WHY DOESN'T SOCIETY MINIMIZE CENTRAL BANK SECRECY?

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Societies have incentives to design institutions that allow central bank secrecy. This paper illustrates two of these incentives. First, *if society tries to constrain secrecy in one way, central bankers will try to regain lost effectiveness by building up secrecy in other ways. Therefore, we may wind up accepting types of secrecy that appear preventable because reducing them would lead to higher costs.* Second, *if the social trade-offs between policy objectives change over time, the public may directly prefer greater central bank secrecy so that it will be surprised with expansionary policies when it most desires them.*

I. INTRODUCTION

Central banks have repeatedly revealed a preference for secrecy in conducting monetary policy. In the United States, for example, the Federal Reserve has expressed its bias towards policy secrecy in a number of ways, ranging from delays in releasing the minutes of Federal Open Market Committee (FOMC) meetings to ambiguous policy statements at Congressional hearings.[1] Nevertheless, the degree of disclosure required by Congress and the court system does not appear to minimize central bank secrecy. Indeed, the Fed's right to limit disclosure of policy intentions was upheld in a recent Supreme Court case.[2] Furthermore, similar social tolerance of central bank secrecy appears in the banking institutions of other countries.

Since legal and social institutions allow for central bank secrecy, its presence may be attributed to the preferences of the social planners who designed these institutions in the first place. Forward-looking planners know that monetary policy in future periods will be the outcome of a symbiotic relationship between monetary authorities, politicians, and private interest groups.[3] As the relative importance of these different groups and their preferences change over time, so will the policy objectives of the monetary authorities. If secrecy is allowed, monetary authorities could effect policy changes in response to relationship changes without immediate detection by private markets. Recognizing this policy effect of secrecy, a social planner would design institutions to affect the environment so that desirable future policy formation takes place.[4]

This paper offers two explanations for why social institutions do not legally minimize central bank secrecy.[5] First, when

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1. See Mayer [1987] on the evolution of disclosure requirements of Federal Reserve policy in the U.S.

2. See Goodfriend [1986] on Merrill vs. the FOMC.

3. On the symbiotic relationship between these groups in forming monetary policy, see Alt [1990], Havrilesky [1988], and Wooley [1984].

4. In a related issue, Rogoff [1985] shows that society would prefer a central banker with relatively more conservative preferences.

5. A similar issue is the effects of central bank independence upon the economy. On this issue, see Alesina [1989] and Alesina and Summers [1990].

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establishing institutional disclosure requirements for central banks, social planners recognize the tendency for central bankers to be secretive. This secrecy imposes costs upon members of society by making shifts in policy objectives more difficult to detect. Faced with this tendency, members of society set legal institutions that *appear* to require less disclosure, because more restrictive laws would induce central bankers to become more secretive in other, less informative, ways.[6]

Second, if the policy objectives that society finds desirable change over time, then members of society may directly prefer some degree of central bank secrecy. Economic theory holds that unanticipated changes in monetary policy can have an economic effect. Intuitively, secrecy allows central banks to conduct unanticipated policy actions in periods when, on average, society most prefers them. For example, in periods when public opinion favors pushing down unemployment, central banks may conduct a surprise monetary expansion.[7]

The paper develops examples of each of these two effects using a discretionary equilibrium similar to that in Cukierman and Meltzer [1986a]. The desired trade-off between two policy objectives changes over time in response to changing political pressures. Although I use the trade-off between output and inflation as an example, the basic results hold with any policy trade-off that varies over time. The policy objectives could include targets for real exchange rates or interest rates, for instance.

6. For example, as a lawsuit was threatening to force the Fed to publish the minutes of the FOMC meetings immediately following each meeting, the Fed decided to abolish the minutes altogether. See Mayer [1987, 13-15; 38-62].

7. This result reverses the causality to the argument in Cukierman and Meltzer [1986a] that central bankers prefer secrecy in order to surprise the money supply in periods when they care most about increasing output. Here, members of society prefer to be surprised by their own central banks.

The plan of the paper is as follows. Section II describes the discretionary equilibrium given institutional settings for the conduct of monetary policy. Sections III and IV describe examples of each of the two explanations for secrecy described above. Concluding remarks follow.

II. THE DEGREE OF POLICY DISCLOSURE IN A DISCRETIONARY EQUILIBRIUM

When the policy objectives of the monetary authorities shift over time due to changing economic or political circumstances, their choice of discretionary policy also shifts.[8] In the absence of a mechanism to pre-commit to a particular policy rule, the authorities will implement policy changes. Furthermore, since central bankers cannot precisely control the money supply over an indefinite time period, the private market cannot directly observe the central bank's intended policy. The interaction between changing policy objectives by central banks, on the one hand, with incomplete private information about these objectives, on the other, yields an equilibrium policy process. In this equilibrium, market participants observe the money supply and other variables that are correlated with central bank objectives in order to form forecasts of future policy. In turn, central banks recognize that market participants are watching current money and other variables when deciding current policy. Within such a discretionary equilibrium, market participants partially observe the central banker's policy intentions by watching variables correlated with monetary policy.

But we must push this analysis back a step if we want to ask how much central bank secrecy a social planner would prefer. Addressing this question amounts to asking what kind of institutional environment society would choose for the central

8. See, for example, Cukierman and Meltzer [1986a; 1986b].

bank to operate in, since this environment implies a corresponding degree of implicit policy disclosure.

This question will be the focus of sections III and IV below. Before considering the secrecy issue, however, we must describe the discretionary equilibrium *given* a particular institutional framework. For this purpose, a discretionary equilibrium similar to Cukierman and Meltzer [1986a] is briefly described next.[9]

The Central Bank's Objectives Given the Social Framework

As a policy-making entity, the government consists of many individuals with objectives that depend upon the ability to stay in office. Furthermore, the popularity of these government officials depends upon key economic variables that affect the well-being of their constituents.[10] For example, an over-valued exchange rate worsens the competitiveness of the export industry, and high interest rates hurt the housing market as well as debtors. Therefore, government officials are influenced in their policy decisions by the effects of these policies upon special interest groups.

Although government objectives depend upon a number of different policy targets, I will take as an example the trade-off between two of them. Specifically, the authorities would like to minimize inflation but also use unanticipated inflation to reduce unemployment, as in Barro and Gordon [1983]. Although this may not literally characterize central bank behavior, I will use this well-known relationship to proxy for other policy trade-offs, such as exchange rates and interest rates. The objective function of the central bank is then given by

$$(1)\quad W_t = x_t[m_t - \mathrm{E}(m_t \mid I_{t-1})] - (\tfrac{1}{2})(m_t^c)^2$$

where m_t is the money supply at time t, m_t^c is the money supply intended by central bankers, $\mathrm{E}(\ \mid I_t)$ is the expectations operator conditional upon the private sector's information set at time t, and x_t is the time-varying trade-off between the first and second components in W_t. The first component says that central bankers would like to push up money, m_t, for any given market forecast of money, since nominal wage contracts incorporate expected inflation. A surprise expansion to the money supply thus induces a surprise fall in real wages and an increase in employment along the labor demand curve. The second component in (1) says that central bankers do not like inflation.

The time-varying parameter x_t represents the authorities' policy trade-off between unemployment and inflation targets. This trade-off captures the time-varying nature of the symbiotic relationship between monetary authorities, politicians, and interest groups. Changes in the distribution of income and political power affect the influences upon the monetary authorities. Thus, x_t reflects the time-varying objectives that monetary authorities pursue as an equilibrium response to political pressure. Note that the objective function (1) is not a social welfare function, but rather the objective function of the monetary authorities.

For the examples below, I characterize the changing objectives of the monetary authorities according to the persistent process:

$$(2a)\qquad x_t = A + p_t$$

9. Since the basic structure is a simplified version of the Cukierman and Meltzer [1986a] discretionary equilibrium, readers familiar with this model may wish to skim through to section III below.

10. The effects of unemployment and inflation upon public opinion about the state of the economy has been studied by Fischer and Huizinga [1982]. The effects upon the popularity of the President is documented in Frey and Schneider [1978]. Havrilesky [1987] considers the effect upon the money supply of changes in government and social expenditures.

(2b) $p_t = \theta v_{t-1} + v_t, \quad 0 < \theta \leq 1,$

where v_t is a serially uncorrelated random variable with zero mean and constant variance, σ_v^2. The positive parameter, A, is known to the private sector and reflects the authorities' unconditional trade-off for expanding output relative to reducing inflation. On the other hand, only the central bankers know the time-varying component, p_t, at each point in time. The disturbance, v_t, represents the most recent change in policy objectives, p_t.

The preference pattern described in (2) implies that changes in political trade-offs persist according to the autocorrelation parameter, θ. This degree of persistence, in turn, depends upon social and legal institutional settings. For instance, the terms of political offices may overlap for individuals both inside and outside the central bank who exert an influence on the authorities' policy-making process.

The simple form of policy preferences in (2) provides a very tractable and convenient solution to the discretionary equilibrium as will be shown below. Despite its utter simplicity, this formulation yields a rich variety of implications regarding the persistence of policy objectives. According to this process for p_t, any current change in period t will also be correlated with the change in the following period at $t+1$. The variance of next period's policy, p_{t+1}, that can be explained by today's policy disturbance is just equal to $\theta/(1+\theta)$.[11] Therefore, the autocorrelation in the policy process, θ, captures the component of current policy preferences that will persist tomorrow.

The Discretionary Equilibrium

As a result of central bank secrecy, monetary authorities maintain inside information about their policy objectives. Therefore, private market participants can only watch variables correlated with these objectives to make inferences about policy. Put into the context of the objectives above, the market can observe the outcome of the money supply, m_t, but only the central bank knows its current objectives, p_t. Based upon the current private information set, market participants then try to detect p_t in order to predict the outcome of future policy.

In order to provide a simple solution, I will assume that past disturbances to policy objectives, v_{t-k}, are observed with some lag, k. Nevertheless, central bankers still have inside information, since they alone know their current objectives, v_t, and therefore p_t. This simplification is not necessary for the results obtained below but significantly streamlines the algebra.[12] Furthermore, this assumption may be reasonable for the United States since the Fed publishes its "Directive" of the past Federal Open Market Committee meeting just prior to the current meeting.

For further simplicity, the policy revelation lag, k, is set equal to one. Therefore, the information set available to the private sector at the end of period t contains current and lagged money and lags of policy objectives. That is, $I_t \equiv \{m_t, m_{t-1}, m_{t-2}, \ldots, v_{t-1}, v_{t-2}, \ldots\}$. In general, the information set may also contain other variables that are correlated with policy objec-

11. That is, the ratio of the variance of p_{t+1} conditional upon p_t over the total variance of p_{t+1} equals $\text{var}[E(p_{t+1} \mid p_t)] / \text{var}(p_{t+1})$ which equals $\theta/(1+\theta)$.

12. If v_t were never observed, then the forecast of policy objectives the following period would depend upon an infinite backward-looking series of the information set. Intuitively, agents would use the entire past history of the information in money to arrive at an estimate of v_{t-1}. In a similar vein, Cukierman and Meltzer [1986a] treat the policy process as an auto-regressive process where the innovations are never observed, so that agents must use an infinite ordered backward-filter to forecast future policy. Although these two specifications may add some realism to the discretionary equilibrium, the assumption in the text does not alter any of the basic results concerning central bank secrecy below.

tives. For example, in section IV the information set will be expanded to include public opinion. Since the basic results remain when including these variables, I will first consider the shorter information set.

Given these objectives, the monetary authorities choose the money supply to maximize the discounted present value of equation (1). In other words,

$$(3) \qquad \max_{m_t^c} \; E\Big[\sum_{j=0}^{\infty} \beta^j W_{t+j} \mid G_t\Big]$$

where m_t^c is the authorities' planned money supply and G_t is the government's information set at time t that includes the government's current preferences; i.e., $G_t \equiv \{v_t, v_{t-1}, \ldots\}$. Although future economic or political conditions are likely to have a high variance, the government has better information about this outcome because it has inside information about current policy.

The authorities can hide their current objectives because they cannot perfectly control the money supply. That is, observed money supply differs from the authorities' planned money supply according to control noise,

$$(4) \qquad m_t = m_t^c + \varphi_t,$$

where φ_t is a serially uncorrelated random variable with mean zero and variance σ_φ^2. Since the money supply cannot be controlled precisely, the variance of the control error has a lower bound so that $\sigma_\varphi \geq \bar{\sigma}_\varphi$, where $\bar{\sigma}_\varphi$ is the minimum possible variance of the control error.

Private market participants form rational expectations about the future money supply. As will be shown below, the private sector's expectations are rational when they believe that the authorities use the following rule to conduct monetary policy:

$$(5) \qquad m_t^c = B_0 A + B_1 v_t + B_2 v_{t-1},$$

where the B_i are constant coefficients that will be determined in equilibrium. Substituting (5) into (4) and taking expectations implies

$$(6) \qquad E(m_t \mid I_{t-1}) = B_0 A + B_2 E(v_{t-1} \mid I_{t-1}).$$

As an appendix available from the author shows, the conditional expectation of the past policy disturbance, v_{t-1}, based upon the private information set equals

$$(7) \qquad E(v_{t-1} \mid I_{t-1}) = a(m_{t-1}^c - B_0 A - B_2 v_{t-2} + \theta_{t-1}),$$

where

$$a \equiv [B_1 \sigma_v^2 / (\sigma_\theta^2 + B_1^2 \sigma_v^2)].$$

As quick inspection of (4) and (5) verifies, private agents observe the composite term in parentheses in equation (7), but not its components. Further substituting (7) into (6) above provides the function that private agents use to forecast government policy:

$$(8) \qquad E(m_t \mid I_{t-1}) = B_0 A + B_2 a(m_{t-1}^c - B_0 A - B_2 v_{t-2} + \theta_{t-1}).$$

That is, although agents cannot directly observe the money supply intended by the authorities, m_{t-1}^c, they forecast it implicitly.

The authorities recognize that their choice of money affects the market's forecasts as described in (8). Therefore, in maximizing their own objectives in (3), they view equation (8) as a constraint. Substituting (8) into (3) and maximizing with respect to m_t^c yields the following first-order condition:

$$(9) \qquad m_t^c = x_t - \beta\, a\, B_2\, \mathrm{E}(x_{t+1} \mid G_t)$$

$$= (A + v_t + \theta v_{t-1})$$

$$- \beta\, a\, B_2\, (A + \theta v_t).$$

This equation provides the equilibrium response of the government given the market's beliefs. The central bankers know their own objectives at time t, but have only a forecast about their objectives in the next period. At each point in time, they would like to set the money supply equal to the current period trade-offs, x_t. But they know that fully responding to these policy preferences would reveal them to the private sector. Therefore, they do not fully respond to their desired policy every period.

To find the equilibrium, we must equate the private sector's beliefs about government policy in equation (5) to the government's actual policy given private beliefs in equation (9). This provides the equilibrium levels of the coefficients:

$$(10a) \qquad B_0 = [1 - \beta\, \theta\, a(B_1)]$$

$$(10b) \qquad B_1 = [1 - \beta\, \theta^2\, a(B_1)]$$

$$(10c) \qquad B_2 = \theta\,.$$

As these equations indicate, B_0 and B_1 depend upon the expectations coefficient, $a(B_1)$, which in turn depends upon B_1. Therefore, B_1 determines the rest of the equilibrium. To focus upon choice variables, but without loss in generality, the rate of time preference, β, will be set equal to one throughout the remaining analysis.

Figure 1 illustrates the solution of B_1 in terms of the intersection between market beliefs from equation (5) and the actual policy from equation (10). The vertical axis shows the rule that the authorities actually follow as a function of B_1, given by the right-hand side of (10b). For given variances, σ_v and σ_θ, the policy function is described by the bold line labeled $1 - \theta^2$ $a(B_1,\ldots)$ and is minimized at $B = (\sigma_v / \sigma_\theta)$. This function intersects with the private market's beliefs, B_1, at point B_{1a}^*. The equilibrium between private market beliefs and government objectives ties down the discretionary equilibrium.

The degree of variability in the market's forecast of policy provides a useful measure of the monetary authorities' inherent secrecy about policy objectives. Using the equilibrium solutions in (10) above, the degree of "secrecy" inherent in any discretionary equilibrium may be written:[13]

$$(11) \qquad S \equiv -\mathrm{E}\{[m_t^c - \mathrm{E}(m_t^c \mid I_t)]^2\}$$

$$= S(\theta, \sigma_\varphi)\,.$$

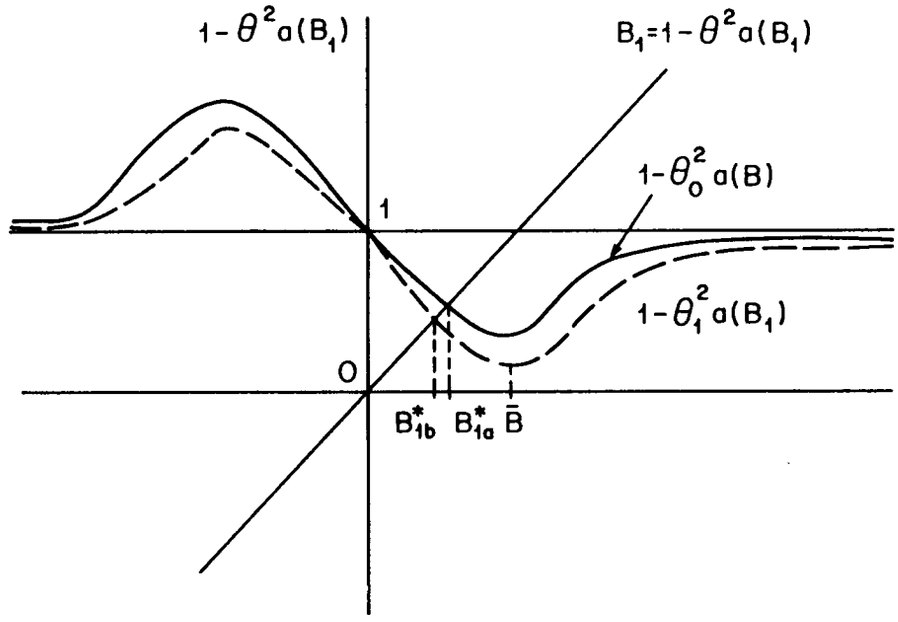
Thus, how much of the current policy objectives can be detected by private agents depends both upon (a) the persistence of policy objectives, deterring authorities from reacting to their current preferences, and upon (b) the degree of monetary noise, allowing authorities to hide their current policy actions. These variables are not arbitrarily determined. Rather, they depend upon choices made when designing the institutions for conducting monetary policy. To examine how these institutions are chosen, along with their implied level of secrecy, I consider two different social objective functions in the next two sections.

III. SECRECY WHEN SOCIETY PREFERS STABLE POLICY

Social and legal institutions such as the Constitution are devised by members of society who try to anticipate future policy

13. Algebraically, this conditional variance is $\{B_1^2 + \theta^2[1 - a(B_1)B_1]^2\}\,\sigma_v^2 - a(B_1)^2\,\theta^2\,\sigma_\varphi^2$ and thus depends upon the parameters, θ, σ_v and σ_φ. Since the variability of monetary noise and persistence in policy will be the focus of the analysis below, the variability of policy preferences are subsumed in equation (11).

FIGURE 1



pressures upon government officials. Similarly, the members of society who originally determined the institutions of central banks recognized that central bankers would face different pressures over time. Therefore, the social planners would have designed these institutions to influence future policy outcomes in accord with their own objectives. This is illustrated in the following example.

Suppose first that these social planners prefer a stable trade-off between unemployment and inflation with an objective function given by

$$(12)\quad U_t = [m_t - \mathrm{E}(m_t \mid I_t)]\, A + \tfrac{1}{2}\,(m_t^c)^2$$

The difference between the policymakers' objectives and society-as-a-whole's objectives can be seen by comparing equation (12) with equation (1). Policymakers are influenced by individuals, such as small interest groups or particular members of the FOMC, through the variable x_t in equation (1).[14]

From the social planners' viewpoint, the variability in the discretionary equilibrium described above imposes costs. The absence of a mechanism to force central bankers to commit to a stable policy rule implies that the authorities will always follow the discretionary policy. But some discretionary equilibria are socially preferable to others, as the expected value of the planners objective function demonstrates. Substituting the private sector money supply beliefs from (5) into (12) and taking expectations yields,

$$(13)\quad \mathrm{E}(U_t) = -\tfrac{1}{2}\,[B_0^2 A^2 + (B_1^2 + B_2^2)\,\sigma_v^2].$$

14. These individuals comprise only an infinitesimal fraction of overall society so that their preferences do not appear in the social objective function (12). The case where these groups are large enough to affect social welfare appears in section IV below.

This cost arises from two components that depend in turn upon A, the unconditional tendency of the authorities to inflate, and upon σ_v, the variability of policy shifts. Specifically, the first component, $\frac{1}{2} B_0^2 A^2$, gives the dead-weight loss of a suboptimally high inflation *level*. The persistence of policy deters the authorities from expanding so that the unemployment trade-off term, A, depends upon a number less than one; i.e., $B_0 = (1 - a\theta) < 1$. By contrast, the second component, $\frac{1}{2} (B_1^2 + B_2^2) \sigma_v^2$, captures the effects of changing policy objectives upon the inflation *variance*. Other things equal, more variability in policy pressures by special interest groups induces greater variability in monetary policy and, therefore, higher expected costs from the viewpoint of social planners.

Although discretionary government policy imposes these social costs, society can influence the behavior of discretionary government policy by its choice of the institutional environment. The degree of policy persistence can be affected by a number of different social and legal institutions that promote longer terms or overlaps of office for governmental officials. For example, the U.S. Banking Act of 1935 instituted fourteen-year terms of appointment for Federal Reserve governors with a turnover of one governor every two years. The purpose of the measure was to make for smoother policy transitions and also to reduce the governors' dependence upon the President who has a shorter term of office. The average turnover in the governorship positions has been about seven years.

Thus, if society could choose the rate of policy persistence to minimize the costs of discretionary policy, how much persistence would it choose? This question may be answered by considering a social planner at the beginning of time who maximizes equation (13) with respect to θ. This maximization is proven in the appendix and implies the following result:

RESULT 1: *For a given degree of policy noise, σ_v, the optimal degree of persistence in policy objectives is the highest persistence possible:* $\theta^* = 1$.

Intuitively, we can see from equation (13) above that a change in persistence will implicitly affect social welfare both through the *level* and the *variance* of inflation. Figure 1 illustrates the effects of changing upon the equilibrium levels of B_1 and, hence, through (10a), B_0. A rise in θ to $\theta_1 > \theta_0$ will shift down the government's reaction function, $1 - \theta^2 a(\cdot)$ at every level of B_1. This implies a lower level of equilibrium B_1 at $B_{1b}^* < B_{1a}^*$, and therefore less reaction to current policy objectives and a lower level of B_0. This deterrent upon changing policy implies both a lower *level* of inflation through B_0, and a lower *variance* of inflation through B_1. For both reasons, society would prefer policies that induce greater policy persistence.

The Government's Desire for Secrecy

Given the degree of policy noise inherent in the monetary operating procedure, the result above says that society would set up institutions that fostered the greatest policy persistence possible. However, given greater stability of tenure in office, policymakers may choose operating procedures that further obfuscate their policy intentions.[15] To consider how the welfare of policymakers depends upon their ability to hide policy intentions, we can calculate their expected utility by substituting equation (5) into equation (1) and taking expectations:

$$(14) \quad E(W_t) = -[B_0^2 A^2 - (B_1^2 + B_2^2) \sigma_v^2].$$

15. In a similar vein, Alesina and Cukierman [1990] demonstrate why politicians may prefer to be ambiguous about their true political views.

Comparing (14) to (13) reveals that the authorities' objectives differ from those of the social planners because the planners prefer smooth policy while the authorities would rather change policy in response to political pressures. The inflation cost represents a cost to both central bankers and social planners. This cost is given by the first term in brackets and depends upon the average level of inflation, B_0A. However, by the second term, $(B_1^2 + B_2^2)\,\sigma_v^2$, the central bankers gain from the variability of policy while society loses. To see why, note from (5) that the authorities react to their current political pressures according to the coefficients B_1 and B_2. However, current preferences, p_t, are correlated in equilibrium with the forecast error by private agents, $(m_t - \mathrm{E}(m_t \mid I_{t-1})$. Therefore, the authorities gain from generally being able to surprise the market with a monetary expansion during the periods when interest groups and other agents in the symbiosis most care about increasing output. But since social planners prefer smooth policy, they view this variation in policy as costly.

As Cukierman and Meltzer [1986a] show, central bankers may prefer greater monetary noise, σ_φ, so they can more easily surprise the market with monetary expansions to stimulating the economy. Intuitively, monetary noise allows the authorities to be ambiguous about their policy intentions and to produce a greater shock to the economy when p_t is large. By determining the monetary policy environment, such as in the choice of operating procedures, they influence the degree of noise inherent in the money supply process. What level of noise would the authorities choose? Maximizing equation (14) with respect to σ_φ for a given level of persistence, θ, yields a second result (which is proven in the appendix).

RESULT 2: *For a given degree of policy persistence, the authorities would choose a higher* σ_φ^* *than the minimum possible variance. Furthermore, the optimal variance,* σ_φ^*, *increases with policy persistence,* θ.

Intuitively, the higher the noise in monetary error, the more the authorities can hide their current policy objectives, and the more, on average, they can gain from surprise expansions.

Society's Choice of Persistence When Central Banks are Secretive

The result above indicates that central bankers would prefer to be more secretive, given a process for policy shifts. However, in developing institutions for conducting monetary policy, social planners recognize this tendency toward secrecy. Therefore, instead of simply choosing institutions that promote policy persistence *given* the noisiness of central bank policy, as in result 1, these planners incorporate the choices made by central banks, as in result 2.

In terms of the example above, we can address this issue by asking: How would a social planner's choice of policy persistence change when he realizes that central banks will choose ambiguity based upon this persistence? More specifically, totally differentiating equation (14) with respect to θ and incorporating result 2 implies

$$[dE(U)/d\theta] = [dE(U)/d\theta]_{\sigma_\varphi} + [dE(U)/d\sigma_\varphi]\,(d\sigma_\varphi^*/d\theta).$$

Result 1 said that society would maximize the first term on the right-hand side, holding σ_φ constant. However, result 2 says that ambiguity increases with the persistence; or, in other words, $(d\sigma_\varphi^*/d\theta) > 0$. On the other hand, social welfare falls as the variance of policy increases, i.e., $(dE(U)/d\sigma_\varphi) < 0$. Therefore, although greater policy persistence reduces variability and hence improves social welfare through the first term, it also prompts central bankers to

conceal their policies, reducing welfare through the second term. This relationship leads to the following result:

RESULT 3: *Society chooses a lower rate of policy persistence when the government decides the degree of policy ambiguity based upon this persistence.*

The result is formally derived in the appendix.

The example in this section also illustrates a more general point. If society tries to constrain secrecy in one way, central bankers will try to regain lost effectiveness by building up secrecy in other ways. This means that in the design of social institutions, account must be taken of the central bank's reactions to any constraints on secrecy. We may therefore wind up accepting types of secrecy that appear preventable because eliminating them or reducing them would lead to higher costs due to the Fed's reaction.

IV. SECRECY WHEN SOCIETY PREFERS DISCRETIONARY POLICY

In contrast to the example above, suppose that social planners anticipate that their future preferences for policy objectives may change over time with changing economic circumstances. In this case, society may directly prefer greater central bank secrecy. To illustrate, suppose that instead of (13), social objectives can be written:

$$(15)\quad U_t = (m_t - \mathrm{E}(m_t \mid I_{t-1})) \times (A + u_t) - \tfrac{1}{2}(m_t^c)^2$$

where $u_t = e_t + \mu e_{t-1}$. That is, public opinion about the importance of unemployment relative to inflation changes over time according to u_t. This variable follows a first-order moving average process as in the authorities objectives (2). Furthermore, since changing social opinion about economic trade-offs influences the authorities' popularity, shifts in public opinion are correlated with shifts in government policies; i.e., $\mathrm{E}(v_t e_t) = \sigma_{ve} > 0$.

Therefore, since they know public opinion, private agents have an additional piece of information about policy intentions. As a result, the private sector's information set every period now includes the most recent state of public opinion, e_t, so that it becomes,

$$I_t \equiv \{m_t, m_{t-1}, m_{t-2}, \ldots, e_t, e_{t-1}, \ldots, v_{t-1}, v_{t-2}, \ldots\}.$$

In this case, the discretionary solution appears the same as described in section I, except that the market's prediction of the policy preferences now depends upon public opinion as well. Instead of (7), we have

$$(16)\quad \mathrm{E}(v_{t-1} \mid I_{t-1}) = \tilde{a}(m_{t-1}^c - B_0 A - B_2 v_{t-2} + \varphi_{t-1}) + b e_t$$

where now $\tilde{a} < a$, since agents pay relatively less attention to money when making forecasts now that they have additional information. Substituting this forecast of policy preferences into the money supply forecast, the discretionary equilibrium can be calculated with the same steps as in section II. Further substituting the money supply beliefs in (5) into the objective function (16) gives the expected value of social welfare as

$$(17)\quad \mathrm{E}(U_t) = -\tfrac{1}{2}[B_0^2 A^2 + (B_1^2 + B_2^2)\sigma_v^2] - b B_2^2 \sigma_e^2 + (B_1^2 + B_2^2)\sigma_{ve}.$$

The first term in brackets is the same as in equation (13). The second term represents the cost arising from periods when society would prefer more monetary stim-

ulation. The last term increases social welfare due to the covariance between public opinion and the preferences of central bankers. Intuitively, during periods when society cares most about stimulating the economy, the authorities do too. However, since the authorities' preferences are not perfectly correlated with the public's preferences, the public will be, on average, surprised by expansions during these periods.

Since greater obfuscation of policy allows central banks to carry out these surprise expansions, social planners may actually prefer greater ambiguity in the form of greater monetary noise. More formally, differentiating (17) with respect to σ_φ demonstrates that whether the social planners directly prefer more secrecy depends upon which of two effects dominates. An increase in the degree of noise improves their welfare since monetary authorities will conduct surprise expansions when society most desires them. However, an increase in the variance of the monetary control noise makes people pay less attention to the money supply when making forecasts, thereby reducing the authorities' ability to conduct surprise inflation in the first place. Overall, when the benefits to unanticipated policy dominate the loss in information from the money supply, society will prefer to be less informed about policy intentions.

V. CONCLUDING REMARKS

This paper has presented two examples that explain why societies allow central banks to remain secretive about their policy intentions. First, when social planners prefer stable policy but monetary authorities respond to the changing influence of interest groups, these planners can induce the central bankers to smooth the monetary policy process through institutions that promote greater policy persistence. However, this action also increases the monetary authorities' incentive to choose a policy process with greater noise and, therefore, more secrecy. Since members of society recognize this incentive, they prefer to choose institutions that appear to allow greater secrecy. Second, when the social planners' own relative trade-offs change over time, society may directly prefer that the central bank maintain secrecy so as to be surprised by monetary expansions during periods when the public prefers more economic stimulation. Although the analysis in this paper has investigated these two extreme motivations for central bank secrecy, the actual reasons are likely to be a combination of both factors.

APPENDIX
Results in the Text

Showing the results stated in the text depends upon the following facts.

FACT 1. $0 < (\partial a / \partial B_1) < 1$.

Proof: $(\partial a / \partial B_1) = \left[\sigma_v^2(\sigma_\varphi^2 - B_1^2\sigma_v^2)/(\sigma_\varphi^2 + B_1^2\sigma_v^2)^2\right]$

The first part is immediately obvious since $\text{sign}(\partial a / \partial B_1) = \text{sign}(\sigma_\varphi^2 - B_1^2\sigma_v^2) > 0$. For the second part, note that if $(\partial a / \partial B_1) < 1$, then:

$$\sigma_v^2(\sigma_\varphi^2 - B_1^2\sigma_v^2) < (\sigma_\varphi^2 + B_1^2\sigma_v^2)^2.$$

But,

$$\sigma_\varphi^2 - B_1^2\sigma_v^2 < \sigma_\varphi^2 + B_1^2\sigma_v^2$$

and,

$$\sigma_\varphi^2 + B_1^2\sigma_v^2 \geq \sigma_v^2 + B_1^2\sigma_v^2 = 2\sigma_\varphi^2 > \sigma_v^2.$$

Therefore, $(\partial a / \partial B_1) < 1$.

FACT 2. $a=\{a:B_1=(1-\theta^2 a), a=\sigma_v^2 B_1/(\sigma_\varphi^2+B_1^2\sigma_v^2)\}$ is (i) strictly decreasing and (ii) convex in θ for $\theta \in (0,1)$.

Proof: Since $(da/d\theta) = (\partial a/\partial\theta)(dB_1/d\theta)$, substitute the definition of $a(B_1)$ from equation (7) into the equilibrium condition (10b) and totally

differentiate with respect to B and θ. Part (i) holds since

$$(da/d\theta) = (\partial a/\partial\theta)(dB_1/d\theta)$$

$$= -2a[\theta(\partial a/\partial B_1)/1 + \theta^2(\partial a/\partial B_1)]$$

and since $(\partial a/\partial B_1) > 0$ by fact 1.

Part (ii) can be established by differentiating (da/dB_1).

$$[d^2a/(d\theta)^2] = -2a\theta(\partial a/\partial B_1)/$$

$$[1 + \theta^2(\partial a/\partial B_1)]^2$$

$$\{2[1 - \theta(1 - \theta)(\partial a/\partial B_1)]$$

$$+ \theta(\partial a/\partial B_1)\} < 0.$$

where the inequality follows since by fact 1, $(\partial a/\partial B) < 1$.

FACT 3. $a = \{a: B_1 = (1 - \theta^2 a),\ a = \sigma_v^2 B_1/(\sigma_\varphi^2 + B_1^2 \sigma_v^2)\}$ is strictly decreasing in σ_φ.

Proof: Since $(dB_1/d\sigma_\varphi) = -\theta^2 (da/d\sigma_\varphi)$, it is sufficient to show that B_1 is increasing in σ_φ. But, differentiating the equilibrium condition, (10b), implies

$$(dB_1/d\sigma_\varphi) = -\left[\theta^2(\partial a/\partial\sigma_\varphi)/1 + \theta^2(\partial a/\partial B_1)\right] > 0$$

where the inequality follows since $(\partial a/\partial B_1)>0$ from fact 1 and since $(\partial a/\partial\sigma_\varphi) < 0$ by inspection.

Proof to Result 1: It is sufficient to show that $(dE(U)/d\theta) > 0$ for $\theta \in (0,1)$. But, $(dE(U)/d\theta) = \sigma_v^2 [(B_1\theta + K^2 B_0)(a + \theta(da/d\theta) + \theta a B_1 + \theta^2)]$, where $K = (A/\sigma_v)$, so that $a + \theta(da/d\theta) > 0$ is a sufficient condition for $(dE(U)/d\theta) > 0$. But by fact 2, a is strictly decreasing in θ while $|(da/d\theta)|$ is strictly increasing in θ. Thus, the sufficient condition holds if at $\theta = 1$, $(\theta/a)\ |(da/d\theta)| = 2[(\partial a/\partial B_1)/\ 1 + (\partial a/\partial B_1)] < 1$,

which is immediate since by fact 1, $(\partial a/\partial B_1) < 1$.

Proof to Result 2: Differentiating the unconditional expectation of the authorities objective function, equation (14), with respect to σ_φ implies

$$[dE(W_t)/d\sigma_\varphi] = -\theta(\sigma_v^2 B_1\theta - A^2 B_0)(da/d\sigma_\varphi).$$

We will next consider two cases:

(i) When $\sigma_\theta^2 > A^2$: Since $(B_1/B_0) > 1$ and $(da/d\sigma_\varphi) < 0$ by fact 1, we have the result that $(dE(W_t)/d\sigma_\varphi) > 0$ at every equilibrium level of B_1 and B_0. Therefore, the highest possible noise variance is optimal.

(ii) When $\sigma_\theta^2 < A^2$, the optimal value of σ_φ is where $(dE(W_t)/d\sigma_\varphi) = 0$, as can be verified by checking the second-order conditions. Solving the first-order condition in terms of B_1 implies

$$B_1^* = A^2(1 - \theta)/\left[\sigma_v^2(A^2 - \theta^2\sigma_v^2)\right].$$

Substituting this value into the authorities' objective function (14) and totally differentiating with respect to θ, it is straightforward to show that

$$(\partial\sigma_\varphi^*/\partial\theta) > 0.$$

Proof to Result 3. The total differential of (13), society's preferences, from a change in persistence is given by

$$[dE(U)/d\theta] = [dE(U)/d\theta]\ |_{\sigma_\varphi}$$

$$+ [dE(U)/d\sigma_\varphi](d\sigma_\varphi^*/d\theta).$$

From result 1, $[dE(U)/d\theta]\ |\ \sigma_\varphi > 0$, so that welfare is always increasing in θ. However, also by result 1, $(d\sigma_\varphi^*/d\theta) > 0$. Differentiating equation (13) with respect to σ_φ implies

$$[dE(U)/d\sigma_\varphi] = \theta\sigma_v^2(K^2 B_0 + \theta B_1)(da/d\sigma_\varphi),$$

where again $K = (A/\sigma_v)$. From fact 3 $(da/d\sigma_\varphi)>0$, so that $(dE(U)/d\sigma_\varphi)< 0$. Therefore, society would prefer a lower level of persistence in policy objectives than when $(d\sigma_\varphi^*/d\theta)=0$.

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