

# 16 Signaling and Private Information about the Ability to Commit and about Objectives with Time-Invariant Types

## Cukierman (1992), ch. 16, sections 1 and 2

### 16.1 Introduction

This chapter considers and compares the consequences of two alternative types of private information about the nature of policymakers. One concerns the ability to commit and the other concerns the relative concern of the policymaker for price stability versus employment.

Unlike in previous chapters, which deal with private or asymmetric information, several simplifications are used. First, only policymakers with finite horizons are considered. Second, it is assumed that the policymaker's type does not change over time and that policy actions are perfectly controllable. Third, only two types—strong and weak—are considered in each case. In one case the strong policymakers possess the ability to commit whereas the weak do not. In the other case the strong types are relatively more concerned about price stability than their weak counterparts. These simplifications permit a sharp comparison between the consequences of asymmetric information about the ability to commit versus asymmetric information about the objectives of policymakers. It also makes it possible to use elements from the theory of signaling (which has been widely applied in modern industrial organization) to characterize equilibrium policy outcomes.

The postulated public's uncertainty about the type of policymakers in office is a proxy for doubts that the public generally has about the commitment of policy to price stability. For example, when central bank or other officials announce monetary targets, the public is generally uncertain about the seriousness of those announcements. By using the "type" device and attaching an a priori probability to the events that weak or strong policymakers are in office, those doubts can be characterized in a precise, quantitative manner.

When policymakers differ in their ability to commit, the public can learn about the commitment ability of policymakers by observing whether there are differences between prior promises and policy outcomes. Strong policymakers (in the commitment sense) always fulfill their prior declarations because their cost of renegeing on it is prohibitive. Weak ones renege more easily since their cost of renegeing is lower. The cost of renegeing is, at least initially, the private information of policymakers. As a consequence preannouncements of policy are not fully believed (since they might have been made by a weak type), but neither are they fully ignored since they also might have been made by strong or dependable policymakers. An

example from a different area is President George Bush's preelection statement on television that if elected he will not impose new taxes—the famous “read my lips” statement. The reason this statement was informative is that the public knew that if Bush reneged on the statement, he would incur a cost. Hence the fact that he made that statement conveyed some new information about the likelihood of new taxes to the public. However, in the absence of precise knowledge about the cost of reneging to Bush, the “read my lips” statement, although informative, still left a margin of uncertainty. When policymakers differ in their relative concern for price stability versus other objectives, the strong types (who are relatively more concerned about price stability) can signal their type by picking a sufficiently low rate of inflation.

Both notions of “strength” in the context of asymmetric information have appeared in the literature. “Strength” as an ability to commit has been dealt with in Barro (1986) and Cukierman and Liviatan (1991). “Strength” as a relatively stronger concern for price stability underlies the work of Rogoff (1985), Vickers (1986), and Hoshi (1988). The work of Backus and Driffill (1985a, 1985b) avoids the need to specify the type of “strength” by simply postulating that strong policymakers always pick a zero rate of inflation.<sup>1</sup>

A main message of this chapter is that the kind of strength about which the public is uncertain makes a lot of difference for actual policy outcomes. In particular, when policymaker types differ in their ability to commit, the strong type partially accommodates inflationary expectations by inflating at a higher rate under incomplete than under complete information. By contrast, when policymaker types differ in their relative concern for price stability in comparison to other objectives, the strong policymakers often inflate at a lower rate under incomplete than under complete information.

The consequences of asymmetric information about the ability to commit are illustrated in section 16.2 and those of asymmetric information about objectives in section 16.3. A comparison and an explication of the source of differences in results appears in section 16.4. Extension and related broader issues are discussed in the concluding section.

## 16.2 Private Information about the Ability to Precommit<sup>2</sup>

This section develops the consequences of private information about the ability to commit within the simplest possible setting. There are two

policymaker types with the same objective function that is positively related to surprise inflation and negatively related to actual inflation. This common objective function is given by

$$v(\pi, \pi^e) = A(\pi - \pi^e) - \frac{\pi^2}{2}, \quad A > 0, \quad (16.1)$$

where  $\pi$  and  $\pi^e$  are actual and expected inflation, respectively. As in chapters 9 through 15, one can think of the positive effect of unexpected inflation on the objectives of policymakers as arising from its expansionary effect on employment in the presence of nominal contracts and market power in the labor market.  $\pi^e$  is a proxy for those contracts. An alternative, not necessarily mutually exclusive, interpretation is that  $\pi - \pi^e$  proxies for other objectives such as seigniorage revenues, nondistortionary reductions in the real value of outstanding government debt, or balance-of-payment considerations.<sup>3</sup> This is in the spirit of Grossman's (1990) generic interpretation of objective functions like equation (16.1).

To focus on private information about the ability to commit, we abstract from some of the elements discussed in previous chapters such as imperfect control of inflation and a multiperiod horizon.<sup>4</sup> As in previous chapters, nominal contracts that are proxied by the expectation  $\pi^e$  are determined prior to the actual choice of inflation by the policymakers in office. In the absence of precommitments this timing leads to an inflationary bias that can be eliminated when policymakers are able to commit. However, as will become evident to the reader of this section, such ability does not suffice. To totally eliminate the inflationary bias, the ability to commit must not only be present but must also be recognized beyond any doubts by the public. Otherwise, a possible lower inflationary bias reappears. To illustrate those ideas, we postulate that the only difference between the two types of policymakers is in their ability to commit. The first policymaker type, to which we refer as dependable, or strong, always lives up to his or her declarations. The other policymaker type, to whom we refer as weak, fulfills previously announced plans only if such a course of action is expedient ex post. In the absence of a policy preannouncement, either type of policymaker maximizes  $v(\cdot)$  taking  $\pi^e$  as given. This leads to the well-known discretionary equilibrium  $\pi = A$ . With rational expectation,  $\pi^e = A$ , so there are no surprises in equilibrium and  $v(\cdot) = -A^2/2$ . If a preannouncement of policy is made, dependable policymakers always adhere to it, whereas weak policymakers are not bound by the announcement.

The issue of why dependability differs across policymakers and is private information could be approached in two ways. First, the distribution of policymakers by their level of dependability may reflect the general norms of society. The adherence to the norm of dependability varies across individuals in a community and is, at least a priori, the private information of each individual. Since policymakers are drawn from the society in which they live there are similar individual variations in dependability across policymakers. The general public is, at least initially, not fully informed about the dependability of policymakers in office for the same reason that the dependability of a randomly drawn individual is not known with certainty. Given existing norms, each individual is informed a priori about the distribution of the population by dependability but not about the dependability of particular other individuals.

It is also possible to motivate differences in dependability and private information about it through a political economy approach that views policymakers as politicians who seek reelection. As stressed in the political science literature (e.g., see Enelow and Hinich 1984, p. 174), voters view dependability as a desirable attribute. Hence dependability is one of the "electoral assets" that improves the likelihood of reelection. But a candidate for office generally offers an entire package of positions on the issues and various personal characteristics, of which dependability is only one component. Under these circumstances one may reasonably assume that the attitude of each voter toward dependability is private information. This forces each policymaker to estimate the effect of dependability on his or her electoral prospects. This estimate is the private information of the policymaker.<sup>5</sup> In this context a dependable policymaker can be viewed as a policymaker who estimates that the electoral cost of renegeing on announcements is larger than the benefits of surprise inflation. The converse holds for a weak policymaker.

The public knows that policymakers may be dependable (type D) or weak (type W), but does not know which types are in office. At the beginning of the period, prior to the choice of  $\pi^e$ , the incumbent policymakers may announce, if they so choose their policy for the period.<sup>6</sup> If they are of type D, and the public is aware of this fact, their statement is fully believed. However, if they are of type W, and this fact is common knowledge, the announcement has no effect on expectations. Under perfect information, where the public knows the policymakers' type, it is easy to see that W's optimal policy is the discretionary solution *A*. The optimal policy for policymakers D is to announce  $\pi = 0$ , and since they are bound by their

announcement, they will adhere to it. Since the announcements of D are fully credible, the public will set  $\pi^e = 0$ . This enables D to achieve  $v(\cdot) = 0$ , which exceeds the discretionary level.

Consider now the imperfect information case. Let  $\alpha$  be the prior probability assigned by the public to the event that the policymakers in office are of type D. The policymakers may or may not choose to make an announcement.

The timing of moves is as follows: First, if they choose to, the policymakers in office make an announcement  $\pi^a$ . Then the public forms its expectation  $\pi^e$ . Finally, the policymakers choose actual inflation  $\pi$ . Since the probability that  $\pi^a$  was announced by type D is  $\alpha$ , the public's rational inflation expectation after being exposed to the announcement is<sup>7</sup>

$$\pi^e = \alpha\pi^a + (1 - \alpha)A. \quad (16.2)$$

We turn next to a characterization of the optimal announcement for dependable policymakers under the (provisional) assumption that they make an announcement. The optimal announcement can be obtained by maximizing the objective function in (16.1) subject to equation (16.2) and the additional restriction<sup>8</sup>

$$\pi = \pi^a. \quad (16.3)$$

Substituting (16.2) and (16.3) into (16.1) and maximizing with respect to  $\pi^a$ ,

$$\pi^a = \pi = (1 - \alpha)A \equiv \pi^*. \quad (16.4)$$

The level of welfare associated with  $\pi^*$  is

$$v(\pi^*, \alpha\pi^* + (1 - \alpha)A) = -(1 - \alpha^2)\frac{A^2}{2}. \quad (16.5)$$

If policymakers D do not preannounce their policy intentions, there is no commitment. Hence the public correctly expects the discretionary rate  $A$ , in this case. The corresponding value of welfare is  $v(A, A) = -A^2/2$ , which is smaller than the level of welfare in (16.5) as long as  $\alpha > 0$ . Hence, provided that they have some reputation ( $\alpha > 0$ ), policymakers D are better off announcing  $\pi^*$  than remaining silent.

Consider now the behavior of policymakers W. Since they incur cost for renegeing on the announcement, they always end up inflating at the discretionary rate  $A$ . Given this fact, they have interest to keep themselves indistinguishable, at the announcement stage, from policymakers D, there-

by maintaining inflationary expectations below  $A$ . The public knows that it is optimal for policymakers D, when they are in office, to announce  $\pi^*$ . Hence, if there is no announcement, or if  $\pi^a \neq \pi^*$ , the public concludes that policymakers W are in office and sets  $\pi^e = A$ . Since  $\pi^e = A$  is worse for policymakers W than any lower expected rate of inflation, they also announce  $\pi^*$ , thus maintaining the public's expectation at

$$\pi^e = \alpha\pi^* + (1 - \alpha)A = (1 - \alpha^2)A < A \quad (16.6)$$

for all  $\alpha > 0$ . Hence the announcement of  $\pi^*$  is an equilibrium strategy for both D and W. The subsequent equilibrium actions are  $\pi^*$  for D and  $A$  for W.<sup>9</sup>

The main point of this section can now be demonstrated by comparing the behavior of dependable or "strong" policymakers under full and imperfect information. With full information dependable policymakers are believed, and they know that they are believed. Consequently they find it optimal to choose a zero rate of inflation in each period and to preannounce it so as to maintain expectations at this level too. Thus dependable policymakers that are known to be dependable eliminate the inflationary bias of policy.

In the presence of imperfect information strong policymakers inflate at the rate  $(1 - \alpha)A$  which is intermediate between zero and the discretionary rate  $A$ . The intuitive reason for this compromise is that the public does not give full credence to their announcement because of the possibility that they are weak. Hence, if dependable policymakers announce (and stick to) a zero rate, they create unemployment. At a zero rate of inflation the combined costs of unemployment and inflation can be reduced by announcing and producing a positive rate of inflation. More precisely, surprise inflation when policymakers D are in office is

$$\pi - \pi^e = (1 - \alpha)(\pi - A),$$

where we made use of (16.2). If policymakers D set  $\pi = 0$ , then surprise inflation is  $-(1 - \alpha)A$ , which diminishes their utility (e.g., implying a rise in real wages and an increase in unemployment). If, from  $\pi = 0$ , they raise  $\pi$  by one percentage point, then their utility loss is cut by  $(1 - \alpha)A$ , while their loss from the increase in inflation is negligible. As  $\pi$  increases, the latter loss becomes significant (i.e.,  $\pi$ ) until an optimum is struck at  $\pi = (1 - \alpha)A$ , which yields (16.4).

Essentially the "shadow" of weak policymakers induces strong policymakers to adjust their behavior toward that of weak policymakers. As is

clear from equation (16.4), the adjustment is not full. It is stronger, the lower the  $\alpha$ —that is, the lower the reputation of policymakers. Thus, if the public has a very pessimistic view about the fraction of dependable policymakers in the population ( $\alpha \rightarrow 0$ ), dependable policymakers behave almost as weak ones.

Before continuing, we pause for a methodological remark that highlights the crucial role of the announcement. One could have claimed that the announcement is not necessary by redefining dependable policymakers as those who never cheat on what the public expects from them and by letting them maximize (16.1) subject to (16.2) and (16.3) with  $\pi^e$  reinterpreted as this expectation rather than as an announcement. Since this problem is formally equivalent to the one we have solved, it obviously has the same solution, which is given by equation (16.4). However, this reinterpretation is not possible since it implies that when they choose actual inflation  $\pi$ , after expectations have been set, policymakers can alter those expectations retroactively. This is obviously impossible, since it contradicts the basic timing of moves in the model. By contrast, the announcement (to which strong policymakers always adhere) conveys information to the public before expectations and nominal contracts have been set. Thus, the announcement is crucial in that it conveys some information to the public about the subsequent action of policymakers before the formation of expectations and of nominal contracts.

In conclusion the ability to commit alone does not suffice to eliminate the inflationary bias of policy. To achieve this result, such ability also has to be fully recognized by the public (i.e.,  $\alpha = 1$ ). Otherwise, when in office, dependable policymakers announce and produce a positive rate of inflation rather than the zero rate they would have announced and produced under complete information.

Note (from equation 16.4) that the degree of accommodation by dependable policymakers is stronger, the lower their initial reputation  $\alpha$ . In particular, when reputation becomes very small, dependable policymakers tend to produce a rate of inflation that is almost as high as the one picked by his weak counterpart.

### 16.3 Private Information about Objectives—Vickers' Model

Strong and weak policymakers can also be conceived in terms of their attitudes toward price stability compared to other objectives such as em-