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Fiscal disciplining effect of central bank opacity: Stackelberg versus Nash equilibrium [Comment]

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Abstract

In contrast to Dai and Sidiropoulos (2011), we show that the fiscal disciplining effect associated with central bank opacity about the central's political preference parameter present in a Stackelberg equilibrium is never observed in a Nash equilibrium.

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Fiscal disciplining effect of central bank opacity: Stackelberg versus Nash equilibrium [Comment]

In a paper in this journal, Dai and Sidiropoulos (2011), henceforth DS, show that in a Stackelberg equilibrium, central bank opacity about the central bank's political preference parameter has a fiscal disciplining effect, leading to lower inflation and output distortions; however they argue that this effect could disappear or be dominated by the direct effect of opacity when the fiscal and monetary authorities play a Nash equilibrium. Thus, they find that in a Nash equilibrium an increase in the degree of central bank opacity will always induce higher inflation rate and higher output distortions, with a higher macroeconomic volatility.

In deriving the Stackelberg equilibrium, DS assume that the government does not observe the central bank's weights assigned to inflation and output gap stabilization. In contrast, for the Nash equilibrium, DS assume that the government does observe the central bank's weights. In this comment, we study whether the disciplining effect of central bank opacity is still present in a Nash equilibrium with the same structural information assumptions as in the Stackelberg game, i.e., where the government is uncertain about the central bank's weights. Our analysis unequivocally concludes that the fiscal disciplining effect is never observed when authorities move simultaneously. Our findings indicate that changes in the degree of central bank opacity do not impact inflation rates or output distortions, yet they do affect macroeconomic volatility.

1. The model

We briefly present the model using DS's notation. Output is given by

$$x = \pi - \pi^e - \tau, \tag{1}$$

where x represents the output gap (in log terms), π represents the inflation rate, π^e is the expected inflation and τ denotes the tax rate.

The fiscal authority's loss function is

$$L^G = E\left[\frac{1}{2}\left(\delta_1\left(\pi\right)^2 + x^2 + \delta_2(g-\overline{g})^2\right)\right], \tag{2}$$

with $\delta_1, \delta_2 > 0$, indicating that the fiscal authority cares about stabilising inflation and output around a zero target and stabilising public expenditures g around a target $\overline{g}$, with $\overline{g} > 0$. The fiscal authority selects τ that minimises (2) subject to the following budget constraint:

$$g = \tau. \tag{3}$$

Monetary policy is delegated to an independent central bank with the following loss function:

$$L^{CB} = \frac{1}{2}\left((\mu - \varepsilon)\,\pi^2 + (1 + \varepsilon)\,x^2\right), \tag{4}$$

where μ denotes the expected relative weight that the central bank assigns to the inflation stabilisation, with $\mu > 0$.

It is assumed that the central bank does not make full disclosure about the wights assigned to the inflation and output-gap stabilisation. Therefore, the private sector and the fiscal authority take ε as a random variable such that $E[\varepsilon] = 0, var[\varepsilon] = \sigma_\varepsilon^2$ and $\varepsilon \in [-1, \mu]$.

The timing of the game is as follows. First, π^e is determined by the private sector under the assumption that they form expectations rationally. Then, the fiscal authority and the central bank simultaneously select τ and π, respectively.

2. The Nash equilibrium

First, consider the central bank's optimisation problem. Minimising (4) subject to (1), taking as given π^e and τ, we have the following central bank's reaction function:

$$\pi = \frac{(\varepsilon + 1)\,(\pi^e + \tau)}{1 + \mu}. \tag{5}$$

In relation to the fiscal authority, notice that minimising (2) subject to (1) and public spending, taking as given π^e and π, we have the following government's reaction function:

$$\tau = \frac{E(\pi) - \pi^e + \delta_2 \overline{g}}{1 + \delta_2}. \tag{6}$$

Substituting (5) into (6), it follows that

$$\tau = \frac{\frac{\pi^e+\tau}{1+\mu} - \pi^e + \delta_2\overline{g}}{1+\delta_2},$$

and isolating τ from the previous expression yields

$$\tau = \frac{(1+\mu)\,\delta_2\overline{g} - \mu\pi^e}{\mu + (1+\mu)\,\delta_2}.$$

Plugging this expression into (5), it follows that

$$\pi = \frac{\delta_2\,(\varepsilon+1)\,(\overline{g}+\pi^e)}{\mu + (1+\mu)\,\delta_2},$$

and taking expectations and isolating π^e from the resulting expression, we have

$$\pi^e = \frac{\delta_2\overline{g}}{\mu\,(1+\delta_2)}.$$

Substituting this expression into the preceding two formulae for τ and π yields the Nash equilibrium solutions denoted by an upper index "N"

$$\tau^N = \frac{\delta_2\overline{g}}{1+\delta_2} and \tag{7}$$

$$\pi^N = \frac{(\varepsilon+1)\,\delta_2\overline{g}}{\mu\,(1+\delta_2)}, \tag{8}$$

and therefore, (1) implies

$$x^N = \frac{(\varepsilon-\mu)\,\delta_2\overline{g}}{\mu\,(1+\delta_2)}. \tag{9}$$

Expression (7) indicates that the degree of central bank opacity, measured by σ_ε^2, does not affect τ^N, which implies that the inflation and output are also not affected by central bank opacity. Therefore, the fiscal disciplining effect of central bank opacity is never observed in a Nash equilibrium.

The reasoning behind the result that τ^N is not affected by central bank opacity is as follows. The first-order condition of the government's optimi-

sation problem is given by

$$\left(E\left[\pi\right]-\pi^{e}-\tau\right)\left(-1\right)+\delta_{2}\left(\tau-\overline{g}\right)=0.$$

Using the rational expectations hypothesis ($E\left[\pi\right]=\pi^{e}$), it follows that

$$\tau=\delta_{2}\left(\overline{g}-\tau\right).$$

The left-hand side of this expression can be interpreted as the marginal cost, measured in terms of lower output, resulting from an increase in taxes. Meanwhile, the right-hand side represents the marginal benefit, measured in terms of higher public expenditures, derived from an increase in τ. Note that central bank opacity does not affect either the marginal cost or the marginal benefit of an increase in taxes. This implies that the tax rate chosen by the government is not influenced by central bank opacity. This result differs from that in the Stackelberg model. There, the government perceives that the marginal costs associated with higher taxes are greater when the central bank is more opaque. This perception leads the government to adopt a less aggressive fiscal policy (the "disciplining effect"). This fiscal stance results in lower inflation and a higher output gap, at the expense of a larger deviation of public expenditures from their target.

Concerning macroeconomic volatility, expressions (8) and (9) yield

$$var\left[\pi^{N}\right]=var\left[x^{N}\right]=\sigma_{\varepsilon}^{2}\left(\frac{\delta_{2}\overline{g}}{\mu\left(1+\delta_{2}\right)}\right)^{2},$$

which indicates that opacity triggers a unique effect on macroeconomic volatility, the direct effect. We can then conclude that more opacity yields an increase in the volatility of inflation and output gap.

3. Conclusions

In this paper, we have shown that the fiscal disciplining effect associated with central bank opacity about the central bank's political preference parameter, which can be present in a framework where the government acts as a Stackelberg leader and the central bank as a follower (see, for instance, Ciccarone et al., 2007, Hefeker and Zimmer, 2010, and Dai and Sidiropoulos, 2011), always disappears when these authorities move simultaneously. In the Nash equilibrium, an increase in the degree of central bank opacity always

leads to higher macroeconomic volatility, without impacting inflation and output gap.

References

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