Whom can we trust to run the Fed?
Theoretical support for the founders' views

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Abstract

The Federal Reserve has been called a bizarre policymaking structure. This paper documents and formalizes a historical argument that the Fed’s structure was a response to public conflict over inflation’s redistributive powers. The paper shows that, in the face of conflict over redistributive inflation, policy by majority can lead to policy that is worse, even for the majority, than obvious alternatives. In balancing the interests for and against surprise inflation, the Fed’s structure can lead to a better outcome.

*Key words:* Central bank design; Monetary policy; Voting

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1. Introduction

The Federal Reserve System has been called a ‘peculiar’, even a ‘bizarre’, governmental structure.¹ It is largely independent from direct government input, and power within the Fed is distributed among many people chosen in accordance with varied and elaborate rules. Now is a particularly interesting time to examine what the burgeoning theoretical literature on monetary policy formation says about the Fed’s structure. The European Community is attempting to design a new central bank, and the U.S. Congress has recently considered bills to

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make the Fed more responsible to democratically elected officials. At the same time, many Western advisors are recommending more democratic governments but independent central banks for emerging market economies.

This paper shows that important features of the Fed can be rationalized in a simply motivated, historically grounded model of strategic policy. The theory is distilled from conventional views of the Fed’s history and is motivated by evidence on the role inflation politics played in the U.S. prior to the Fed’s founding. The basic argument is that in the face of conflict over redistributive inflation, monetary policy by majority might well lead to policy that is worse — even for the majority — than obvious alternatives. U.S. economic performance under the Articles of Confederation and during the free silver debates arguably illustrates this result. The Fed’s structure, which emerged in legislation between 1913 and 1935, reflects the view that a better outcome will result from turning monetary policy over to a small group of people selected so as to balance the interests for and against inflation.

At the core of the analysis is a simple and generic point: the median voter’s preferences may not reflect what is best for society. This is the same point exploited in Rogoff’s (1985) argument that society might optimally choose a conservative central banker; Alesina and Grilli (1992) lay out similar reasoning in examining proposals for the European Central Bank.2 Persson and Tabellini (1992) consider alike issues in the context of national capital tax rates.

This paper emphasizes two elements that are not standard in the literature. First, the source of inflationary bias is the heterogeneous preferences of the public. Most of the literature follows Barro and Gordon (1983) in which the bias arises from an exogenously specified preference for inflation surprises. This preference is rationalized in informal arguments. In this paper, the bias arises endogenously from the redistributive effects of inflation, and the historical importance of this source of bias is documented. Second, the paper highlights the internal structure of the central bank which, as Rogoff (1987) notes, is often ignored.3

Initially the paper reviews the historical literature, emphasizing the role redistributive inflation played in determining the Fed’s structure. The historical argument is then formalized in the remainder of the paper.

2 More generally, a number of papers have emphasized different aspects of the issue of heterogeneous policy preferences, e.g., Alesina (1987), Alesina and Tabellini (1987), Havrilesky (1987), Hibbs (1977, 1987).

3 Waller (1992) is a notable exception.

2. The Fed’s formation: A selective review

After the banking panic of 1907, most political and financial interests realized that some legislation would be enacted to provide an elastic currency. Although
this might have seemed a narrow, technical goal, conflict arose over who could be trusted to exercise the associated money creation powers. This issue was resolved over a 23-year period of legislation beginning with the Federal Reserve Act in 1913, including the Banking Act of 1933, and ending with the Banking Act of 1935, which brought the Fed essentially to its current form.

While the nature and extent of Federal Reserve independence has been much discussed, the Fed’s unique internal power structure has received little attention. By the 1930s, it was clear that the power resided with the Federal Open Market Committee (FOMC), which is made up of the governors and the presidents of the Reserve Banks (Board of Governors, 1990). There are 12 votes on the FOMC: five presidents vote on a rotating basis, always including the president of the New York Fed and either the Chicago or Cleveland Fed president. The Reserve Bank presidents are nominated by the boards of their respective banks and confirmed by the Federal Reserve Board. The nominating boards are composed of nine directors, six chosen by district bankers (three representing district bankers and three representing general district interests), and three chosen by the Federal Reserve Board. The seven governors are nominated by the President of the U.S. with due regard to a fair representation of the financial, agricultural, industrial, and commercial interests. No two governors can come from one Federal Reserve district.

Obviously, the Fed’s structure was designed to balance voting interests. The claim that inflation politics is crucial to understanding this structure is not novel. This section highlights the evidence for the view summarized by Kettl (1986, p. 42):

The Fed was born in controversy. Farmers and small businessmen wanted a decentralized organization under strong governmental control to counterbalance the power of eastern bankers. The financial community, on the other hand, feared that political control of the system would bring inflation.

2.1. Conflict between nominal debtors and creditors

Ignoring the internal structure of the Fed, it seems reasonable to suppose that the Fed was made independent to insulate policy from electoral manipulation. This danger was certainly understood by the framers. Such principal–agent issues between voters and the Federal government, however, cannot explain why the Fed was made largely independent not only of the political agents, but of their principals as well.\footnote{For example, Congress could have mandated great openness in monetary policymaking. In reality bankers got a direct channel for communication with the Board, the Federal Advisory Committee, but the public got none.} Many framers were clearly concerned not only about principal–agent problems, but with the prospect that politicians would be \textit{too} responsive to their principals. Their concerns were well founded.
Populist demands for debt relief through surprise inflation or other means have deep roots in the U.S. Such demands following the Revolutionary War 'threatened the existence of credit' according to John Marshall (12 Wheat. 213, p. 354); James Madison (The Federalist, No. 44) cited this problem as the basis of the Constitution's Article I, section 10 prohibition of bills of credit and of laws impairing the obligation of contracts. Populist inflation remained a political issue throughout the 1800s, but the free silver debates that reached peak intensity in the 1890s were most relevant to the Fed's founding.\(^5\) Eastern creditors viewed with alarm Harvey's (1963, p. 175) popular 1894 tract, which argued that by re-monetizing silver "[y]ou increase the value of all property by adding to the number of money units in the land. You make it possible for the debtor to pay his debts...." Debtors in the West, for their part, saw the end of free coinage of silver as the crime of '73, pushed through by the money power, selling out rural mortgage holders in order to push up asset values (e.g., Timberlake, 1978). While the pro-silver forces ultimately failed, Friedman and Schwarz (1963) argue that the fluctuating political prospects of the free silver forces led to large disruptions in international capital flows in the 1890s.

The desire to avoid a recurrence of such battles was clear in much of the debate surrounding the Fed's founding. J. Laurence Laughlin (1933, p. 218), a noted monetary economist of the day, argued: '[P]oliticians find it easy to appeal to the underlying prejudice in favor of inflation in order to raise prices, or to lift the burden of debt.' Senator Aldrich (Kettl, 1986, p. 21) contended: 'No government has yet been found strong enough to resist the pressure for enlarged issue in times of real or imagined stress.' Thus, many parties to the founding of the Fed argued that a 'formula had to be found by means of which these two elements [big business and politicians] would be called upon to balance one another' (Warburg, 1930, p. 773).

The struggle over this balance was perhaps most explicit in the 1935 debates regarding how to divide FOMC voting power between Reserve Bank presidents and the politically appointed governors. Henry Steagall sponsored the House Bill in which only the politically appointed Federal Reserve Board members would vote. Senator Glass responded that Steagall was without peer in his advocacy of inflation (Congressional Record, 1935, p. 11825). The ultimate voting balance adopted was summarized by Steagall (Congressional Record, 1935, p. 13706):

> [U]nder the bill embodied in the conference report the board will stand 5 to 7 giving the people of the country, as contradistinguished from private banking interest, control by a vote of 7 to 5 instead of by a vote of 3 to 2 [as proposed in the Senate].

\(^5\)See Friedman (1990) for a richer account of this period.
Some may find it difficult to reconcile the framers’ fear of inflation with the fact that the U.S. was on the gold standard during much of the formative period. It is, however, easy to see why the gold standard was seen as an unreliable anchor. The U.S. was off the gold standard from the Civil War until 1879, and the free silver forces nearly took the U.S. effectively off again in the 1890s. The ratios of monetary gold to money and high powered money varied by a factor of two between 1879 and 1914 (Briggs et al., 1988). Foreign shipments of gold were suspended during World War I and convertibility was suspended outright in 1933. More importantly, perhaps, during the 1920s and early 1930s, when the FOMC was formulated, the desirability of the gold standard anchor was widely questioned, and many key players came to view monetary policy as a discretionary art.\textsuperscript{6}

The remainder of the paper illustrates how the problem faced by the framers and the solution they chose arise naturally in monetary economies. While the modelling is, of necessity, less rich than that described in the historical evidence, three intuitively appealing features of the model drive the results: 1) Expected inflation is harmful – increases in steady-state inflation lower everyone’s utility, 2) surprise inflation redistributes resources away from the nominally wealthy, and 3) the winners from surprise inflation outnumber the losers.

Given these three features, policy by majority is likely to, though does not necessarily, result in excessive inflation. The explanation for this parallels that given in the time consistency literature (e.g., Kydland and Prescott, 1977; Barro and Gordon, 1983). Although steady-state inflation is costly, the winners from surprise inflation – whom I call the working class – want to inflate away the wealth of the rich. They will do so whenever the marginal benefit from redistribution exceeds the marginal inflation cost. Everyone is aware of this, so the expected rate of inflation in equilibrium is the rate at which the marginal benefit from a surprise increase in inflation to the workers is just offset by the marginal cost. Because this inflation rate is fully expected, the workers get no benefit from redistribution, but everyone suffers the cost associated with equilibrium inflation. An \textit{ad hoc} solution to the pro-inflation bias in this model is to hand policy over to a board with properly balanced interests.

3. The model

This section presents an overlapping generations model. I chose the overlapping generations framework because it is simple and well-studied, and most importantly, because it is one of the few well-known monetary models with heterogeneous agents and winners and losers from surprise inflation. The model has

\textsuperscript{6}This view was by no means unanimous. For example, see Kettl (1986) on the debate between Henry Simon (rules) and Marriner Eccles (discretion).
two-period people; a single asset, money; and no uncertainty. The young agents
form the working class. They use their earnings to finance consumption when
young and to acquire money with which they buy consumption when old. Thus,
the old form the nominally wealthy class. While the tie between the model's
young and old generations and the nominal debtors and creditors of the historical
conflict is not direct, the model forms a convenient illustration. Of course, since
the nominally indebted do tend to be younger than the nominally wealthy, the
direct analogy is not empty.

This section lays out the model and its competitive equilibria under exogenous
monetary policy. For simplicity, I focus exclusively on constant money growth
equilibria. Three assumptions define the basic model.

A.1. Agents. i) Each agent lives two periods. ii) The old population at t is \( N_t; \)
\( N_0 > 0; \) population grows at the rate \( x > 0. \) iii) Each member of the generation
born at \( t \) maximizes:

\[
u(c_{y,t}, c_{o,t+1}) = \ln(c_{y,t}) + \delta \ln(c_{o,t+1}), \quad 0 < \delta < 1,
\]

(1)

where \( c \) is consumption with indices indicating whether the consumption is by a
(y)oung or (o)ld person and the date at which consumption occurs. iv) Each
young person supplies labor inelastically for a fixed commodity wage, \( w, \) that
cannot be stored.

A.2. Money. i) Money is durable and cannot be consumed. ii) The stock of
money at \( t \) is \( M_t; \) before trade opens at \( t = 0, \) each old person holds \( M_0/N_0 > 0 \)
units of money. iii) The money stock grows at a rate \( z_t \) between \( t \) and \( t + 1. \)

Any addition to the money stock between period \( t \) and \( t + 1 \) is distributed in
equal shares to the old at \( t + 1 \) before any trading occurs.

A.3. Inflation/deflation cost. i) The young and old at \( t \) each pay \( \Phi(z_t) = \phi z_t^2, \)
\( \phi > 0, \) in real terms for the growth in the money stock. ii) The money growth
rate, \( z_t, \) strictly satisfies the resource constraint: \( (2 + x)/(1 + x) \Phi(z_t) < w. \)
iii) The minimum feasible \( z \) is greater than \(-1.9\)

While some sort of quadratic cost like assumption A.3 is nearly universal in the
political monetary policy literature, the assumption is ad hoc. One could generate
the cost in a somewhat richer way, but only at the cost of considerable added
machinery. Further, most existing alternatives rely on some difficult-to-motivate

\( ^7\)This is not too tight a restriction in that all of the policy formation structures studied can achieve
a Pareto optimal outcome.

\( ^8\)While logarithmic utility is expositonally convenient, the basic character of the results requires only
mild restrictions on preferences.

\( ^9\)The last two technical restrictions simplify the proofs by bounding the feasible growth rate between
\(-1 \) and \( 1, \) with positive consumption at the limits.
assumption such as putting real balances in the utility function (McCallum, 1987). The focus of this paper is not on why inflation is costly, but on why a pro-inflation bias might arise despite an inflation cost. Thus, while I carefully motivate the preference for inflation surprises, I follow the literature in assuming an inflation cost.

The competitive, exogenous policy equilibrium is defined in the standard way:

Definition 1. A competitive equilibrium is a sequence of nonnegative consumption pairs for young and old, money stocks, and prices, such that for each $t$, $c_{y,t}$, $c_{o,t+1}$, and $m_t^d$ maximize utility (1) subject to the budget constraints:

$$w \geq c_{y,t} + \frac{m_t^d}{p_t} + \Phi(z_t),$$

(2)

$$\frac{m_t^d}{p_{t+1}} + \frac{z_t M_t}{N_{t+1} p_{t+1}} \geq c_{o,t+1} + \Phi(z_{t+1}),$$

(3)

and that also satisfy the aggregate resource and money supply constraints:

$$w \geq c_{y,t} + \Phi(z_t) + \frac{c_{o,t} + \Phi(z_t)}{1 + x},$$

(4)

$$\frac{M_t}{N_{t+1}} \geq m_t^d.$$  

To examine the equilibria of the model, begin with the young consumers’ first-order condition,

$$p_{t+1}/p_t = \delta c_{y,t}/c_{o,t+1}.$$  

(5)

Define real balances per member of the old generation, $r_t = M_t/(N_t p_t)$, substitute for consumption in (5) using the budget constraints, and rearrange to give

$$R(z_t, z_{t+1}, r_{t+1}) = r_t = \frac{\delta (1 + x)(w - \Phi(z_t))}{(1 + z_t)(1 - \Phi(z_{t+1}) r_{t+1}^{-1}) + \delta}.$$  

(6)

This function reveals how real balances evolve whenever the consumers’ first-order conditions are satisfied. The steady-state level of real balances associated with constant money growth, $z^*$, is

$$\bar{R}(z^*) = \frac{\delta (1 + x)(w - \Phi(z^*)) + (1 + z^*)\Phi(z^*)}{1 + z^* + \delta}.$$  

(7)

From (6), it is clear that, starting from a zero money growth, a one-shot increase in money growth at $t$ lowers real balances: $\partial R(z_t, 0, \bar{R}(0))/\partial z_t|_{z=0} < 0$. The surprise increase in money growth from $t$ to $t + 1$, announced before trading at $t$, leads to higher expected inflation. The lower implied real return on money
makes the young less willing to hold money from $t$ to $t + 1$, and the value of money falls.

To evaluate the welfare implications of higher steady-state money growth, combine (7) with the budget constraints to give steady-state consumption:

$$
\tilde{c}_y(z^*) = w - \frac{\tilde{R}(z^*)}{1 + \alpha} - \Phi(z^*),
$$

$$
\tilde{c}_o(z^*) = \tilde{R}(z^*) - \Phi(z^*).
$$

From these equations it is straightforward to establish the following:

**Proposition 1.** For every rate of money growth, $z^*$, feasible under A.3, there is a constant money growth equilibrium with real balances $\tilde{R}(z^*)$ and consumption $\tilde{c}_y(z^*)$ and $\tilde{c}_o(z^*)$.

i) For all but the initial old, equilibrium utility falls monotonically as money growth rises or falls from zero.

ii) For the initial old, utility falls monotonically as money growth rises from zero. Utility initially rises and ultimately falls as money growth is lowered from zero.

**Proof.** See the Appendix.

For all but the initial old, deviations from zero money growth hurt by increasing the inflation/deflation cost and by driving the real rate of return on money away from the growth rate of output. At zero money growth, the old would prefer to lower money growth, which raises real balances. At some point, however, this benefit is outweighed by the deflation cost. If a benevolent policymaker’s options were limited to setting $z^*$, she clearly would choose a money growth rate somewhere between zero and the negative rate that maximizes utility of the initial old.

4. Equilibria with endogenous policy by majority

This section considers which of the constant money growth equilibria can be supported when policy is chosen by majority will. The central result is that the majority workers may choose positive money growth, making everyone worse off than under zero money growth. Showing the result for agents who take full account of the effect of current votes on future policy involves some complications and involves some added machinery. Assume that policy is chosen according to:

**A.4.** Before any trading takes place in period $t$, the agents vote on the money growth rate, $z_t$. The growth rate receiving the most votes is implemented.
To explore equilibrium policy chosen in this way, I build on Chari and Kehoe’s (1990) work on sustainable plans. A key feature of the endogenous policy equilibrium is that agents have rational expectations about how future agents will respond to current policy. In particular, the expected response of future agents must be consistent with rationality of those future agents. This restriction falls under the heading of a perfect equilibrium constraint.

The demonstration of majority rule equilibria begins with voting strategy functions, which give the growth rate that the current young and old generations are expected to vote for at $t$ as a function of past policy,

$$z_{yt} = v_y(Z_{t-1}), \quad z_{ot} = v_o(Z_{t-1}),$$

where $Z_{t-1}$ is the history of money growth before $t$.

The perfect equilibrium constraint on, for example, the young’s strategy says that for every history of growth rates, the expected voting behavior of the young must maximize their utility, conditional on all future agents voting according to strategy. Defining $U_y(z_t, Z_{t-1})$ as the utility payoff to the young when $z_t$ is adopted after history $Z_{t-1}$, perfect equilibrium requires that

$$U_y(v_y(Z_{t-1}), Z_{t-1}) = \max_{Z_t} U_y(z_t, Z_{t-1}), \quad (10)$$

for all $t$ and $Z_{t-1}$. The payoff function, $U_o$, and the perfect equilibrium constraint are analogously defined for the old. Now the majority rule equilibrium can be defined:

**Definition 2.** A majority rule equilibrium is given by a competitive equilibrium with a sequence of money growth rates, $\{z^*_t\}$, and strategy functions for young and old that i) satisfy the perfect equilibrium constraints and that ii) make $z^*_t$ the equilibrium choice for the majority generation at time $s$ when all previous generations have chosen according to $\{z^*_t\}$.

4.1. The inflationary bias

The simplest equilibrium strategy is one in which every young generation unconditionally votes for some $z^*$, and the economy follows the stationary $z^*$ equilibrium. The equilibrium $z^*$ must be such that the young do best choosing $z^*$ no matter what has happened before, so long as $z^*$ is expected to be chosen thereafter.

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10Loewy (1988) studied policy set by the young or old in an overlapping generations model, but does not consider the cost of inflation or any dynamic linkages of policy through time.

11Chari and Kehoe (1990) provide a detailed account of the perfect equilibrium interpretation in a context similar to that here.

12For simplicity, I only consider nonrandom strategies in which voters condition only on past monetary growth rates.
Consider a candidate $z^*$. What utility could the young get from *unexpectedly* voting for $z_t \neq z^*$ at $t$? Since future generations are expected to choose $z^*$, the only stationary equilibrium involves all real variables — including the current young's consumption when old — returning to their $z^*$ equilibrium values at $t+1$. Thus, the young can do no better than to choose $z_t$ to maximize consumption when young, which from (2) and (5) requires

$$\frac{1}{(1+x)} \frac{\partial r_t}{\partial z_t} = \Phi'(z_t).$$

The young balance the marginal benefit of surprise inflation (through shrinking the wealth of the old) against the marginal inflation cost, $\Phi'$. The crucial term is the change in real balances following a one-shot increase in money growth. As emphasized above, starting from zero money growth, such a one-shot increase lowers real balances. This benefits the young and comes at an inflation cost of $\Phi'(0) = 0$. Thus, the point where the marginal benefit to surprise inflation is just offset by the cost involves positive inflation:

**Proposition 2.** An unconditional voting equilibrium with constant money growth exists. Any such equilibrium has positive money growth.

**Proof.** See the Appendix.

Of course, positive money growth equilibria leave everyone worse off than under zero money growth.

4.2. Other good and bad equilibria

Having found an unconditional strategy equilibrium in Proposition 2, it is straightforward to lay out voting strategies that will support any constant money growth rate leaving the young as well off as in the unconditional equilibrium. The simplest strategies of this sort are *trigger* strategies. The young majority is expected to vote for some $z^*$ so long as the previous generation has. If some generation deviates, however, all future generations switch to the growth rate chosen in the unconditional equilibrium. Such behavior might arise in practice if, for example, surprise inflation today breaks down some societal consensus for low inflation.

The trigger strategies will satisfy the perfect equilibrium constraint so long as the young can be deterred from deviating from $z^*$ today by the fear of facing the unconditional equilibrium growth rate, call it $z''$, when old. The previous section showed that, if they expect $z''$ when old, the young can do no better than to choose $z''$ now: those who deviate can at best attain the utility of the $z''$ equilibrium. From this reasoning it is clear that:
Proposition 3. There exists a \( z^U < 0 \) such that any growth rate, \( z^* \in [z^U, z^u] \), can be supported as a majority rule equilibrium.

The positive money growth equilibria leave everyone worse off than under zero money growth. The zero money growth equilibrium and those with small negative rates are efficient among market outcomes.

Of all these majority rule equilibria, which ones involve expectations and strategies that seem likely to occur in practice? Achieving a good equilibrium requires a certain coordination in the beliefs of current voters about current and future voters. Such factors as communication, morals, and conventions might increase the chance of a good outcome, but the reliability of such factors in a large and diverse economy is difficult to assess. Unless the required coordination came to pass, an economy might be expected to have periodic struggles resisting the redistributive urges, which is precisely what was common in the U.S. before the founding of the Fed. In such a situation, it is natural for the society to seek a better alternative.

5. Endogenous policy by independent, balanced board

The framers of the Fed attempted to improve upon policy by majority by creating an independent, balanced board. The essence of this solution can be illustrated in this model by considering policy set by a board made up of one worker and one wealthy person. While the formal demonstration of the problem with policy by majority involved some subtleties, the solution is easy to see. If the wealthy board member exerts any influence, there is a clear presumption that the board's policy will involve a lower money growth rate than the bad, majority voting outcome.

It is important to ask why the balanced board solution is of interest in the face of other solutions in this model, such as a zero money growth rule. As emphasized in Section 2, the framers doubted whether they could codify a good rule. In a richer (necessarily unsolvable) model, the choice of discretionary policy might arise naturally if the complexity of the economic environment made codification of a satisfactory monetary rule too costly.

To draw conclusions about board behavior, bargaining rules are needed. For simplicity, I consider bargaining rules described by Rubinstein (1982):

A.5. Before trading takes place in period \( t \), one young agent and one old agent must agree on the money growth rate, \( z_t \). The two alternate in making money growth rate offers, beginning with the young, until some offer is accepted.

When there is a cost of delaying agreement, these rules give the first mover an advantage that is limited by the cost of proceeding to the next bargaining round.
In the context of this paper, this cost is surely minuscule; thus, I interpret balanced power as the case of a vanishingly small bargaining cost. Specifically, take the payoff functions of the previous section and add a small per-round bargaining cost of $d$. Now the expected utility for young and old from agreeing to any $z_i$ in bargaining round $i$ at time $t$ are $U_o(z_i, Z_{t-1}) - d(i-1)$ and $U_o(z_i, Z_{t-1}) - d(i-1)$.$^{13}$

As in the previous section, the two agents have strategy functions. The young’s strategy function in bargaining round $i$ at time $t$ gives her offer as a function of rejected offers in earlier bargaining rounds at $t$ and of the history of growth rates. In even numbered rounds, the young’s strategy dictates acceptance or rejection of the old’s offer as a function of the offer, earlier offers, and the history of growth rates. The old agent’s strategy is similarly defined. Given such strategy functions, the equilibrium can be defined parallel to the majority rule equilibrium:

**Definition 3.** An equilibrium by board is given by a competitive equilibrium with a sequence of money growth rates, $\{z_s\}$, and strategy functions for the young and old bargainer such that i) in every bargaining round $i$, at every time $t$, no matter what offers and growth rates have come before, no board member can attain higher utility by deviating from the strategy than by following it, and such that ii) $z_s$ is the equilibrium bargain at $s$ when all previous bargains have gone according to $\{z_s\}$.

It is particularly illuminating to consider the analog here of the unconditional voting equilibria. The unconditional strategies dictate that the young bargainer always offers some $z^*$, and accepts offers at least as good as getting $z^*$ in the next bargaining round. The old bargainer offers some $\tilde{z}$ and accepts offers as good as getting $\tilde{z}$ in the next bargaining round. Rubinstein’s argument shows that the strategies based on $(z^*, \tilde{z})$ form a perfect equilibrium if the old bargainer is indifferent between $z^*$ immediately and $\tilde{z}$ next round:

$$U_o(z^*, Z_{t-1}) = U_o(\tilde{z}, Z_{t-1}) - d. \tag{12}$$

Similarly the young must be indifferent between $\tilde{z}$ next round and $z^*$ immediately:

$$U_y(\tilde{z}, Z_{t-1}) = U_y(z^*, Z_{t-1}) - d. \tag{13}$$

Under these conditions, the old will accept $z^*$ in the initial round, since there is nothing to gain from going on.

A revealing characterization of the equilibrium can be derived by considering the balanced power case in which the bargaining cost is small. Solving (12) and (13) for $d$ and equating gives

$$U_y(z^*, .) - U_y(\tilde{z}, .) = U_o(\tilde{z}, .) - U_o(z^*, .). \tag{14}$$

$^{13}$Given log utility, this formulation implies that preferences are a monotonic transform of (for the young) $\exp(d)^{(t-1)}c_yc_o$. This is analogous to Rubinstein’s constant discounting case.
For small \( d \), both sides of this equation will be near zero. Under a first-order approximation, \( U_y(z^*, \cdot) - U_y(\tilde{z}, \cdot) \approx (z^* - \tilde{z})U'_y(z^*, \cdot) \), where the derivative is with respect to the first argument. Substituting the approximations for young and old in (14) implies that for vanishing \( d \),

\[
U'_y(z^*, \cdot) = -U'_o(z^*, \cdot).
\tag{15}
\]

The workers can push the growth rate up only if the marginal benefit to them is greater than the marginal cost to the wealthy. In contrast, in the unconditional voting case, the workers pushed inflation up until no further benefit remained to the workers. This reasoning is summarized in,

**Proposition 4.** There is a constant money growth equilibrium with policy by board involving unconditional bargaining strategies and sufficiently small bargaining cost. No such equilibrium has positive money growth.

**Proof.** See the Appendix.

I believe this result illustrates the general principle relied upon by the framers of the Fed: a board on which the preferences for and against surprise inflation have been re-balanced relative to the general population is likely to select a better policy than that which would be adopted by the majority. While seriously modelling the actual bargaining process of the FOMC would be impossible, this model captures the essence of why such a policymaking structure might be adopted.

6. Discussion

Whom can we trust to run the Fed? The answer chosen by the Fed’s framers reflected a fear of both banker and political or populist control. Indeed, given these fears, ‘the only eligible appointees would have been a group of vestal virgins’ (Timberlake, 1978, p. 199). Lacking a reliable source of such appointees, the framers suggested forming a board on which the destructive forces for and against surprise inflation were re-balanced relative to the general population.

Did the framers get the balance right? A review of the Fed’s performance is beyond the scope of this paper. Several bits of evidence, however, suggest that the structure of the Fed has been important. Hetzel (1986), for example, argues that in dealing with the Fed, Congress’s concern with distributional issues exerts an ‘all pervasive influence’. Congress’s perception that the Fed had refused to inflate sufficiently in sympathy with the Kennedy tax cuts of 1964 led to a proposal that, among other things, would have removed voting rights of the Reserve Bank presidents on the FOMC. Supporters of bills to make the appointment of the Bank presidents more democratic have emphasized the presidents’ historical

The most general lessons from this work are that two largely ignored factors — the diverse inflation preferences of the public and the internal decisionmaking structures of the central bank — are important in studying inflation. For example, Hirshman (1985) suggests an inflation bias like that outlined above has also operated in some South American countries. Successful institutional reform in these countries may require some policy formation mechanism that over-samples the interests of the anti-inflation forces relative to their presence in the general population. By the same token, some societies may coordinate on a low inflation equilibrium without the sort of institutional structures described here. For example, Germany’s experience with hyperinflation may have served to coordinate the public in this way.

Some have attacked the optimality of independent central banks because they are at odds with democratic principles (Friedman, 1962; Tobin, 1991). While an independent central bank is clearly not democratic in the simplest sense of the term, neither are many important institutions in democracies. For example, some of the U.S. Constitution’s Article I, Section 10 restrictions were put in place to thwart the popular desire for periodic debt relief. Few economists would suggest that capitalism would be well-served by repealing Section 10 and leaving contract enforcement open to majority vote. Similar reasoning clearly applies regarding the power to alter the terms of nominal contracts through surprise inflation.

Appendix

Proof of Proposition 1. Existence of equilibrium: the first-order condition and budget constraints are satisfied by construction; the positivity and second-order conditions are easily verified. Part i: Define $Q(z^*) = w - (2 + x)/(1 + x)Q(z^*)$ and $k(z^*) = \tilde{c}_y(z^*)/Q(z^*)$. Defining steady-state utility of the young $\tilde{u}_y(z^*)$, we have

$$\frac{\partial \tilde{u}_y(z^*)}{\partial z^*} = Q(z^*)[\tilde{c}_y^{z*} - \delta(1 + x)/\tilde{c}_o]k'(z^*)$$

$$+ [\tilde{c}_y^{z*} k(z^*) + \delta \tilde{c}_o^{-1}(1 - k(z^*))](1 - x)]Q'(z^*).$$

Now show that both of these terms have the opposite sign of $z^*$. Term 1: $Q(z^*) > 0$, and $k'(z^*) > 0$ since [using the definition of $k$ and (5)] $k(z^*) = (1 + z^*)/(1 + z^* + \delta)$. Manipulation (5) shows that the term in brackets has the opposite sign of $z^*$. Term 2: $Q'(z^*)$ has the opposite sign of $z^*$, and the remaining term is positive.
Part ii: Using the same logic for the initial old,
\[ \hat{c}_o(z^*)/\hat{c}_o = \hat{c}_o^{-1}(1 + x)((1 - k(z^*))(Q(z^*) - Q(z^*)k'(z^*)). \]
This expression is negative for \( z^* \geq 0 \), and, hence, for negative \( z^* \) near zero. The derivative must turn positive as \( z^* \) falls to its lower bound under A.3 at which consumption falls to zero. Q.E.D.

**Proof of Proposition 2.** Given a fixed \( z^* \) expected of future agents, young utility from choosing \( z_t \) is a monotonic transform of young consumption, \( c_y(z_t, z^*) = w - R(z_t, z^*, \hat{R}(z^*))(1 + x) - \Phi(z_t) \). To maximize this, consider \( \hat{c}'_y(z_t, z^*) = \hat{c}' c_y(z_t, z^*)/\hat{c}_t \). The following properties can be easily verified: i) For each fixed \( z^* \) feasible under A.3, there exists one and only one feasible \( z_t^* \) such that \( \hat{c}'_y(z_t^*, z^*) = 0; z_t^* > 0 \); \( c'_y \) crosses zero from above at \( z_t^* \). Thus, for any \( z^* \), there is a unique best action \( z_t^* > 0 \). ii) There exists a feasible \( z^* \) such that \( \hat{c}'_y(z^*, z^*) = 0 \). Together, i) and ii) show that for some fixed \( z^* > 0 \) and for no \( z^* < 0 \), if future agents are expected to pick \( z^* \), then \( z^* \) is best for the young today. Q.E.D.

**Proof of Proposition 4.** Given the strategies in the text, for existence of equilibrium at \( t \) given future policy of \( z^* \), it is sufficient that we find a \((z^*, \hat{z})\) pair such that i) (12) and (13) hold and ii) neither \( z^* \) or \( \hat{z} \) are strictly Pareto dominated. The strategies and argument in the text establish this as an equilibrium, and if this is an equilibrium at \( t \), it is also an equilibrium for all times.

Given that \( U_y \) and \( U_o \) are smooth, existence of a \( \hat{z} \) that is not Pareto dominated and that satisfies \( g(\hat{z}) = U'_y(\hat{z}, \hat{z}) + U'_o(\hat{z}, \hat{z}) = 0 \) implies existence of a \((z^*, \hat{z})\) pair close to \( \hat{z} \) satisfying i) and ii) for any sufficiently small \( d \) so long as both \( U'' \) functions are continuous at \( \hat{z} \) and \( U''(\hat{z}) \neq -U''(\hat{z}) \).

Using the definitions in the previous proof, \( U'_y(z_t, \hat{z}) = c'_y(z_t, \hat{z})/c_y(z_t, \hat{z}) \). For the old, define \( c_o(z_t, \hat{z}) = R(z_t, \hat{z}, \hat{R}(\hat{z})) - \Phi(z_t) \) and \( c'_o(z_t, \hat{z}) = \hat{c}' c_o(z_t, \hat{z})/\hat{c}_t \). Using these definitions, it is easy to verify that \( g(0) < 0 \) and \( c'_o(\hat{z}, \hat{z}) > 0 \) for all \( \hat{z} \leq 0 \). Direct calculation reveals that \( c'_o(\hat{z}, \hat{z}) \) is positive at the \( \hat{z} < 0 \) that maximizes steady state consumption for the old (where \( \hat{c} = 0 \)). Thus, by continuity, there is a \( \hat{z} \in [\hat{z}, 0] \) with \( g(\hat{z}) = 0 \). Verifying that \( \hat{z} \) satisfies the second derivative restriction and is not Pareto dominated is tedious but straightforward.

Under the assumptions here i) is necessary for equilibrium for sufficiently small \( d \), so to rule out positive money growth equilibria, we show that \( g(\hat{z}) = 0 \) implies \( \hat{z} < 0 \). Assume \( g(\hat{z}) = 0 \), implying \( \hat{c}_o(\hat{z})/\hat{c}_o(\hat{z}) + c'_o(\hat{z}, \hat{z}) = 0 \). From (5), the first term is \( \delta(1 + x)/(1 + \hat{z}) \). From the resource constraint, \( c'_y + c'_o(1 + x) + (2 + x)/(1 + x)\Phi(\hat{z}) = 0 \), implying \( c'_o(\hat{z}, \hat{z}) = (1 + \hat{z})(2 + x)\Phi(\hat{z})[(1 + x)(\delta - (1 + \hat{z}))]^{-1} \). For positive \( \hat{z} \), both this expression and \( c'_o(\hat{z}, \hat{z}) \) are negative, but this contradicts \( g(0) = 0 \). Q.E.D.
References