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AND SOCIAL EQUALITY**

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Abstract

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The problem of monetary policy delegation is formulated as a two-stage game between the government and the central bank. In the first stage the government chooses the institutional design of the central bank. Monetary and fiscal policy are implemented in the second stage. When fiscal policy has a social equality component, there is a natural conflict between optimally configured monetary policies and equality. As a result, governments interested in social redistribution, when faced with an independent central bank, will have an incentive to limit their use of fiscal policy.

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1. Introduction

In the debate over the design of the institutions of monetary policy, it is widely accepted that inflation control requires a central bank that is independent of the fiscal authority, and that is also more conservative in its response to output disturbances than the fiscal authority.

Rogoff (1985) was the first to suggest that a conservative central bank might be the way to reduce the inflation biases which emerge when, in addition to price stabilization, output stabilization and employment growth are also objectives. However Rogoff also noted that too much conservatism could be harmful because monetary policy would then underreact to output shocks. Lohmann (1992) argued that, if those shocks are large, welfare would be improved if some credibility (conservatism) were sacrificed for greater flexibility. Subsequently, Weymark (2001) and Hughes Hallett and Weymark (2001) showed that, if the choice of institutional arrangements is allowed to become endogenous, then there will be a continuum of conservatism and independence combinations that optimizes society's welfare.

In this note we extend the existing literature in two ways: (1) we allow for interactions between fiscal and monetary policies and explicitly endogenize the choice of monetary institutions and (2) we endow the fiscal authority with social (redistributive) objectives as well as stabilization goals in order to analyze the impact of optimal monetary arrangements on social equality.¹ We find that, with proportional taxation, there is always a conflict between optimal monetary policies (or an independent central bank) and greater social equality.

2. Economic Structure

Consider the following three equations as a representation of any national economy:²

$$\pi_{it} = \pi_{it}^e + \alpha_i y_{it} + u_{it} \tag{1}$$

¹Alesina and Tabellini(1987) and Debelle and Fischer (1994) also used models incorporating fiscal as well as monetary policies; but they did not endogenise the institutions, nor did they consider any issues of social inequality.

²For the purposes of this exposition, we suppress the potential spillover effects between countries.

$$y_{it} = \beta_i(m_{it} - \pi_{it}) + \gamma_i g_{it} + \epsilon_{it} \quad (2)$$

$$g_{it} = m_{it} + s_i(b_i y_{it} - \tau_{it}) \quad (3)$$

where π_{it} is the inflation rate in country i in period t , y_{it} is output growth in country i in period t , and π_{it}^e represents the rate of inflation that rational agents expect will prevail in country i in period t . The variables m_{it} , g_{it} , and τ_{it} represent the growth in the money supply, government expenditures, and tax revenues in the i th country in period t . Because problems of institutional design and income redistribution are longer term phenomena, our fiscal and monetary policies are best viewed as long term policy responses, rather than short term demand management tools (Taylor 2000).

The variables u_{it} and ϵ_{it} are random disturbances which are independently distributed with zero mean and constant variance. The coefficients α_i , β_i , γ_i , s_i , and b_i are all positive. The microfoundations of the aggregate supply equation (1), originally derived by Lucas (1972, 1973), are well-known. McCallum (1989) shows that aggregate demand equations like (2) can be derived from a standard, multiperiod utility-maximization problem.

Equation (3) describes the government's budget constraint.³ For the purposes of illustration, we allow *discretionary* tax revenues to be used for redistributive purposes only. The government must finance its discretionary expenditures by selling bonds to the central bank or to private agents. We assume that there are two types of agents, rich and poor, and that only the rich use their savings to buy government bonds. Thus, b is the proportion of pre-tax income (output) that goes to the rich and s is the proportion of after-tax income that the rich allocate to saving. The tax, τ_{it} , is used by the government to redistribute income from the rich to the poor. All variables are measured as deviations from their long run, equilibrium paths, and thus reflect impact of discretionary policy. We treat the trend budget variables as precommitted.

The structure we have described distinguishes between the sources of financing available to support output-enhancing government expenditures g_{it} and government transfers τ_{it} . Many government expenditures have a significant redistributive im-

³The derivation of this budget constraint may be found in Weymark (2001).

pact because they benefit the poor to a much greater degree than the rich. However, there are also government expenditures which are principally undertaken for the purpose of benefiting everyone, regardless of income level; for example, expenditures on health, education, transportation, and infrastructure. In reality, most government expenditures have both redistributive and output-enhancing characteristics. However, for the purposes of this analysis, we consider only two types of expenditure here — expenditures whose impact is primarily redistributive (τ_{it}), and expenditures that are output-enhancing and have no real redistributive impact (g_{it}). Both types of expenditure are financed by aggregate tax revenues, i.e., discretionary and (budget balancing) tax revenues. Discretionary expenditures in excess of tax revenues must be financed by the sale of bonds.

Using (1) and (2) to solve for π_{it}^e , π_{it} and y_{it} yields the following reduced forms:

$$\pi_{it}(g_{it}, m_{it}) = (1 + \alpha_i \beta_i)^{-1} [\alpha_i \beta_i m_{it} + \alpha_i \gamma_i g_{it} + m_{it}^e + \frac{\gamma_i}{\beta_i} g_{it}^e + \alpha_i \epsilon_{it} + u_{it}] \quad (4)$$

$$y_{it}(g_{it}, m_{it}) = (1 + \alpha_i \beta_i)^{-1} [\beta_i m_{it} + \gamma_i g_{it} - \beta_i m_{it}^e - \gamma_i g_{it}^e + \epsilon_{it} - \beta_i u_{it}]. \quad (5)$$

Equations (5) and (3) then imply

$$\begin{aligned} \tau_{it}(g_{it}, m_{it}) = [s_i(1 + \alpha_i \beta_i)]^{-1} & [(1 + \alpha_i \beta_i + s_i b_i \beta_i) m_{it} - (1 + \alpha_i \beta_i - s_i b_i \gamma_i) g_{it} \\ & - s_i b_i \beta_i m_{it}^e - s_i b_i \gamma_i g_{it}^e + s_i b_i \epsilon_{it} - s_i b_i \beta_i u_{it}] \end{aligned} \quad (6)$$

We assume that the preferences for growth and income distribution (or social equality) will be reflected in the types of governments that are voted into office. We therefore write the national objectives as:

$$L_{it}^g = \frac{1}{2}(\pi_{it} - \hat{\pi})^2 - \lambda_{i1}^g y_{it} + \frac{\lambda_{i2}^g}{2} [(b_i - \theta_i) y_{it} - \tau_{it}]^2 \quad (7)$$

where $\hat{\pi}$ is the government's inflation target, λ_{i1}^g is the weight assigned to output growth, and λ_{i2}^g is the weight assigned to income redistribution. The parameter θ_i represents the proportion of national output that government i would like to allocate to the rich.

We further assume that national central banks may have objectives that are distinct from those of their national governments:

$$L_{it}^{cb} = \frac{1}{2}(\pi_{it} - \hat{\pi})^2 - (1 - \delta_i)\lambda_i^{cb}y_{it} - \delta_i\lambda_{i1}^g y_{it} + \frac{\delta_i\lambda_{i2}^g}{2}[(b_i - \theta_i)y_{it} - \tau_{it}]^2 \quad (8)$$

where $0 \leq \delta_i \leq 1$, and λ_i^{cb} is the weight that central bank i assigns to output growth. The parameter δ_i measures the degree to which the central bank is forced to take the government's objectives into account. The closer δ_i is to 0, the greater is the independence of the central bank. The central bank is said to be 'conservative' when $\lambda_i^{cb} < \lambda_{i1}^g$.

3. Optimal Central Bank Design

In our framework, fiscal and monetary policies are the outcome of a two-stage game in which the structure of the model and the objective functions are common knowledge. In the first stage, the government chooses the institutional parameters δ_i and λ_i^{cb} . The second stage is a simultaneous-move (non-cooperative) game in which the government and the monetary authority set their policy instruments, given the δ_i and λ_i^{cb} values determined at the previous stage. The central bank is assumed to have full instrument independence and therefore controls the money supply m_{it} . Thus:

Stage 1

The government solves the problem

$$\min_{\delta_i, \lambda_i^{cb}} \mathbb{E} L_i^g(g_{it}, m_{it}, \delta_i, \lambda_i^{cb}) = \mathbb{E} \left\{ \frac{1}{2}[\pi_{it}(g_{it}, m_{it}) - \hat{\pi}]^2 - \lambda_{i1}^g[y_{it}(g_{it}, m_{it})] + \frac{\lambda_{i2}^g}{2}[(b_i - \theta_i)y_{it}(g_{it}, m_{it}) - \tau_{it}(g_{it}, m_{it})]^2 \right\} \quad (9)$$

Stage 2

- (i) Private agents form rational expectations about future prices before the shocks u_{it} and ϵ_{it} are realized.
- (ii) The shocks u_{it} and ϵ_{it} are realized and observed by the government and by the central bank.

(iii) The government chooses g_{it} , taking m_{it} as given, to minimize

$$L_i^g(g_{it}, m_{it}, \bar{\delta}_i, \bar{\lambda}_i^{cb}), \text{ where } \bar{\delta}_i \text{ and } \bar{\lambda}_i^{cb} \text{ indicate values determined in stage 1.}$$

(iv) The central bank chooses m_{it} , taking g_{it} as given, to minimize

$$\begin{aligned} L_i^{cb}(g_{it}, m_{it}, \bar{\delta}_i, \bar{\lambda}_i^{cb}) &= \frac{(1 - \bar{\delta}_i)}{2} [\pi_{it}(g_{it}, m_{it}) - \hat{\pi}]^2 - (1 - \bar{\delta}_i) \bar{\lambda}_i^{cb} [y_{it}(g_{it}, m_{it})] \\ &\quad + \bar{\delta}_i L_i^g(g_{it}, m_{it}, \bar{\delta}_i, \bar{\lambda}_i^{cb}) \end{aligned} \quad (10)$$

This game can be solved by first solving the second stage problem for optimal values of m_{it} and g_{it} with δ_i and λ_i^{cb} fixed; and then solving the first stage by substituting those values into (9). We obtain:

$$\pi_{it}(\delta_i, \lambda_i^{cb}) = \hat{\pi} + \frac{(1 - \delta_i) \beta_i \phi_i \lambda_i^{cb}}{\alpha_i [\beta_i \phi_i + \delta_i \gamma_i \Lambda_i]} + \frac{\delta_i [\beta_i \phi_i + \gamma_i \Lambda_i] \lambda_{i1}^g}{\alpha_i [\beta_i \phi_i + \delta_i \gamma_i \Lambda_i]} \quad (11)$$

$$y_{it}(\delta_i, \lambda_i^{cb}) = \frac{-u_{it}}{\alpha_i} \quad (12)$$

$$\tau_{it}(\delta_i, \lambda_i^{cb}) = \frac{(1 - \delta_i) \beta_i \gamma_i s_i (\lambda_i^{cb} - \lambda_{i1}^g)}{[\beta_i \phi_i + \delta_i \gamma_i \Lambda_i] \lambda_{i2}^g} - \frac{(b_i - \theta_i) u_{it}}{\alpha_i} \quad (13)$$

where $\phi_i = 1 + \alpha_i \beta_i - \gamma_i \theta_i s_i$ and $\Lambda_i = 1 + \alpha_i \beta_i + \beta_i \theta_i s_i$ are positive; and where

$$\begin{aligned} \lambda_{i2}^g (1 - \delta_i) \phi_i \left\{ (1 - \delta_i) \beta_i \phi_i \lambda_i^{cb} + \delta_i [\beta_i \phi_i + \gamma_i \Lambda_i] \lambda_{i1}^g \right\} \\ + \alpha_i^2 (1 - \delta_i)^2 \beta_i \gamma_i^2 s_i^2 (\lambda_i^{cb} - \lambda_{i1}^g) = 0 \end{aligned} \quad (14)$$

$$\begin{aligned} \lambda_{i2}^g \phi_i \left\{ (1 - \delta_i) \beta_i \phi_i \lambda_i^{cb} + \delta_i [\beta_i \phi_i + \gamma_i \Lambda_i] \lambda_{i1}^g \right\} (\lambda_i^{cb} - \lambda_{i1}^g) \\ + \alpha_i^2 (1 - \delta_i) \beta_i \gamma_i^2 s_i^2 (\lambda_i^{cb} - \lambda_{i1}^g)^2 = 0. \end{aligned} \quad (15)$$

are the first-order conditions which define the optimal institutional arrangements. There are two possible solutions here. One is $\delta_i = 1$ and $\lambda_i^{cb} = \lambda_{i1}^g$. This solution describes a central bank which is fully dependent. But (14) and (15) are also satisfied when

$$\delta_i = \frac{\beta_i \phi_i^2 \lambda_i^{cb} \lambda_{i2}^g + (\alpha_i \gamma_i)^2 \beta_i s_i^2 (\lambda_i^{cb} - \lambda_{i1}^g)}{\beta_i \phi_i^2 \lambda_i^{cb} \lambda_{i2}^g + (\alpha_i \gamma_i)^2 \beta_i s_i^2 (\lambda_i^{cb} - \lambda_{i1}^g) - \phi_i [\beta_i \phi_i + \gamma_i \Lambda_i] \lambda_{i1}^g \lambda_{i2}^g}. \quad (16)$$

Or when

$$\lambda_i^{cb} = \left\{ \frac{(\alpha_i \gamma_i s_i)^2}{\lambda_{i2}^g \phi_i^2 + (\alpha_i \gamma_i s_i)^2} - \frac{\phi_i \delta_i (\beta_i \phi_i + \gamma_i \Lambda_i) \lambda_{i2}^g}{[\lambda_{i2}^g \phi_i^2 + (\alpha_i \gamma_i s_i)^2] \beta_i (1 - \delta_i)} \right\} \lambda_{i1}^g < \lambda_{i1}^g. \quad (17)$$

Substituting (11)-(13) into (9), with $\delta_i = 1$ and $\lambda_i^{cb} = \lambda_{i1}^g$, gives

$$EL_i^g = \frac{(\lambda_{i1}^g)^2}{2\alpha_i^2} \quad (18)$$

But substituting (11)-(13) into (9) with (16) instead, yields

$$EL_i^g = \frac{(\lambda_{i1}^g)^2}{2\alpha_i^2} \left\{ \frac{(\alpha_i \gamma_i s_i)^2}{(\alpha_i \gamma_i s_i)^2 + \phi_i^2 \lambda_{i2}^g} \right\}. \quad (19)$$

Since $\lambda_{i2}^g \geq 0$, the value of (18) always exceeds (is no less than) the value of (19). Hence (16) and (17) define the optimal central bank for country i .

4. Transfers to the Poor

Since $\lambda_i^{cb} < \lambda_{i1}^g$, it is clear that an optimally configured central bank will generate negative transfers to the poor, on average, in this model even if there is a desire for redistribution. Only negative shocks to prices or inflation ($u_{it} < 0$) generate positive transfers when $\phi_i > 0$. However, that does not mean that all the poor will be worse off on average. If the share of income going to the rich is reduced as planned, then some of the previously ‘poor’ will have become ‘rich,’ so that a negative transfer may be consistent with an improving distribution of income.

Further examination of the role of transfers provides additional insights. First, there are a number of politically interesting circumstances in which the negative transfers go to zero regardless of the actual degree of income inequality. Substituting for λ_i^{cb} when the central bank is independent ($\delta_i = 0$) in (13) we get

$$E\tau_i = \frac{-\phi_i \gamma_i s_i \lambda_{i1}^g}{\alpha_i^2 \gamma_i^2 s_i^2 + \phi_i^2 \lambda_{i2}^g}. \quad (20)$$

Evidently, the expected transfer $E\tau_i$ goes to zero if the government is conservative ($\lambda_{i1}^g = 0$); or if the government has a strong commitment to redistribution (λ_{i2}^g large);

or if $\phi = 0$. From (13) itself it is also apparent that $E\tau_i = 0$ when the central bank is fully dependent ($\delta = 1$).

Second, the expected transfer can be positive; this requires $\phi_i < 0$. The interpretation of this condition is of particular interest in that it provides insight into how our model of redistribution works. By definition, $\phi_i < 0$ implies that

$$\gamma_i > \frac{1 + \alpha_i \beta_i}{\theta_i s_i} \quad (21)$$

Since $\theta_i < 1$ and $s_i < 1$ by definition, the inequality in (21) requires fiscal policy to have a strong enough impact (implausibly so perhaps) over the redistribution period, a Phillips curve that is flat enough, and weak monetary transmissions. Typically $\gamma_i > 3$ or 4 would be required. This reveals a fundamental feature of fiscal policy, captured by our model but which might not have been evident in models that give no particular role to redistribution or social equality. A conflict arises because, if new expenditures are to be financed by borrowing from (or taxing) the rich, then there must be sufficient output growth to ensure that the rich have savings to be taxed/borrowed. (This is all relative to the status quo ante, as all variables are measured as deviations from their equilibrium values.) Consequently, to get a positive transfer, fiscal expenditures have to have a sufficiently large, positive impact on national income that they replace the savings borrowed or taxed *and* provide a net transfer to the poor. Only then can we get both increases in output and transfers to the poor.

To get fiscal policy as ‘productive’ as that, the inequality in (21) must be satisfied. If it is not, there will be a trade off and each increase in output (whether generated in response to shocks, or to restrain an overly restrictive monetary policy), will be accompanied by a negative transfer (on average) to the poor.⁴ This is the self-regulating control on fiscal policy, for governments with social policy objectives, which we commented on so extensively in Hughes Hallett and Weymark (2001). It means

⁴The other conditions below (1) now fall into place. A dependent central bank (i.e. monetary policy can be diverted to reduce this trade off), a conservative central bank or one committed to redistribution, would all reduce that trade off and hence the adverse transfers.

that fiscal policy should not need to react too aggressively to a tight monetary policy if governments do have equity or redistribution objectives. It also implies that, in the case of the European Union, the Stability Pact should not be used to provide cuts in redistribution or public expenditure programmes.

Consequently, what our model actually shows is that, assuming (21) fails, the most that social policy can achieve is no redistribution as long as taxes remain no more than proportional. If we want to do better than that, we must have taxes that are progressive.

5. Policy Implications

There are two further insights in this model. First, it shows the actual mechanism by which negative transfers would be created when there is a trade off between the two objectives of fiscal policy (i.e. when (21) fails). Substituting for λ_i^{cb} in (11) when $\delta_i = 0$, shows that the optimal inflation bias will be related to the optimal transfers as follows:

$$E\pi_i - \hat{\pi}_i = -\beta_i \alpha_i \gamma_i s_i E\tau_i \quad (22)$$

where the inflation target $\hat{\pi}_i$ may be zero. Hence the negative transfer (if there is one) is actually induced via an inflation tax, which hits the poor through their higher propensity to consume or because they get drawn into the tax net through non-indexed taxes. Hence higher inflation implies a higher incidence of regressive taxes; and lower inflation, less regressive taxes. Likewise, negative transfers cause a larger inflation bias, and smaller transfers a smaller inflation bias. Hence monetary policy may limit these effects, but it will also limit the size of any transfers or conflicts within fiscal policy.

Second, even if $\delta \neq 0$, setting $\lambda_i^{cb} = \lambda_{i1}^g$ in (13) implies $E\tau_i = 0$. But, as we have shown at (16)-(19), that is always a sub-optimal construction from society's point of view. That means there is always a conflict between monetary policies that are optimal (or a central bank that is optimally configured), and the social or redistributive aspects of fiscal policy. The only way to overcome this conflict is to

bring new instruments to bear (through labour market regulation perhaps?). That would not be attractive if structural reforms were important as well. But it cannot be done by fiscal and monetary policies alone, even if $\lambda_{i2}^g = 0$.

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