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DOES CONSERVATISM MATTER? A TIME-SERIES APPROACH TO CENTRAL BANK BEHAVIOUR*

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Empirical studies crediting 'independent and conservative central banks' with lowering inflation and inflation volatility have been criticised for their focus on policy outcomes instead of policies, and for their unsystematic conflation of independence and conservatism. We present results from time-series models for the German Bundesbank that avoid these shortfalls. Conservatism matters in the following sense: (*i*) more conservative Bundesbank Councils tend to react stronger to changes in inflation and output, and (*ii*) an increase in conservatism leads to a more activist stabilisation policy. This is in line with simple policy models incorporating economic persistence with implementation lags for monetary policy.

Rogoff's (1985) 'conservative central banker' is widely considered to be a possible remedy for the time-inconsistency problem in monetary policy described by Kydland and Prescott (1977). In equilibrium, so the argument goes, rational wage setters will realise that the more conservative and independent a central bank is relative to the government, the fewer incentives it has to exploit short-term rigidities in the labour market by following an expansionary policy. Thus, given a sufficient degree of independence and everything else being equal, central bank conservatism and equilibrium inflation should be negatively correlated. The characteristics of a conservative central bank with regard to stabilisation of macroeconomic shocks depend to some degree on the structural and dynamic characteristics of the economy. The Svensson (1997, 1999) model, for instance, predicts that a more conservative central banker will react more strongly not only to supply shocks, but also to demand shocks (Ball, 1997). The reason is that monetary policy instruments work through intermediate variables such as output. Shocks to these variables might prove to be as strong a threat to price stability as shocks to inflation.

The empirical literature to date focuses almost exclusively on policy outcomes. As Cukierman (1998), Eijffinger and de Haan (1996) and Berger *et al.* (2001) report, there is hardly a paper that does not find a significant negative correlation between central bank independence/conservatism on the one hand and inflation and inflation variance on the other. Recently, however, such findings have received a fair amount of criticism. Obviously, focusing on differences in policy outcomes such as inflation instead of on differences in policies might produce misleading results if other determinants of outcomes remain unexamined. Some cross-country studies omit control variables altogether.[1] A second evident problem is that most

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[1] For instance, Romer (1993) argues that openness is an important determinant of cross-country differences in inflation. An exception from the outcome-oriented literature is, for example, Eijffinger *et al.* (1996), who use a panel data approach to compare monetary policy across countries using simple reaction functions for short-term interest rate changes.

papers use indices of central bank characteristics that mix measures of conservatism and independence. While the assumption that a higher degree of independence from the government implies a higher degree of conservatism appears to be reasonable in some circumstances, a more careful approach should focus on the two aspects separately.[2] Yet another criticism concentrates on measurement. Many indices of central bank characteristics are based on a comparison of institutional and legal arrangements – an approach that Forder (1996) has criticised because theory points to differences in behaviour and not to differences in rules.[3] A related issue is the possible endogeneity of central bank status. Posen (1993, 1995) argues that the strength of the financial sector rather than the legal status of the central bank determines the degree of conservatism and independence of a central bank. While this particular result may have its shortcomings (Eijffinger and de Haan, 1996), Posen's general observation should be taken seriously.

In the light of the prevailing interest in central bank reform, the criticisms of the existing literature on central bank independence/conservatism are important. If the success of Rogoff's (1985) 'conservative central banker' were essentially the artefact of a neglect of policy analysis and of methodological flaws, recent institutional reforms towards more central bank independence and conservatism, including the installation of the highly autonomous European System of Central Banks, might be ill fated.[4] But it is by far too early to close the case against the Rogoff solution. In fact, in what follows we will provide proof that many of the criticisms justly levelled at the traditional cross-country approach can be avoided by turning to a single-country time-series analysis. Selecting the example of Germany's Bundesbank, one of the world's most independent central banks, we find evidence that 'conservatism matters' with regard to monetary policy.

Consider for a moment the advantages of the single-country approach. A major benefit is that it is easier to draw a distinction between central bank independence and conservatism. It is generally believed that the German Bundesbank has enjoyed relatively high legal and, for that matter, actual independence since the early 1950s (Berger, 1997*a*; Maier and de Haan, 2000). In addition, according to Cukierman (1992), the bank's legal degree of independence has remained unchanged throughout the entire post-war period. At the same time, the information available on the changing membership of the Bundesbank Council, the German central bank's equivalent of the Monetary Policy Committee of the Bank of England, allows inferences to be made about the time path of the Bundesbank's degree of conservatism over the years (Vaubel, 1997*a*). Another advantage of a single-country approach is obviously that there is no need for cross-country comparisons of different degrees of legal and actual central bank autonomy. Also, many variables considered to be possible exogenous determinants of central bank

[2] The only paper in the cross-country tradition that follows this approach is de Haan and Kooi (1997). They construct separate cross-country indices for conservatism and independence. They find only weak evidence for an impact of conservatism on inflation or inflation variability. Of the various measures of independence, only instrument independence shows the expected influence on inflation.

[3] Exceptions include Cukierman's (1992) turnover index.

[4] See Walsh (1995) for the alternative contract-based solution to time-inconsistency in monetary policy. For an assessment of real-world institutions falling into that category, e.g. the Reserve Bank of New Zealand, see the contributions in Bernanke *et al.* (1999).

independence are more or less time-invariant. For instance, Posen's (1995) indicator of the political strength of the German financial sector is constant from the 1950s to the present. Other variables, such as the prevailing exchange rate system or the government's view on inflation, are also more easily controlled for within a single-county approach. All in all, a single country such as Germany looks like a good testing ground for the role of the 'conservative central banker'.

Does conservatism matter in the German case? A crucial element of our analysis is the identification of Bundesbank preferences. Rather than relying on revealed-preferences methods that attempt to disentangle economic structure and preferences (Favero and Rovelli, 1999; Cecchetti *et al.*, 1999), we base our approach on exogenous information, namely the political background of Bundesbank Council members. Our identifying assumptions are, first, that Council members bear the partisan preferences of the nominating Länder or federal government and, second, that those appointed by right-wing-dominated governments are more inflation-averse than those appointed by left-wing governments (Vaubel, 1997*a*; Hibbs, 1977). We provide evidence from individual voting behaviour in the Council in the 1950s and 1960s that supports our identifying assumptions.[5] Unfortunately, the 30-year waiting period for access to Bundesbank minutes forces us to base our general analysis on the behaviour of computed Council majorities rather than on individual voting behaviour.

A major benefit of the single-country approach is that it facilitates a more detailed analysis of central bank stabilisation behaviour. Preliminary analysis of the time-series data indicates that conservative majorities in the Bundesbank Council allowed (real) interest rates to fluctuate more widely than non-conservative majorities. While short-term interest rate levels are approximately similar under both regimes, interest rate volatility is larger under conservative Council majorities. To see whether the differences in observed interest rate volatility under conservative compared to non-conservative Bundesbank regimes is due to differences in policy, we employ (*i*) standard reaction function analysis as well as (*ii*) impulse response functions drawn from standard structural VAR models. Impulse response functions permit a glimpse of not only the direction and strength but also the dynamics of monetary policy – a feature that the reaction function approach lacks.[6] Our base model identifies demand and supply shocks based on the AS/IS/LM framework established by Galí (1992).

As a robustness check, we also provide evidence from generalised impulse responses that take into account the interactions between monetary policy and the economy as well as those between the policy targets of the central bank, without forcing the researcher to impose any short or long-run restrictions on the parameters of the VAR model.[7] Applying either method to conservative and

[5] See, among others, Havrilesky and Gidea (1991) for similar evidence for the US Fed.

[6] For recent work on the Bundesbank using standard reaction function techniques see, among others, Bernanke and Mihov (1997), Clarida and Gertler (1997) and Berger and Woitek (2001).

[7] Standard ways of imposing such restrictions are the Cholesky decomposition (Sims, 1980), which assumes a recursive contemporaneous causal structure between the variables in the VAR, or the Blanchard-Quah decomposition (Blanchard and Quah, 1989), where assumptions about the long-run relationship between the variables solve the identification problem.

non-conservative majorities in the Bundesbank Council, we find that conservative Bundesbank regimes were indeed associated with a more activist stabilisation policy with regard to macroeconomic shocks. This is in line with the theoretical predictions briefly discussed above. The results turn out to be robust with regard to changes in the exchange rate regime and cannot be explained simply by a 'post-Keynesian' structural break in central bank behaviour.

The remainder of the paper is organised as follows. Section 1 discusses the influence of central bank conservatism on monetary policy. In Section 2, we explain in detail the method of measuring conservatism employed in this paper. Section 3 presents and discusses our basic results concerning the behavioural differences between more or less 'conservative central bankers' in the case of the German Bundesbank. Section 4 concludes.

1. Central Bank Conservatism and Monetary Policy

What monetary policy to expect from a more conservative central bank? A simple backward-looking model based on Svensson (1997, 1999) and Ball (1997) helps to illuminate the issue.[8] Consider a closed economy in which aggregate supply is determined along a Phillips-curve

$$\pi_t = \pi_{t-1} + \alpha y_{t-1} + \varepsilon_t, \tag{1}$$

with $\alpha > 0$ and where π_t and π_{t-1} stand for present and one-period lagged inflation. The term y_{t-1} measures the lagged output gap and ε_t is a iid cost-push or supply shock with $\mathrm{E}\varepsilon = 0$ and known variance σ_ε^2 occurring at time t. E is the expectations operator. Equation (1) specifies that inflation in period t is a function of lagged inflation, the lagged output gap, and a contemporaneous supply shock. Aggregate demand evolves according to

$$y_t = \beta y_{t-1} - \gamma(i_{t-1} - \mathrm{E}_{t-1}\pi_t - \bar{r}) + \theta_t, \tag{2}$$

with $\beta, \gamma > 0$ and where θ is a contemporaneous iid IS or demand shock with $\mathrm{E}\theta = 0$ and variance σ_θ^2. Equation (2) implies that the output gap depends on its own past value, the deviation of the lagged *ex ante* real interest rate from its long-run equilibrium level, $\bar{r}$, and a demand shock. The *ex ante* real interest rate in any period t is defined as the difference between the nominal interest rate i_t and the inflation expectations for period $t+1$ formed in period t, $\mathrm{E}_t\pi_{t+1}$. The negative sign in front of second expression in (2) implies that, for instance, an unexpected increase in the nominal interest rate in period t will lower the output gap in period $t+1$. Following (1), the same change in interest rates will – working through the lagged effect of demand – have a dampening effect of inflation in period $t+2$. Thus interest rates influence the output gap with a one-period and inflation with a two-period lag.

[8] For empirical evidence suggesting that this approach is a valid description for the US and the Euro area, see Rudebusch and Svensson (1998) and Peersman and Smets (1998). The German economy is somewhat smaller and more open than these economies. The theoretical argument developed below will still hold, however, as long as the exchange rate channel of monetary policy does not qualitatively alter the control lag structure. For a survey of the entire field of 'New Keynesian' monetary policy models see Clarida *et al.* (1999).

Abstracting from control uncertainty, it is assumed that nominal interest rates are set by an independent central bank with a standard quadratic per-period loss function

$$L(\pi_t, y_t) = \frac{1}{2}\left[(\pi_t - \pi^*)^2 + \lambda y_t^2\right], \tag{3}$$

that is increasing in deviations of the output gap and inflation from given target levels. The output gap target is assumed to be zero and the inflation target $\pi^* > 0$. The parameter $\lambda > 0$ is the relative weight the central bank attaches to the output gap target. Conventionally a conservative central bank is assumed to put less weight on losses due to deviations of output from target than a less conservative central bank. Writing *CONS* for conservative and *NONCONS* for a less or 'non-conservative' central bank, it must hold that $\lambda_{NONCONS} > \lambda_{CONS} > 0$.

Given (3) and subject to (1) and (2) the bank sets i_t to minimise its intertemporal loss function

$$\mathrm{E}_t \sum_{z=t}^{\infty} \delta^{z-t} L(\pi_z, y_z), \tag{4}$$

where $0 < \delta < 1$ is a constant discount factor and E_t marks the expectations formed at period *t*. Svensson (1997, Appendix B) shows that inserting (1), (2), and (3) into (4), deriving the first-order condition, and observing that the conditional inflation forecast $\mathrm{E}_{t-1}\pi_t = \pi_{t-1} + \beta y_{t-1}$, yields the central bank's optimal interest rate reaction function as[9]

$$i_t^* = \bar{r} + \pi^* + a(\pi_t - \pi^*) + b y_t, \tag{5}$$

where a and b are defined as

$$a = \frac{1 + \alpha\gamma - c(\lambda)}{\alpha\gamma}, \quad b = \frac{\alpha[1 + \alpha\gamma - c(\lambda)]}{\alpha\gamma} + \frac{\beta}{\gamma},$$

and where the coefficient $c(\lambda)$ is a positive function of λ, that is, $c_\lambda > 0$. Moreover, $0 \leq c(\lambda) < 1$, $c(0) = 0$, and $c(\infty) \equiv \lim_{\lambda \to \infty} c(\lambda) = 1$.[10] This implies $a, b > 0$ and $a_\lambda, b_\lambda < 0$. In other words, the model suggests that *conservative central banks follow a more activist stabilisation policy* in the sense that they react with stronger changes in interest rates to deviations of inflation and the output gap from their respective targets. Note that according to (4) the average real and nominal interest rate are regime-independent. This directly follows from the assumptions that there are no

[9] Svensson's (1997) model is similar to ours except that he assumes the average long-run interest rate to be zero. Since this does not change the proof, we refer the reader to the exposition mentioned in the main text. Also see the discussion of the closely related models in Svensson (1999) and Ball (1997).

[10] Formally:

$$c(\lambda) = \lambda/[\lambda + \delta\alpha^2 k(\lambda)],$$

with

$$k(\lambda) = 1/2\left([\delta\alpha^2 - \lambda(1-\delta)/\delta\alpha^2] + \left\{[\delta\alpha^2 + \lambda(1-\delta)/\delta\alpha^2]^2 + 4\lambda/\alpha^2\right\}^{1/2}\right) \geq 1.$$

long-term effects of changing central bank preferences on the real economy ($\bar{r}$ is constant) and the inflation target is the same under both regimes.[11] The latter assumption is probably best interpreted as representing a legal constraint on the bank's inflation target, for instance the 'safeguarding price stability' provision present in the Bundesbank law of 1957.

To illustrate the intuition underlying the formal result, consider the example of a central bank that aims to counter a positive demand shock to the output gap in period t threatening to drive up inflation in period $t + 1$. Since changes in both output and inflation are persistent, the shock will influence future inflation through two channels. First, it will increase one-period ahead inflation because the shock drives up demand for a given supply. It will continue to do so in future periods, as well, because the persistence inherent in the time path of the output gap carries the surge in demand into the future. Second, once being tipped off its equilibrium level, inflation will also continue to be higher than before the shock because of persistence. If the central bank were able to compensate for the initial output shock immediately, it would do so no matter its degree of conservatism, because there is no trade-off between the price and output gap stability involved. Stabilising output will also ensure stable prices. But things change if the bank can influence the real economy only with a time lag as it is assumed in (2). Then it will have to distort the output gap from its target level to compensate for both the lagged output gap effects of the shock and the lagged repercussions on inflation. The more conservative it is, i.e. the less weight it puts on avoiding real fluctuations, the more recklessly it will do so. Thus we should expect conservative central banks to raise interest rates more strongly in a reaction to demand shocks than a non-conservative institution.[12] Turning to shocks directly affecting inflation, the same argument applies: the more conservative the central bank is, the more strongly it will raise interest rates to depress demand and thus, over time, inflation.

2. Identifying Conservatism

Section 1 has developed a testable hypothesis regarding the behaviour of conservative and non-conservative central banks. To make this conjecture empirically operational, we need to measure conservatism. As argued earlier, the case of the German Bundesbank 1950–98 is particularly well suited to accommodate our needs. Arguably, the Bundesbank was more or less independent throughout the entire period and other institutional determinants of central bank behaviour such as, for instance, the vested interests of the financial sector hardly changed over time (see Section 1).

An analysis of Bundesbank preferences must start with the Bundesbank Council, the bank's decision-making body that, until 1999, controlled all

[11] A recent literature argues that central bank characteristics might influence the real sector in the long-run if unions have market power and are inflation averse; see the survey in Berger *et al.* (2001). The empirical evidence given the following Section seems to support the assumptions made in the text, however.

[12] A similar argument can be made concerning shocks to money demand. Here, a conservative central bank should also be expected to react more strongly than a non-conservative bank.

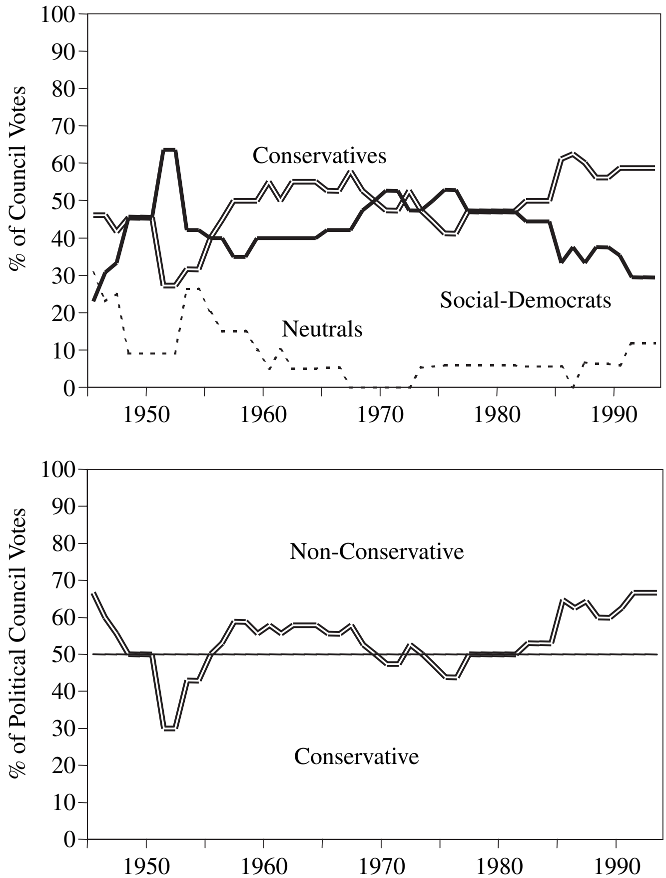

Fig. 1. *The Time Path of Bundesbank Council Votes,* 1950–98
Note: Political vote shares are defined as the share of either conservative or social democratic nominees in the Council, excluding nominees of neutral governments. Source: Vaubel (1997*a*), Bundesbank Annual Reports (various), own calculations.

measures of monetary policy by majority voting. Individual members of the Council are selected in part by the central government and in part by the local German States (Länder). To identify the monetary policy preferences of these individuals, we follow Vaubel (1997*a*) and Hibbs (1977) in assuming, first, that the Council members share the partisan beliefs of the state or federal governments that nominated them. Second, we take the view that governments dominated by the conservative party and, thus, their nominees, are more inflation-averse than those led by social democrats. Consequently, a Bundesbank Council member selected by a conservative government is classified as a conservative 'hawk', while social-democratic appointees are said to be non-conservative 'doves'. Figure 1 shows the time path of the percentage of Bundesbank Council votes held by members appointed by governments dominated by conservatives and social democrats. The third group, termed 'neutrals', consists of those members who were appointed by mixed governments and who therefore cannot be assigned to one the two 'political' groups.[13]

The conservatives on average held about 48% of the overall Council votes, nominees of social-democratic and neutral governments 43% and 9% respectively. But Figure 1 also shows considerable variance. After 1957, for instance, when the former Bank deutscher Länder became today's Bundesbank, a major shift towards a more conservative central bank Council occurred. The reason was that the Bundesbank law gave the executive board voting rights in the Council. This increased the number of members appointed by the then conservative federal government. Otherwise the Bundesbank very closely resembled its predecessor (Berger, 1997*a*).[14]

One way to evaluate the identifying assumption for the preferences of the Bundesbank Council behind Figure 1 is to analyse available information on the individual voting behaviour of its members. Information on voting is limited by two factors. First, German laws allow access to Bundesbank minutes only with a time lag of 30 years. Second, even where the minutes are available, it is sometimes impossible to infer the voting behaviour of individual members. Berger (1997*b*) reports some voting data on actual discount rate changes in the period 1948 to 1961.[15] But the voting records are not always complete and some results have to be meticulously gathered from Council discussions. Even less information is available about votes on decisions not to change policy (Neumann, 1998).[16]

Notwithstanding these limitations, the available data allow some analysis of dissent voting behaviour. Table 1 presents the results of OLS regressions of the percentages of 'no' votes by Council members nominated by conservative, social democratic and 'neutral' Länder and federal governments on discount rate changes in percentage points (Δ *Discount Rate*). Two results stand out. First, political background matters: social democratic appointees especially seem to be more likely to resist upward than downward changes of the discount rate, while conservatives in the Council cast their votes independently of the direction of the policy change. Neutral members lean in the direction of the social democrats, but the results are somewhat less clear. Across columns, Δ *Discount Rate* has a marginally significant positive effect on left-wing and (with exceptions) neutral but not on conservative dissent voting in the sample (columns (1) to (7)). Second, there is some herd behaviour: the dissenting vote was highly correlated among groups. Columns (3), (4), and (7) reveal that all groups were more inclined to vote 'no' if members of other groups did so as well. In the case of neutral council members,

[13] The data on the Council's composition 1950–94 are published in Vaubel (1997*a*). Data for 1995–98 has been collected by the authors. The complete set is available on request.

[14] Vaubel (1997*a*,*b*) argues that the Bundesbank Council members' political background does colour their behaviour towards incumbent governments around elections. Several empirical studies have questioned this finding, however (Neumann, 1998; Berger and Woitek, 2001). Sieg (1997) offers a theoretical discussion.

[15] The information content of the Council minutes after 1962 is, as a rule, too poor to extend the vote database.

[16] There is also no systematic poll on the members' opinions on staff policy proposals that could be exploited quantitatively. Chappel *et al.* (1999) develop such a data set for the US Fed under Arthur Burns in the 1970s.

Table 1

Evidence from Individual Dissent Voting Behaviour in the Bundesbank (1948–61)

	Conservative Nominees		Social Democratic Nominees		Neutral Nominees		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	14.22***	5.63	19.26***	11.82**	9.23**	2.61	1.31
	(3.73)	(1.39)	(4.62)	(2.70)	(2.19)	(0.65)	(0.27)
Δ *Discount Rate*	0.92	−2.45	7.57*	7.08*	11.76	9.15	11.24**
	(0.19)	(0.52)	(1.97)	(1.87)	(1.40)	(1.05)	(2.61)
Social Dem. 'No' Votes		0.44***				0.34**	
		(3.24)				(2.55)	
Conservative 'No' Votes				0.52*			0.55**
				(2.09)			(2.49)
R^2 (adj.)	−0.05	0.13	0.06	0.23	0.20	0.26	0.39
Obs.	19	19	19	19	19	19	19

Notes: ***/**/* indicate significance at the 1, 5 and 10% level respectively. White HC t-Statistics in parentheses below coefficients. The LHS variables are the percentage of conservative (columns (1) and (2)) and social democratic Council nominees (columns (3) and (4)) that voted 'no' on the proposed discount rate change. The term 'Neutral' refers to nominees appointed to the Council by governments that were dominated by neither of the two parties (columns (5), (6) and (7)). Δ *Discount Rate* is the change in the Bundesbank discount rate, the bank's main policy instrument at the time, in percentage points.

this herd behaviour is sufficiently strong to render Δ *Discount Rate* insignificant in column (7).

The results in Table 1 are at least suggestive. Even when controlling for the correlation among the dissent voting behaviour of groups, it would seem that conservatives showed a preference for a more conservative monetary policy than non-conservatives, especially left-wing nominees. The result motivates a closer look at the matter, even though this means moving from individual voting behaviour to an analysis of Council majorities. In what follows, we will assume that the way the Bundesbank Council reached decisions on monetary policy can be captured by the median voter model. In particular, we will assume that a conservative central bank regime reigned when the number of conservative (as defined above) Bundesbank Council members exceeded that of non-conservative members excluding the 'neutral' votes in the Council.[17] In other words, a conservative central bank regime is assumed to hold if more than 50% of the 'political' Council votes are held by individuals with conservative preferences. Otherwise the central bank regime is non-conservative.

3. Empirical Results

Section 1 suggests that – under some assumptions – conservative central bank regimes should be following a more activist stabilisation policy. Equipped with the information on the reign of conservative and non-conservative regimes in the Council of the German Bundesbank described in Section 2 we should be able to test this hypothesis empirically. Some preliminary evidence is gathered in Table 2.

[17] The empirical results are robust with regard to the treatment of the 'neutral' Council members.

Table 2
Interest Rates by Council Regime

	Conservatives	*Non-Conservatives*
Mean (i)	5.23	5.15
Mean (i^{real})	2.27	2.29
Stdev (i^{real})	2.08^{+}	1.88^{+}

+: Significantly different at the 11% level from other regime (F-test).
Notes: Sample excludes the early EPU-period (1951–52), an outlier with regard to CPI inflation volatility. i^{real} defined as *ex post* difference between nominal short-term interest rate and inflation.

Table 2 provides selected conditional sample statistics for the nominal interest rate and the real interest rate for conservative and non-conservative Bundesbank majorities. The data are monthly and available from Bundesbank publications.[18] These cover the post-war period to 1998, excluding only the balance-of-payments crisis occurring during the early phase of the European Payments Union 1950–1.[19]

The data show no significant difference between the average nominal and real interest rates of conservative and non-conservative regimes, but a marginally significantly more volatile real exchange rate under conservative regimes. This seems to be in broadly consistent with the model discussed in Section 2, which asserts that the real and nominal interest rate are the same across regimes, but predicts a more aggressive stabilisation policy under conservative central bank regimes. The evidence gathered in Table 2 – while perhaps indicative – is incomplete, however, as a proper analysis should control for the variance in the determinants of central bank interest rate setting. The reaction function approach discussed below will work along this line.

3.1. *Reaction Function*

A direct test of the hypothesis that Bundesbank stabilisation policy behaviour changed with the preferences of its Council is to estimate a standard reaction function for short-term interest rates, including dummy variables to capture the effect of different council regimes or majorities. Specifically, we estimate a standard interest rate function of the general form

$$\begin{aligned} i_t = a &+ [CONS_t b_1 + (1 - CONS_t) b_2] y_t \\ &+ [CONS_t c_1 + (1 - CONS_t) c_2] m_t + [CONS_t d_1 + (1 - CONS_t) d_2] \pi_t \\ &+ [CONS_t g_1 + (1 - CONS_t) g_2] i_{t-1} + e_t. \end{aligned} \tag{6}$$

[18] Interest rate and CPI data are taken from the Bundesbank CD-Rom: 'Deutsche Bundesbank: *50 Jahre Deutsche Mark*. Monetäre Statistiken 1948–1997'. Munich, C.H. Beck/Vahlen. Data after 1997 are from Bundesbank Monthly Reports (various issues), Bundesbank Annual Reports (various issues) and own calculations. The data are not seasonally adjusted. The real interest rate is computed as an *ex post* rate using year-on-year CPI inflation data. The backward-looking model uses six-month moving averages of inflation, the output gap, and money growth.

[19] The European Payments Union eventually enforced austerity policy measures, asking the Bundesbank to increase interest rates. Where appropriate, the econometric exercises later on control for the event. See Berger (1997*a*) for a summary and references to the relevant literature.

The short-term (day-to-day) interest rate is i, output gap is represented by y, m is the growth rate of M1, and π the CPI inflation rate.[20] All growth rates are based on monthly data (1951:01–1998:12) and computed as annual first differences.[21] Money is included because, most visibly after the mid 1970s, the Bundesbank has indicated that its interest rate decisions were (at least in part) influenced by money growth. The autoregressive part on the left-hand-side of the last line of (6) models the strong inertia present in most interest rate series. Estimating regime-dependent inertia allows us to compute the interest rate shift induced by a permanent one-unit increase in a right-hand-side variable from the empirical model. The variable that helps us distinguish the behaviour of conservative and non-conservative Bundesbank regimes is *CONS*. It takes the value 1 whenever a conservative regime reigns in the Bundesbank Council. Consistent with the analysis in the previous Sections we assume that $CONS = 1$ whenever the number of conservative political votes in the Bundesbank Council exceeds 50%. Otherwise we set $CONS = 0$.

In addition to the time series discussed above, the model also includes a number of regime-exogenous control variables encompassing two time dummies $D_1 = 1$ 1959:01–1973:01, 0 otherwise; $D_2 = 1$ 1990:06–1991:05, 0 otherwise. The latter time dummy models the impact of German unification, the former time dummy covers the convertibility period of the Bretton Woods system.[22] In addition, we have the US short-term interest rate (Federal Funds Rate) and seasonal dummies in our model to capture market-induced movements in the short-term interest rate.[23] The complete model can estimated by OLS.

Marked 'CPI backward', 'GAP backward', and 'M backward', Figure 2 shows the difference between the estimated long-run coefficients for conservative and non-conservative Bundesbank Council majorities for permanent changes in π, m, and y as defined by the model specified in (6). To construct the 90% confidence intervals for the difference between the long-run coefficients of the two regimes, we applied a parametric bootstrap technique (Efron and Tibshirani, 1993), using the estimated variance-covariance matrix, and assuming a multivariate normal distribution for the parameter estimators.[24] Figure 2 implies that, while the point estimate for the difference is positive in all three cases, only in the case of CPI inflation is the conservative long-run coefficient significantly (at least at the 10% level) larger than the long-run coefficient under non-conservative regimes.

[20] The sources of the additional data are again: 'Deutsche Bundesbank: *50 Jahre Deutsche Mark.* Monetäre Statistiken 1948–1997'. Munich, C.H. Beck/Vahlen; Bundesbank Monthly Reports (various issues), Bundesbank Annual Reports (various issues); and own calculations. The one-time increase in the money stock due to German unification, a statistical artifact already well known to the Bundesbank at the time it occurred, has been subtracted before computing m. The output gap in period t is defined as the difference of the growth rate of actual and potential output in t. Potential output is estimated using the Hodrick-Prescott filter, with a smoothing weight $\mu = 14400$.

[21] As mentioned earlier, the original data are not seasonally adjusted. Based on standard HEGY-tests the use of annual growth rates is indeed the proper way to get rid of the seasonal component in our data (available on request) (Berger and Woitek, 2001).

[22] Including a time dummies $D_1 = 1$ 1950:01–1952:05, 0 otherwise, that covers an early balance-of-payments crisis occurring during the EPU period does not change our results.

[23] The Federal Funds Rate is from the NY Fed website.

[24] The results are based on 2,000 replications.

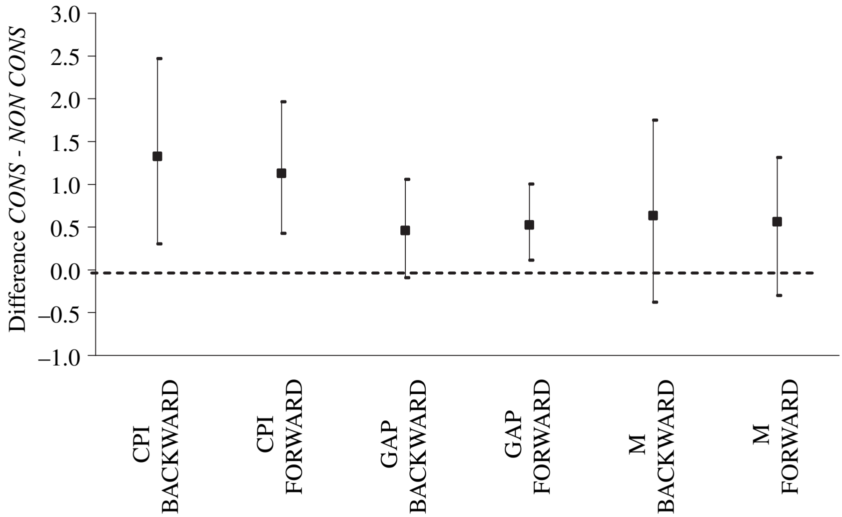

Fig. 2. *Difference of Long-run Coefficients Between Conservative and Non-Conservative Majorities* (Forward- and Backward-Looking Reaction Function)
Note: The figure shows the 90% confidence intervals (based on a Monte Carlo experiment with 2000 replications) for the difference of long-run coefficients between conservative and non-conservative majorities. The difference is marked by the rectangle in the midst of the confidence interval.

To check the robustness of this result with regard to the assumption that only contemporaneous realisations of the right-hand-side variables are included in the model, we also estimated a forward looking reaction function. The model applies TSLS to regress the short-term interest rate on expected values of π, y, and m. Instruments are present and lagged (1 to 12 months) commodity (DM-)price inflation, the lagged long-run German interest rates, lagged CPI inflation, lagged output gap, and lagged money growth.[25] The results, marked 'forward' in Figure 2, are more or less the same as for the backward-looking variant of the reactions function. Note, however, that the point estimate of the difference between the long-run coefficients of conservative and non-conservative regimes for CPI inflation is now significant at least at the 10% level. All in all, the evidence presented in Figure 2 seems to suggest that Bundesbank majorities indeed show some of the predicted regime-specific behaviour in line with the hypothesis developed in Section 1.

We also experimented with specifications that allowed for monetary policy targets as defined by the Bundesbank since the mid-1970s. As a rule, however, these targets remained without influence on Bundesbank policy and did not change the findings just discussed. This is true for the chosen specification using M1 as well as for models based on broader aggregates such as M3.[26]

[25] For a comparable approach see, for instance, Clarida *et al.* (2000). The commodity price data have been compiled from the Bundesbank CD-Rom: 'Deutsche Bundesbank: *50 Jahre Deutsche Mark.* Monetäre Statistiken 1948–1997', Munich, C.H. Beck/Vahlen and Bundesbank Monthly Reports (various issues). The model uses one-quarter ahead forecasts of inflation, the output gap, and money growth instrumented as described in the text.

[26] Similar results have already been reported by Bernanke and Mihov (1996) and Berger and Woitek (2001).

3.2. *Structural VAR*

While the reaction function illuminates the direction and strength of monetary policy under different central bank regimes, it does not allow to asses the dynamics of monetary policy. This gap can be filled by moving from the reaction function framework to standard VAR modelling. What can we say about the monetary policy conducted under conservative and non-conservative Bundesbank regimes when we take into account the interaction between interest rates and the determinants of monetary policy?

To capture the dynamic relationship between monetary policy and the economy properly, we estimate a standard VAR model of the form

$$\mathbf{A}(\mathrm{L})\mathbf{y}_t = \mathbf{u}_t, \tag{7}$$

where $\mathbf{y}_t = (y_t i_t \pi_t m_t)'$ is a (4×1) vector of observations at time t. The data set is similar to the one used to estimate the reaction functions.[27] In addition to $\mathbf{y}_t$, the model also includes as exogenous variables two dummies capturing German unification and the convertibility period of the Bretton Woods system and the DM-based inflation of commodity prices.[28] Again, all growth rates are based on monthly data (1951:01–1998:12) and computed as annual first differences.[29] The (4×1) vector of disturbances $\mathbf{u}_t$ follows the usual assumptions, i.e. $\mathrm{E}(\mathbf{u}_t) = \mathbf{0}$, $\mathrm{E}(\mathbf{u}_t\mathbf{u}_t') = \Sigma$, $\mathrm{E}(\mathbf{u}_t\mathbf{u}_{t'}') = \mathbf{0}\ \forall\, t \neq t'$. $\mathbf{A}(\mathrm{L})$ is a matrix polynomial in the lag operator L (maximum lag length: 12).

Since we are interested in how German central bank behaviour differs under conservative and non-conservative majorities in the Bundesbank Council, we have to control for regime switches of this kind. The difference between regimes is again captured by the dummy variable *CONS*. If we employ this framework to characterise possible differences in the conduct of monetary policy under alternative policy regimes, (7) becomes

$$\begin{aligned} &\mathbf{A}_1(\mathrm{L})\mathbf{y}_t = \mathbf{u}_{1t} \text{ if } CONS_t = 1 \\ &\mathbf{A}_2(\mathrm{L})\mathbf{y}_t = \mathbf{u}_{2t} \text{ otherwise,} \end{aligned} \tag{8}$$

where the order of the VAR is the same in both models. When estimating (8), we include past observations on $\mathbf{y}$ that extend into the time period preceding a given Bundesbank Council regime.

The final step is to compute the impulse responses for well-identified structural shocks and to compare them across both regimes. In order to identify supply and demand shocks, we use a set of long- and short-run

[27] Note that when estimating the VAR, we do not look at the output gap, but at output growth instead. This is in line with the Galí (1992) identification scheme employed here. In addition, it helps to minimise the number of restrictions necessary to identify the model as the output gap cannot be measured directly.

[28] See Section 3.1 For notational ease, we ignore the exogenous variables in the formal presentation of the model. Other than in the previous section, including the US interest rate and/or seasonal dummies does not change results.

[29] Being aware of the fact that a difference specification may lead to inconsistent results in the presence of cointegration, we also estimated the model in log levels. Since the results are robust, we decided to present the models in growth rates, because it allows easier interpretation.

identification restrictions developed from a simple IS-LM model by Galí (1992, p. 715, Table 1). To see how this set of restrictions can be employed for the model described in (8), note that the VAR can be written in a moving average representation

$$\mathbf{y}_t = \mathbf{E}(\mathrm{L})\mathbf{u}_t, \tag{9}$$

which, in turn, can be interpreted as the reduced form of a structural VAR

$$\mathbf{B}(\mathrm{L})\mathbf{y}_t = \mathbf{e}_t, \tag{10}$$

where $\mathbf{e}_t$ is the vector of serially uncorrelated structural disturbances (e_{S}: supply shock; e_{ms}: money supply shock; e_{md}: money demand shock; e_{IS}: IS shock). When calculating impulse responses, we are interested in the parameters of the moving average representation of (9),

$$\mathbf{y}_t = \mathbf{C}(\mathrm{L})\mathbf{e}_t, \tag{11}$$

which trace the impact of a structural shock through the system. The structural disturbances $\mathbf{e}_t$ and the reduced form disturbances $\mathbf{u}_t$ are linked by a (4×4) full rank matrix $\mathbf{S}$: $\mathbf{u}_t = \mathbf{S}\mathbf{e}_t$. Identifying the coefficients of $\mathbf{C}(\mathrm{L})$ in (11) requires us to introduce restrictions on the 16 elements of $\mathbf{S}$. Once we have the restrictions, it is straightforward to calculate $\mathbf{C}(\mathrm{L})$ by postmultiplying $\mathbf{E}(\mathrm{L})$ by $\mathbf{S}$.

Using the fact that after normalisation, $\mathrm{E}(\mathbf{e}_t\mathbf{e}_t') = \mathbf{I}$, we know that $\mathbf{SS}' = \Sigma$. Thus, we obtain ten nonlinear restrictions on the elements of $\mathbf{S}$. In addition, following Galí (1992), we assume that shocks to aggregate demand and money supply are neutral with regard to output in the long-run, implying $C_{12}(1) = C_{13}(1) = C_{14}(1) = 0$. This leads to the following restrictions on $\mathbf{S}$:

$$\begin{aligned} &E_{11}(1)S_{12} + E_{12}(1)S_{22} + E_{13}(1)S_{32} + E_{14}(1)S_{42} = 0;\\ &E_{11}(1)S_{13} + E_{12}(1)S_{23} + E_{13}(1)S_{33} + E_{14}(1)S_{43} = 0;\\ &E_{11}(1)S_{14} + E_{12}(1)S_{24} + E_{13}(1)S_{34} + E_{14}(1)S_{44} = 0. \end{aligned} \tag{12}$$

The remaining restrictions we need are on the short-run interaction between the variables in our system. The absence of contemporaneous effects of money supply and money demand shocks on output leads to two additional direct constraints on $\mathbf{S}$: $S_{12} = S_{13} = 0$. In addition, we assume contemporaneous homogeneity in money demand, i.e. $B_{33}(0) = 0$. From the estimated MA parameter matrices $\mathbf{E}(\mathrm{L})$ and the error covariance matrix $\mathbf{\Sigma}$ it is now possible to find the matrix $\mathbf{S}$, which, in turn, allows us to identify the structural shocks to the system.

Figure 3 compares the generalised impulse responses of conservative and non-conservative Bundesbank regimes to sudden inflationary pressure caused by IS shocks, money demand shocks, and (negative) supply shocks. The first column shows the Bundesbank reaction to shocks under conservative Council majorities (VAR1), the second column the impulse responses under non-conservative Councils (VAR2). The last column plots the difference between the former and the latter (VAR1 – VAR2). The 90% confidence intervals are calculated using a standard non-parametric bootstrap technique (Efron and Tibshirani, 1993). To

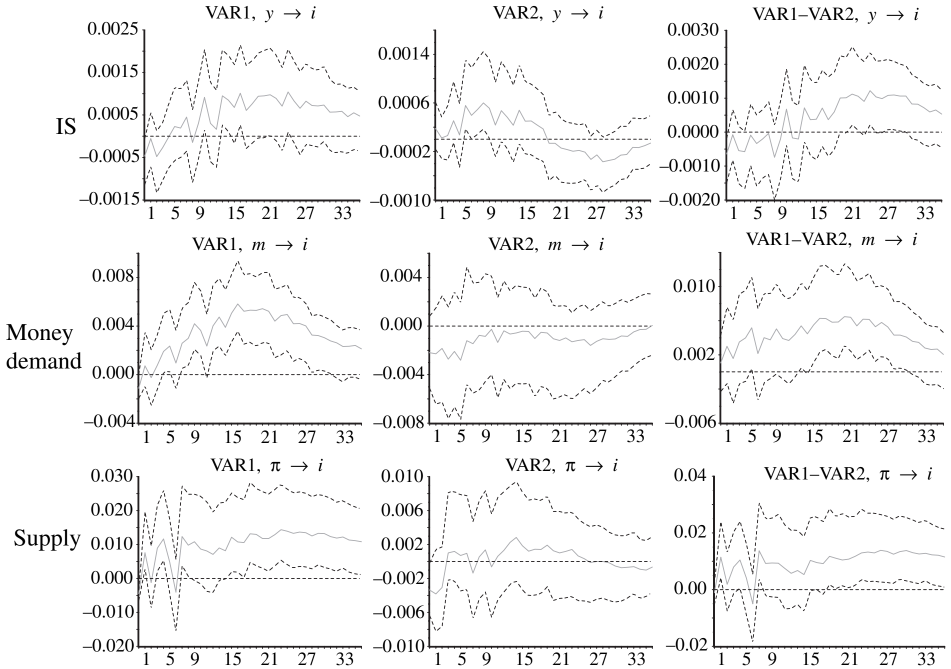

Fig. 3. *Interest Rate Reaction after IS Shocks, Supply Shocks, and Money Demand Shocks.*

avoid small sample bias, we use the correction procedure proposed by Kilian (1998).[30]

The reaction of the short-term interest rate under conservative central bank regimes depicted in the first column indicates that the monetary policy became more contractionary when confronted with inflationary demand or supply shocks. In all three cases the impulse response functions show an increase in the interest rate that is significantly different from zero.[31] The interest rate reactions to demand shocks are hump-shaped, indicating that the increase is not permanent but temporary, while the response to supply shocks (assumed to exert a long-term influence on output and prices) appears to be of somewhat more permanent nature. The picture changes, however, when we turn to the second column in Figure 3, which shows the impulse responses under non-conservative Bundesbank regimes. While we still find a significant positive interest rate reaction – albeit shorter in duration than under conservative regimes – to IS shocks, the reaction to money demand and supply shocks is not significantly different from zero. Column three measures the difference of the impulse responses. It confirms that conservative Bundesbank Council majorities reacted significantly stronger not only to money demand and supply shocks but also to IS shocks than non-conservative

[30] The procedure has two steps: first, the small-sample bias is estimated based on 1,000 replications of the estimated model. Then, the confidence intervals are derived from 2,000 replications of the corrected model (including a stationarity correction).

[31] We speak of (economic) significance when a computed impulse response function or difference is significantly different from zero for more than one period within the 36 months horizon.

majorities. To summarise, the results displayed in Figure 3 suggest that conservatism mattered for the way the Bundesbank conducted monetary policy: similar to Section 3.2, we find that more conservative Council majorities reacted more aggressively to inflationary pressure than non-conservative majorities.

To check the robustness of the results with regard to sample selection, we computed the impulse response functions of both types of majority separately excluding the period of the 'hard' Bretton Woods system of fixed exchange rates (Obstfeld, 1993). That period runs from January 1959, when the D-Mark became fully convertible, to early 1972, when the Bretton Woods System finally dissolved. We categorise the years after 1973 as a period of a floating exchange rate, since the Bundesbank *de facto* operated as the – unconstrained – anchoring central bank of the European exchange rate mechanisms (Kenen, 1995). We found that the results without the Bretton Woods period were similar to the results discussed above.[32] A second robustness check was conducted by splitting our overall sample into 'Keynesian' and 'post-Keynesian' subsamples, drawing the line in 1980. The general results did not differ significantly between the two periods.[33]

3.3. *Generalised Impulse Responses*

Section 3.2 showed that there is a distinct difference in the way conservative and non-conservative Bundesbank regimes reacted to shocks identified by economic theory. One might argue, however, that the decision makers at the time were not faced with well-defined demand or supply shocks but rather unexpected changes in, for instance, output and inflation. In that sense the results discussed above might not capture 'actual' differences in central bank behaviour under differing degrees of conservatism. Therefore, as a further robustness check, in addition to the impulse responses based on just identifying restrictions, we also present generalised impulse responses (Koop *et al.*, 1996; Pesaran and Shin, 1998). The purpose of this exercise is to show that our main results are robust under very general conditions, and do not depend on the underlying restrictions. Based on the same basic regime-specific VAR model (8) as in Section 3.2, generalised impulse responses (GI) have the form

$$\mathbf{GI}(h, \mathbf{d}, \mathbf{\Omega}_{t-1}) = \mathrm{E}\big(\mathbf{y}_{t+h}|\mathbf{u}_t = \mathbf{d}, \mathbf{\Omega}_{t-1}\big) - \mathrm{E}\big(\mathbf{y}_{t+h}|\mathbf{\Omega}_{t-1}\big), \tag{13}$$

where $\mathbf{y}_t = (y_t\ i_t\ \pi_t\ m_t)'$ is the same (4×1) vector of observations at time t introduced in the previous section.[34] The GI can be interpreted as the difference between two h-step forecasts of $\mathbf{y}$, based on the set on information available at time t, $\mathbf{\Omega}_{t-1}$. We predict $\mathbf{y}$, given that our system is hit by a vector of shocks $\mathbf{d}$ at time t, and subtract from this forecast the forecast of $\mathbf{y}$ without the shocks. Generalised impulse responses allow us to analyse this question by taking into account the

[32] We also conducted a more elaborate test comparing the performance of conservative majorities within and outside the hard Bretton Woods period. The results showed that the impulse response of the interest rate was both quicker and stronger without the fixed exchange rate constraint.

[33] The same holds for alternative break points around 1980:01.

[34] The empirical GI-model will also include the same set of exogenous variables discussed in Section 3.2.

contemporaneous correlation between the variables, which are given by the off-diagonal elements of the error variance-covariance matrix. Reinterpreting the impulse response function as a conditional forecast, we avoid the identification problems in VAR analysis. While the shocks to the system cannot be interpreted as structural, they represent the historical properties of the data well. In what follows, we are interested in the reaction of the interest rate i to shocks in output, inflation and money.

Assume that the system is hit by a vector of shocks $\mathbf{d}$. As generalised impulse response we obtain

$$GI(h, \mathbf{d}, \boldsymbol{\Omega}_{t-1}) = \underbrace{\mathrm{E}(i_{t+h}|\mathbf{u}_t = \mathbf{d}, \boldsymbol{\Omega}_{t-1})}_{= \mathbf{e}'_1[\mathbf{B}_h \mathrm{E}(\mathbf{u}_t|\mathbf{u}_t = \mathbf{d})]} - \underbrace{\mathrm{E}(i_{t+h}|\boldsymbol{\Omega}_{t-1})}_{=0}. \tag{14}$$

where $\mathbf{B}_h$ is the parameter matrix of the MA-representation of the underlying VAR model at lag h, and $\mathbf{e}_1$ is a (4×1) vector with 1 as the first element and zeroes as the other three elements.[35] The (4×1) vector $\mathbf{u}_t$ contains the reduced form disturbances to y, i, m, and π.

What we need next is an expression for $\mathrm{E}(\mathbf{u}_t|\mathbf{u}_{2t} = \mathbf{d})$. Assuming that the distribution of $\mathbf{u}_t$ is multivariate normal, and that we look at a forecast conditional on a shock hitting equation j, we obtain

$$GI(h, \mathrm{d}, \boldsymbol{\Omega}_{t-1}) = \mathbf{e}'_1 \mathbf{B}_h \left[E\left(\mathbf{u}_t | u_{jt} = d\right)\right] = \mathbf{e}'_1 \left.\frac{\mathbf{B}_h \Sigma \mathbf{e}_j}{\sqrt{\sigma_{jj}}}\right|_{\mathrm{d}=\sqrt{\sigma_{jj}}}. \tag{15}$$

The shock to equation j is normalised and has the size of one standard deviation.

Figure 4 compares the generalised impulse responses of conservative and non-conservative Bundesbank regimes to shocks in output, money growth, and inflation, as formalised in (14). As in Figure 3, the first columns shows the Bundesbank reaction to positive shocks to y, m, and π under conservative Council majorities (VAR1), the second column the impulse responses under non-conservative Councils (VAR2). The last column plots the difference between the former and the latter (VAR1–VAR2). The 90% confidence intervals are calculated using the same standard non-parametric bootstrap technique as in Section 3.2 above.

The pattern that emerges from Figure 4 is – again – that conservative Council majorities did follow a more activist policy.[36] While the Bundesbank showed a positive and at least marginally significant positive reaction to shocks to y, m, and π under conservative regimes, its reaction under non-conservative regimes was much less pronounced. In the case of m, there is a even a significant negative response. The difference between both impulse responses is positive up to a three-year horizon in the case of output and money growth and up to about two years for inflation. Only in the latter case is the difference not significant.

[35] The vector $\mathbf{e}_1$ extracts the first row elements (i.e. the interest rate reaction) of the resulting vector of responses.

[36] As in the previous Section, the results are robust with regard to changes in the exchange rate regime and cannot be explained simply by a 'post-Keynesian' structural break in central bank behaviour.

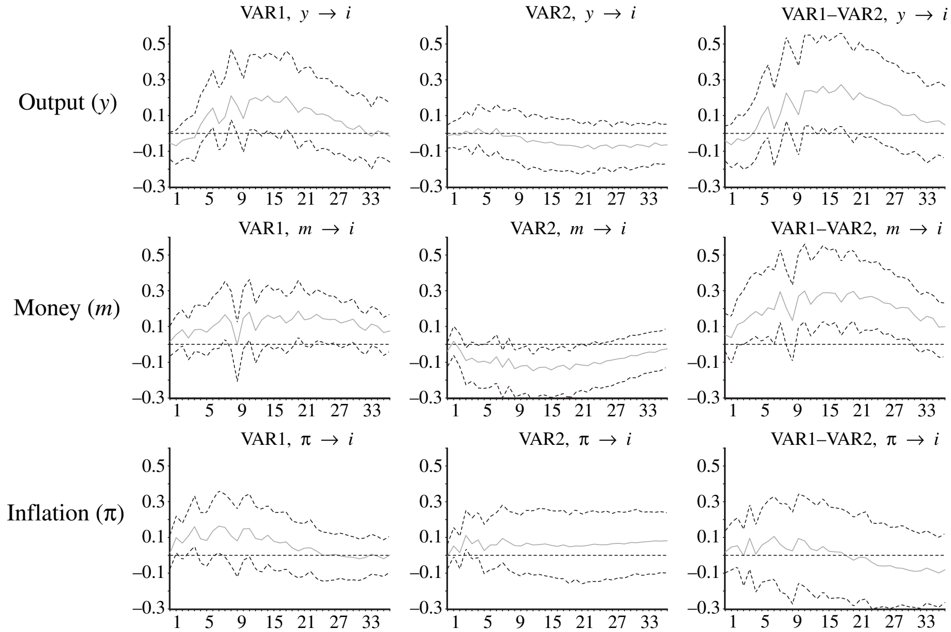

Fig. 4. *Generalised Impulse Response Interest Rate Reaction after Shocks to y, π, and m.*

Two possible explanations for the results on inflation come to mind. First, if the spillovers of shocks to output or money on inflation are the predominant source of inflation variance, i.e. more important than direct shocks to inflation, an increase in the degree of conservatism might also decrease the relative importance of inflation shocks from the perspective of the Council. Second, from a more political economy point of view, it could be argued that especially non-conservative central bank Councils find it easier to take a tough stance on shocks to inflation. In contrast to output shocks, which might influence inflation only with a lag and could require politically difficult 'pre-emptive' policy action before inflationary pressure becomes visible (Blinder, 1998), a contractionary reaction to a sudden surge in inflation is more-or-less self-explanatory and less likely to provoke criticism from trade unions.[37]

4. Conclusion

Does conservatism matter for monetary policy? The consensus view that it does matter has grown stronger with every paper written on the cross-country correlation between measure of central bank independence/conservatism and inflation since Bade and Parkin (1984). The stylised fact emerging from this literature is that a more conservative central bank, given sufficient independence from a less

[37] Alternatively, it could be argued that non-conservative majorities decide to act on shocks to inflation rather than on shocks to output, in order to uphold a reputation as hard-nosed central bankers.

conservative government, helps to lower both the level and the variance of inflation (Eijffinger and de Haan, 1996; Berger *et al.*, 2001). The consensus view is also very much in line with theory, because this is exactly why a society with a preference for low and stable inflation has an incentive to delegate monetary policy to a relatively conservative central banker in the first place (Rogoff, 1985). The idea also has proved to be a powerful force in shaping real world institutions. In order to control inflation, the EMU's European System of Central Banks was deliberately modelled on one of the most independent and conservative central banks, the German Bundesbank, and it is, if anything, even more inflation-averse and autonomous than its role model (de Haan, 1997). But, according to a growing number of critics, such reforms may have been premature.

The critique of the consensus view argues that the available evidence is incomplete and insufficient. It may be incomplete because of its focus on outcomes instead of policies. It is certainly far from clear whether the observed cross-country differences in inflation and inflation variance are the consequence of differences in monetary policy and thus central bank conservatism, or of other determinants. A more complete test would, for instance, look for higher interest rates and a more active stabilisation policy under more conservative central banks (Svensson, 1997; 1999). The existing empirical evidence also may be insufficient because it is based on measures of central bank characteristics that unsystematically conflate conservatism and independence. In addition, the traditional literature often uses measures based on legal rather than behavioural data and ignores their possible endogeneity with regard to, for instance, the nature of the financial system (Forder, 1996). The criticism is potentially severe but by no means insurmountable. One way to address it is to use a different approach than the conventional cross-country one.

In this article we argue that a single-country framework is much better equipped to deal with many of the arguments raised against the evidence stemming from the traditional cross-country literature. Quite obviously, a single-country approach avoids the necessity of producing reliable measures of central bank characteristics across different countries. An even more important advantage is that it allows a more detailed analysis, especially of the dynamic properties of central bank behaviour. In addition, it makes it much easier to distinguish between central bank independence and conservatism. Focusing on the example of the German Bundesbank, which is characterised by a virtually time-invariant degree of independence in the post-war period, we are able to identify conservative and non-conservative regimes in the bank's policy Council by looking at the political background of individual members. This identifying assumption is supported by an analysis of individual voting behaviour, which shows that conservative nominees are less likely to resist interest rate increases than non-conservative nominees. Yet another advantage of the single-country approach is that possible determinants which influence both policy outcomes of central bank behaviour, such as the strength of the financial sector, have been shown to be time-invariant in the German case (Posen, 1995).

Does conservatism matter for monetary policy, once we change from a cross-country to a single-country perspective? Our main findings suggest it does. First, we find that, based on a sample of monthly data covering most of the post-war period, conservative Bundesbank Council majorities were associated with more volatile short-term interest rates. This corresponds to our second finding, namely the fact that – in a standard reaction function framework – conservative Bundesbank majorities reacted more decisively with higher interest rates to changes in inflation and output than non-conservative majorities. A third result, based on a structural VAR model that takes into account the dynamic interaction of monetary policy and the economy, is that conservative Bundesbank regimes also reacted significantly more actively when faced with unexpected inflationary demand and supply shocks. The finding is supported by a Generalised Impulse Response (GIR) analysis that shows that the difference between regimes is not confined to their reaction to shocks that might be theoretically well defined but quite different from what decision makers within the Bundesbank Council observed at the time. The GIR show that conservatism also mattered significantly for the way in which conservative and non-conservative Council majorities reacted to unexpected movements in observables such as output, money growth and inflation.

In summary, it would seem that the findings arising from a single-country approach do not reject the hypothesis that central bank conservatism matters for monetary policy. The basic outcomes summarised above are quite robust. The policy differences between conservative and non-conservative Bundesbank regimes do not, for instance, depend on whether the reaction function is formulates as forward or backward-looking or, regarding the VAR exercises, the inclusion or exclusion of the Bretton Woods period.

The results discussed above are based on a single-country study and, therefore, might or might not be idiosyncratic to the German case. Thus an interesting task for future research would be to extend the analysis to other countries as well. For instance, it would be interesting to investigate whether the changes in the U.S. Fed's policy activism identified by Christiano *et al.* (1998) are related to changing degrees of conservatism in the Open Market Committee. The findings by Clarida *et al.* (2000), for instance, that there were significant differences in the Fed's policy conduct under the pre-Volker and the Volker-regime seem to suggest that conservatism matters for central banking not only in the case of the Bundesbank but in other cases, too.

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