Dynamic Inconsistency, Tradeoffs and Delegation in a Developing Economy

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July 20, 2004

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Acknowledgement

This is a revised version of a paper presented at the IGIDR conference on Money and Finance. I thank Ashok Nag, P.J. Nayak, Veena Mishra, S.L. Shetty, and A. Va-sudevan for useful comments; other conference participants for stimulating questions; Mridul Saggar and Anurag Sharma for the information used in Table 2.
Abstract

Strategic interaction between the government and economic agents can lead to the creation of more populism than is socially optimal. The tradeoffs through which this occurs, important for a populous democracy with a large number of poor, is that between populism and growth. This has not received much analytical attention. We model this tradeoff and show that (i) a Nash equilibrium will occur with a level of populism higher than the optimal, (ii) define a sustainable rate of growth, (iii) specify the conditions on which the results depend, (iv) discuss stabilisation possibilities, and (v) show that optimal delegation is to a pro-growth monetary authority and a conservative fiscal authority. This would lower populism and inflation while keeping growth at sustainable levels. Last, the model is used to interpret Indian macroeconomic performance.

JEL Classification: E63, O11

Key words: growth, populism, tradeoffs, dynamic inconsistency, delegation
1 Introduction

Recent macroeconomic literature has explored the implications of strategic interaction between the government and economic agents. Where the government acts after private agents, it tries to push them in socially desirable directions. But, over time, as agents come to anticipate this they take countering actions. The only long-term effect is distortions that reduce social welfare. Well researched examples are the creation of more inflation than is socially optimal in an attempt to reduce unemployment or government debt. The tradeoff through which this occurs normally is the Phillips curve,\(^1\) which gives an opportunity for the government to lower unemployment by reducing real wages through unanticipated inflation. A rise in the latter also reduces real government debt \(^2\). A major tradeoff, important for a populous democracy with a large number of poor, is that between populism and growth. This has not received the analytical attention it deserves. It also involves strategic interactions over time, between the government and private agents, with potential welfare loss. In this paper we formalise and systematically explore the implications of such a tradeoff for welfare and for optimal macroeconomic policy.

If costs outweigh the benefits from it, populism is in excess of the social optimal. These costs arise from the distorting effects of administered prices, controls, subsidies, and low user costs. Unanticipated populist distortions work only in the short-term since agents take defensive actions such as reducing effort or turning to the black economy\(^3\). We show that a Nash equilibrium will occur with populist consumption that is higher than the optimal, define a sustainable rate of growth, specify the conditions causing higher welfare loss in the Nash Equilibrium, discuss stabilisation possibilities in the presence of supply shocks, and obtain optimal delegation schemes.

The welfare losses that occur in this class of problems are due to a lack of a credible government commitment device. For example, in the story with government debt, because private agents expect the government to inflate they set high interest rates. This forces the government to inflate because the cost of servicing debt rises steeply. A commitment technology that has been much discussed is delegation of key policy decisions to agents with different preferences. For example, a conservative central banker, is said to credibly lower inflation.

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\(^1\)The seminal paper was Kydland and Prescott (1977). This led to a huge literature. Key papers are collected in Person and Tabellini (1994), and the material is well surveyed in Walsh (1998). Sargent (1999) is a lucid application to the analysis of American inflation.

\(^2\)Calvo analysed this, for Latin America, in a series of papers (collected in Calvo 1996). This is more relevant for developing economies with dualistic labour markets, where the Phillips curve holds only for a small modern sector.

\(^3\)Goyal (1999) documents details of such instances.
A major new insight of this paper is that optimal delegation, with the new trade-off, is to a fiscal authority with a lower weight on populism and a pro-growth monetary authority. This would lower populism keep inflation low and growth at sustainable levels. Since populist expenditures are mainly undertaken by the fiscal authority delegation to a conservative minister would tend to reduce these. Inflation is the major target of the central bank. But in a developing economy, a fall in inflation benefits the poor. Thus a democratically accountable central banker will tend to put too much weight on reducing inflation. If the central bank is not independent of the fiscal authority and is influenced by the latter’s objectives, delegation to a more pro-growth central banker would improve outcomes. Second, even if the central bank is independent, the suggested delegation would credibly improve fiscal and monetary policy coordination and lead to the unique optimal equilibrium. Last, the model is shown to help understand Indian macroeconomic performance.

The structure of the paper is as follows: section 2 describes the tradeoff between growth and re-distribution. Section 2.1 presents the formal model and section 2.2 derives the implications of dynamic inconsistency. Section 3 brings in supply shocks and therefore the role of stabilisation policies. Section 4 explores how delegation can resolve inefficiencies, and help coordinate fiscal and monetary policies. Section 5 uses the model to interpret Indian experience. Section 6 concludes. Some proofs are in the Appendix.

2 The tradeoff

In a populous democracy, incumbent governments want to please the large mass of poor voters in order to maximise vote-banks. Therefore there is a temptation to raise populist consumption. But this tends to lower growth due to inefficiencies and distortions arising from productive agents’ countering actions. Examples are black-markets, flight of capital, labour migration, fall in effort, the rich switching to higher quality private service-providers from public sector providers. If revenue falls below cost quality of public service provision falls. Re-distribution to the poor fulfils an essential social purpose, but there exists an optimal level above which costs become too high, although it may be possible to lower these costs with better designed policies.

If the government moves after the private agents, it has an incentive to manipulate the latter by raising populist expenditures above expected values. In any one period, if populism is higher than anticipated, growth is not harmed since private agents have taken their decisions. The rise in expenditure raises output and growth. But, over a number of periods, as agents adjust their expectations, populism higher than socially
optimal will result, while growth remains at the sustainable rate. We demonstrate this in the following section.

2.1 The model

The max potential level of growth is $\bar{g}$, the actual is $g$, so that $G = \bar{g} - g$ is growth foregone. We postulate that there is a maximum socially desirable growth rate of populist consumption, $\bar{p}$. Actual populist consumption is $p$, so that $P = p - \bar{p}$ measures the excess growth of populist consumption over the desired value.

The government chooses a $P \subset S$. There is a continuum of private agents. The expected value of $P$ is $P^e$. The average value of $P^e$ is $P^a$. The one period payoff of a private agent is:

$$V(P^e, P^a, P) = -0.5((P - P^e)^2 + P^2)$$  \hspace{1cm} (1)

Agents maximise their payoffs if $P^e = P$, that is, if they make an accurate forecast of $P$, so that the government cannot trick them$^4$. Since all agents have the identical problem $P^a = P^e$. Therefore $P^a$ is also an element of set $S$. Assume $S$ to be a compact subset of the real line.

The government’s one period payoff or objective function is:

$$U = -\frac{b}{2}G^2 - \frac{1}{2}P^2$$ \hspace{1cm} (2)

That is, returns to the government fall with growth shortfalls and as subsidies etc. rise above their socially optimal value. The tradeoff that links foregone growth to excess populism is given by:

$$G = G^* - \alpha(P - P^a)$$ \hspace{1cm} (3)

Where $\alpha > 0$, and $G^*$ gives the sustainable level of growth shortfall, and $g^*$ is the corresponding sustainable level of growth. An unexpected rise in $P$ allows growth to temporarily exceed $g^*$. If $P$ is fully expected, avoiding action would be taken by agents. Since government moves after private agents it has an incentive to raise

$^4$Since $\bar{p}$ gives growth in socially optimal populism a positive $P$ lowers the the utility of private agents. Although such expenditure upto the limit of $\bar{p}$ increases welfare, the productive aspects of populism are exhausted after $\bar{p}$. An unanticipated rise in $P$, raises output growth in the short-term, but lowers welfare since it is some time before agents can take compensating actions.
$P$ above $P^a$, as long as growth is less than potential. Since $P$ is a constituent of government expenditure, there is a simple Keynesian multiplier relationship between output and the expenditure injection caused by a growth in excess populism: $g = mP$. The multiplier $m$ raises output and therefore its one period growth rate $g$, or reduces the growth shortfall $G$, as a function of the multiplier injection $P$. But we assume that anticipated excess populism, $P^a$ enters the production function negatively, because of distortions and a reduction in individual effort. Thus only $P$ in excess of $P^a$ can reduce the growth shortfall temporarily, giving the tradeoff Eq. 3.

Substituting Eq. 3 into the government’s objective function gives its payoff as a function of the private actions embodied in the tradeoff, Eq. 3.

$$U(P, P^a) = -b_2(G^* - \alpha(P - P^a))^2 - \frac{1}{2}P^2$$

(4)

The government’s reaction function, Eq. 5, maximises the objective function with respect to its decision variable $P$, giving its best response or optimal choice of $P$ given $P^a$.

$$r(P^a) = \text{argmax}_P U(P, P^a)$$

(5)

This is the decision rule for setting $P$ given the public’s expectation $P^a$. Two kinds of equilibria are possible, and since the public solve a forecasting problem, so that they cannot be continuously fooled, both the equilibria must satisfy rational expectations.

A rational expectations equilibrium (RE) is a triple $(U, P, P^a)$, satisfying the trade-off Eq. 3, and $P = P^a$.

An optimal equilibrium (OE) is the value of $P$ that maximises $r(P, P^a)$.

If the timing protocol is such that the government chooses first, the OE results.

A Nash equilibrium (NE) is a pair $(P, P^a)$, satisfying $P = P^a$ and $P = r(P^a)$.

If the government decides after private agent’s set their expectations, NE results.

The government’s best response is obtained by differentiating Eq.4, with respect to $P$, and solving for $P$, the government’s decision variable:
\[ P = r(P^a) = \frac{\alpha b}{\alpha^2 b + 1} G^* + \frac{\alpha^2 b}{\alpha^2 b + 1} P^a \]  

(6)

With these building blocks, we next explore the different equilibria, and their welfare implications.

2.2 Results

Result 1: \( g^* \) is the sustainable rate of growth (SRG).

Proof: Substituting \( P = P^a \) in the tradeoff eq. 3, and taking expectations shows that \( G = G^* \), in any \( RE \). Therefore, over the long-term, no other \( G \) would be sustainable. Substituting \( G = G^* \) in \( G = \bar{g} - g \) gives the SRG \( g^* \).

Result 2: In the \( NE \), \( P^a = P^a_N = \alpha b G, G = G^* \), and \( U(P_N, P^a_N) = -\frac{b}{2} G^{*2} (1 + \alpha^2 b) \)

Proof: The first, second and third results come by respectively substituting \( P_N = P^a_N \) in the government’s reaction function Eq. 6, the tradeoff Eq. 3, and the government’s objective function, Eq. 4.

Result 3: In the \( OE \), \( P_O = P^a_O = 0, G = G^* \), and \( U(P_O, P^a_O) = -\frac{b}{2} G^{*2} \).

Proof: The value of \( P \) that maximises \( U(P, P) \) is zero. The second and third results follow by respectively substituting \( P_O = P^a_O = 0 \) in the tradeoff Eq. 3, and the government’s objective function, Eq. 4.

Result 4: The welfare loss in the \( NE \) compared to the \( OE \), is \( \frac{(\alpha b G^*)^2}{2} \).

Proof: \( U(P_O, P^a_O) - U(P_N, P^a_N) \) gives \( \frac{(\alpha b G^*)^2}{2} \), which is the loss in the government’s objective function if \( OE \) changes to \( NE \).

Figure 1 shows both the \( OE \) and the \( NE \), and also explains why, when the government moves second, dynamic adjustment will lead to the \( NE \). The downward sloping lines are the tradeoff eq. 3, drawn for different values of \( P^a = 0, P_1, P_N \), and slope \( \alpha = -1 \). Tangency points with the indifference curves based on the government’s one-period payoff or objective function Eq. 2, lie on the government’s reaction function, and give the government’s best response in setting \( P \) for a given \( P^a \). Since both rising \( G \) and \( P \) lower welfare, the indifference curves are downward sloping: a rise in \( P \) needs to be compensated by falling \( G \). A higher indifference curve has both higher and therefore shows a lower welfare level.

PLACE FIGURE 1 HERE

The optimal equilibrium has \( (G^*, 0) \). The \( NE \) has \( (G^*, P_N) \). Although the \( NE \)
lies on a lower indifference curve, the government’s best response will inevitably lead

Raising $P$ and lowering $G$ along the same tradeoff, brings the economy closer
to $\bar{g}$, and raises the government’s payoff, if $P^*$ is unchanged. Thus, in Figure 1, even
at the $OE$, with $P^* = 0$, the government would set $P = P_1$, in order to move to
its point of tangency. The public responds with $P^* = P_1$, the government raises $P$
again and the process continues until $P = P^* = r(P^*)$ at the $NE$. The dynamics are
$P_t = r(P_{t-1})$, with the government setting $P$ in each period as the best response to
the last period’s $P$, until the process converges to the $NE$.

Result 5: The payoff to the government from raising $P$ rises in $\alpha$ and $b$.

Proof: At the $NE$, $P_N = \alpha b G$. The higher is $b$, the greater is the payoff to the
government from a fall in $G$. The higher is $\alpha$, the greater is the fall in $G$, from an
unanticipated rise in $P$, in the tradeoff Eq. 3.

One way to prevent the welfare loss that arises in an $NE$ is to choose a policy
rule such as $P_t = 0$. But such a rigid rule can lower welfare in the presence of supply
shocks.

3 Supply shocks and stabilisation policy

We now introduce a random independently distributed supply shock affecting the
tradeoff eq. 3. The shock $\epsilon_t$, has zero mean and variance $\sigma_{\epsilon}^2$. Therefore:

$$G_t = G^* - \alpha(P_t - P_a) + \epsilon_t \quad (7)$$

Substituting this in the government’s objective function, differentiating this re-
action function to get the government’s best response or first order condition with
respect to $P_t$, and solving for rational expectations at the $NE$ by the method of
undetermined coefficients (see appendix A.1), we get:

$$P_t = \alpha b G^* + \frac{\alpha b}{\alpha^2 b + 1} \epsilon_t \quad (8)$$

$$P_t^* = \alpha b G^* \quad (9)$$

$$G_t = G^* + \frac{1}{\alpha^2 b + 1} \epsilon_t \quad (10)$$

The sequence of events is that first private agents expectations are set, then the
shock occurs and is observed, finally $P_t$ is chosen by the government. We assume
$\bar{g} - g^* > 0$, so the government always has an incentive to try to increase the growth
rate. But a reduction in volatility, or stabilizing the effect of shocks, also raises
welfare. A positive $\epsilon_t$ raises the growth shortfall—it is a negative supply shock. In addition to the populist bias $\alpha b G^*$ raising $P_t$, similar to sections 2 and 3, there is now also a term, $\frac{\alpha b}{\alpha^2 b + 1}$ due to the shock.

Taking expectations leads to:

$$E(P) = \alpha b G^*$$

$$E(G) = G^*$$

(11)  

(12)

Average populist expenditures are higher than the desired level, without any improvement in average growth over the SRG. This is the time inconsistency problem again. But calculating the variances:

$$\text{var}(P) = \left( \frac{\alpha b}{\alpha^2 b + 1} \right)^2 \sigma^2 \epsilon$$

$$\text{var}(G) = \frac{1}{(\alpha^2 b + 1)^2} \sigma^2 \epsilon$$

(13)  

(14)

The variance of growth is lower because of government expenditure $P$. Thus there is a role for discretionary stabilisation policy, even though it does imply a positive populist bias raising $P$. Some of the variance in growth, due to the shock, is stabilised.

**Result 6:** If there are supply shocks, $P \neq 0$ that allows stabilisation can do better than a shock-invariant rule.

**Proof:** If the government were to set optimal $P_t^* = \frac{\alpha b}{\alpha^2 b + 1} \epsilon_t$, it would keep $E(P_t) = 0$, while the variance of growth would be at the lower level of Eq. 14. But if the shock-invariant policy rule $P_t = 0$ is chosen, there is no stabilisation of growth, since $\text{var}(G)$ remains at $\sigma^2 \epsilon$ which exceeds Eq. 14.

If the shock is small in size in relation to the populist bias, the loss to adopting a simple policy rule such as $P_t = 0$, will be low, even though the rule implies that stabilisation is given up completely. In such a case the rule should be preferred over discretion. But in a developing country supply shocks are frequent and often large. Some discretionary government expenditure in the face of an agricultural drought or oil price hike raises welfare.

Moreover any rule may not be credible, since the policy maker has an incentive, ex post, once expectations are formed, to deviate from the rule, and increase $P_t$ to raise the growth rate. Even if it were to be written as a law there would be problems of monitoring and implementing it. In such a context, delegation may be effective. Delegating policy choices to an agent that has a stronger aversion to populism than the government itself does, is a credible commitment device that may lower equilibrium
excess populism, and yet retraining more discretionary flexibility than a rigid rule. In section 4 we analyze the implications of such delegation in our context.

4 Delegation

If the government can delegate policy to an agent who places less weight on growth shortfalls than the government itself does, it should lead to a welfare improvement. The populist bias would be lower, but some of the benefits of stabilisation would be retained\(^5\).

If the agent is independent in the sense that she cannot be dismissed ex post, after the shock has occurred and before the policy is chosen, the delegation is credible. The sequence now is that first the policymaker chooses an agent, second expectations are formed, third the shock is realised, and last the agent chooses policy. The policymaker can only change the agent in the next period, but then his optimal choice will be the same as it was in the first period.

The agent will choose an action based on her own preferences, with a weight on \(G\) in her payoff function given by \(b^\circ\), rather than \(b\). The policymakers utility will now depend on his own preference weight \(b\), and on the agent’s preference parameter \(b^\circ\), because the latter will determine the policy the agent will follow, once appointed. Therefore the policy maker’s objective function now is:

\[
\max E(U(b,b^\circ)) = E\left(-\frac{1}{2}(\alpha b^\circ G^* + \frac{\alpha b^\circ}{\alpha^2 b^\circ + 1} \epsilon_t)^2 - \frac{b}{2}(G^* + \frac{1}{\alpha^2 b^\circ + 1} \epsilon_t)^2\right) \quad (15)
\]

Result 7: If policy is delegated to an independent agent who is less pro-growth than the policy maker herself, the utility of the policy maker and social welfare both rise.

Proof: Maximising expected utility Eq. 15 with respect to \(b^\circ\) and solving the FOC gives the result that \(0 < b^\circ < b\) (see appendix A.2).

The independent agent should place relatively less weight on deviations from maximum growth and more on deviations from the optimal populist expenditure than the policy maker himself. Such an agent would be less tempted to increase \(P_t\) in order to raise growth, and a credible discretionary equilibrium with lower \(P_t\) plus stabilisation benefits would result. This analysis applies to the fiscal authority (FA) in a developing country, who decides on populist expenditures. The government could delegate

\(^5\)The seminal paper on this kind of delegation was Rogoff (1985). Alesina et. al. (1997) have a useful discussion of this.
fiscal policy to a more conservative minister.

What is the role of the monetary authority (MA), and how does interaction between the MA and the FA affect outcomes? The MA’s instrument is the money supply or the interest rate and its objective is to lower growth shortfalls and inflation. Both are concerned to lower growth shortfalls, $G$, but the FA puts greater weight on $G$ and the MA on decreasing inflation. Excess populism, which puts pressure on its budget, negatively enters the FA’s objective function, and excess inflation, $\pi$, which lowers the value of money negatively enters the MA’s objective function.

Figure 2 shows a relatively flat or elastic aggregate supply (AS) curve in $G$ and $\pi$ space. It becomes vertical at the social optimum $g$ in the short-run and at the feasible rate of growth $g^*$ in the long run. In equilibrium since growth shortfall $G$ must equal $G^*$, $g$ must equal $g^*$, although the government can achieve higher growth in the short-run. The aggregate demand curve is downward sloping and shifts outwards with a rise in $P$ and inwards with a fall in the money supply growth. With $P$ at zero (which we write as $P$ low or $P_L$), the equilibrium is at the pair $\pi_L, g^*$. We assume that a rise in $P$ to a high value such as $P_H$ shifts up the aggregate supply in the medium-term because distortions lower efficiency. Moreover, supply-side distortions may cause the potential rate of growth $f$ itself to fall over time.

**Result 8:** The medium-term equilibrium pair $\pi, g$, is determined by equating aggregate demand and supply, taking account of the effect of $P$ on both. A rise in $P$ raises $g$ if the AS is flat, and a rise in $P$ may lower $g$ if the AS is steep. With a flat AS there is little change in $\pi$. If it is steep $\pi$ rises with a rise in both money supply growth and $P$. If a fall in money supply growth implies a rise in $P$, the effect of $P$ on $\pi$ dominates that of the money supply.

**Proof:** Deriving the equations for aggregate demand and supply, solving for the equilibrium pair $\pi, g$, and the effect of changes in the growth of money supply and $P$ on the pair, gives the result (see appendix A.3).

First consider the case where the MA is not independent and passively implements the preferences of the FA. A rise in fiscal populism would be funded by an accommodative rise in money supply. But when per capita income is low, a rise in inflation hurts the poor$^6$, and costs the government votes in a democracy. Therefore administrative measures, such as fixing prices and user charges, and large reserve requirements, are used to control inflation and repress the effects of the rise in money supply. These measures to keep inflation low reduce efficiency and shift up the AS

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$^6$Easterly and Fischer (2001) present evidence for this in a cross country empirical study.
curve to the dashed level associated with $P_H$. They are a form of unanticipated excess populism, and the short term growth benefits are reversed in the longer term. The equilibrium shifts from a short-run higher growth equilibrium $3'$ to 3 through medium-run equilibria where the the AS curve shifts up and shrinks to the left. At 3 growth stays at $g^*$ and inflation is at the higher level $\pi^H$ although repressed somewhat by the interventionist measures. Delegation to a more conservative fiscal authority by preventing the rise in $P$ may keep the economy nearer the optimal equilibrium 1 (Figure 2).

Second, consider the case where the MA is independent. The interaction between the two now becomes strategic since each optimizes its objective function taking account of the other’s action. We briefly model the game between the FA and MA and show how delegation can improve outcomes. Two strategies available to each of the authorities are $C$ (cooperate) and $NC$ (do not cooperate). $C$ for the FA means keeping $P$ low, and for the MA means accommodating the money supply to the requirements of output and and $P$ growth. FA is the row player and MA is the column player (Figure 2).

PLACE FIGURE 3 AND 4 HERE

The (Nash) equilibrium in the game between the FA and the MA is characterized by the pair $\pi^*, P^*$ such that $P^*$ minimizes $U^{FA}$ taking $\pi$ as given and $\pi^*$ minimizes $U^{MA}$ taking $P$ as given, when $b > 1$, where

$$
U^{FA} = -\frac{b}{2}G^2 - \frac{1}{2}P^2
$$

$$
U^{MA} = -\frac{1}{2}G^2 - \frac{b}{2}\pi^2
$$

If the FA plays $C$, keeping $P$ low at $P_L$, the MA can raise its payoff by tightening money supply to lower $\pi$. But $g$ will fall so much that the FA will have to raise $P$ to compensate. The fall in $\pi$ also implies a rise in $P$. These repressive measures will shift up the aggregate supply curve as they become anticipated, and the economy moves from an equilibrium like $2'$ to 2 (Figure 2). The outcome is thus $P_H, \pi_L$ at the strategy combination $(C, NC)$ (Figure 3, 4).

If the FA plays $NC$ and raises $P$ but the MA cooperates and accommodates the $FA$, $\pi$ will rise, as the $AD$ shifts up, but the $AS$ will also follow upwards and the

\footnote{Stiglitz and Greenwald (2003) point out that tight money supply can reduce aggregate supply as firms’ net worth is reduced}
economy will move from equilibrium \(3'\) to \(3\) (Figure 2). The growth advantage will be lost as adjusting anticipations shift up and shrink the AS curve. Over time the potential rate of growth \(\bar{\gamma}\) itself may fall due to supply-side distortions. The rise in \(\pi\) will lower \(P\). Even if a monetary squeeze follows, it may not be able to lower inflation which will remain high as costs rise. The outcome under \((NC, C)\) will therefore be \(P_L, \pi_H\). Note that it is monetary policy that determines the final value of \(P\).

In \(C\) the two authorities coordinate, or work together. The FA does not raise \(P\), and the MA finely balances money supply growth, keeping it neither too low nor too high, so that both \(\pi\) and \(P\) are low at \(P_L, \pi_L\) (Figure 3a, and equilibrium 1, Figure 2).

Because each party stands to loose if the other plays NC, the unique equilibrium is Nash \((NE)\), with \(NC, NC\), and 4 in Figure 1. Both \(P\) and \(\pi\) are higher at \(P_H, \pi_H\) and payoffs lower than under \(C, C\). But no party has a unilateral incentive to defect from the \(NE\).

The payoffs are obtained by substituting values of \(P\) and \(\pi\) in the payoff or objective functions. Using the sum of payoffs along the path to equilibrium would give qualitatively similar results. Figure 3(a) shows the values of \(P\) and \(\pi\) for different strategy combinations, and 3(b) gives the corresponding payoffs, which follow from the inequality relationships among the \(P\) and \(\pi\) outcomes. Whoever plays \(NC\) when the other plays \(C\) gets a relatively higher payoff. This is the crux of the Prisoner’s Dilemma game and the reason why \(C, C\) cannot be sustained.

Next, consider delegation to a more conservative FA and less conservative MA, and turn to the extensive form of the game (Figure 3). The payoffs are now those of the agent, and a weight \(b^* > 1\) now attaches to \(G\) for the MA and \(P\) for the FA. In the sequential game the FA moves first as the Stackelberg leader (Figure 4). Since the conservative FA gets a lower utility from the initial excess populism required, the returns to \(NC, C\) fall for the FA. But unless the MA is less conservative, so that the returns to the MA from low inflation and high growth shortfall (or \(C, NC\)) are lowered, to play \(C\) is still not the subgame perfect equilibria for the FA. Since the FA knows a conservative MA will switch to NC, the FA will also play NC. Under delegation to a more pro-growth MA and less populist FA, the unique credible equilibrium becomes \(CC\), with higher payoffs for both. \(P\) and \(\pi\) are both lower and at their optimal values. Delegation has changed the Prisoner’s Dilemma game to one with a unique optimal equilibrium, which is also subgame perfect.

In the literature, a conservative MA is more inflation averse. Therefore, appointing an independent conservative central banker is expected to result in a lower rate of inflation. But, in our model, appointing a less conservative central banker results in lower inflation. The reason is the improvement in the coordination between the
FA and MA, in the structure of our prototype developing economy. This may be summed up in the following proposition.

**Proposition 1** In a developing country, if the aggregate supply curve is relatively flat before the feasible level of growth, and if excess populism and tight money both shift up the aggregate supply, delegating monetary authority to a less conservative central banker, who places more weight on growth than the policy maker, and fiscal authority to an agent who is more conservative than the policy maker, will result in lower excess populism and lower inflation.

Our model considers only a few of the factors affecting inflation. It must be kept in mind that there are other factors affecting both. Cost shocks play a large role in raising \( AS \) and triggering off a rise in \( P \) and tightening of money supply.

It may be difficult to delegate to a fiscal authority that is less pro-growth than the government, since the finance minister is an active party member. In a multi party framework, a law preventing fiscal populism, may be a useful alternative commitment device. Since all the parties would be bound by it, they would have less incentive to engage in competitive populism. If any one party is sure that no other is going to woo the electorate with unproductive give-aways, it will not do so either. Ideally, the law should protect productive government investment in infrastructure and education, which also raises \( G^* \). A reduction in populist expenditures will make more funds available for this.

In the next section we examine if Indian macroeconomic experience is broadly consistent with this framework of analysis.

## 5 Indian macroeconomic experience

Tests have found some support for dynamic inconsistency type arguments, but have not established these fully\(^8\). Hardly any tests have been undertaken for developing countries. In this section we present a few pieces of evidence.

First, if the Phillips curve or an upward rising aggregate supply curve were the dominant trade-off, we would expect to see higher inflation accompany higher growth as aggregate demand shifted along the supply curve. But Table 1 shows an overall

\(^8\)See Walsh (1998) for a survey of tests conducted using cross country data for advanced countries. Researchers have regressed inflation on measures of central bank independence. The coefficient is negative, showing that independence lowers inflation. But tests also show that the variation of output is not increased. This should have happened if less pro-growth independent central bankers were not undertaking stabilisation. Therefore other mechanisms must be involved. It may be that some other factors lead to both independent central banks and low inflation.
Table 1: Annual Average Indian Growth and Inflation Rates

<table>
<thead>
<tr>
<th>An average</th>
<th>GDP growth</th>
<th>Inflation(WPI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981-89</td>
<td>5.57</td>
<td>6.4</td>
</tr>
<tr>
<td>1989-93</td>
<td>4.54</td>
<td>10.36</td>
</tr>
<tr>
<td>1993-97</td>
<td>7.08</td>
<td>8.4</td>
</tr>
<tr>
<td>1996-97</td>
<td>7.8</td>
<td>4.6</td>
</tr>
<tr>
<td>1997-03</td>
<td>5.28</td>
<td>4.62</td>
</tr>
<tr>
<td>2000-01</td>
<td>4.4</td>
<td>7.2</td>
</tr>
</tbody>
</table>

Source: Government of India, Economic Survey, 2002-03, NAS, CSO.

An inverse relationship between inflation and growth, suggesting that shifts in supply, along a downward sloping demand curve were more common. Such shifts are caused by a rise in $P$ in our model. In interpreting Table 1 it must be kept in mind that there was a downward trend in inflation from the late nineties as a result of more competitiveness and the restraint from border prices in a more open economy.

Second, inflation was low by developing country standards. This is the expected outcome if containing inflation was necessary to please voters. The Indian Reserve Bank was not independent of the fiscal authorities. Only in the nineties have some limits been put on automatic financing of budget deficits. Therefore central bankers largely followed the preferences of the elected governments. Although monetary measures were used to keep inflation low, administrative measures such as price controls and low user charges also played a major role.

Third, Indian central bankers have been normally conservative in the sense of being anti-inflation. A squeeze on money and credit in response to supply shocks, often intensified the demand recession that followed (Dash and Goyal, 2000). This discouraged growth and productivity increases that would have lowered inflation from the cost side. Higher growth and lower inflation maybe feasible with optimal policy coordination.

Fourth, Table 2 shows that growth, inflation and monetary policy have differed in the tenures of various Reserve Bank governors. The overall direction may have been dictated by the preferences of the elected government as, for much of the period, the Reserve Bank was not autonomous. But the delegated agent, or the Governor, has been able to make a difference. The divergence in performance in the regimes of different Governor’s suggests that their preferences affected growth rates. Second, governors in whose regime growth was higher have delivered lower inflation, as our
model would predict. Of course, there are other factors affecting growth and inflation. Cost shocks normally sparked higher inflation, but the monetary response affected growth and future inflation. Short-run sharp inflation caused by supply shocks was controlled, but in ways that harmed longer-term growth. Cost shocks combined with populism in order to give short-term stimuli and electoral advantage, led to cumulative fiscal decay. Still, the clear differences in regimes suggest that governors whose policies did not allow growth to recover ended up with higher inflation also.
Reforms have given the Reserve Bank more independence. Interest rates are no longer administered and are available as additional instruments. Therefore governors will have even more impact in the future, and the question of their preferences acquires greater importance.

A historical narrative account of monetary/fiscal responses to specific shocks further illustrates the argument. The drought and terms of trade shocks over 1965-67, led to a fiscal tightening, with a cut in budget deficits and public investment. Monetary policy was non-accommodating but not severe. Fiscal and monetary policies were closely linked, as the budget deficit was automatically financed. The oil price plus agricultural supply shock over 1973-75 lead to a similar response. In both cases there was an unnecessary loss of output. A focus on expanding food supply would have been more effective. The lesson was learnt by the 1979-80 crisis.

There was no cut in public investment, no monetary tightening, no long-term adverse effects on output, and a rapid recovery. Money supply was decreased sharply in mid 1979 and in mid 1973, with especially severe measures undertaken in 1974. In both cases inflation was well under way. Although there was a steady rise in the fiscal deficit from the mid-seventies, the rise in money supply was much lower. This was helped by the long-term fall in the velocity of broad money as financial deepening took place. But the populist fiscal response to supply shocks was having a cumulative effect in widening the revenue deficit. The response to the early nineties balance of payments crisis included a cut in public investment, an artificial agricultural supply shock as procurement prices for food grains were raised, and a monetary tightening to sterilize capital inflows in 1992-93. Growth revived in 1993-94, and monetary policy was accommodating, but exchange rate volatility in 1995 led to a monetary squeeze that precipitated a slowdown. The monetary stance was relaxed, but reversed again at the first sign of exchange rate volatility. Inflation fell, with the improvements in productivity, but industrial growth did not revive until 2003. Fiscal and monetary policy coordination could have achieved better outcomes.

In the nineties structural changes associated with reform have been able to raise the trend rate of growth above five per cent. The Government of India is seriously considering adopting a fiscal responsibility act. Ideally, such an act should be designed to protect investment while controlling populism. The Reserve Bank has been given more autonomy. A pro-growth central banker would complement the reforms. Understanding tradeoffs and preferences aid the design of effective institutions.
Table 1: Annual Average Macro Statistics in Tenures of Reserve Bank Governors

<table>
<thead>
<tr>
<th>Governor</th>
<th>From</th>
<th>To</th>
<th>Tenure period</th>
<th>Monetary policy</th>
<th>GDP Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shri L. K. Jha</td>
<td>Jul-67</td>
<td>May-70</td>
<td>1967-68 to 1969-70</td>
<td>7.97</td>
<td>8.58</td>
</tr>
<tr>
<td>Shri Jagannathan</td>
<td>Jun-70</td>
<td>May-75</td>
<td>1970-71 to 1974-75</td>
<td>12.93</td>
<td>15.44</td>
</tr>
<tr>
<td>Shri I G Patel</td>
<td>Dec-77</td>
<td>Sep-82</td>
<td>1977-78 to 1982-83</td>
<td>15.57</td>
<td>17.55</td>
</tr>
<tr>
<td>Shri Manmohan Singh</td>
<td>Sep-82</td>
<td>Jan-85</td>
<td>1983-84 to 1984-85</td>
<td>23.46</td>
<td>18.6</td>
</tr>
<tr>
<td>Shri R N Malhotra</td>
<td>Feb-85</td>
<td>Dec-90</td>
<td>1985-86 to 1990-91</td>
<td>16.54</td>
<td>17.14</td>
</tr>
<tr>
<td>Shri S Venkatiramanan</td>
<td>Dec-90</td>
<td>Dec-92</td>
<td>1991-92 to 1992-93</td>
<td>12.35</td>
<td>17.05</td>
</tr>
<tr>
<td>Dr C Rangarajan</td>
<td>Dec-92</td>
<td>Nov-97</td>
<td>1993-94 to 1997-98</td>
<td>15.64</td>
<td>17.72</td>
</tr>
<tr>
<td>Dr Bimal Jalan</td>
<td>Nov-97</td>
<td>Sept-03</td>
<td>1998-99 to 2002-03</td>
<td>10.28</td>
<td>15.42</td>
</tr>
</tbody>
</table>

Source: For the period after 1970-71, Reserve Bank(2003), before that reserve money is from IMF, Financial Statistics, and inflation and output from NAS, CSO.

*Note: The last four columns give growth rates. The output figures from * refer to the New Series of the CSO, with base 1993-94, prior to that the base was 1980-81. The inflation series are derived from the Wholesale Price Index, before @ the base is 70-71, and after it is 1981-82, and for the last row 1993-94.
6 Conclusion

The contribution of this paper is to develop and work out the consequences of strategic interaction between the government and private agents in the context of a tradeoff between growth and populism. This is the major tradeoff affecting a number of developing economies. Dynamic inconsistency arguments extend to the fiscal authority also and there is a startling reversal with respect to the monetary authority. One of the accepted conclusions in the literature is that delegation of monetary policy to a more conservative central banker will lower inflation. In this analytical framework it turns out that a more pro-growth central banker will deliver lower inflation. Optimal delegation, in these circumstances, would be to a less pro-growth fiscal authority and a more pro-growth monetary authority, compared to the government.

The theory and results are shown to be consistent with broad stylised features of Indian macroeconomic experience, but more systematic empirical tests need to be undertaken. The working of other commitment technologies, such as reputation, rules, and contracts, can also be explored in the new context.

Appendix

A.1 Method of undetermined coefficients to solve $B(P^a)$ for $P_t$ in the presence of shocks

Assume the solution is of the form:

$$P_t = \phi_0 + \phi_1 \epsilon_t$$  \hspace{1cm} (18)

Then $P^a = \phi_0$.

Substituting for $P_t$ and $P^a$ in the government’s best response function, $B(P^a)$, we get

$$\phi_0 + \phi_1 \epsilon_t = (abG^* + \alpha^2 b \phi_0 + \alpha b \epsilon_t) \frac{1}{\alpha^2 b + 1}$$  \hspace{1cm} (19)

Therefore, it is necessary that:

$$\phi_0 = (abG^* + \alpha^2 b \phi_0) \frac{1}{\alpha^2 b + 1}$$  \hspace{1cm} (20)

$$\phi_1 = \frac{ab}{\alpha^2 b + 1}$$  \hspace{1cm} (21)

Solving for $\phi_0$ and $\phi_1$ directly gives the values of $P_t$ and $P^a$, and $G_t$ is obtained.
by substituting these values in the tradeoff Eq. 7.

A.2 Deriving the preference weights of the delegatee

Maximising the policy makers objective function with respect to his choice of the agent’s preference weight $b^\circ$,

$$E(U(b, b^\circ)) = E\left(-\frac{1}{2}(\alpha b^\circ G^* + \frac{\alpha b^\circ}{\alpha^2 b^\circ + 1}\epsilon_t)\right)^2 - \frac{b}{2}(G^* + \frac{1}{\alpha^2 b^\circ + 1}\epsilon_t)^2 \right)$$

(22)

gives the first order condition$^9$:

$$E\left(-\left((\alpha b^\circ G^* + \frac{\alpha b^\circ}{\alpha^2 b^\circ + 1}\epsilon_t)(\alpha G^* + \frac{\alpha}{(\alpha^2 b^\circ + 1)^2}\epsilon_t) + b((G^* + \frac{1}{\alpha^2 b^\circ + 1}\epsilon_t)\frac{\alpha^2}{(\alpha^2 b^\circ + 1)^2}\epsilon_t)\right) = 0ight)$$

(23)

Simplifying and taking expectations, where $\sigma^2_\epsilon = E(\epsilon^2)$ or the variance of $\epsilon$, leads to:

$$\alpha^2 b^\circ G^* \beta^2 = \frac{(b - b^\circ)}{\alpha^2 b^\circ + 1}$$

(24)

Therefore $b = b^\circ$ cannot be a solution since it would imply that the RHS of the above equation is zero and the LHS positive—a contradiction. The solution must have $b > b^\circ$ to match signs across the two sides of the equation.

A.3 Deriving AS, AD and the medium-run equilibrium $(\pi, g)$ pair

We assume that household demand rises with money balances and populist transfers, so that the level of aggregate demand for output is $Y^d = (MPop)/Pr$, where $Pr$ is the price level and $Pop$ is the level of excess populist expenditure. Aggregate supply responds to the price level with elasticity $a$, rises with productivity $A$ and falls with wages $W$, and $Pop$. That is $Y^s = (AP^\alpha)/WPop$. Logarithmic differentiation, assuming for simplicity the change in $W$ and $A$ to be zero, and that the exponential term $a$ takes two values, zero denoting inelastic supply, and two denoting elastic, we get the following aggregate demand and aggregate supply curves in $(\pi, g)$ space:

$$g^d = g_m - \pi + \frac{P}{2}$$

(25)

$$g^s = \pi - \frac{P}{2}$$

(26)

$^9$Alesina et. al. (1997) have a similar derivation
The equilibrium condition \( g^d = g^s = g \) allows us to solve for the equilibrium \((\pi, g)\) pair as a function of \( P \) and \( g_m \), where \( g_m \) is the growth rate of money supply.

\[
g = \frac{ag_m + (a - 1)P}{(1 + a)} \tag{27}
\]

\[
\pi = \frac{g_m + 2P}{(1 + a)} \tag{28}
\]

Simple comparative statics with these equations tell us that \( g \) will rise with \( P \) if \( a > 1 \) or the Supply curve is relatively flat and elastic. If \( a \) is large there will be little effect on inflation, but if as \( g_m \) falls \( P \) rises, the effect of \( P \) on \( \pi \) will dominate.

References


Figure 1: The Optimal and Nash equilibrium and the approach to the Nash equilibrium

Figure 2: Monetary and fiscal policy coordination
Equilibria: 1 (C, C : P_L, Π_L), 2 (C, NC : P_H, Π_L), 3 (NC, C : P_L, Π_H), 4 (NC, NC : P_H, Π_H)
2', 3' and AS' represent short-run
Figure 3: Values of $\Pi$, $P$ and numerical payoffs under different strategies

$\Pi_H > \Pi_L; P_H > P_L$

2 (a) 2(b)

Figure 4: The extensive form game and equilibria with and without delegation.

-4 (-4(anti-populism FA)), -8

-4 (-4(pro-growth MA))