

Publicity of Debate and the Incentive to Dissent: Evidence from the US Federal Reserve¹

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Abstract

When central banks are transparent about their decision making, there may be clear benefits in terms of credibility, policy effectiveness, and improved democratic accountability. While recent literature has focused on all of these advantages of transparency, in this paper we consider one potential cost: the possibility that publishing detailed records of deliberations will make members of a monetary policy committee more reluctant to offer dissenting opinions. Drawing on the recent literature on expert advisors with “career concerns”, we construct a model that compares incentives for members of a monetary policy committee to voice dissent when deliberations occur in public, and when they occur in private. We then test the implications of the model using an original dataset based on deliberations of the Federal Reserve’s Federal Open Market Committee, asking whether the FOMC’s decision in 1993 to begin releasing full transcripts of its meetings has altered incentives for participants to voice dissenting opinions. We find compelling evidence that transcript publication has stifled the FOMC’s debate over short-term interest rates.

1 Introduction

There has been much recent discussion of the advantages of transparency in monetary policymaking. When central banks decide to publish macroeconomic forecasts, reveal individual votes on monetary policy committees, or release minutes of meetings, it is commonly argued that these steps will lead to improved economic outcomes. Transparency makes it easier to judge whether a central bank is committed to an announced policy, and in related fashion, transparency can improve the effectiveness of monetary policy to the extent that financial markets find it easier to interpret policy changes.¹ Transparency also has the advantage of facilitating democratic accountability. While recent research has attempted to model and empirically evaluate the benefits of transparency, there has been less effort to systematically examine whether there might also be disadvantages for monetary policymaking. This is a critical question because, in the absence of such costs, it might seem that full transparency should always be the rule. In this paper we focus on one specific type of transparency, publishing verbatim transcripts of central bank board meetings, and one specific reason why this type of transparency might not be desirable, the possibility that the quality of deliberation on a central bank board will suffer if deliberation occurs in public. We develop a theoretical model that helps identify the potential costs of this type of transparency, and we then empirically test the model using an original dataset on deliberations of the Federal Reserve's Federal Open Market Committee (FOMC); our dataset is unique in that it records views expressed by policymakers at FOMC meetings and not just their official votes. Our empirical tests focus in particular on the observed effect of the institutional change that occurred in 1993, when the FOMC decided to begin releasing transcripts of its meetings after a delay of five years.

¹See Faust and Svensson (2001) for a model that demonstrates how credibility depends upon transparency. Gerlach-Kristen (2003) presents empirical evidence on releasing voting records of monetary policy committees. See Geraats (2002) for a survey of the literature on transparency in monetary policy. See also Kohn and Sack (2003), Thornton(2003), Goodfriend (1986) for an early discussion of the issue, and empirical evidence in Chortareas, Stasavage, and Sterne (2003).

To investigate the above issue, we first develop a model of deliberation on a monetary policy committee, where members care both about reaching the correct decision and about convincing an outside audience that they have a high level of expertise. We consider a three-member committee that must decide on a binary action, with the “correct” action depending on the realization of an unobserved state variable. One interpretation would be to have the binary action be the choice between raising interest rates or holding them constant, while the state variable could be whether output is at or above its potential level. Individual committee members receive informative private signals about the state variable and, as a result, the committee is more likely to make the correct policy choice when members accurately reveal this information. In addition, we assume that committee members are uncertain about the accuracy of their private signal, that they speak in sequence, and that a committee member who is known to have a high level of expertise speaks first. As discussed below, these assumptions closely fit current FOMC practice. We consider how the incentive for committee members to truthfully reveal their private signals varies depending on whether the statements they make during committee deliberations remain private or are subsequently revealed to the public. In a paper that considers a similar model but only in the context of public deliberation, Ottaviani and Sorenson (2001) show that when a committee member who is known to have high expertise speaks first, subsequent speakers can face an incentive to mimic the behavior of the known expert rather than to accurately reveal their private information. Their result parallels a number of other papers in the literature on expert advisors with “career concerns”, which have shown how advisors can face incentives to withhold private information if accurate revelation would lead principals to infer that they have a low level of expertise.² Our result extends the conclusions

²See Ottaviani and Sorensen (2003), Levy (2003), and Scharfstein and Stein (1990) for examples. Prat (2003) is an exception in this literature in considering both a case where an expert’s recommendation is observed and a case where it is not observed. Seidmann (2003) looks at voting in public and private committees when there is complete information about the state of the world and all actors know *ex ante* which action will maximize their utility.

of these previous studies by showing that when deliberation between expert advisors occurs in private there will be a greater incentive to reveal private information. Our idea that deliberation may be hindered by publicity is not a new one. Speaking about the secrecy rule that prevailed during the US Constitutional Convention of 1787, James Madison emphasized that full publicity would have made members more reluctant to freely express their true opinions, and he saw secrecy as having been critical to the Convention's ultimate success.³ As we will discuss below, similar opinions have been expressed regarding the deliberations of the FOMC.

In Section 2 we show that when a known expert on a committee speaks first, other members of a monetary policy committee will have a greater incentive to truthfully reveal their private information if their individual statements in committee meetings *are not* subsequently made public. When deliberation occurs in private, incentives of individual committee members are more closely aligned with those of the committee as a whole, because outside observers will establish inferences about the expertise of individual committee members based on the quality of the committee's policy decision, rather than on the accuracy of individual statements. Based on this result, we develop the testable proposition that any such committee that switches from private to public deliberation (provided members care sufficiently about their reputations and a known expert speaks first) should be associated with fewer instances in which committee members express opinions that dissent from those expressed by the chair. It should be emphasized that because our model focuses on the specific issue of incentives for officials to reveal information, it cannot be used to make a general assessment of when private deliberation is preferable. Such a calculation would depend upon weighing the costs of transparency in terms of reduced quality of deliberation against the observed benefits in terms of increased accountability and increased effectiveness of monetary

³Max Farrand (ed.) *The Records of the Federal Convention of 1787*, New Haven (1911) Vol III, p.478.

policy. Finally, while in practice it might also be possible to alter incentives for truthful information by altering the order of speakers on a committee, for example by having a known expert speak last, we do not focus on this issue in our analysis, because there has been no such change in speaking order on the FOMC during the period we consider in our empirical tests.

In Sections 3 and 4, we test our proposition about public vs. private deliberation by considering a natural experiment involving the US central bank's policymaking body, the FOMC. Before 1993, the FOMC published individual votes of committee members as well as summary minutes of meetings, but it did not publish full transcripts that would allow outside observers to determine exactly what individual committee members said during proceedings. Under pressure from Congress, in the fall of 1993 the FOMC agreed to release lightly-edited transcripts of each meeting after a five-year delay. As discussed in Section 3, while the five-year delay was implemented to ensure that committee members would continue to express their opinions freely, some observers at the time thought that even a five-year delay might not be sufficient for this purpose. Our empirical evidence supports this concern. Fortunately for our purposes, the FOMC decision involved the publication of lightly-edited transcripts going back to 1976, based on literal transcriptions made from tape recordings. While many officials before 1993 knew that FOMC meetings were tape-recorded, most thought the recordings were used to prepare meeting minutes and then the tapes were recorded over. Because transcripts exist from a time when meeting participants did not know that their deliberations would be made public, we are able to compare the behavior of committee members before 1993, when committee members believed that their remarks were private, and after 1993, when they knew that all statements would eventually be made public. To do this we make use of an original dataset that records whether individual FOMC members expressed verbal opposition to the Fed chairman's policy proposal for the appropriate level of the short-term rate (the Fed funds rate). It is important to consider these

cases of verbal dissent, because Meade (2005) shows that in the majority of instances where members of the FOMC verbally dissent from the chair’s position, they do not subsequently dissent from the chair’s position in the official vote. As a result, analyzing only actual votes, and not the statements made during the committee discussion, can provide a misleading interpretation of FOMC debates.

We find clear evidence of a change in the character of FOMC deliberations following the 1993 decision to release full transcripts. Distinguishing between FOMC members who are Board Governors, those who are voting Presidents of regional Federal Reserve Banks, and those who are non-voting Presidents, we find that the two former groups have been significantly less likely to express verbal dissents on policy decisions since 1993. The results remain robust when controlling for other potential determinants of individual committee member positions and when controlling for unobserved individual-specific effects by using a random effects logit estimation. Finally, these results are supported by a number of parallel observations about the changing character of FOMC debate since 1993. While before 1993 FOMC discussions were characterized by frequent “off the cuff” remarks and interruptions, since 1993 there has been an increased tendency for committee members to present the sort of pre-prepared statements that may result in less real deliberation. These empirical results have significant implications for the design of monetary policy institutions, as well as for the operation of committee-based government decisionmaking more generally. They suggest that while transparency in policymaking may have many important benefits, attention should also be given to the possibility that publicity might stifle debate.

In what follows we first present our model of monetary policy deliberation in public and private settings in Section 2. Section 3 discusses the 1993 debate regarding the advantages and disadvantages of publishing transcripts. Section 4 presents our data on FOMC deliberations and reviews our empirical estimates of the likelihood of verbal dissent. Section 5 concludes.

2 Monetary Policy Deliberation

In this section we present a simple model of a three player monetary policy committee, composed of players A , B , and C that must decide on a binary action $a \in \{0, 1\}$. This binary action describes reasonably well the choice faced by modern-day central banks, which make interest rate changes in discrete steps and virtually always weigh a tightening or easing move against the alternative of holding interest rates unchanged. Each committee member receives a binary signal s_i about a state of the world $\omega \in \{0, 1\}$, with each state equally probable. Player A has a known level of expertise, and her signal is accurate with probability p with $p > 0.5$. Players B and C also receive a separate signal s_i . With probability λ each of these officials has the same high level of expertise as A (they are of type h), and with probability $(1 - \lambda)$ their signal is uninformative, and they have a low level of expertise (they are of type l). Players B and C know these priors, but they do not know their own type, and they do not subsequently learn their own type. The expected accuracy of the signals of Player B and C is represented by $q = p\lambda + (1 - \lambda)0.5$.

We assume that utility for each player depends on both choosing the best policy and on an *outside* observer's *ex post* assessment of the player's level of expertise. This outside observer could be someone who is considering whether to reappoint the committee member, or it could be a prospective employer for the member subsequent to her period of committee service (a firm, university, or other). More generally, even if members of a monetary policy committee are not motivated by explicit future career concerns, they may be motivated by the more simple desire to appear for posterity as someone who has a high level of expertise. In this case all of the assumptions, and thus the

predictions, of our model remain fully applicable.⁴ The best policy action a matches the realization of the state variable ω . The outside observer's *ex post* assessment that a player is of type h is conditional on observing the action chosen by the committee, the realization of the state ω , and (when these can be observed) the message m_i that an individual sends during committee deliberations and her vote v_i . We assume that each player receives a reputational payoff proportional to the outside observer's posterior probability that the player has a high level of expertise.⁵ In the case where both votes and messages eventually become public this would be $\Pr(h|a, m_i, v_i, \omega)$. In addition, we assume that this reputational payoff is scaled by the parameter β with $\beta > 0$. There are a number of factors that might affect the value of β , but one in particular is that officials who have a longer term to serve on the committee before receiving their reputational payoff would logically discount the present value of this payoff more heavily.⁶ Utility for each player follows the following state-dependent function.

$$\begin{cases} a + \beta \Pr(h|a, m_i, v_i, \omega) & \text{if } \omega = 1 \\ (1 - a) + \beta \Pr(h|a, m_i, v_i, \omega) & \text{if } \omega = 0 \end{cases} \quad (1)$$

To the extent that they would like to choose the right policy, players have an incentive to fully reveal their signals. However, their reputational concerns can conflict with this incentive for accurate revelation. We will demonstrate how incentives to

⁴It is also possible that members of a monetary policy committee want to present a "united front" and appear to the public to reach decisions by consensus and without internal tensions. In this case, making deliberation public may result in less disagreement among committee members but not due to reputational concerns. We do not model this desire for consensus, but mention it because it appears to be important for some monetary policy committees, such as the ECB Governing Council. However, desires to present a united front (presumably with respect to political authorities), would probably apply most directly to immediate release of meeting transcripts, and not to the delayed release of transcripts we consider. As we argue below, delayed release may still have a big impact on a policymaker's long-run reputation.

⁵See Holmstrom (1982) and Dewatripont, Jewitt, and Tirole (1999).

⁶One interpretation would be to have $\beta = c\delta^n$, where c is a parameter, δ is a discount factor reflecting the rate of time preference, and n is the number of periods before receiving the reputational payoff. However, this would also raise the issue of incentives to truthfully reveal signals in a multi-period game.

reveal information accurately depend on the outside observer's ability to monitor an individual's message and on the parameter β . The timing of the game is as follows:

1. The state of the world ω is realized (but not observed) and private signals s_i are realized.
2. Each player sends a message m_i with the A speaking first, followed by Player B , then Player C .
3. Players vote on an action $a \in \{0, 1\}$ in the same sequence as during the message round.
4. The state of the world ω becomes public, and each player receives a payoff determined by the action a and the posterior probability that she has high expertise.

Given the above assumptions, there will always exist equilibria where at the message stage A reports her signal truthfully and where B and C mimic A 's message, regardless of their private signals. These "uninformative" equilibria can be sustained, both under public deliberation and private deliberation, as long as B and C each anticipate that the other will mimic A .⁷ After an uninformative message stage there are several different equilibrium voting possibilities, as B and C might follow A 's lead when voting, or they might vote according to their private signal. In either case the outcome will be inefficient, as no player will be able to make their voting decision conditional on the information about the state held by both of the other players. In what follows, we concentrate on identifying the conditions for existence of an "informative" equilibrium where at the message stage A reports her message truthfully, B always reports her message truthfully, and C reports her message truthfully if it is "pivotal". A message

⁷As in any model with costless messages, there will also always exist a "babbling" equilibrium in which all three players send untruthful messages.

is “pivotal” here if truthful reporting would result in other players changing their beliefs about which state of the world is more likely. At the voting stage in the informative equilibrium all players vote $v_i = 1$ if two or more players previously sent a message $m_i = 1$, and they will vote $v_i = 0$ otherwise. We argue that this combination of message and voting strategies constitutes the only plausible equilibrium in which more than one player sends an informative message.

2.1 Public Deliberation

We begin by considering incentives for the three players when both individual votes and individual messages are made public. During the voting stage, the voting rule that produces the “best” expected policy outcome for the three players would be as follows – vote 1 if it is believed, given the outcome of the message round, that the state is more likely to be 1, and vote 0 otherwise. Given that this strategy produces the highest expected policy payoff for each player, the only possible incentive to pursue a different voting strategy would be if it resulted in a player receiving a higher reputational payoff than would otherwise have been the case. When we restrict ourselves to considering potential “informative” equilibria, defined as those where players send truthful messages in equilibrium, then we can argue that all voting strategies other than the efficient one are implausible. The reason for this is that once outside observers have learned the outcome of the message round, and given they know that a player has an incentive to send a truthful message in equilibrium, then there is no further information upon which that player could condition their voting behavior that would allow an outside observer to update a prior belief about the player’s level of expertise. After an informative message round, it might technically be possible to have an equilibrium where players fail to condition their vote on information learned during the message round, but such equilibria could only be supported by implausible out-of-equilibrium beliefs.⁸

⁸So, for example, both B and C might always vote 1 regardless of their belief about the state, provided that an outside observer believed that any deviation from this strategy indicates a low level of

Given incentives at the voting stage, the big question is whether and when players B and C will have an incentive to accurately reveal their signals at the message stage. For players B and C the key condition for existence of the informative equilibrium involves their incentive to truthfully reveal their signal, even if it differs from that reported by Player A , who has a known high level of expertise. Consider first the incentives faced by Player C . If A and B send identical messages, then C knows that her message will not be pivotal, and she has a clear incentive to mimic the message sent by A and B regardless of the signal she receives. This is because she knows her message will have no effect on the voting outcome (anticipating the equilibrium voting incentives above), and given all available information C believes it more likely that the state is as announced by A and B .⁹ This implies that there cannot be an informative equilibrium where all players report truthfully in all cases. However, it is still possible to have an informative equilibrium where C reports truthfully if her message is pivotal. Consider the incentives during the message round for C if A and B do not send the same message. If A and B send different messages about the state, and the signal received by C corresponds to the message reported by B , then C 's belief about the state will be as follows (we denote this by θ),

$$\Pr(\omega = m_a | m_a, m_b, s_c) = \frac{p(1-q)^2}{p(1-q)^2 + (1-p)q^2} = \theta \quad (2)$$

Under these conditions, if $\theta < 0.5$, meaning C 's message is pivotal, and C truthfully reports her signal, then her expected payoff is as follows.

$$(1 - \theta) + \beta \left((1 - \theta) \frac{p\lambda}{p\lambda + 0.5(1-\lambda)} + \theta \frac{(1-p)\lambda}{(1-p)\lambda + 0.5(1-\lambda)} \right) \quad (3)$$

expertise, but there is no clear reason why an outside observer would hold this belief given that signals have already been truthfully revealed during the message round.

⁹In the case where she received a signal contradicting A and B her posterior belief $\Pr(\omega = m_a | m_a, m_b, s_c)$ would simply be p .

In expression (3) and the subsequent expressions, the reputational payoff in the case that C 's message corresponds to the true state is $\Pr(h|m_c = \omega) = \frac{p\lambda}{p\lambda+0.5(1-\lambda)}$. Her payoff in the case where her message turns out to be incorrect is $\Pr(h|m_c \neq \omega) = \frac{(1-p)\lambda}{(1-p)\lambda+0.5(1-\lambda)}$. If Player C falsely reports her signal, then her expected payoff is shown in (4).

$$\theta + \beta\left(\theta\frac{p\lambda}{p\lambda+0.5(1-\lambda)} + (1-\theta)\frac{(1-p)\lambda}{(1-p)\lambda+0.5(1-\lambda)}\right) \quad (4)$$

Based on (3) and (4), it is straightforward to observe that if $\theta < 0.5$, the expected utility from truthful reporting will be higher than the expected utility from false reporting. As a result, Player C has an incentive to report her signal accurately if her message is pivotal (in the sense that it will result in both A and B believing that the probability that A 's message is accurate is less than 0.5).

Consider now the incentives faced by Player B . If Player B receives the same signal as reported by A , then it is straightforward to show that B has an incentive to truthfully report. The key question is what incentives face Player B if her signal does not correspond to the message reported by A . Under these conditions B faces a tradeoff. If she reports truthfully her expected policy payoff is higher, but if she reports falsely and follows A 's message, then her expected reputational payoff is higher. If $s_b \neq m_a$ then B 's belief that the state is as reported by A is $\Pr(\omega = m_a|m_a, s_b) = \frac{p(1-q)}{p(1-q)+(1-p)q}$. If B herds by sending a false message $m_b = m_a$, then she knows that Player C will also send the same message, and all players will vote $v_i = m_a$. As a result, her expected utility from false reporting is

$$\frac{p(1-q)}{p(1-q)+(1-p)q} + \beta\left(\left(\frac{p(1-q)}{p(1-q)+(1-p)q}\right)\frac{p\lambda}{p\lambda+0.5(1-\lambda)} + \left(1 - \frac{p(1-q)}{p(1-q)+(1-p)q}\right)\frac{(1-p)\lambda}{(1-p)\lambda+0.5(1-\lambda)}\right) \quad (5)$$

If B instead reports her signal accurately, then she receives the following expected

utility (provided that $\theta < 0.5$):

$$q + \beta \left(\left(1 - \frac{p(1-q)}{p(1-q)+(1-p)q} \right) \frac{p\lambda}{p\lambda+0.5(1-\lambda)} + \left(\frac{p(1-q)}{p(1-q)+(1-p)q} \right) \frac{(1-p)\lambda}{(1-p)\lambda+0.5(1-\lambda)} \right) \quad (6)$$

Based on (5) and (6), as long as the following inequality is satisfied, B will report her signal truthfully.

$$q - \frac{p(1-q)}{p(1-q)+(1-p)q} > \beta \left(2 \frac{p(1-q)}{p(1-q)+(1-p)q} - 1 \right) \left(\frac{p\lambda}{p\lambda+0.5(1-\lambda)} - \frac{(1-p)\lambda}{(1-p)\lambda+0.5(1-\lambda)} \right) \quad (7)$$

When the expression in (7) is satisfied, Player B will accurately report her signal, regardless of whether it corresponds to the message sent by A . This inequality can be satisfied for a plausible range of parameters, but it is less likely to be satisfied as $\beta \rightarrow \infty$. As mentioned above, one factor that may lead to a higher value of β is if a player has a relatively short term to serve on the committee. This provides us with a first proposition.¹⁰

Proposition 1 *When a known expert speaks first, no other committee members will dissent as long as their reputational concerns are sufficiently strong.*

2.2 Private Deliberation

The next step is to consider conditions for existence of the informative equilibrium under private deliberation. In order to fit current FOMC practice, we can define private deliberation as involving a closed-door session for the message round but subsequent publication of individual votes after the voting round.

Under private deliberation, if both Player A and Player B truthfully report their

¹⁰The remaining possibility for an informative equilibrium in pure strategies under private deliberation can be ruled out. It could never be an equilibrium for B to mimic A 's signal and for C to subsequently report truthfully, because C would know that in the case where her message contradicted a truthful message sent by A , her belief about the state would be $\Pr(m_a = \omega | m_a, s_c) = \frac{(1-q)p}{(1-q)p+(1-p)q}$, which will always be greater than 0.5, given our assumption that $q < p$. Consequently, Player C would have an incentive to send the same message as A .

signals, then Player C will continue to have an incentive to truthfully reveal her signal if it is pivotal, as was the case under public deliberation.¹¹ Player B 's incentives change significantly when deliberation takes place behind closed doors, as she no longer faces a tradeoff between providing a truthful message and maximizing her expected policy payoff and providing a false message and maximizing her expected reputational payoff. This is because both the policy and reputational payoff now depend exclusively on the action a . As before, we focus on the incentive for Player B to truthfully report her signal, even if it contradicts the message sent by Player A . If Player B truthfully reports her signal, her expected payoff is as expressed in (8), provided that the condition $\theta < 0.5$ holds. This ensures that if both B and C receive a different signal from A , the posterior that the state is as declared by A is less than 0.5. Otherwise, both B and C would always mimic A 's message.

$$q + \beta(q \Pr(h|a = \omega) + (1 - q) \Pr(h|a \neq \omega)) \quad (8)$$

The first term in expression (8) is the expected policy payoff, which depends exclusively on the probability that C 's signal is accurate, since C 's pivotal message will determine the outcome. The remainder of the expression represents the expected reputational payoff which depends on whether the action a matches the state ω . If Player B instead falsely reports her signal, then her expected payoff is

$$\frac{p(1-q)}{p(1-q)+(1-p)q} + \beta\left(\frac{p(1-q)}{p(1-q)+(1-p)q} \Pr(h|a = \omega) + \left(1 - \frac{p(1-q)}{p(1-q)+(1-p)q}\right) \Pr(h|a \neq \omega)\right) \quad (9)$$

Given expressions (8) and (9) it is straightforward to show that B will have an incentive to truthfully report as long as the following inequality holds. It is important to note that B 's incentive to truthfully report in this case does not depend on the

¹¹In addition, when her signal is not pivotal, Player C will now be indifferent between herding and truthful reporting when sending her message, because her reputational payoff will not depend on her message.

relative strength of reputational concerns (the value of β). The simple reason for this is that the action that maximizes B 's expected reputational payoff now also maximizes her expected policy payoff.

$$q - \frac{p(1-q)}{p(1-q)+(1-p)q} > 0 \quad (10)$$

The inequality in (10) will in fact be satisfied for all values of p and q for which $\theta < 0.5$ (expression 2). This implies that the informative equilibrium will exist under private deliberation whenever the expected accuracy of the signals of B and C is not so low that the belief about which state is more likely will be unchanged regardless of whether both B and C 's information contradicts that held by A .

Taking expressions (10) and (7) together, we conclude that the informative equilibrium is more likely to exist under private deliberation, and will not exist under public deliberation if reputational concerns are present (i.e., β is sufficiently positive). This leads to our second and principal proposition for empirical testing.

Proposition 2 *When a known expert speaks first and reputational concerns are sufficiently strong, there is a greater likelihood that committee members will dissent if deliberation occurs in private.*

3 Deliberation and the Fed's FOMC

From time-to-time, the US Federal Reserve has been subjected to pressures to make its procedures more transparent. One important instance of this sort commenced in the fall of 1992 when the chairman of the House Banking Committee,¹² Representative Henry Gonzalez, requested that the Fed publish detailed accounts of discussions by its monetary policymaking committee, the FOMC, shortly after the conclusion of each meeting.¹³ Gonzalez' request culminated in Federal Reserve testimony before Congress

¹²The official name is the Committee on Banking, Finance and Urban Affairs.

¹³Specifically, the Federal Reserve Accountability Act of 1993 introduced in January 1993 called for minutes, a transcript, and a videotape to be made available to the public within 60 days of an FOMC

on two occasions in October 1993, and the FOMC's subsequent decision in November of that year to publish lightly-edited transcripts of FOMC meetings after a five-year delay.¹⁴ We briefly summarize the debate over this issue based upon FOMC transcripts and Congressional records from that period. One topic that received considerable attention at that time was the effect of transcript publication on the freedom of debate in policy meetings—the question we address in this paper.

Gonzalez' challenge to Fed practices arose in the context of changing attitudes about the rights of government agencies to secrecy. Goodfriend (1986) argues that after the passage of the Freedom of Information Act (FOIA) in 1966, Federal agencies could no longer “keep documents confidential merely by arguing that secrecy was in the public interest” (p. 64). In the midst of the Gonzalez episode, President Clinton's Justice Department changed its interpretation of FOIA as it applied to deliberative materials from a presumption of secrecy to a presumption of disclosure. And, in a legal challenge to FOMC disclosure policy in the mid-1970s (*Merrill v. FOMC*), the presiding district court stated in its decision that “if it is necessary for the FOMC to carry out its monetary policy in secrecy then that determination must be made by Congress and not this Court” (Goodfriend 1986, p. 67).¹⁵

During the fall of 1992, in several letters to Fed Chairman Alan Greenspan and the Presidents of the Fed's twelve district banks (who serve in a fixed rotation on the FOMC), Gonzalez called for the prompt publication of detailed minutes of FOMC meetings. In his request, Gonzalez recalled that the FOMC had in the past published accounts of its meetings in a heavily-edited transcript called the Memorandum of Discussion, but that this practice had been discontinued in the spring of 1976.¹⁶ After the

meeting.
¹⁴At the time, the FOMC's decision applied only to meetings from 1976 to 1993. The active decision to publish lightly-edited transcripts of all meetings going forward was not taken until January 1995.

¹⁵A number of issues arose in the context of the Gonzalez legislation and hearings, but we only address those that bear directly on the hypothesis examined in this paper.

¹⁶Publication of these Memoranda was discontinued after the passage of FOIA. A "precipitating

first FOMC discussion of the Gonzalez request, Greenspan responded in writing that:

“The major concern in assessing these proposals is their effect on the deliberative process—the free flow of information and ideas essential to policymaking. Members need to feel free to trade ideas, question assumptions, advance hypotheses, make projections, speculate on alternative policies and possible outcomes, and especially to change their views in response to the arguments of others.”

During October 1993, there was considerable discussion of Gonzalez’ proposed legislation and its implications in the context of testimony by Alan Greenspan (on the 13th) and by six Fed Board members (including Greenspan) and ten Reserve Bank Presidents (on the 19th). In an FOMC conference call prior to the testimonies, Edward Boehne, President of the Federal Reserve Bank of Philadelphia and the only Fed policymaker to have been part of FOMC deliberations in the 1970s, indicated that at the time that the Memoranda of Discussion were published, “meetings were much more formal [with] less give-and-take and there was a tendency for people to come in with prepared statements, which made it difficult for the subsequent give-and-take that I think has become a real strength of the Committee (p. 4, 1993 Transcripts, October 5 conference call). Boehne’s comment provides evidence that in a prior experience with this sort of transparency practice, the FOMC’s discussion had been noticeably affected, despite a lag of five years before publication.

In his testimony before the House Banking Committee on October 13, Greenspan stated that “... central banks should be disclosing everything they can up to the point where the disclosure affects their effectiveness” (p. 27, Hearing, 1993a). In his

factor" in the decision to discontinue them was the FOMC’s concern that FOIA could be interpreted to mean that "a considerable portion of the memorandum might have to be made public with a very short lag" (see Kohn, 1992 Transcripts, November 17 meeting).

subsequent testimony, Greenspan elaborated on his concerns that certain disclosure practices could impede the deliberation process, saying (p. 10, Hearing, 1993b):

“A considerable amount of free discussion and probing questioning by the participants of each other and of key FOMC staff members takes place. In the wide-ranging debate, new ideas are often tested, many of which are rejected. . . . The prevailing views of many participants change as evidence and insights emerge. This process has proven to be a very effective procedure for gaining a consensus around which a directive to the Open Market Desk can be crafted. It could not function effectively if participants had to be concerned that their half-thought-through, but nonetheless potentially valuable, notions would soon be made public. I fear in such a situation the public record would be a sterile set of bland pronouncements scarcely capturing the necessary debates which are required of monetary policymaking. A tendency would arise for one-on-one pre-meeting discussions, with public meetings merely announcing already agreed-upon positions or for each participant to enter the meeting with a final position not subject to the views of others.”

Between the two Congressional hearings in October 1993, FOMC members were informed that the Fed staff had kept raw, unedited transcripts of all FOMC discussions since 1976. Until this revelation, Fed officials thought that any changes in transparency practices would affect future, but not past, meetings. Although discussions were tape-recorded, most FOMC officials thought that these tapes were used to construct minutes and then recorded over at the next meeting. What few policymakers knew was that the staff prepared literal transcriptions of the tapes in the process of writing the minutes, and that these literal transcriptions were on file from 1976. With this revelation, the question was no longer whether to publish transcripts, but when to publish them, in

what form, and after what time lag.

At its meeting in November 1993, the first item on the agenda was FOMC practices and, in short order, the committee voted to publish lightly-edited transcripts with a five-year delay in the case of meetings for which literal transcriptions were available,¹⁷ and to defer the question of future practices pending further consideration by a sub-committee. What is notable about the transcript of this meeting is a decidedly scripted element to the discussion—official statements appear to have been prepared and read into the record and, in contrast with earlier meetings, there is much less give-and-take.

In January 1995, an FOMC sub-committee headed by Alan Blinder reviewed the transcript issue and proposed that the FOMC agree to continue with the publication of lightly-edited transcripts after a delay of five years. There was no clear consensus among policy officials regarding the effects of known transcription on the quality of deliberation and debate. The view of the sub-committee was that the FOMC would have been better served if the tape had never been running. An extreme view was offered by Reserve Bank President Hoenig who stated that “the tape has had some chilling effect on our discussions. I see a lot more people reading their statements.” (p. 20, 1995 Transcripts, January meeting). But, Greenspan’s tone was more moderate, noting that “there is very little evidence that the quality of our discussions has been reduced.” (p. 22, 1995 Transcripts, January meeting). This variation in views suggests that, on the margin, the deliberative process may have been affected by the publication of the transcripts—the hypothesis we test in section 4.

¹⁷Fed attorneys obtained permission from the US Archivist to destroy the unedited, literal transcriptions once lightly-edited transcripts were published; other possible options would not have permitted the destruction of the literal transcriptions.

4 Empirical Tests

4.1 The FOMC Transcript Data

Although the Fed publishes the official votes of FOMC members, the transcripts also provide an interesting source from which to assess agreement and disagreement among policymakers. During the Greenspan era, FOMC meetings have been divided into two "rounds" of discussion. In the first round officials present their general views on the economy, while in the second round officials discuss policy options. The second round culminates in a formal vote. The first policymaker to speak in the second round is Alan Greenspan, who generally offers lengthy remarks on his views and makes a policy recommendation. Other policymakers follow. At the end of the discussion, a formal vote is taken (with the chairman casting his vote first). Thus, the model used in this paper follows the actual structure of FOMC discussions in which a known expert, Greenspan, speaks first. Although there are only twelve voting members at any given FOMC meeting, it is typical for all nineteen policy officials to participate in both rounds of the discussion. It is therefore possible to ascertain whether non-voting participants behave differently from official voters with respect to the policy proposal.

Blinder et al. (2001) noted strong internal pressure for official FOMC voters to agree with Greenspan's policy proposal, suggesting that official votes over-state the extent of consensus within the committee. The official votes do indeed suggest a strong element of consensus, with dissents during the Greenspan period averaging just over 6 percent. Interestingly, dissents have declined markedly since the end of 1993: between August 1987 (Greenspan's first FOMC meeting) and the end of 1993, official dissents were nearly 9 percent of all votes; since 1994, the dissent rate has been less than 4 percent. Krause (1994) found evidence that dissent rates have declined as the tenure of various Fed chairmen rose and attributed this to the rise in the number of Fed officials appointed during a chairman's term.

Our original dataset codes voiced preferences for the short-term interest rate expressed by each meeting participant (whether voting or non-voting), based on the transcripts for FOMC meetings between 1989 and 1997.¹⁸¹⁹ We focus on the short-term interest rate despite the fact that the Fed formally targeted borrowed reserves over much of the sample period (other researchers have done this as well, see Thornton and Wheelock, 2000). Voiced preferences differ from official votes because voting FOMC members are more likely to voice disagreement with Greenspan’s proposal than to cast an official dissent; moreover, official votes do not include contributions by non-voting participants.²⁰

After some experimentation with the dating of a dummy variable to capture the effects of transcript release on the deliberation process, we decided to exclude observations for all 1993 meetings. It is difficult to determine with any certainty when meeting participants knew that the literal transcriptions existed and that their comments would eventually become public. In fact, the dating of this must range widely, because Greenspan knew about the existence of the literal transcriptions from late 1992, while some officials did not find out until the Gonzalez hearings in October 1993.²¹ Thus, our empirical analysis examines the pre-tape period of 1989 through 1992 and the post-tape period of 1994 to 1997, a total of 64 FOMC meetings. From those 64 meetings, the transcript dataset contains 1068 voiced preferences for the direction of the Fed funds rate (the views expressed by voting and non-voting meeting participants other than

¹⁸For additional detail on the dataset, see Meade (2005).

¹⁹Our dataset does not include inter-meeting conference calls. Between 1989 and 1997, there were 41 conference calls, many of which were concerned with issues other than the setting of short-term interest rates. For the calls that were concerned with the stance of policy, none resulted in an official vote and are thus excluded from our analysis.

²⁰The policy under consideration at each meeting over the period we examine in this study had two dimensions: a level for the Fed funds rate and the “bias” or “tilt” in the policy directive. We ignore the bias in our analysis, largely because the precise role of the bias has been subject to some debate. Thornton and Wheelock (2000) and Meade (2005) have shown that its main role was to help in achieving a consensus on short-term interest rates.

²¹In a conference call on 15 October 1993, Greenspan and other officials discussed when they first became aware of the literal transcriptions (see FOMC Transcripts).

Greenspan) and 645 official votes (excluding the votes cast by Greenspan).

The frequency distribution for policymakers' agreement or disagreement with Greenspan's proposed interest rate over the pre- and post-tape periods is shown in table 1. We have broken down the identity of policymakers into Board members (the Governors, excluding Greenspan, who vote at every FOMC meeting), voting Federal Reserve Bank Presidents (the New York Bank President and four others), and non-voting Presidents (seven participate but do not vote). The degree of consensus in voiced preferences has risen in the post-1993 period for Board members and voting Bank Presidents; this parallels the rise in consensus in the official vote. Only the behavior of the non-voting Presidents reflects greater dissensus after 1993 than before.

4.2 Estimation Results

We used binomial logit estimation to examine three different hypotheses regarding the effects of transcript release on FOMC deliberations. Our first hypothesis is that monetary policymakers should be less likely to voice disagreement with Greenspan's interest rate proposal after 1993 than before. This hypothesis is derived directly from our theoretical model. To investigate this hypothesis, we use a binomial indicator of voiced agreement (0) or disagreement (1) with Greenspan's proposal as the dependent variable.²² Our second hypothesis is that known transcription should have no effect on voting behavior, because votes were published both before and after 1993. To investigate this hypothesis, we use a binomial indicator of voted assent (0) or dissent (1) as the dependent variable. Our third hypothesis is that a policymaker should be less likely to switch his view between voicing a preference and casting a vote after 1993 than before. This hypothesis is also derived directly from our theoretical model, since in the "informative" equilibrium, which is more likely to exist under private deliberation, there

²²Over the period studied, Greenspan's interest rate proposal at the start of the discussion was identical to the policy proposal that the FOMC voted on.

will be a greater probability of committee members switching their publicly expressed position about the state ω between the message round and the voting round. To investigate this hypothesis, we use a binomial indicator that tracks officials who did not switch views (0) and those who did (1).²³

For each hypothesis, we first estimated a “tape” specification that included a simple set of indicator variables and interaction terms as independent variables (see table 2): a dummy to pick up the effects of known transcription after 1993 (TAPE), a dummy to detect differences in behavior between voting Bank Presidents and other meeting participants (BPVOTER), a dummy to distinguish between non-voting Bank Presidents and other meeting participants (NonVOTER), an interaction of the tape and voting Bank President dummies (TAPE*BPVOTER), and an interaction of the tape and non-voting Bank President dummies (TAPE*NonVOTER).

Next, we estimated a “tape + macro” specification that included a broader set of variables in order to control for contemporaneous economic conditions and uncertainty: the experience differential in months between Greenspan and the respective policymaker to detect effects of relative tenure or reputation (EXP), the 1-month change in the consumer price index (CPI), an estimate of the output gap in the month of the FOMC meeting (GAP), the conditional variance of productivity (PROD), a measure of CPI forecast uncertainty (FVCPI), and a measure of GDP forecast uncertainty (FVGDP).²⁴ As the dependent variable for the three hypotheses is a measure of agreement or disagreement and not a measure of short-term interest rates, we wanted to control for factors that might cause policymakers to agree or disagree with a specific proposal. Monetary policymakers are particularly concerned with consumer price inflation and

²³This variable SWITCH is related to the dependent variables used to test hypotheses 1 and 2, but is not a simple linear transformation of them. In hypothesis 3, we look explicitly at the decision to switch positions, given that a view has already been voiced.

²⁴Because the dependent variable classifies all disagreement in a single category and is not concerned with the direction of the disagreement (as between lower or higher interest rates) we use the absolute value of the output gap and the inflation rate. The conditional variance of productivity was estimated using a GARCH(1,1) model.

the output gap; agreement or disagreement with a specific policy proposal may be systematically related to these variables, although the sign of the relationship is not clear *a priori*. It may be the case that extreme values of inflation and the output gap are associated with greater dissensus, or alternatively that these are precisely the periods when there will be the most agreement on the committee about actions to be taken. The expected sign of the uncertainty variables (PROD, FVCPI, and FVGDP) is also not clear *a priori*. More uncertainty about economic conditions may be associated with more dispersed signals received by committee members and thus greater disagreement. Alternatively, greater uncertainty may make policymakers more likely to follow the initial position provided by the chair.

Finally, we estimated a “reduced specification” in which we eliminated from the “tape + macro” equation any variable that was not significant at the 10 percent level. Each specification was estimated using standard logit and random-effects logit techniques.²⁵ Because policymakers voiced their preference before casting their vote or switching their view, we included the voiced preference as an independent variable when testing the second and third hypotheses.

Table 3 provides coefficient estimates and standard errors for the first hypothesis. The coefficient on the TAPE dummy is significant and negative in all six equations, indicating that once Fed policymakers knew that their discussions were being taped, they tended to voice greater agreement with Greenspan’s proposals. Of the macroeconomic variables included in the broader specification, only CPI is statistically significant and suggests that higher inflation was associated with a greater voiced disagreement. The variables that reflect uncertainty (PROD, FVCPI, and FVGDP) all point to greater voiced agreement as uncertainty rises, but none is significant.

²⁵Unlike conventional random effects estimators, the consistency of the random effects logit estimator does not depend on the assumption that the random effect is uncorrelated with the independent variables. See Wooldridge (2002 p.490). Fixed effects logit estimates were very similar, but fixed effects estimation drops from the sample individuals who have no variation in voiced preference or voting behavior.

Table 4 summarizes the marginal effects of the independent variables for each type of FOMC meeting participant from the tape equation and the two other specifications. The estimated probability of disagreement with Greenspan's rate proposal drops sharply after 1993 for Board members and Bank Presidents who cast an official FOMC vote.²⁶ After 1993, the probability of dissent from the proposed interest rate is only 3-6 percent for Board members and 12-14 percent for voting Bank Presidents (depending on the specification), down from 10-11 percent and 17-20 percent, respectively, before 1993. In addition, the different specifications indicate that the probability of dissent for non-voting Bank Presidents rises after 1993 and is much higher than that of other policymakers. These interesting results appear to align with the magnitude of the reputational payoff parameter discussed above. Over the period studied, the *de facto* term of a Board member averaged 5.8 years, less than the 12-year average that Bank Presidents remained in their position. Thus, reputational concerns could play more of a role for Board members than for Bank Presidents, accounting for greater herding behavior and less dissent among the former than the latter after 1993.²⁷ Although we do not examine separately the terms in office for voting and non-voting Bank Presidents, it would not be surprising if the reputational concerns of non-voters were weaker than for participants whose official votes are recorded.

Table 5 provides estimation results for the second hypothesis that looks at the effect of known transcription on official votes. The voiced preference is positive and highly significant in all equations, indicating that a vote is most likely to be assenting (dissenting) when verbal agreement (disagreement) was voiced. In general, no other independent variable is statistically significant in the specifications, and because of this

²⁶The estimated probability for each group before and after 1993 was calculated by setting the relevant dummy variables equal to 1 or 0, while other variables were set to their means. So, for example, to calculate the estimated probability of dissent for voting Bank presidents after 1993 we set TAPE=1, BPVOTER=1, NonVOTER=0, TAPE*BPVOTER=1, and TAPE*NonVOTER=0. Any other variables included in the specification were set equal to their mean values.

²⁷It is important to note that Board members often stay for less than the full length of their official term.

we do not report a reduced specification. While the coefficient on TAPE is negative and significant in the “tape” equation estimated using conventional binomial logit, this effect becomes insignificant in the extended specification, and it is also always insignificant in the random effects logit models. From this we conclude that official votes, which were made available to the public both before and after 1993, were not affected by the release of the transcripts.

Table 7 provides information on the consistency between preferences voiced and votes cast for FOMC policymakers. While the majority of voters did not switch position either before or after 1993, the number of voters who did switch positions dropped from 41 before 1993 to 18 after that date. Voters who switch are most likely to voice disagreement but cast an assenting vote.²⁸ Table 8 reports the results of estimation which looks at the likelihood of switching position between the voicing of a preference and the casting of a vote. The voiced preference is positive and highly significant; in addition, the tape effect is negative and significant in all estimated specifications. Several of the macro variables are statistically significant as well: the greater the absolute value of the output gap and uncertainty about future inflation, the lower the likelihood of a switch in position, while a higher conditional variance of productivity and a greater uncertainty about future output growth are associated with a greater likelihood of a switch in position. Table 8 provides estimates of the likelihood of a switch in position for each specification, based on the marginal effects of the independent variables. According to the reduced specification, the estimated probability of a switch in position drops from 7 percent before 1993 for all meeting participants, to 1 percent after 1993.

²⁸Meade (2005) suggests that this reflects the pressure for consensus. She also provides a detailed discussion of the instances of voiced agreement and subsequent voted dissent.

5 Conclusion

In this paper, we have considered the effects of a specific type of transparency—the publication of detailed transcripts from monetary policy meetings—on the quality of a monetary policy committee’s discussion and debate. We first developed a theoretical model of deliberation on a three-member monetary policy committee in which a known expert speaks first and all members of the committee are concerned both about making the correct policy decision and about having a good reputation in public. We showed that in this model the likelihood of having an informative equilibrium in which members accurately reveal private information is greater when deliberation takes place behind closed doors than when deliberation occurs in public. We then subjected this model to empirical testing using an original dataset on deliberations of the Federal Reserve’s FOMC from 1989-1997. The Fed provides a natural experiment for testing our model because of an institutional change in 1993 after which the FOMC decided to begin releasing transcripts of its meetings after a delay of five years. During its 1993 debate over whether or not to change its transparency practices, FOMC officials discovered that the Fed’s staff had maintained literal transcriptions of FOMC meetings dating back to 1976. Thus, there are transcripts for FOMC meetings during a period when monetary policymakers did not know such transcripts existed (before 1993) and for a period when these officials knew that their deliberations would eventually be published (after 1993). Using binomial logit regressions, we find that the evidence provides compelling support for our empirical hypotheses. Fed policymakers appear to have responded to the decision to publish meeting transcripts by voicing less dissent with Greenspan’s policy proposals for the short-term interest rate. While voiced preferences show an effect of known transcription, the official votes, which were made public throughout the entire period, do not. Consistent with these findings, our work also shows that voters were less likely to switch positions between voicing a preference and the official

vote after 1993 than before. Our work provides some theoretical and quantitative evidence for one downside to transparency, in contrast to much of the literature that argues for greater openness in policymaking without weighing potential drawbacks.

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Table 1. Percent disagreeing with interest rate proposal

	Pre-1993	Post-1993
Voiced preference		
Voting Board members	10.2	3.1
Voting Bank Presidents	19.6	13.8
Non-voting Bank Presidents	17.1	23.1
Official vote		
Voting Board members	9.6	1.3
Voting Bank Presidents	11.9	6.9

Table 2. Independent variables

Name	Definition
TAPE	Indicator equal to 1 after 1993, 0 before 1993.
BPVOTER	Indicator equal to 1 if the participant is a Bank President who casts an official FOMC vote, 0 otherwise.
NonVOTER	Indicator equal to 1 if the participant is a Bank President who does not cast an official FOMC vote, 0 otherwise.
EXP	Differential experience in months between Greenspan and Fed official.
CPI	Absolute value of the 1-month change in the consumer price index.
GAP	Absolute value of the monthly output gap (computed as the difference between actual quarterly real GDP and potential real GDP; potential GDP was calculated using a Hodrick-Prescott filter; monthly data were interpolated using capacity utilization).
PROD	Conditional variance of output per hour in the US nonfarm business sector, interpolated.
FVCPI	Standard deviation of 1-year-ahead CPI forecast.*
FVGDP	Standard deviation of 1-year-ahead GDP forecast.*

*Forecasts from Consensus Economics.

Table 3. Logit equations, voiced preference¹

Dependent variable: VOICED PREF						
Voiced agreement with Greenspan interest rate proposal (0), Voiced disagreement (1)						
	Tape specification		Tape + macro specification		Reduced specification	
	Logit	T-value	Logit	T-value	Logit	T-value
TAPE	-1.26	-2.41	-1.39	-2.53	-0.63	-2.78
BPVOTER	0.76	2.34	0.65	1.67	0.67	3.27
TAPE*BPVOTER	0.84	1.39	1.03	1.59		
NonVOTER	0.60	1.89	0.46	1.23		
TAPE*NonVOTER	1.63	2.83	1.90	3.08	1.56	5.69
EXP			0.00	1.42		
CPI			0.14	2.55	0.15	3.54
GAP			0.24	0.92		
PROD			-2.29	-0.83		
FVCPI			-1.79	-1.12		
FVGDP			-2.39	-1.60		
Sample start year	1989		1990		1989	
# obs	1068		931		1068	
Prob>Chi2	<0.01		<0.01		<0.01	

	Tape specification		Tape + macro specification		Reduced specification	
	RELogit	T-value	RELogit	T-value	RELogit	T-value
TAPE	-1.56	-2.65	-1.85	-2.82	-0.68	-2.33
BPVOTER	0.64	1.46	0.38	0.70	0.56	2.24
TAPE*BPVOTER	1.13	1.65	1.65	2.21		
NonVOTER	0.46	1.07	0.10	0.19		
TAPE*NonVOTER	1.87	2.87	2.45	3.42	1.36	3.91
EXP			0.00	0.65		
CPI			0.16	2.54	0.15	3.10
GAP			0.26	1.03		
PROD			-1.95	-0.67		
FVCPI			-2.68	-1.45		
FVGDP			-2.14	-1.31		
Sample start year	1989		1990		1989	
# obs	1063		926		1063	
Prob>Chi2	<0.01		<0.01		<0.01	

¹Constants included but not reported. Equations in upper panel estimated using White standard errors. Equations in bottom panel estimated with random effects logit.

Table 4. Estimated probability of disagreement with Greenspan's interest rate proposal (based on marginal effects from logit regressions in upper panel of Table 3, standard errors in parentheses)

	Pre-1993		Post-1993	
Tape specification				
	Prob	SE	Prob	SE
Voting Board members	0.10	(0.02)	0.03	(0.01)
Voting Bank Presidents	0.20	(0.03)	0.14	(0.03)
Non-voting Bank Pres.	0.17	(0.03)	0.23	(0.03)
Tape + macro specification				
	Prob	SE	Prob	SE
Voting Board members	0.10	(0.03)	0.03	(0.01)
Voting Bank Presidents	0.17	(0.04)	0.13	(0.03)
Non-voting Bank Pres.	0.15	(0.03)	0.22	(0.03)
Reduced specification				
	Prob	SE	Prob	SE
Voting Board members & Non-voting Bank Pres.	0.11	(0.01)		
Voting Board members			0.06	(0.01)
Voting Bank Presidents	0.20	(0.03)	0.12	(0.02)
Non-voting Bank Pres.			0.25	(0.03)

Table 5. Logit equations, official vote¹

Dependent variable: ² VOTE				
Voted assent (0), Voted dissent (1)				
	Tape specification		Tape + macro specification	
	Logit	T-value	Logit	T-value
VOICED PREF	3.13	8.46	3.19	7.01
TAPE	-1.81	-2.47	-1.04	-1.17
BPVOTER	-0.27	-0.59	-0.20	-0.34
TAPE*BPVOTER	1.36	1.58	1.25	1.32
EXP			-0.00	-0.62
CPI			0.16	1.37
GAP			0.41	0.93
PROD			4.81	0.82
FVCPI			4.35	1.13
FVGDP			-4.05	-1.50
Sample start year		1989		1990
# obs		642		559
Prob>Chi2		<0.01		<0.01

	Tape specification		Tape + macro specification	
	RELogit	T-value	RELogit	T-value
VOICED PREF	3.72	7.35	3.84	6.25
TAPE	-1.46	-1.48	-1.47	-1.29
BPVOTER	0.15	0.23	-0.62	-0.49
TAPE*BPVOTER	0.23	0.19	0.90	0.66
EXP			-0.00	-0.63
CPI			0.17	1.18
GAP			0.18	0.28
PROD			9.97	1.38
FVCPI			0.83	0.18
FVGDP			-1.68	-0.41
Sample start year		1989		1990
# obs		642		559
Prob>Chi2		<0.01		<0.01

¹Constants included but not reported. Equations in upper panel estimated using White standard errors. Equations in bottom panel estimated with random effects logit.

²Dependent variable excludes votes cast by Greenspan.

Table 6. Switched view between voiced preference and vote in monetary policy decisions (number)

	Pre-1993	Post-1993
Voters who did not switch	283	300
Voters who did switch	41	18
<i>Of which:</i>		
Voiced disagreement but voted assent	27	16
Voiced agreement but voted dissent	14	2

Table 7. Logit equations, switched view¹

Dependent variable: ² SWITCH						
No switch between voiced preference and vote (0), Switch (1)						
	Tape specification		Tape + macro specification		Reduced specification	
	Logit	T-value	Logit	T-value	Logit	T-value
VOICED PREF	3.72	10.24	4.37	9.20	4.43	9.50
TAPE	-1.45	-2.34	-2.55	-3.29	-1.78	-2.88
BPVOTER	-0.09	-0.18	-0.19	-0.29		
TAPE*BPVOTER	1.05	1.39	1.40	1.60		
EXP			-0.00	-0.13		
CPI			0.12	0.99		
GAP			-1.07	-2.36	-0.99	-2.26
PROD			12.40	1.92	10.25	1.82
FVCPI			-8.23	-2.13	-7.75	-1.98
FVGDP			6.34	2.27	5.39	2.10
Sample start year	1989		1990		1990	
# obs	642		559		559	
Prob>Chi2	<0.01		<0.01		<0.01	

	Tape specification		Tape + macro specification		Reduced specification	
	RELogit	T-value	RELogit	T-value	RELogit	T-value
VOICED PREF	4.27	8.91	5.40	7.31	5.31	7.85
TAPE	-1.94	-2.20	-3.84	-2.77	-2.12	-3.18
BPVOTER	-0.18	-0.27	-0.50	-0.57		
TAPE*BPVOTER	1.55	1.47	2.55	1.75		
EXP			12.47	0.00		
CPI			0.17	1.00		
GAP			-1.27	-2.08	-1.18	-2.10
PROD			15.10	2.16	12.38	1.93
FVCPI			-7.35	-1.53	-6.91	-1.52
FVGDP			5.39	1.37	4.48	1.25
Sample start year	1989		1990		1990	
# obs	642		559		559	
Prob>Chi2	<0.01		<0.01		<0.01	

¹Constants included but not reported. Equations in upper panel estimated using White standard errors. Equations in bottom panel estimated with random effects logit.

²Dependent variable excludes votes cast by Greenspan.

Table 8. Estimated probability of a switch between voiced preference and official vote in monetary policy decisions (based on marginal effects from regressions in upper panel of Table 7, standard errors in parentheses)

	Pre-1993		Post-1993	
Tape specification				
	Prob	SE	Prob	SE
Voting Board members	0.06	(0.02)	0.02	(0.01)
Voting Bank Presidents	0.06	(0.02)	0.04	(0.01)
Tape + macro specification				
	Prob	SE	Prob	SE
Voting Board members	0.07	(0.03)	0.01	(0.01)
Voting Bank Presidents	0.06	(0.03)	0.02	(0.01)
Reduced specification				
	Prob	SE	Prob	SE
All Voters	0.07	(0.03)	0.01	(0.00)