

# Central Bank Transparency and Shocks\*

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## Abstract

According to the literature, in an expectations-augmented Phillips curve model, opacity is always preferred to transparency on central bank forecasts. By modelling the private sector's behavior explicitly, we show that transparency reduces the shocks. Consequently, transparency can be preferred.

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## 1 Introduction

Following the widespread move toward more central bank (CB) transparency, there has been a large development of the theoretical literature on CB transparency. In this literature, "reduced form" models, where the underlying behavior of economic agents is not made explicit, have often been used. This may not be adequate if the equations of the model actually depend on the degree of transparency.

Here we will develop such a point in the case of the "expectations-augmented Phillips curve" model, where employment depends on inflation surprises. Such a model has often been considered in this literature. We will underline that the shock affecting this equation should depend on the degree of transparency on CB forecasts. As a consequence, some results obtained in the literature are biased against transparency. Thus, the literature has claimed that opacity is better than transparency on CB forecasts because

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transparency prevents the central bank from using inflation surprises to stabilize the economy<sup>1</sup>. Here, by considering an underlying model which makes the behavior of the private sector more explicit, we show that transparency on CB forecasts reduces the magnitude of the shock in the Phillips curve. This effect is favorable to transparency and may dominate the negative effect underlined in the literature. This implies that transparency can be preferred to opacity<sup>2</sup>.

## 2 A reduced form analysis

We first consider the "reduced form model" of the expectations-augmented Phillips curve. It has been shown in the literature that more transparency on CB forecasts is harmful in such a model. As a useful benchmark we will briefly reproduce this analysis here. We have

$$n = \alpha (\pi - \pi^e) + \varepsilon \quad (1)$$

$$L^{CB} = An^2 + \pi^2 \quad (2)$$

We have  $\alpha > 0$  and  $A > 0$ . Equation (1) indicates that employment  $n$  is an increasing function of inflation surprises, where  $\pi$  is the inflation rate and  $\pi^e$  the inflation rate expected by the private sector. Expectations are rational. The variable  $\varepsilon$  represents a zero-mean shock. The CB wants to stabilize employment and inflation according to the loss function (2)<sup>3</sup>.

To simplify the analysis, the CB is assumed to know<sup>4</sup> the shock  $\varepsilon$ . The CB chooses  $\pi$  which minimizes  $L^{CB}$ , taking the private sector's expectation  $\pi^e$  as given. This gives the first order condition

$$\pi = -A\alpha n \quad (3)$$

Plugging  $n$  given by (3) into (1), we obtain

$$\pi = \frac{A\alpha^2}{A\alpha^2 + 1} \pi^e - \frac{A\alpha}{A\alpha^2 + 1} \varepsilon \quad (4)$$

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<sup>1</sup>See Cukierman (2001), and Geraats (2006) (in the case of "perfect common knowledge"). Note that our analysis is only about transparency on CB forecasts. Other kinds of transparency have also been considered (see Geraats (2002) for a survey and references).

<sup>2</sup>Transparency can be preferred to opacity for different reasons from the one developed here (see Cukierman and Meltzer (1986) and Herrendorf (1999)). Therefore, our contribution is to develop an additional reason why transparency may be preferred.

<sup>3</sup>In the absence of shocks the CB has an employment objective which can be achieved without inflation surprises, and therefore there is no systematic inflationary bias problem. The analysis is concerned with stabilization policy in response to shocks.

<sup>4</sup>In Cukierman (2001) the case where the CB has a noisy information on  $\varepsilon$  is also considered. This does not change the result that opacity is better.

At the beginning of the period, the CB may or may not reveal its forecast of the shock. Under full transparency the private sector knows the CB forecast. As the CB has been assumed to know  $\varepsilon$ , this implies  $\varepsilon_{tr}^e = \varepsilon_{tr}$ . Then, by taking expectations of (4) and subtracting to (4) we get  $\pi_{tr}^e = \pi_{tr}$ , which, using (1), gives

$$n_{tr} = \varepsilon \quad (5)$$

Under opacity the private sector does not know the CB's forecast and has no information about the shock. We therefore have  $\varepsilon^e = E\varepsilon = 0$ . Then, taking expectations of (4) gives  $\pi_{op}^e = 0$ , which, using (4), implies  $\pi_{op} = -\frac{A\alpha}{A\alpha^2+1}\varepsilon$ . Then, from (3) we get.

$$n_{op} = \frac{1}{A\alpha^2 + 1}\varepsilon \quad (6)$$

From (2) and (3), at the equilibrium we get

$$L^{CB} = A(A\alpha^2 + 1)n^2. \quad (7)$$

The CB prefers opacity to transparency when we have  $L_{op}^{CB} < L_{tr}^{CB}$ . From (7), this is equivalent to  $n_{op}^2 < n_{tr}^2$ . From (5) and (6), this condition is always fulfilled. Therefore, opacity is always preferred to transparency. The reason of the result is that opacity leaves the possibility of using inflation surprises.

### 3 Analysis with an underlying model

The expectations-augmented Phillips curve (1) has often been justified by the existence of nominal wage rigidity through wage contracts. Here we will consider a model which makes explicit the underlying behavior of the private sector<sup>5</sup>. As in Herrendorf and Lockwood (1997), there is a large number of trade unions and firms, with sector specific skills for households, each trade union (TU) having a monopoly power in its sector. Each TU wants to stabilize both employment and the real wage, with a relative weight given by  $C \geq 0$ , according to the loss function<sup>6</sup>

$$L^{TU} = Cn^2 + (w - \pi)^2 \quad (8)$$

<sup>5</sup>A classical reference is Rogoff (1985). We consider a more general model in the sense that, beside employment, the wage setters may also want to stabilize the real wage.

<sup>6</sup>As we are interested only in the response to shocks, we have eliminated any systematic inflation bias by assuming that the employment and real wage targets of the TU are equal to zero.

As all sectors are alike,  $w$  and  $n$  can be taken to represent aggregate variables for the (log) nominal wage and employment, respectively. As the (log) price level of last period is normalized to zero,  $w - \pi$  is the (log) real wage. In each sector, the nominal wage is fixed by the TU and then employment is determined by firms' labor demand, according to the standard equation:

$$n = -\gamma(w - \pi) + \gamma z \quad (9)$$

We have  $\gamma > 0$ . Employment is a decreasing function of the real wage. The variable  $z$  is a zero-mean shock (due to a change in productivity of labor). The model is now given by the three equations (2), (8) and (9).

Each TU first determines the nominal wage  $w$  and then the CB determines the inflation rate  $\pi$ . As there is certainty equivalence, the nominal wage  $w$  chosen by each TU minimizes  $L^{TU}$  under the constraint (9) where, in (8) and (9), the variables  $n$ ,  $\pi$  and  $z$  have been replaced by their expected values  $n^e$ ,  $\pi^e$  and  $z^e$  conditional on the information available to the TU. As each TU is small, it takes  $\pi^e$  as given. The first order condition implies

$$w = \pi^e + \frac{C\gamma^2}{C\gamma^2 + 1} z^e \quad (10)$$

Plugging this expression of  $w$  into (9), we get the expectations-augmented Phillips curve (1), where we have  $\alpha = \gamma$  and

$$\varepsilon = \gamma \left( z - \frac{C\gamma^2}{C\gamma^2 + 1} z^e \right) \quad (11)$$

We see that now the shock  $\varepsilon$  depends on  $z^e$ . Therefore, this shock changes when we move from opacity to transparency. As under transparency we have  $z^e = z$ , while under opacity we have  $z^e = Ez = 0$ , we get

$$\varepsilon_{tr} = \frac{1}{C\gamma^2 + 1} \gamma z \quad ; \quad \varepsilon_{op} = \gamma z \quad (12)$$

The shock is therefore smaller in absolute value in case of transparency. As we will now see, this makes it possible for transparency to be preferred. From (7), the CB prefers transparency to opacity if and only if we have  $n_{tr}^2 < n_{op}^2$ . Replacing  $\varepsilon$  by  $\varepsilon_{tr}$  in (5), and by  $\varepsilon_{op}$  in (6) (and also replacing  $\alpha$  by  $\gamma$ ), we get

$$n_{tr} = \varepsilon_{tr} \quad ; \quad n_{op} = \frac{1}{A\gamma^2 + 1} \varepsilon_{op} \quad (13)$$

From (12) and (13),  $n_{tr}^2 < n_{op}^2$  is equivalent to  $C > A$ . Therefore we get

**Proposition 1** *The central bank prefers transparency when we have  $C > A$ , and prefers opacity when we have  $C < A$  (with indifference when  $C = A$ ).*

By modelling the behavior of the private sector more explicitly, we have shown that the result in favor of opacity found in the literature does not hold. The CB may prefer transparency on CB forecasts to opacity.

The results can be more intuitively explained in the following way. From (7), as we have indicated, the CB prefers transparency to opacity if and only if, at the equilibrium, employment is more stabilized under transparency than under opacity (because, from (3), if employment is more stabilized, then inflation is also more stabilized)<sup>7</sup>. Under transparency, at the equilibrium, the CB cannot stabilize employment because it cannot create inflation surprises, but the private sector can let the nominal wage respond to the shock, which helps to stabilize employment. This effect appears through a reduced magnitude of the shock  $\varepsilon_{tr}$  in the Phillips curve under transparency. This favorable response of the private sector to shocks under transparency was not taken into account in the literature, because the analysis was done by considering a reduced form Phillips curve where the shock  $\varepsilon$  was assumed to be given independently of whether there is transparency or opacity.

Thus, the role of stabilizing employment by responding to the shock, which is played by the CB under opacity, is played by the private sector under transparency. The CB would therefore be indifferent between transparency and opacity if the private sector, when reacting to the shock under transparency, stabilized employment in the same way as the CB would under opacity. This would occur if, under opacity, the CB maximized the same objective function as the private sector under transparency. This is actually equivalent to having  $A = C$ <sup>8</sup>.

Therefore, a real choice between transparency and opacity exists only if, under opacity, the CB maximizes an objective function which is different from the objective function that the private sector maximizes under transparency. In the case  $C > A$ , the private sector gives a greater relative weight to its employment objective than the CB. This implies that, under transparency, the private sector stabilizes employment more than the CB does under opacity. Therefore, in this case, the CB prefers transparency. When we have  $C < A$ ,

<sup>7</sup>It is therefore not necessary, in each case, to explicitly consider what happens to equilibrium inflation (which is determined by the CB according to (3)).

<sup>8</sup>Under opacity, as the nominal wage does not respond to the shock, stabilizing inflation becomes equivalent to stabilizing the real wage. (More formally, under opacity we have  $z^e = 0$  and  $\pi^e = 0$ , which, using (10), gives  $w = 0$ . This implies that, for the CB under opacity, we have  $\pi^2 = (w - \pi)^2$ .) Therefore, under opacity, the CB minimizes the same loss function as the private sector under transparency if and only if we have  $A = C$ .

the opposite is true. The private sector gives a smaller relative weight to its employment objective than the CB, and, consequently, under transparency the private sector stabilizes employment less than the CB does under opacity. This implies that the CB prefers opacity in this case.

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