Central Bank Accountability and Transparency: Theory and Some Evidence

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Abstract

The first part of this paper outlines the concept of democratic accountability of central banks, and compares the legal accountability of the ECB with some other central banks (Bank of Canada, Bank of Japan, Bank of England and the Federal Reserve System). In the second part, we present a theory of central bank accountability. Two aspects of accountability are considered: *transparency* of actual monetary policy and the question of who bears *final responsibility* for monetary policy. The paper shows that accountability through transparency leads to a lower expected rate of inflation and less stabilization of supply shocks. Accountability through shifting final responsibility in the direction of the government leads to higher inflationary expectations and more stabilization of supply shocks.

Keywords: monetary policy, central banks, transparency, accountability
JEL codes: E52, E58

Zusammenfassung

Der erste Teil dieses Papiers umreißt das Konzept der demokratischen Rechenschaftslegung von Zentralbanken und vergleicht die gesetzlich festgelegte Rechenschaftspflicht der EZB mit der einiger anderer Zentralbanken (Bank of Canada, Bank of Japan, Bank of England und Federal Reserve System). Im zweiten Teil stellen wir eine Theorie über die Rechenschaftspflicht der Notenbanken vor. Dabei werden zwei Aspekte der Rechenschaftspflicht in Betracht gezogen: die *Transparenz* der aktuellen Geldpolitik und die Frage, wer die *endgültige Verantwortung* für die Geldpolitik trägt. Das Papier zeigt auf, dass die Rechenschaftspflicht mittels Transparenz zu einer erwarteten niedrigeren Inflationsrate und einer geringeren Stabilisierung von Angebotsschocks führt. Dagegen führt die Rechenschaftspflicht mittels Verlagerung der endgültigen Verantwortung hin zur Regierung zu höheren Inflationserwartungen und einer stärkeren Stabilisierung von Angebotsschocks.

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1 Introduction

Nowadays is it widely believed that a high level of central bank independence (CBI) coupled with some explicit mandate for the bank to restrain inflation are important institutional devices to assure price stability. An independent central bank can give full priority to low levels of inflation, whereas in countries with a more dependent central bank other considerations (notably, re-election perspectives of politicians and a low level of unemployment) may interfere with the objective of price stability. Indeed, there is quite some evidence for a negative relationship between central bank independence and inflation (see Eijffinger and De Haan, 1996 for a review). The European Central Bank (ECB) is widely considered to be (at least) legally independent. One objection towards a completely independent central bank is lack of democratic accountability (see e.g. Stiglitz, 1998). We first outline in Section 2 the concept of democratic accountability[1]. In Section 3 we compare the legal accountability of five central banks. Furthermore, in Section 4 we present our theoretical model. In Sections 5 and 6 we look at the issues of transparency and final responsibility, respectively. Finally, we give in Section 7 some concluding comments.

It is often argued that central bank independence and democratic accountability are contradicting. This is however only correct as far as decisions about the ultimate goal(s) of and final responsibility for monetary policy are concerned. If the central bank cannot determine the ultimate objectives of monetary policy, it has no goal independence. As we will argue in the following section, in a democratic society a central bank should not have (explicit or implicit) goal independence. Although an override mechanism reduces the independence of a central bank it may enhance democratic accountability.

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1 This part of the paper heavily draws on De Haan, Amtenbrink and Eijffinger (1999). For a comprehensive discussion of the democratic accountability and transparency of the European Central Bank, with particular reference to the debate between Buiter (1999) and Issing(1999), see De Haan and Eijffinger (2000).

2 Democratic Accountability of the European Central Bank

The Oxford English Dictionary defines accountable as "obliged to give a reckoning or explanation for one's actions; responsible". How can this general concept be made operational in relation to central bank accountability? We distinguish three main features of central bank accountability:

1. decisions about the *explicit definition and ranking of objectives* of monetary policy;
2. *transparency* of actual monetary policy;
3. who bears *final responsibility* with respect to monetary policy.

In a democratic society, elected politicians should decide on the *explicit definition and ranking of objectives of monetary policy*. It is questionable whether it is legitimate in a democratic system to leave the decisions on the objectives of monetary policy in the hands of an independent institution, which is not subject to elections or ministerial responsibility. Furthermore, these objectives should be clearly defined. Unfortunately, the primary objective of the ECB as described in primary Community law – i.e. to maintain price stability - is not precisely specified. In the current setting it is left to the ECB to provide an operational expression of its primary objective. Any body – be it the European Parliament or some other body - charged with holding the central bank accountable is therefore strictly speaking not provided with an effective statutory yardstick to evaluate the performance of the bank, and thus to hold the bank accountable for its conduct of monetary policy. The choice of a single objective also simplifies the monitoring of central bank performance. The announcement of a single goal (or a primary goal), rather than several unranked goals, enables authorities and public opinion to control performance more effectively. In this sense, the ECB Statute is very clear: it provides for a hierarchy of goals. The Federal Reserve System faces multiple objectives which may be conflicting (maximum employment, stable prices, and moderate long-interest rates). Neither the Federal Reserve Act nor any other law provides for any hierarchy. A good example of a clear prescription of objectives is the Reserve Bank of New Zealand which has as its primary objective: the pursuit of price stability. The governor of the Reserve Bank of New Zealand has to agree with the government a tight target range for inflation. In this so-called *Policy Target Agreement* (PTA) the concept is clearly defined and a target range for the inflation rate is provided.

Transparency is also a very important element of accountability. Whatever other arrangements concerning democratic accountability may exist, their scope is limited without transparency because information concerning the behaviour is crucial for the evaluation of its performance. Where the reasons for a certain monetary policy decision lay open it is easier to make a judgement and to hold central bank officials accountable for their behaviour. So,

a central bank should be required to report in regular intervals on its past performance and future plans for monetary policy in accordance with the monetary objective. This is even more important where a clear monetary objective is missing because in such cases the central bank can only be judged on the basis of its own statements. As transparency should not be left to the discretion of the central bank, the *law* should prescribe certain procedures about explaining monetary policy (see also Bini Smaghi, 1998). There are various possibilities, ranging from reports, minutes and other communication devices. Transparency will be certainly improved if the monetary authorities have to explain the extent to which they were able to reach the final objectives of monetary policy. The legal basis of the ECB foresees the publication of reports on the activities of the ECB on at least a quarterly basis. Whether and to what extent they will include details on the past performance and projections on the future development of monetary policy and/or self-proclaimed targets for monetary policy, is again left to the ECB to decide. The Maastricht Treaty and ECB Statute do not include any details on the contents of these reports. In its attempts to enhance transparency the ECB has decided to publish a Monthly Bulletin. By publishing its reports more frequently than required, the ECB shows that it takes complaints about accountability and transparency quite serious.

The transparency of the monetary policy is enhanced if the decision-making body of the central bank is required to publish *minutes* of its meetings and/or the (reasoned) decisions it has taken. Furthermore, there may be other mechanisms (e.g., press conferences) to explain in public why certain decisions have been taken. However, no matter what the ECB does in this respect, it is not obliged to do so. The Governing Council of the ECB has decided that it will regularly inform the public about its monetary policy decisions. The Council will meet every fortnight. The first meeting in every month will be followed by a *press conference*. When policy decisions are made, the reasoning behind specific decisions will be communicated to the public immediately after the meeting at which they have been taken. The idea behind presenting the reasoning of the Governing Council is, of course, exactly the same as those of who are in favour of publishing minutes, i.e. the explanation of the decisions taken.

The most disputed issue is, of course, whether *voting behaviour* should be revealed. As the Council has a clear collective responsibility the usefulness of making voting behaviour public is only limited. In fact it could undermine the credibility of a decision taken by only a slight majority and may put pressure on presidents and governors of national central banks. This would jeopardise the development of a euro-wide perspective of the Council members in accordance with the collective responsibility of the Council for European monetary policy as stated in the Maastricht Treaty.

However, in practice both interest rate decisions of the ECB in 1999 - the interest rate cut with 0.5 per cent in April 1999 and the interest rate increase of 0.5. per cent in November 1999 - were not taken by majority voting within the Governing Council but by *consensus* decision making[2].

Sometimes there may be sound policy reasons for a central bank not to reveal everything. Still, only those aspects of monetary policy-making should remain closed where ambiguity is really essential. One can think of instruments of monetary policymaking, foreign exchange market interventions or, even, of open market operations. To this end it would be useful if explicit rules were provided for in the legal basis of a central bank, laying down the conditions under which minutes of meetings and (explanations of) decisions may be withheld. The new Bank of England Act sets a positive example in this respect, as it regulates such conditions profoundly.

With respect to the *final responsibility for monetary policy*, three issues are crucial: the relationship with parliament, the existence of some kind of override mechanism and the dismissal procedure for the central bank governor.

The relationship between the central bank and parliament has to play a major role in any evaluation of the democratic accountability of the central bank itself. There should be a legal requirement for the central bank to report to parliament and/or explain policy actions in parliament. Parliament should have the opportunity to review the performance of the central bank with regard to monetary policy on a regular basis, while the central bank at the same time can explain and justify its conduct. These contacts have to be foreseen in the legal basis of the central bank. Apart from the obligatory yearly presentation of an annual report of the activities of the ECB by the president of the ECB, the European Parliament can ask the members of the Executive Board to appear in parliament. The ECB has gone some way again as president Duisenberg has expressed his willingness to appear before the European Parliament at least *four* times a year, apart from the presentation of the Annual Report.

Parliament always holds the ultimate responsibility for monetary policy since it can change the legal basis of the central bank. Indeed, the mere threat of a change of the law may ensure

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[2] The non-disclosure of voting behaviour within the Governing Council is, of course, guaranteed by consensus decision making. However, one could argue that the principle of 'one (wo)man, one vote' was designed for the ECB to let majority voting to be used for monetary policy decision making.

that even independent central banks (like the Bundesbank) will ensure that monetary policy will in general be in accordance with the wishes of elected politicians. This holds true in the European case only for national parliaments. Furthermore, the power of national parliaments with respect to the legal basis of the ECB is quite limited, if not non-existent, as a change would require amendment of primary Community law, which implies that all countries have to agree. We would prefer that in the case of the Statute of the ECB the European Parliament would have the final say and, thus, could act as real parliament.

In general, the central bank may not (only) be directly accountable to parliament but (also) to government, which is, in turn, accountable to parliament. In that case it is important that the government is able to influence central bank behaviour. Without such instruments, accountability would not go beyond mere reporting by government to parliament of central bank policies, for which government can in that case not be held responsible. An *override mechanism* for government would be an instrument to change central bank policy. If the government does not interfere, it apparently agrees with central bank policies and can be held accountable for this by parliament. Such a mechanism existed in the Netherlands before the latest change of the Dutch central bank law. It has also been considered for the ECB, but was rejected for various reasons, one of them being that at the European level there is no equivalent to the Dutch Minister of Finance, nor is there at the European level an equivalent to the Dutch parliament. In other words, this is a clear example of the price of lack of further political integration than currently exists in the European Union.

If an override mechanism exists, it is crucial that the conditions under which it can be applied are laid down in detail. It has to be ensured that the mechanism is not used as a tool for undesired political influence. The procedure for the application for the override mechanism itself needs to be transparent. The decision to apply the override mechanism should be made public. Furthermore, the procedure to apply an override should provide for some kind of review (like a possibility for the central bank to appeal) to make sure that the override is being used carefully. Finally, the *dismissal procedure* for a central banker can account to a mechanism of *ex post* accountability if a central bank official can be dismissed on grounds of bad performance, that is not realising stated objectives. Dismissal may function as a sanction for poor performance by linking the tenure of central bank officials to policy results, i.e. meeting the predetermined monetary policy target. This is the case for the Reserve Bank of New Zealand where the PTA between the governor of the Bank and the Minister of Finance lays down the policy targets, which the former has to achieve. Inadequate performance can result in the dismissal of the governor. In contrast, the president of the ECB can only be dismissed if he no longer fulfils the general conditions required for his performance or in case of serious misconduct.

3 Democratic Accountability and Transparency: A Comparison of Laws

De Haan, Amtenbrink and Eijffinger (1999) have constructed an indicator for democratic accountability based on the general definition as given in the previous section.[3] Table 1 is reproduced from this study. They pose 13 different questions and the total number of positive answers determines the score for the central bank concerned. It should be pointed out that the indicator – like the indicators for central bank independence discussed previously - is based on central bank laws.

It is shown by this index that, in contrast to the Bank of England, the ECB has a low degree of (legal) democratic accountability. As pointed out before, the ECB goes in some respects further than the law prescribes (operationalisation of the objective, monthly report, the reasoning behind specific decisions is made public immediately, appearances before European Parliament). Therefore, the final column of Table 1 also shows in parentheses the score for the ECB if actual practice is taken into account[4]. The ECB has then a higher score, but still the ECB cannot be considered to "be among the most transparent and accountable central banks in the world" (Issing, 1999, p.505). The Maastricht Treaty has, as we have shown in Table 1, an accountability deficit. Nevertheless, the ECB has gone quite some way to remedy the accountability deficit in practice as explained by Issing (1999). The ECB has done so rightly, because democratic accountability of a central bank is a good in itself as argued by Buiter (1999). Moreover, transparency of monetary policy in the sense of less uncertainty about the central bank's preferences could enhance the credibility of monetary policy. This issue will be discussed in the next section (see also Eijffinger, Hoeberichts and Schaling, 2000).

Buiter and Issing do not disagree about the principle of central bank accountability *ipso facto*, but they do have different concepts of accountability and transparency in mind. They reflect the difference in thinking about the preferred degree of accountability and transparency in central banking between the Anglo-Saxon and continental-European countries. One could conjecture that the trade-off (the 'loss function') of central bank independence and accountability differs between these groups of countries.

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3 For an earlier attempt to quantify democratic accountability, see Briault et al. (1996).

4 The press conferences led by president Duisenberg are sometimes referred to as the *Duisenberg minutes*, although one could conjecture that the arguments and explanations given during these press conferences have strongly an *ad hoc* character. Thus, the score in parentheses for aspect 5 might be questionable.

4 A Model for Central Bank Accountability and Transparency

In the remainder of this paper we present a theoretical model of central bank accountability and transparency. We focus on *transparency*[5] of actual monetary policy and on the *final responsibility* for monetary policy. The third feature of accountability, setting the ultimate objectives of monetary policy, is related to the question of *goal independence* of a central bank. Our model builds on earlier work by Lohmann (1992), Schaling and Nolan (1998) and Eijffinger, Hoeberichts and Schaling (2000). The government delegates monetary policy to a conservative central banker. However, the government and society don't know exactly the central banker's preferences for inflation stabilisation relative to output stabilisation. The extent to which the central bank has private information about its preferences is determined by the transparency of monetary policy. After the central bank has proposed its preferred rate of inflation, the government can decide to override the central bank at a fixed cost. In this set up, the central bank is partially independent. The cost of overriding is related to the question of who has final responsibility for monetary policy. If this cost is prohibitive, final responsibility lies with the central bank. If, on the other hand, this cost is negligible, final responsibility rests with the government.

In this paper we want to discuss the implications of these two types of accountability for macroeconomic outcomes. In particular, we look at the effects on the level of inflation and the stabilisation of supply shocks.

We show that more transparency leads, in expectation, to a lower rate of inflation and less stabilisation of supply shocks. A low cost of overriding leads to a higher rate of inflation and more stabilisation of supply shocks.

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[5] In a recent paper, Geraats (2000) distinguishes five aspects of transparency: political, procedural, policy and operational transparency. In her analysis Geraats focuses on *economic* transparency, while we are focusing on *political* transparency.

Table 1: Comparing Accountability and Transparency of Various Central Banks

Various aspects of accountability:	**Bank of Canada**	**Bank of Japan**	**Bank of England**	**Fed. Res. System**	**ECB**
1.does the central bank law stipulate the objectives of monetary policy?	*	*	*	*	*
2. is there a clear prioritisation of objectives?	-	-	*	-	*
3. are the objectives clearly defined?	-	-	*	-	- (*)
4. are the objectives quantified (in the law or based on document based on the law)?	-	-	*	-	- (*)
Subtotal on *ultimate objectives of monetary policy*	1	1	4	1	2 (4)
5. must the central bank publish an inflation or monetary policy report of some kind, in addition to standard central bank bulletins/report?	*	_	*	*	- (*)
6. are minutes of meetings of the governing board of the central bank made public within a reasonable time?	-	-	*	*	-
7. must the central bank explain publicly to which extent it has been able to reach its objectives?	*	*	*	*	*
Subtotal on *transparency*	2	1	3	3	1 (2)
8. is the central bank subject to monitoring by Parliament (is there a requirement – apart from an annual report - to report to Parliament and/or explain policy actions in Parliament)?	*	*	*	*	*
9. has the government the right to give instructions?	*	*	*	-	-
10. is there some kind of review in the procedure to apply the override mechanism?	*	*	*	*	-
11. has the central bank possibility for an appeal in case of an instruction?	-	-	-	-	-
12. can the central bank law be changed by a simple majority in Parliament?	*	*	*	*	-
13. is past performance a ground for dismissal of a central bank governor?	-	-	-	-	-
Subtotal on *final responsibility*	4	4	4	2	1
Total on accountability	**7**	**6**	**11**	**6**	**4 (7)**

Source: De Haan, Amtenbrink and Eijffinger (1999)

Output is determined by a simplified Lucas supply function:

$$y = \pi - \pi^e + v \qquad \text{with } v \sim N(0, \sigma_v^2) \tag{1}$$

where y is the log of output, π the actual rate of inflation, π^e the expected rate of inflation and v a random supply shock. The government and society do not like inflation and output to deviate from their desired levels (without loss of generality the desired rate of inflation is normalised at zero). Moreover, the government incurs a fixed cost c if it decides to override the central bank. As in Lohmann (1992), the nature of this cost is determined by the political institutions in the society. The dummy variable δ takes a value of 1 if the central bank is overridden and a value of 0 if it is not overridden. The following loss-function for the government results:

$$L_G = \frac{1}{2}\pi^2 + \frac{1}{2}(y - y^*)^2 + \delta c \tag{2}$$

where $y^* > 0$ is the government's output target. The government delegates monetary policy to a conservative central banker with stochastic preferences. The central bank's conservativeness is embodied in a quadratic contract with parameter f. The central bank has private information about the realisation of the uniformly distributed preference shock x. The central bank's loss function is as follows[6]

$$L_{CB} = \frac{1-x}{2}\pi^2 + \frac{1}{2}(y - y^*)^2 + \frac{f}{2}\pi^2 \text{, with } x \sim U[-h, h] \text{ and } h < f \tag{3}$$

Without delegation of monetary policy, the government would set a discretionary inflation rate that minimises its loss:

$$\pi_G = \frac{y^* + \pi^e - v}{2} \tag{4}$$

If monetary policy is delegated to the central bank, the rate of inflation is set in order to minimise the central bank's loss function:

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6 We ensure that the central bank is always more conservative than the government by assuming $h < f$. Without this assumption, the central bank could be overridden for accommodating too much to supply shocks, which complicates the analysis considerably.

$$\pi_{CB} = \frac{y^* + \pi^e - v}{2 - x + f} \tag{5}$$

Since, as in Rogoff (1985), the central bank is always more inflation averse than the government ($f - x > 0$), the conservative central bank has a lower inflationary bias than the government but it responds less actively to supply shocks.

After monetary policy is delegated to the central bank and the central bank has set the inflation rate, the government has to decide whether to override the central bank or accept the central bank's inflation rate as is given in (5).

If the government overrides, we use (4) in (2) with (1) and $\delta = 1$ to find its loss to be:

$$L_G(\pi_G) = \frac{1}{4}(y^* + \pi^e - v)^2 + c \tag{6}$$

If the government chooses to accept the central bank's inflation rate, we use (5) in (2) with (1) and $\delta = 0$, to find its loss to be equal to:

$$L_G(\pi_{CB}) = \frac{1 + (x - 1 - f)^2}{2(x - 2 - f)^2}(y^* + \pi^e - v)^2 \tag{7}$$

The government's decision problem is whether to override the central bank or accept the inflation rate. Minimising its loss, the central bank will be overridden if:

$$L_G(\pi_G) < L_G(\pi_{CB}) \tag{8}$$

If the government finds that the *cost* of overriding the central bank is higher than the *benefit* of setting the government's preferred inflation rate, the central bank is independent. The region of independence of the central bank depends on the cost of overriding (c), the degree of conservativeness of the central bank (f) and the realisation of the stochastic supply shock v and the preference shock x. Substituting the government's loss with overriding (6) and the government's loss with delegation of monetary policy (7) in the condition for overriding the central bank (8) we find that the central bank will be independent if

$$c \geq \frac{(x - f)^2}{4(x - 2 - f)^2}(y^* + \pi^e - v)^2 \tag{9}$$

However, if the cost of overriding is low enough ($c < \frac{(x-f)^2}{4(x-2-f)^2}(y^* + \pi^e - v)^2$) the central bank cannot set its preferred rate of inflation without being overridden. Instead, it will act in such a manner such that the government is indifferent between overriding or not.

Thus, depending on the realisation of the shocks, the central bank either will be independent $((x,v) \in I)$ or it will accommodate $((x,v) \in A)$. In the latter case, the central bank will set a rate of inflation that is a weighted average of the government's preferred inflation (4) and the central bank's preferred rate (5):

$$\pi_{ACC} = \phi\pi_G + (1-\phi)\pi_{CB} = \frac{2-\phi(x-f)}{2(2-x+f)}(y^* + \pi^e - v), 0 \le \phi \le 1 \qquad (10)$$

If the central bank sets this inflation rate, inserting (10) in (2) and using (1) we find that the government's loss will be:

$$L_G(\pi_{ACC}) = \frac{1+(x-1-f)^2 - \phi(x-f)^2(1-\frac{1}{2}\phi)}{2(2-x+f)^2}(y^* + \pi^e - v)^2 \qquad (11)$$

The central bank will always accommodate so that the government is indifferent between overriding or not. Therefore, the central bank chooses ϕ such that $L_G(\pi_{ACC}) = L_G(\pi_G)$.

Equalising (2) and (11) we find that

$$\phi = \begin{cases} 1 - \dfrac{2(2-x+f)\sqrt{c}}{\left|y^* + \pi^e - v\right|\left|x-f\right|} & \text{if } (x,v) \in A \\ 0 & \text{if } (x,v) \in I \end{cases} \qquad (12)$$

Inserting the expression for the weight given to the government's preferred inflation rate (12) into (10) this results in the following rate of inflation if the central bank accommodates[7]

$$\pi_{ACC} = \frac{y^* + \pi^e - v}{2} - \sqrt{c}\,\mathrm{sgn}(f-x)\mathrm{sgn}(y^* + \pi^e - v)$$

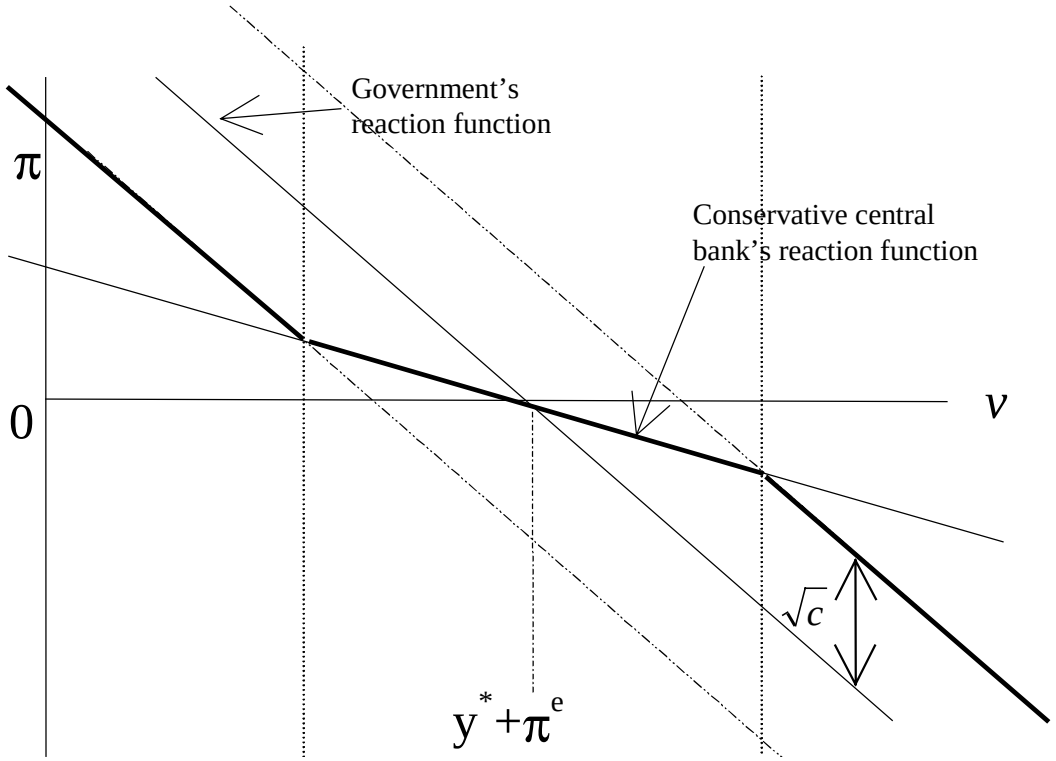
7 The signum-operator: sgn(x)=1 if x>0, sgn(x)=-1 if x<0 and sgn(x)=0 if x=0.

Using our assumption that the central bank will always be conservative, whatever its preference shock may be ($f > x$), we can write:

$$\pi_{ACC} = \frac{y^* + \pi^e - v}{2} - \sqrt{c}\,\mathrm{sgn}\left(y^* + \pi^e - v\right) \qquad (13)$$

Figure 1 shows what monetary policy looks like if the government faces a positive cost of overriding a conservative central bank. In the centre of the figure, around $v = y^* + \pi^e$, the central bank is independent and sets its preferred rate of inflation. However, on the left-hand side and on the right-hand side of this region of independence, the central bank must accommodate to the government's preferred rate of inflation. In these region of accommodation, the government finds the cost of the (in its view) insufficient stabilisation of supply shocks so high that it would not accept the central bank's preferred rate. Parallel to the government's reaction function, at a distance that depends on the cost of overriding ($\sqrt{c}$ to be precise) there are two lines. The crossings of these lines with the reaction function of the conservative central bank determine the region of independence, which lies between the two crossing points.

Figure 1. Actual Monetary Policy with a Positive Cost of Overriding



5 The Transparency of Monetary Policy

Shocks to the central bank's preferences influence the slope of the reaction function of the independent central bank. A positive shock makes the central bank less conservative so that it reacts stronger to supply shocks. In the graph, the reaction function becomes steeper and the region of independence increases. A negative preference shock has an opposite effect. The central bank becomes more conservative, the slope of the reaction function becomes flatter and the region of independence will be smaller. However, the effect of a positive preference shock is stronger than the effect of a negative preference shock. Because of this asymmetry, a lower variance of preference shocks makes the expected slope of the independent central bank's reaction function flatter, as is shown in Figure 2. Therefore, the expected region of independence becomes smaller and the expected rate of inflation decreases. This is our next proposition:

Proposition 1: The expected region of independence (conditional on the realisation of supply shock v) decreases if the central bank becomes more transparent.

Proof: The central bank becomes more transparent if the central bank's preferences become less uncertain, or h decreases. From appendix B we know that less preference uncertainty makes the central bank effectively more conservative. From Figure 1 and 2 it is clear that more conservativeness, which means a flatter central bank's reaction function, makes the region of independence smaller. For a formal proof, see appendix A.

Next, we want to show the effect of accountability through transparency on the expected rate of inflation. We expect that transparency leads to lower inflationary expectations since lower preference uncertainty leads effectively to a more conservative central bank. This is formalised in the following proposition:

Proposition 2: If the transparency of monetary policy increases (h decreases), the expected rate of inflation decreases.

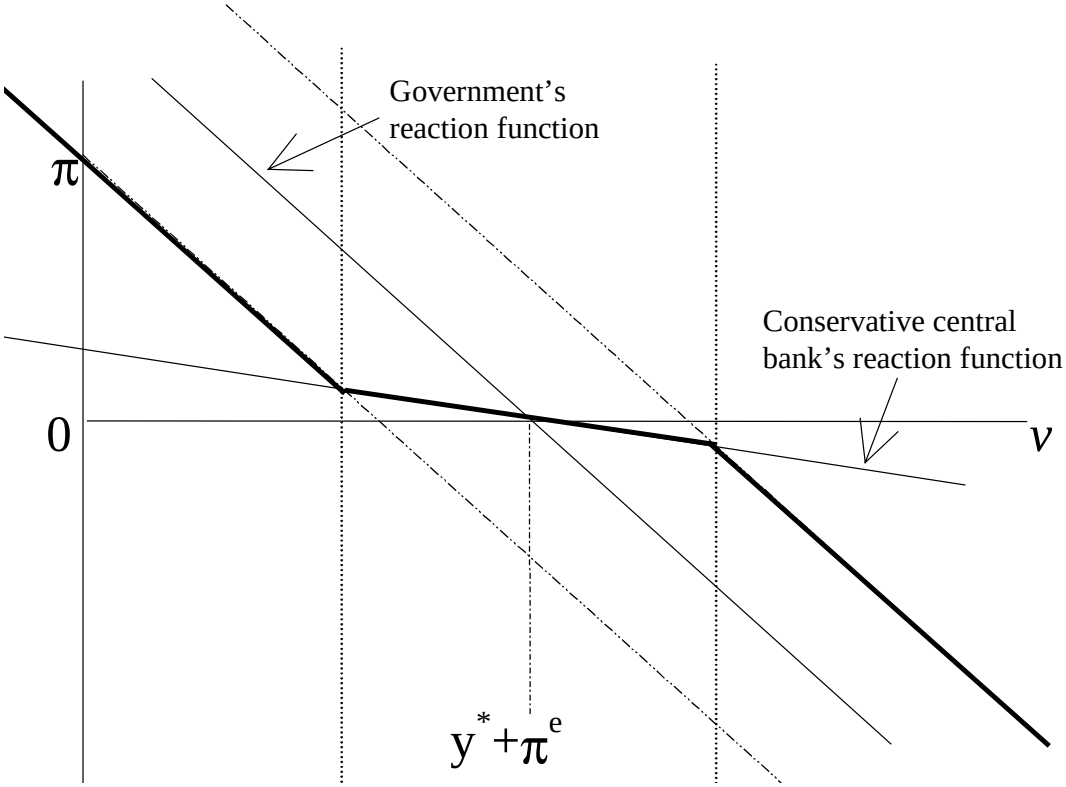
Proof: See appendix B

To complete the analysis of the effects of accountability through transparency, we have looked at the stabilisation of supply shocks. This leads to the next proposition:

Proposition 3: If the transparency of monetary policy increases (h decreases), there is less stabilisation of supply shocks.

Proof: See appendix B

Figure 2. The Central Bank Becomes More Conservative



The transparency type of accountability leads to a lower expected rate of inflation and less accommodation of supply shocks, especially within the region of independence. Therefore, this type of accountability is most appropriate for countries with a serious credibility problem (high y^*) relative to their flexibility problem (σ_v^2). Clearly, this type of accountability does not reduce the effective independence of the central bank. Although the region of independence becomes smaller, the macroeconomic outcomes move in the central bank's preferred direction when transparency is increased.

Transparency can be achieved by a central bank through publication of relevant information. Publishing minutes of meetings and giving a motivation for the actions that are taken increase transparency and reduce the uncertainty about the central bank's preferences.

6 The Final Responsibility for Monetary Policy

Another way to increase accountability of a central bank is to shift the final responsibility for monetary policy in the direction of the government, away from the central bank. In our model we do this by making the cost of overriding (c) lower. As is shown in Figure 3, the distance between the government's reaction function and the two lines parallel to it

becomes smaller. Inevitably this also reduces the effective independence of the central bank.

Proposition 4: The expected region of independence (conditional on the realisation of supply shock *v*) becomes smaller if the final responsibility for monetary policy shifts in the direction of the government.

Proof: If the final responsibility for monetary policy shifts in the direction of the government, the cost of overriding (*c*) becomes lower. Comparing Figure 1 with Figure 3 it is easy to see that the expected region of independence becomes smaller if the cost of overriding becomes lower. In appendix A, this is shown formally.

Proposition 5: If the final responsibility for monetary policy shifts in the direction of the government (*c* decreases), the expected rate of inflation increases.

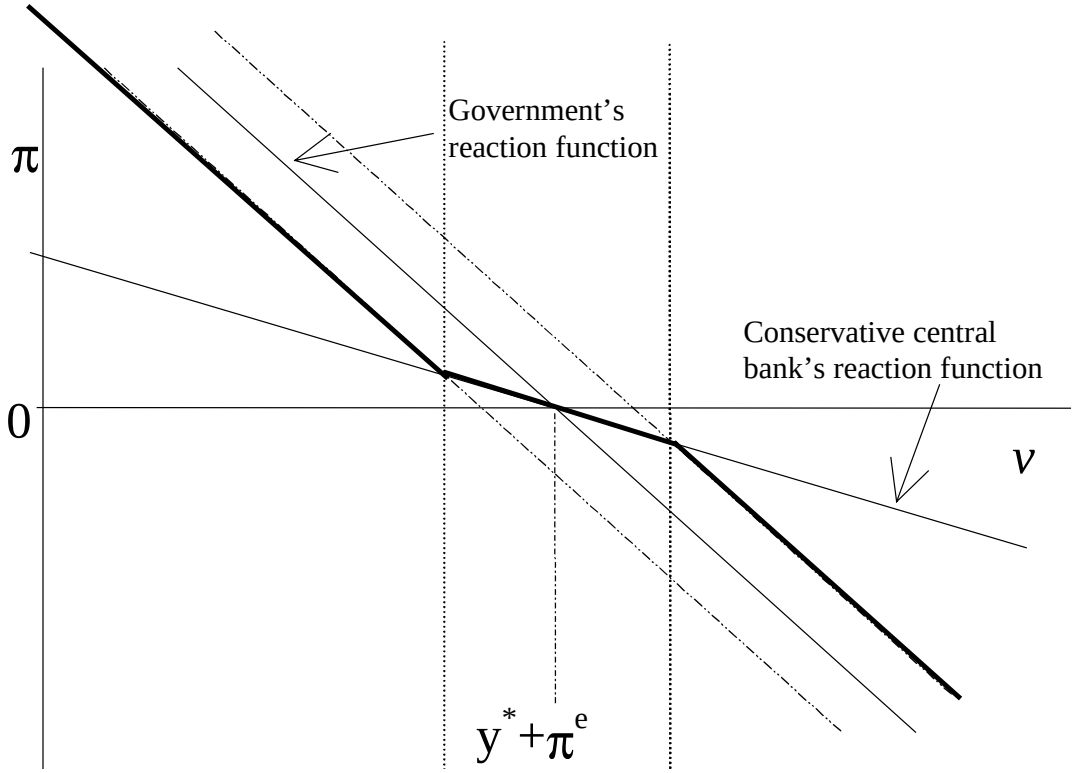
Proof: If *c* decreases, the inflation rate set by the accommodating central banker increases for $v < y^* + \pi^e$ and decreases by the same amount for $v > y^* + \pi^e$. However, since the probability density of the supply shock *v* is higher for $v < y^* + \pi^e$, the expected rate of inflation will increase.

Proposition 6: If the final responsibility for monetary policy shifts in the direction of the government (*c* decreases), there is more stabilisation of supply shocks.

Proof: From Proposition 4 is straightforward that the region of accommodation increases when the final responsibility for monetary policy shifts in the direction of the government. There will be more stabilisation for shocks that were within the region of independence before the shift of final responsibility and within the region of accommodation after the shift.

Achieving accountability by lowering the cost of overriding (lower *c*) makes the region of independence smaller. However, in this case the expected rate of inflation goes up and the (expected) slope of the reaction functions doesn't change. Lowering the cost of overriding makes the central bank more flexible towards shocks that fell just inside the region of independence before the lowering in the cost of overriding and fall in the region of accommodation after the change. Therefore, achieving central bank accountability by moving the final responsibility for monetary policy in the direction of the government is most appropriate for countries that have a serious flexibility problem relative to the credibility problem.

Figure 3. The Cost of Overriding Becomes Lower



7 Concluding remarks

In this paper we have investigated the effects of accountability on macroeconomic outcomes. In the analysis, we have focused on two types of accountability: accountability through transparency and accountability through final responsibility. Transparency reduces the uncertainty about the central bank's preferences and can be achieved by publication of relevant information. For instance, publishing minutes of meetings and inflation reports that give a motivation for the actions that the central bank has taken increase the transparency of monetary policy. We show that, although transparency makes the region of independence smaller, effective central bank independence increases with transparency. This leads to a lower expected rate of inflation and less stabilisation of productivity shocks. So, more transparency shifts the balance of credibility vs. flexibility in the direction of credibility. Therefore, achieving accountability through transparency is especially attractive for countries that face a serious credibility problem relative to the flexibility problem.

The other way of achieving accountability that is studied in this paper is shifting final responsibility for monetary policy in the direction of the government. The government is under democratic control from the parliament. By shifting final responsibility to the government, indirectly the parliament has more influence on monetary policy. In our

model, shifting this responsibility is implemented by lowering the cost of overriding the central bank. We find that effective central bank independence decreases when the final responsibility shifts in the direction of the government. This leads to higher inflationary expectations and more stabilisation of supply shocks. Achieving accountability by shifting final responsibility for monetary policy in the direction of the government therefore appears most appropriate for countries that face a serious flexibility problem relative to their credibility problem.

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Appendix A. The Expected Region of Independence

The central bank is independent if

$$y^* + \pi^e - \frac{2\sqrt{c}(f+2-x)}{f-x} < v < y^* + \pi^e + \frac{2\sqrt{c}(f+2-x)}{f-x} \qquad \text{(A.1)}$$

With $x \sim U[-h,h]$ the expected region of independence is:

$$y^* + \pi^e - 2\sqrt{c} - \frac{2\sqrt{c}}{h}\left(\log\frac{f+h}{f-h}\right) < v < y^* + \pi^e + 2\sqrt{c} + \frac{2\sqrt{c}}{h}\left(\log\frac{f+h}{f-h}\right) \qquad \text{(A.2)}$$

In order to show that the region of independence increases with *h*, it is sufficient to show that $\frac{\partial\left(\frac{1}{h}\log\frac{f+h}{f-h}\right)}{\partial h} > 0$ with $0 < h < f$.

$$\frac{\partial\left(\frac{1}{h}\log\frac{f+h}{f-h}\right)}{\partial h} = \frac{1}{h^2}\left(\frac{2fh}{f^2-h^2} - \log\frac{f+h}{f-h}\right) =: \frac{1}{h^2}H(h) \qquad \text{(A.3)}$$

It is easy to show that *H(h)* is a continuous function for $0 < h < f$. Furthermore, $\lim_{h\to 0} H(h) = 0$ and $\frac{\partial H(h)}{\partial h} = \frac{4h^2 f}{\left(h^2 - f^2\right)^2} > 0$ and therefore *H(h)* > 0 and $\frac{1}{h^2}H(h) > 0$.

Therefore, the expected region of independence becomes larger if *h* increases and, conversely, becomes smaller if *h* decreases (Proposition 1).

From (A.2) it is also easy to show that the expected region of independence becomes smaller if the cost of overriding (*c*) becomes lower (Proposition 4).

Appendix B. The Expected Slope of the Central Bank's Reaction Function

The expected slope of the conservative central bank's reaction function is given by

$$\frac{1}{2h}\int_{-h}^{h}\frac{1}{2-x+f}\,dx = \frac{1}{2h}\log\left(\frac{2+h+f}{2-h+f}\right) \qquad \text{(B.1)}$$

Along the same lines as the proof in appendix A, it is straightforward to show that this slope is increasing with *h*.

Lemma 1: Changes in the reaction function for supply shocks $v < y^* + \pi^e$ are weighted with more probability density than changes in the reaction function for supply shocks $v > y^* + \pi^e$.

Proof: It is important to note that the monetary reaction function of the conservative central bank, the government and the accommodating central bank have a point of symmetry in $v = y^* + \pi^e$. Therefore, changes in the position or the slope of the monetary reaction functions due to changes in *h* or *c* always have opposite effects on the realised rate of inflation on either side of this point of symmetry. However, the distribution of the random supply shocks *v* is symmetric around $v = 0$ and the probability density becomes smaller the larger the distance between the supply shock and point of symmetry $v = 0$. Because $y^* + \pi^e > 0$, the changes in the reaction function when $v < y^* + \pi^e$ will be weighted with more probability density then the (opposite) changes in the reaction function when $v > y^* + \pi^e$.

Lemma 2: The expected rate of inflation within the region of independence decreases if transparency of monetary policy increases.

Proof: As shown above, a lower *h* implies a flatter reaction function. So inflation decreases for $v < y^* + \pi^e$ and increases with the same amount for $v > y^* + \pi^e$. However, due to the probability density function of *v*, the expected rate of inflation in the region of independence decreases.

Lemma 3: The central bank's reaction to shocks that were within the expected region of independence before the decrease in *h* and in the expected region of accommodation after the change, will be weaker.

Proof: Monetary policy can be summarised as $\pi = Max\{\pi_{ACC}, \pi_{CB}\}$ if $v < y^* + \pi^e$ and $\pi = Min\{\pi_{ACC}, \pi_{CB}\}$ if $v > y^* + \pi^e$. If, due to a change in π_{CB}, the regime switches from independence to accommodation, then there must have been a decreasing inflation for $v < y^* + \pi^e$ and an increasing inflation for $v > y^* + \pi^e$.

When we apply the probability density function on Lemma 3 we are able to show that the expected rate of inflation for shocks that were within the expected region of independence before the decrease in *h* and in the expected region of accommodation after the change, will be lower. When we combine this with Lemma 2, then we can prove Proposition 2.

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