	1.12** (0.55)	0.18 (0.50)	0.81 (0.52)	0.75 (0.48)	0.55 (0.43)	0.15 (0.57)	0.18 (0.46)
c_{AE}	3.14 (3.31)	1.33 (2.88)	0.85 (3.30)	-0.43 (3.39)	-0.97 (3.45)	-3.56 (3.99)	-2.06 (3.82)	1.54 (3.63)	0.96 (3.53)	-1.51 (2.98)
$\alpha_{\pi_{AE}}$	0.65 (0.40)	1.07*** (0.36)	1.53*** (0.44)	0.92** (0.46)	1.17** (0.46)	1.98*** (0.53)	1.10** (0.49)	0.74 (0.48)	0.80 (0.49)	1.90*** (0.42)
$a_{y_{AE}}$	-0.78 (0.58)	-1.13** (0.51)	-1.81*** (0.57)	-0.75 (0.57)	-0.45 (0.56)	-1.30* (0.69)	-0.55 (0.65)	-0.59 (0.64)	-1.00 (0.71)	-0.02 (0.58)
c_{BR}	2.13 (2.73)	2.04 (2.42)	1.63 (2.85)	0.75 (2.99)	-0.68 (3.01)	1.40 (3.24)	4.58* (2.61)	5.36** (2.22)	4.82** (2.23)	3.98** (2.02)
$\alpha_{\pi_{BR}}$	2.22*** (0.56)	1.99*** (0.49)	1.86*** (0.58)	2.06*** (0.59)	1.65*** (0.57)	1.17* (0.65)	0.44 (0.55)	0.35 (0.47)	0.71 (0.49)	0.52 (0.44)
$a_{y_{BR}}$	1.84*** (0.62)	1.58*** (0.55)	1.17** (0.59)	0.76 (0.58)	0.53 (0.56)	0.64 (0.60)	0.97* (0.50)	0.73* (0.44)	0.90** (0.44)	0.70 (0.44)
c_{AR}	5.95*** (1.93)	6.08*** (1.67)	6.77*** (1.89)	5.30*** (1.89)	6.69*** (1.94)	8.11*** (2.31)	5.04*** (1.85)	2.91* (1.65)	3.67** (1.82)	5.28*** (1.74)
$\alpha_{\pi_{AR}}$	-0.22 (0.40)	-0.04 (0.34)	0.02 (0.38)	0.31 (0.36)	0.76** (0.33)	0.61 (0.39)	1.39*** (0.35)	1.65*** (0.32)	1.31*** (0.34)	1.03*** (0.31)
$a_{y_{AR}}$	0.61 (0.55)	0.67 (0.47)	1.06** (0.51)	0.51 (0.47)	0.90* (0.48)	1.36** (0.58)	0.46 (0.48)	0.44 (0.42)	0.48 (0.44)	0.25 (0.39)
$\alpha_{\pi_{BE}} = \alpha_{\pi_{AE}}$	1.96 (0.16)	0.23 (0.63)	0.22 (0.64)	0.01 (0.93)	0.16 (0.69)	2.35 (0.13)	0.01 (0.93)	0.63 (0.43)	0.33 (0.56)	3.55* (0.06)
$\alpha_{\pi_{BR}} = \alpha_{\pi_{AR}}$	8.21*** (0.00)	7.72*** (0.01)	4.81** (0.03)	4.43** (0.04)	1.33 (0.25)	0.41 (0.52)	1.67 (0.20)	4.16** (0.04)	0.81 (0.37)	0.72 (0.40)
$\bar{R}^2$	0.93	0.93	0.93	0.94	0.94	0.94	0.95	0.95	0.94	0.94
J-Stat	0.03 (0.99)	0.04 (0.71)	0.04 (0.82)	0.04 (1.00)	0.04 (1.00)	0.05 (1.00)	0.05 (1.00)	0.06 (1.00)	0.08 (1.00)	0.08 (1.00)
N	2915	2685	2439	2194	1950	1707	1463	1219	976	733

Notes: Sample-period 1977M9-2010M6, GMM estimates, */**/*** denote significance at the 10%/5%/1% level, for significant differences in $\alpha_{\pi_{XE}}$ and $\alpha_{\pi_{XR}}$ the standard Wald test is used, here corresponding p-values in parentheses, $\bar{R}^2$ is the adjusted R^2 as a measure of the goodness of fit, N = Number of observations.

Taking the state of the output gap leads to the results shown in table 7. The tendencies remain the same as for the full sample, but the differences become overall less significant. This leads in this case to the result that if output is above target only for $k = 5$ there are significant differences but no longer for $k = 8 - 6$. The same applies to the states where the output gap is negative since here the significant difference of $k = 6$ vanishes.

Table 7: Asymmetries before and after elections given output above or below potential without euro area

k	12	11	10	9	8	7	6	5	4	3
ρ	0.90***	0.89***	0.91***	0.91***	0.91***	0.93***	0.92***	0.91***	0.90***	0.90***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
c_{BE}	8.82**	9.09***	6.89*	5.44	7.88**	6.26	5.46	5.22	4.00	-0.74
	(3.65)	(3.13)	(3.48)	(3.62)	(3.67)	(4.28)	(3.87)	(3.54)	(3.77)	(3.91)
$\alpha_{\pi_{BE}}$	1.63***	1.08**	2.01***	1.72***	0.86*	1.19**	1.30**	1.66***	2.16***	2.06***
	(0.58)	(0.48)	(0.55)	(0.54)	(0.51)	(0.61)	(0.55)	(0.49)	(0.53)	(0.57)
$a_{y_{BE}}$	-3.04*	-1.95	-2.81*	-0.70	-1.58	-1.49	-0.62	-0.93	-1.33	-0.34
	(1.55)	(1.37)	(1.49)	(0.54)	(1.41)	(1.63)	(1.39)	(1.27)	(1.41)	(1.34)
c_{AE}	6.22**	5.42**	6.63**	3.29	2.57	2.40	-0.04	-1.66	2.02	7.18**
	(3.13)	(2.60)	(2.93)	(3.11)	(3.15)	(3.54)	(3.34)	(3.17)	(3.06)	(3.28)
$\alpha_{\pi_{AE}}$	0.36	0.52**	0.51*	0.62**	0.73**	0.83**	0.56*	0.80**	0.23	-0.13
	(0.31)	(0.26)	(0.30)	(0.31)	(0.30)	(0.36)	(0.33)	(0.31)	(0.36)	(0.44)
$a_{y_{AE}}$	-0.54	-0.50	-0.79	-0.21	0.86	1.06	1.92**	2.11**	1.33*	0.72
	(0.92)	(0.74)	(0.78)	(0.81)	(0.78)	(0.87)	(0.87)	(0.84)	(0.75)	(0.75)
c_{BR}	1.01	-0.52	2.19	3.70	-1.33	0.33	1.25	2.67	2.78	3.86*
	(2.59)	(2.20)	(2.46)	(2.53)	(2.52)	(2.94)	(2.52)	(2.14)	(2.09)	(2.28)
$\alpha_{\pi_{BR}}$	2.03***	1.87***	1.05***	1.13***	1.36***	0.62	0.20	-0.04	-0.13	-0.20
	(0.41)	(0.34)	(0.36)	(0.37)	(0.37)	(0.43)	(0.39)	(0.35)	(0.37)	(0.37)
$a_{y_{BR}}$	1.39**	0.80	0.81	0.85	-0.15	0.24	0.20	-0.03	-0.14	-0.03
	(0.67)	(0.53)	(0.56)	(0.54)	(0.49)	(0.54)	(0.46)	(0.38)	(0.41)	(0.47)
c_{AR}	1.21	1.18	-0.92	-0.99	1.17	0.47	-2.03	-3.31	-2.60	-2.48
	(2.99)	(2.54)	(2.98)	(3.26)	(3.18)	(3.80)	(3.51)	(3.12)	(3.00)	(2.95)
$\alpha_{\pi_{AR}}$	-0.01	0.48	1.07***	0.61	1.30***	2.12***	2.62***	2.36***	2.45***	2.67***
	(0.41)	(0.34)	(0.37)	(0.40)	(0.39)	(0.51)	(0.47)	(0.40)	(0.40)	(0.44)
$a_{y_{AR}}$	-1.39*	-1.14*	-1.24	-1.48*	-0.58	-0.49	-1.43	-1.68**	-0.99	-0.49
	(0.83)	(0.67)	(0.77)	(0.86)	(0.80)	(0.94)	(0.92)	(0.83)	(0.78)	(0.68)
$a_{y_{BE}} = a_{y_{AE}}$	1.45	0.66	1.17	0.07	1.81	1.49	1.89	3.10*	2.31	0.43
	(0.23)	(0.42)	(0.28)	(0.80)	(0.18)	(0.22)	(0.17)	(0.08)	(0.13)	(0.51)
$a_{y_{BR}} = a_{y_{AR}}$	6.07**	4.68**	4.29**	4.87**	0.20	0.42	2.37	3.27*	0.95	0.33
	(0.01)	(0.03)	(0.04)	(0.03)	(0.66)	(0.52)	(0.12)	(0.07)	(0.33)	(0.57)
$\bar{R}^2$	0.92	0.93	0.93	0.94	0.94	0.94	0.94	0.94	0.94	0.94
J-Stat	0.03	0.04	0.04	0.04	0.04	0.05	0.04	0.05	0.06	0.07
	(0.99)	(0.66)	(0.79)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)
N	2915	2685	2439	2194	1950	1707	1463	1219	976	733

Notes: Sample-period 1977M9-2010M6, GMM estimates, */**/*** denote significance at the 10%/5%/1% level, standard errors in parentheses, for significant differences in α_{π_x} and a_{y_x} the standard Wald test is used, here corresponding p-values in parentheses, $\bar{R}^2$ is the adjusted R^2 as a measure of the goodness of fit, N = Number of observations.

The result of these minor changes when excluding the euro area is somehow surprising, since we would have expected that dropping these observations would have a favorable effect the political business cycle in monetary policy theory since the ECB as the central bank for more than one country is supposed to be less bound to individual governments. But even the reverse is true: We observe that in general the differences become less significant in this setting, meaning that the ECB is even more influenced by the governments of the member countries than other central banks that conduct monetary policy for only one country. One possible explanation is the inclusion of the recent financial crisis in our sample where the ECB lost part of its independence and also engaged to support national interests. So it has to be concluded that a common monetary policy does only lead to more central bank independence in normal times but not necessarily in a crisis period.

Table 8: Asymmetries before and after elections only US presidential elections

k	12	11	10	9	8	7	6	5	4	3
ρ	0.91***	0.91***	0.92***	0.92***	0.92***	0.94***	0.93***	0.92***	0.92***	0.92***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
c_B	0.87	2.02	2.65*	4.05**	2.91*	3.33*	3.10*	2.79**	2.60*	2.46*
	(1.58)	(1.38)	(1.60)	(1.70)	(1.59)	(1.86)	(1.61)	(1.39)	(1.37)	(1.39)
α_{π_B}	2.07***	1.72***	1.54***	1.54***	1.30***	1.01***	0.95***	0.91***	1.02***	0.53**
	(0.31)	(0.25)	(0.28)	(0.28)	(0.25)	(0.29)	(0.26)	(0.24)	(0.25)	(0.26)
a_{y_B}	1.23***	1.20***	1.20***	1.13***	0.42	0.77**	0.79***	0.52**	0.46	0.41
	(0.38)	(0.32)	(0.33)	(0.34)	(0.29)	(0.33)	(0.30)	(0.26)	(0.28)	(0.31)
c_A	3.82***	2.73**	2.15	1.24	1.66	1.47	2.21	1.90	2.17	2.52*
	(1.44)	(1.27)	(1.49)	(1.58)	(1.49)	(1.76)	(1.52)	(1.33)	(1.32)	(1.35)
α_{π_A}	0.12	0.43*	0.66***	0.48*	0.91***	1.21***	1.07***	1.23***	1.07***	1.43***
	(0.28)	(0.23)	(0.25)	(0.26)	(0.24)	(0.28)	(0.25)	(0.23)	(0.25)	(0.25)
a_{y_A}	-0.27	-0.41	-0.47	-0.30	0.16	0.02	-0.17	-0.02	-0.20	-0.10
	(0.35)	(0.29)	(0.31)	(0.33)	(0.31)	(0.38)	(0.35)	(0.33)	(0.35)	(0.33)
$\alpha_{\pi_B} = \alpha_{\pi_A}$	11.94***	7.55***	2.92*	4.08**	0.74	0.14	0.07	0.52	0.01	3.98**
	(0.00)	(0.01)	(0.09)	(0.04)	(0.39)	(0.71)	(0.79)	(0.47)	(0.91)	(0.05)
$a_{y_B} = a_{y_A}$	4.93**	8.22***	8.10***	5.66**	0.23	1.45	2.92*	1.14	1.52	0.93
	(0.03)	(0.00)	(0.00)	(0.02)	(0.63)	(0.23)	(0.01)	(0.29)	(0.22)	(0.34)
$\bar{R}^2$	0.93	0.94	0.94	0.94	0.95	0.95	0.96	0.96	0.95	0.95
J-Stat	0.03	0.04	0.04	0.04	0.04	0.05	0.06	0.07	0.09	0.09
	(0.97)	(0.58)	(0.67)	(1.00)	(1.00)	(0.92)	(0.98)	(1.00)	(0.98)	(1.00)
N	3183	2918	2652	2387	2121	1856	1591	1326	1061	796

Notes: Sample-period 1977M9-2010M6, GMM estimates, */**/*** denote significance at the 10%/5%/1% level, standard errors in parentheses, for significant differences in $\alpha_{\pi_{XE}}$ and $\alpha_{\pi_{XR}}$ the standard Wald test is used, here corresponding p-values in parentheses, $\bar{R}^2$ is the adjusted R^2 as a measure of the goodness of fit, N = Number of observations.

4.2.2 Only US-presidential elections

In our baseline specification we included every election of the general government, irrespectively of the time between two elections. In most cases there is no problem with this choice since most countries are voting every four to five years so every country is almost equally represented with numbers of elections in our sample. However, there is one exception: The US are in fact voting every two years. But since the election of the president of the US is done every four years and corresponds to the election of the general government, we used as a second robustness check only those “double-elections”. With these adjustment the US are no longer overrepresented in our sample. We suspect that, since the president in the US is quite influential compared to other countries, by taking only these elections into account, the connection of a political business cycle and monetary policy is even stronger because promoting the incumbent (president and party) pays in these cases a double dividend to the Fed.

Table 9: Asymmetries before and after elections given inflation above or below target only US presidential elections

k	12	11	10	9	8	7	6	5	4	3
ρ	0.91*** (0.01)	0.90*** (0.01)	0.91*** (0.01)	0.91*** (0.01)	0.91*** (0.01)	0.93*** (0.01)	0.92*** (0.01)	0.91*** (0.01)	0.91*** (0.01)	0.91*** (0.01)
c_{BE}	2.05 (3.27)	3.70 (2.75)	4.38 (2.99)	7.83** (3.12)	7.68*** (2.96)	6.16* (3.19)	6.18** (3.02)	3.52 (2.75)	3.55 (2.89)	2.48 (2.69)
$\alpha_{\pi_{BE}}$	1.63*** (0.48)	1.28*** (0.39)	1.04** (0.42)	1.00** (0.43)	0.85** (0.39)	0.78* (0.43)	1.06*** (0.40)	1.24*** (0.37)	1.10*** (0.40)	0.53 (0.40)
$a_{y_{BE}}$	0.36 (0.63)	0.58 (0.55)	1.01* (0.60)	1.35** (0.60)	0.24 (0.52)	0.85 (0.54)	0.78 (0.51)	0.53 (0.44)	0.23 (0.55)	0.04 (0.45)
c_{AE}	0.25 (3.26)	-1.66 (2.83)	-3.15 (3.19)	-4.05 (3.39)	-4.95 (3.30)	-7.51* (3.91)	-6.93* (3.86)	-3.38 (3.59)	-2.42 (3.52)	-3.01 (3.03)
$\alpha_{\pi_{AE}}$	0.75* (0.43)	1.16*** (0.38)	1.69*** (0.46)	0.99** (0.51)	1.36*** (0.48)	2.20*** (0.54)	1.34*** (0.52)	1.11** (0.49)	1.12** (0.48)	2.08*** (0.44)
$a_{y_{AE}}$	-0.59 (0.55)	-0.95** (0.48)	-1.43*** (0.53)	-0.61 (0.57)	-0.49 (0.54)	-1.33** (0.65)	-0.96 (0.64)	-0.84 (0.61)	-1.18* (0.68)	-0.16 (0.57)
c_{BR}	0.14 (2.46)	0.75 (2.19)	0.73 (2.54)	0.57 (2.78)	0.05 (2.72)	2.65 (3.04)	5.53** (2.65)	5.53** (2.23)	3.82* (2.23)	3.63* (2.07)
$\alpha_{\pi_{BR}}$	2.74*** (0.55)	2.34*** (0.48)	2.26*** (0.56)	2.39*** (0.61)	1.70*** (0.57)	1.24* (0.66)	0.36 (0.60)	0.34 (0.50)	0.94* (0.52)	0.55 (0.47)
$a_{y_{BR}}$	1.59*** (0.55)	1.31*** (0.48)	0.89* (0.51)	0.59 (0.52)	0.53 (0.49)	0.77 (0.52)	1.10** (0.46)	0.88** (0.40)	0.89** (0.40)	0.76* (0.43)
c_{AR}	7.04*** (2.03)	6.65*** (1.76)	7.07*** (1.98)	5.34** (2.10)	6.54*** (2.02)	7.39*** (2.33)	4.98*** (1.92)	3.31** (1.66)	4.34** (1.86)	5.09*** (1.78)
$\alpha_{\pi_{AR}}$	-0.52 (0.40)	-0.24 (0.34)	-0.21 (0.37)	0.07 (0.38)	0.62* (0.34)	0.43 (0.40)	1.27*** (0.37)	1.54*** (0.33)	1.13*** (0.35)	1.05*** (0.32)
$a_{y_{AR}}$	0.72 (0.53)	0.81* (0.45)	1.16** (0.50)	0.71 (0.51)	1.22** (0.50)	1.61*** (0.59)	0.90* (0.52)	0.73 (0.45)	0.66 (0.46)	0.40 (0.42)
$\alpha_{\pi_{BE}} = \alpha_{\pi_{AE}}$	1.11 (0.29)	0.03 (0.86)	0.69 (0.41)	0.00 (0.99)	0.47 (0.49)	2.93* (0.09)	0.14 (0.71)	0.03 (0.86)	0.00 (0.98)	4.91** (0.03)
$\alpha_{\pi_{BR}} = \alpha_{\pi_{AR}}$	14.68*** (0.00)	12.68*** (0.00)	8.88*** (0.00)	7.20*** (0.01)	1.91 (0.17)	0.82 (0.37)	1.32 (0.25)	3.29* (0.07)	0.08 (0.78)	0.64 (0.42)
$\bar{R}^2$	0.93	0.93	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.95
J-Stat	0.03 (0.98)	0.04 (0.68)	0.04 (0.79)	0.04 (1.00)	0.04 (1.00)	0.04 (0.99)	0.04 (1.00)	0.06 (1.00)	0.07 (0.99)	0.08 (1.00)
N	3183	2918	2652	2387	2121	1856	1591	1326	1061	796

Notes: Sample-period 1977M9-2010M6, GMM estimates, */**/*** denote significance at the 10%/5%/1% level, for significant differences in $\alpha_{\pi_{XE}}$ and $\alpha_{\pi_{XR}}$ the standard Wald test is used, here corresponding p-values in parentheses, $\bar{R}^2$ is the adjusted R^2 as a measure of the goodness of fit, N = Number of observations.

Table 8 shows the results for the adjusted sample taking only asymmetries before and after elections into account. Compared to table 2 there are no changes in significant differences.

This is even reinforced when taking additional asymmetries of the state of the inflation rate into account (table 9). Here the same significant differences are found as for the full sample period. So we again verify that there is a political business cycle in monetary policy with respect to the inflation response for low numbers of k if it is above target and longer time horizons if it is below target.

Table 10: Asymmetries before and after elections given output above or below potential only US presidential elections

k	12	11	10	9	8	7	6	5	4	3
ρ	0.91***	0.90***	0.91***	0.92***	0.92***	0.93***	0.92***	0.91***	0.90***	0.91***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
c_{BE}	11.39***	11.94***	9.44***	8.29**	12.18***	11.66***	9.82**	8.22**	6.35*	1.62
	(4.07)	(3.45)	(3.64)	(3.87)	(3.80)	(4.26)	(3.82)	(3.41)	(3.60)	(3.81)
$\alpha_{\pi_{BE}}$	1.46**	1.04**	1.94***	1.81***	0.69	0.94	1.19**	1.65***	2.12***	2.00***
	(0.60)	(0.50)	(0.55)	(0.57)	(0.54)	(0.62)	(0.57)	(0.50)	(0.53)	(0.57)
$a_{y_{BE}}$	-3.56**	-2.74**	-2.90**	-1.24	-2.55**	-2.73*	-1.95	-1.95*	-1.85	-1.22
	(1.48)	(1.30)	(1.35)	(1.40)	(1.29)	(1.47)	(1.27)	(1.13)	(1.21)	(1.18)
c_{AE}	3.65	3.26	4.64	1.87	1.62	1.34	-0.61	-1.57	1.43	7.00**
	(3.37)	(2.81)	(3.08)	(3.42)	(3.35)	(3.63)	(3.40)	(3.20)	(3.10)	(3.41)
$\alpha_{\pi_{AE}}$	0.40	0.49*	0.49	0.56	0.69**	0.75**	0.42	0.69**	0.08	-0.34
	(0.35)	(0.29)	(0.32)	(0.35)	(0.32)	(0.37)	(0.34)	(0.32)	(0.37)	(0.47)
$a_{y_{AE}}$	0.01	-0.11	-0.57	-0.28	0.70	1.01	1.87**	1.91**	1.33*	0.85
	(0.95)	(0.76)	(0.80)	(0.88)	(0.82)	(0.90)	(0.89)	(0.85)	(0.78)	(0.81)
c_{BR}	1.58	0.42	3.44	4.99*	0.62	2.23	1.89	2.62	2.16	3.98*
	(2.69)	(2.29)	(2.52)	(2.73)	(2.64)	(3.03)	(2.62)	(2.21)	(2.18)	(2.35)
$\alpha_{\pi_{BR}}$	2.29***	2.00***	1.14***	1.25***	1.52***	0.81*	0.36	0.10	-0.00	-0.20
	(0.44)	(0.37)	(0.38)	(0.41)	(0.39)	(0.43)	(0.39)	(0.35)	(0.36)	(0.37)
$a_{y_{BR}}$	1.83***	1.03**	0.94*	0.98*	0.06	0.40	0.24	-0.03	-0.18	-0.02
	(0.67)	(0.52)	(0.53)	(0.53)	(0.46)	(0.51)	(0.43)	(0.36)	(0.40)	(0.45)
c_{AR}	0.54	-0.29	-3.42	-3.56	-2.57	-4.67	-5.04	-4.66	-3.33	-3.99
	(3.24)	(2.70)	(3.09)	(3.50)	(3.32)	(3.87)	(3.51)	(2.97)	(2.87)	(2.97)
$\alpha_{\pi_{AR}}$	-0.11	0.48	1.13***	0.58	1.38***	2.27***	2.79***	2.47***	2.62***	3.01***
	(0.43)	(0.35)	(0.38)	(0.43)	(0.41)	(0.52)	(0.49)	(0.40)	(0.40)	(0.47)
$a_{y_{AR}}$	-1.43*	-1.13	-1.31*	-1.50*	-0.71	-1.10	-1.67*	-1.58*	-0.96	-0.48
	(0.86)	(0.69)	(0.77)	(0.90)	(0.83)	(0.96)	(0.94)	(0.81)	(0.79)	(0.70)
$a_{y_{BE}} = a_{y_{AE}}$	2.85*	2.16	1.66	0.25	3.36*	3.49*	4.53**	5.52**	3.69*	1.67
	(0.09)	(0.14)	(0.19)	(0.62)	(0.07)	(0.06)	(0.03)	(0.02)	(0.05)	(0.20)
$a_{y_{BR}} = a_{y_{AR}}$	6.83***	4.95**	4.80**	4.72**	0.58	1.70	3.10*	2.99*	0.79	0.33
	(0.01)	(0.03)	(0.03)	(0.03)	(0.45)	(0.19)	(0.08)	(0.08)	(0.37)	(0.56)
$\bar{R}^2$	0.93	0.93	0.94	0.94	0.95	0.95	0.95	0.95	0.94	0.94
J-Stat	0.03	0.04	0.04	0.04	0.04	0.05	0.04	0.05	0.06	0.07
	(0.99)	(0.64)	(0.76)	(1.00)	(1.00)	(0.96)	(1.00)	(1.00)	(1.00)	(1.00)
N	3183	2918	2652	2387	2121	1856	1591	1326	1061	796

Notes: Sample-period 1977M9-2010M6, GMM estimates, */**/*** denote significance at the 10%/5%/1% level, standard errors in parentheses, for significant differences in $a_{y_{XE}}$ and $a_{y_{XR}}$ the standard Wald test is used, here corresponding p-values in parentheses, $\bar{R}^2$ is the adjusted R^2 as a measure of the goodness of fit, N = Number of observations.

The pictures changes slightly when adding asymmetries of the output gap instead of the inflation rate (table 10). While the significant differences remain compared to the full sample if output is below potential, in a situation where this measure is above there are now also for

$k = 12$ and 4 significant differences in line with our predictions. That proofs that with respect to the output response of the Fed the governmental elections are not that important as the double elections where additionally the president gets elected.

5. Conclusions

The theory of a political business cycle and its connection to monetary policy has been investigated in this article using a novel approach of a two-dimensional asymmetric Taylor reaction function which takes different responses before and after an election into account. The theory would predict that central banks promote output before elections on the cost of higher inflation while they come back to its mandate to guarantee stable prices afterwards.

Using a sample of 16 OECD-countries we can indeed find a role for political business cycles in monetary policy. However, the change in the response coefficient depends crucially on the time horizon chosen. We used a symmetric approach investigating the reaction coefficients of k months before and after an election took place and found out that with respect to the inflation response only up to 7 months before and after elections there is a significant difference in the reaction coefficients. So the periods where central banks support the incumbent are limited to the last months before an election.

A different picture emerges when looking at asymmetries in the output response. Here we can verify statistically significant differences even for longer time horizons, which is understandable since supporting output/ employment is what catches votes for the incumbent and as far as it does not coincide with rising inflation rates there is no need to react differently to other variables than the output gap.

Overall for long periods the political business cycle theory is driven by states of inflation and output below target/potential due to fact that the Taylor rule and political business cycle theory both predict to lower interest rates. If both exogenous variables are above target/potential the support is limited to the last months before an election due to the conflicting predictions of the rule and theory.

However, our finding of a political business cycle in monetary policy casts doubts on the independence of the central banks included in our sample, which are surely among the most independent ones in the world according to de facto and de jure independence measures. We argue that those measures need to be adjusted by more empirical evidence as conducted in this article to fully account for all interdependencies between the fiscal and monetary authorities. The ultimate goal has to be to eliminate political business cycles in monetary policy in order to give the central banks the full power to fulfill their mandate without changing their policy depending on other influences. Following the Taylor rule might be a good way to proof independence from the government as it can easily be applied and thus observed by the market participants.

References

Abrams, B. and Iossifov, P. (2006): Does the Fed Contribute to a Political Business Cycle?, Public Choice, Vol. 129, pp. 249-262.

Alesina, A. (1988): Macroeconomics and Politics; NBER Macroeconomic Annual, Vol. 3, pp. 13-62.

Alesina, A and Summers, L. (1993): Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence, Journal of Money, Credit and Banking, Vol. 25 No. 2, pp. 151-162.

Arestis, P. and Chortareas G. (2007): Natural Equilibrium Real Interest Rate Estimates and Monetary Policy Design, Journal of Post Keynesian Economics, Vol. 29 No. 4, pp. 621-643.

Bade, R. and Parkin, M. (1988): Central Bank Laws and Monetary Policy, University of Western Ontario; October 1988.

Bec, F., Collard, F. and Salem, M. (2002): Asymmetries in Monetary Policy Reaction Function: Evidence for U.S. French and German Central Banks, Studies of Nonlinear Dynamics & Econometrics, Vol. 6 (2), Art. 3.

Belke, A. and Klose, J. (2009): Does the ECB Rely on a Taylor Rule? Comparing Ex-post with Real Time Data, Ruhr Economic Paper No. 133, Essen.

Belke, A. and Klose, J. (2010): (How) Do the ECB and the Fed React to Financial Market Uncertainty? The Taylor Rule in Times of Crisis, Ruhr Economic Paper No. 166, Essen.

Belke, A. and Polleit, T. (2007): How the ECB and the US Fed Set Interest Rates, Applied Economics, Vol. 39 No. 17, pp. 2197 - 2209.

Belke, A. and Potrafke, N. (2009): Does Governmental Ideology Matter in Monetary Policy? A Panel Data Analysis for OECD-countries, Ruhr Economic Paper, No. 94.

Berger, H., de Haan, J. and Eijffinger, S. (2001): Central Bank Independence: An Update of Theory and Evidence, Journal of Economic Surveys, Vol. 15, pp. 3-40.

Berger, H. and Woitek, U. (2001): The German Political Business Cycle: Money Demand rather than Monetary Policy, European Journal of Political Economy, Vol. 17, pp. 609-631.

Bunzel, H. and Enders, W. (2010): The Taylor Rule and "Opportunistic" Monetary Policy, CREATES Research Paper 2010-4, Aarhus (Denmark).

Clarida, R., Gali J. and Gertler, M. (1998): Monetary Policy Rules in Practice – some Empirical Evidence, European Economic Review, Vol. 42, pp. 1033-1067.

Clark, T. and Kozicki, S. (2005): Estimating Equilibrium real Interest Rates in Real-Time, The North American Journal of Economics and Finance, Vol. 16(3), pp. 395-413.

Cuaresma, J., Gnan, E. and Ritzberger-Gruenwald, D. (2004): Searching for the Natural Rate of Interest: A Euro Area Perspective, Empirica, Vol. 31, pp. 185-204.

Drazen, A. (2000). The Political Business Cycle After 25 Years, in Bernanke, B.S. and Rogoff, K. (Eds.). NBER Macroeconomics Annual 2000, Vol. 15, pp. 75-138, MIT Press.

Eijffinger, S. and de Haan, J. (1996): The Political Economy of Central-Bank Independence; Princeton Special Papers in International Economics, No. 19.

Eijffinger, S. and Schaling, E. (1995): Central Bank Independence: Criteria and Indices, Kredit und Kapital, No.13, pp. 185-217.

Eijffinger, S., Schaling, E. and Hoeberichts, M. (1998): Central Bank Independence: A Sensitivity Analysis, European Journal of Political Economy, Vol. 14, pp. 73-88.

Fuhrer, J. (1997): Central Bank Independence and Inflation Targeting: Monetary Policy Paradigms for the next Millennium, New England Economic Review 1/2, pp. 19-36.

Galbraith, J., Giovannoni, O. and Russo, A. (2007): The Fed's Real Reaction Function – Monetary Policy, Inflation, Unemployment, Inequality and Presidential Politics, Levy Economics Institute Working Paper, No. 511.

Gamber, E. and Hakes, D. (1997): The Federal Reserve's Response to Aggregate Demand and Aggregate Supply Shocks: Evidence of a Partisan Political Cycle, Southern Economic Journal, Vol. 63 No. 3, pp. 680-691.

Garnier, J. and Wilhelmsen, B. (2009): The Natural Real Interest Rate and the Output Gap in the Euro Area: A Joint Estimation, Empirical Economics, Vol. 36 No. 2, pp. 297-319.

Gerdesmeier, D. and Roffia, B. (2005): The Relevance of Real-Time Data in Estimating Reaction Functions for the Euro Area, North American Journal of Economics and Finance, Vol. 16 No. 3, pp. 293-307.

Grilli, V., Masciandaro, D. and Tabellini, G. (1991): Political and Monetary Institutions and Public Financial Policies in the Industrial Countries; Economic Policy, Vol. 6 No. 13, pp. 341-392.

Hayo, B. (1998): Inflation Culture, Central Bank Independence and Price Stability; European Journal of Political Economy, Vol. 14, pp. 241-263.

Hayo, B. and Hefeker, C. (2008): Does Central Bank Independence cause low Inflation? A skeptical View, Paolo Baffi Centre Research Paper No. 2008-04.

Hibbs, D. (1977): Political Parties and Macroeconomic Policy, American Political Science Review, Vol. 71, pp. 1467-1487.

Hielscher, K. and Markwardt, G. (2011): The Role of Political Institutions for the Effectiveness of Central Bank Independence, Cesifo Working Paper No. 3396, Munich.

Hodrick, R. and Prescott, E. (1997): Postwar U.S. Business Cycles: An Empirical Investigation, Journal of Money, Credit and Banking, Vol. 29 No. 1, pp. 1-16.

Kaddour, H., Lockwood, B. and Maloney, J. (1998). Does Central Bank Independence Smooth the Political Business Cycle in Inflation? Some OECD Evidence. The Manchester School of Economic & Social Studies Vol. 66 No. 4, pp. 377-395.

Klomp, J., de Haan J. (2010): Inflation and Central Bank Independence: A meta Regression Analysis, Journal of Economic Surveys, Vol. 24 No. 4, pp. 593-621.

Klose, J. (2011): Asymmetric Taylor Reaction Functions of the ECB: An Approach Depending on the State of the Economy, North American Journal of Economics and Finance, Vol. 22 No. 2, pp. 149-163.

Laubach, T. and Williams, J. (2003): Measuring the Natural Rate of Interest, Review of Economics and Statistics, Vol. 85 No. 4, pp. 1063-1070.

Leigh, D. (2008): Estimating the Federal Reserve's implicit Inflation Target: A State Space Approach; Journal of Economic Dynamics and Control, Vol. 32, pp. 2013-2020.

Maloney, J., Pickering, A.C., and Kaddour, H. (2003). Political Business Cycles and Central Bank Independence. The Economic Journal, Vol. 113(486), pp. C167-C181.

Mésonnier, J. and Renne, J. (2007): A Time-Varying "Natural" Rate of Interest for the Euro Area, European Economic Review, Vol. 51, pp. 1768-1784.

Nordhaus, W. (1975): The Political Business Cycle, Review of Economic Studies 42, pp. 169-190.

Orphanides, A. (2001): Monetary Policy Rules Based on Real-Time-Data, American Economic Review Vol. 91 No. 4, pp. 964-985.

Sauer, S. and Sturm, J. (2007): Using Taylor Rules to Understand European Central Bank Monetary Policy, German Economic Review, Vol. 8 No. 3, pp. 375-398.

Sturm, J. and de Haan, J. (2001): Inflation in developing countries: Does Central Bank Independence matter?, Ifo Studies, Vol. 47., pp. 389-403.

Taylor, J. (1993): Discretion versus Policy Rules in Practice, Carnegie-Rochester Conference on Public Policy, Vol. 39, pp. 195-214.

Tufte, E. (1978): Political Control of the Economy, Princeton University Press, Princeton.