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DISCUSSION PAPER NO. 201

THE DEMAND FOR AND SUPPLY OF INFLATION

by

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## THE DEMAND FOR AND SUPPLY OF INFLATION\*

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"The printing press is the machine gun of the proletariat, mowing down the monied classes."--G. Sokolnikov.<sup>1</sup>

"The first panacea for a mismanaged nation is inflation of the currency; the second is war. Both bring a temporary prosperity; both bring a permanent ruin. But both are the refuge of political and economic opportunists."--Ernest Hemingway.<sup>2</sup>

### I. INTRODUCTION

Economic research on the causes of inflation has been primarily devoted to the theoretical and empirical study of the links between government policy variables and the rate of inflation. While debate continues on the process of short-run adjustment, most economists are prepared to agree that in the long run "inflation is always and everywhere a monetary phenomenon."<sup>3</sup> Abundant empirical evidence has confirmed that the major historical accelerations and decelerations of inflation--not only during wars and hyperinflations but also during peacetime--have been accompanied by accelerations and decelerations in the rate of growth of the supply of money.<sup>4</sup> But confirmation of the connection between money and prices is only the first and easiest step in the development of a full theory of the causes of inflation, because it leaves completely unexplained the sources of changes in money.

The central task of a comprehensive theory of inflation is the identification of the sources of differences in the rate of inflation and hence of monetary growth across time in particular countries, and across countries at a given time. The worldwide acceleration of inflation in the 1960s and 1970s requires explanation, as does the more general contrast between the centuries-long era of zero average inflation prior to World War II and the post-war era of consistently positive inflation.<sup>5</sup> The thesis of this paper is that accelerations in money and prices are not thrust upon society by a capricious or self-serving government, but rather represent the vote-maximizing response of government to the political pressure exerted by a potential beneficiaries of inflation. It is not enough, in short, for economists to issue the facile judgment that inflation would end if governments would simply reduce the growth rate of the money supply, because this recommendation unrealistically ignores the reaction of constituents prepared to vote against politicians who carry out such a policy.<sup>6</sup>

The analysis of the political economy of inflation can be fruitfully divided into two major sub-topics, the "demand for" and "supply of" inflation. While no group in society explicitly "demands" more inflation, pressures for the government to pursue a more inflationary policy, or not to pursue an anti-inflationary policy, emanate from taxpayers who resist tax increases made necessary by increases in expenditures (e.g., during wartime), beneficiaries of government programs who resist expenditure reductions, groups attempting to obtain an increase in their share of national income, and, in open economies, from price increases and inflows of money from abroad. These pressures constitute an implicit, if not an explicit, demand for inflation.

The first part of the paper analyzes two major sets of factors which explain differences in the magnitude of such pressures across time in particular countries, and across countries at a given time, the inflationary episodes associated with money creation (a) during wars and periods of postwar reconstruction when conventional taxes impose allocative, administrative, and avoidance costs, and (b) in the wake of "cost-push" by economic groups attempting to increase their income shares.

The mere existence of pressures on the government to inflate does not guarantee that inflation will occur. Variations in the monetary expansion "supplied" in response to a given level of pressure must be explained as well. If voters are sufficiently myopic, politicians may manipulate the economy in a vote-maximizing political business cycle, which, as Nordhaus has shown, can raise the actual average rate of inflation above the economic optimum.<sup>7</sup> But the political business cycle is only a part of a complete theory of the supply of inflation. The nature of government response to a given demand for inflation depends not only on the proximity of elections, but as well on the structure of labor markets, since the degree of rigidity of wages determines the unemployment cost of an attempt to resist inflation; on the complexity of political institutions required to ratify an increase in conventional taxes, since a relatively high legislative negotiation cost tends to increase the share of any given expenditure increase financed by the inflation tax; on the degree of insulation of the Central Bank from political pressure; on the degree to which party lines coincide with the division in society between relative gainers and losers from inflation (given the high cost of search for alternative forms

of political organization); and on the existence of dominant noneconomic political issues which emerge from time to time to divert voters' attention from the economic performance of the incumbents.

The main alternatives to our two-sided demand-supply approach to inflation theory are the "hard-line monetarist" and "hard-line cost-push" frameworks. As set forth by Johnson, the "basis of the world inflation is the expansion of the world money supply," and any attempt to bring in other factors, particularly those of the cost-push variety, represents a distressing resort to "amateur sociology and politics" which can play "no part whatsoever in the problem."<sup>8</sup> Cost-push proponents are not nearly as ready to rule out the relevance of the money supply, since they recognize that a push, e.g., an attempt by a labor union to increase its income share, causes higher unemployment rather than continuing inflation unless accommodated by the monetary authorities. Marris motivates his cost-push analysis by asking "...why have governments felt it necessary to create so much money?"<sup>9</sup> Wiles considers the supply of money "not unimportant."<sup>10</sup> Some members of the cost-push camp, however, do reject the proposition that a constant monetary-growth-rate rule could prevent the acceleration of inflation in the face of cost pressure, arguing (without empirical evidence) that the long-run relation between money and prices can be broken by a highly elastic demand for money and/or a highly elastic supply of money substitutes, e.g., Eurodollars.<sup>11</sup>

This paper rejects hard-line monetarism as uninteresting on the twin grounds that it leaves unexplored the sources of excessive money creation

and that its explanation of world inflation before 1972 as the result of U. S. money creation leaves unexplained the failure of non-U. S. governments to allow their exchange rates to float upward; the shift from the gold standard to the Bretton Woods system and finally to flexible exchange rates needs an explanation and cannot be accepted as a datum.<sup>12</sup> The theoretical and empirical underpinning of cost-push is examined, not as a single universal explanation, but rather as one of several manifestations of the "demand for inflation," i.e., sources of pressure for monetary accomodation. Similarly, theoretical and empirical support for the political business cycle--the deliberate generation by vote-buying politicians of election-synchronized economic expansions--is explored as one of several determinants of the supply of inflation.

This paper consists primarily of a theoretical analysis of the several ingredients of the demand for and supply of inflation: what are the assumptions necessary for each to constitute a logically valid cause of an acceleration or deceleration in the rate of inflation, holding constant the contribution of other ingredients? While no new empirical results are provided, both recent empirical papers by other investigators and individual historical cases are reviewed for evidence which supports the relevance of each ingredient and, implicitly, refutes as inadequate the single-explanation theories.

## II. THE DEMAND FOR INFLATION BY TAXPAYERS

Inflation as a Source of Government Finance

The neoclassical analysis of the optimum rate of inflation does not in general attribute any particular merit to the maintenance of price stability. This nonpolitical approach is of limited interest except as a point of departure, because of its restrictive assumptions that inflation is (a) perfectly anticipated, (b) completely adjusted to by market institutions (e.g., all effective usury ceilings on interest rates have been eliminated), and (c) causes no changes in relative prices. The only institutional rigidity is the maintenance of a zero interest rate on money, so that steady inflation acts as a selective excise tax on real balances. Since the social cost of creating real balances is zero, the welfare cost of steady inflation can be measured by the area under the demand curve for real balances between the quantity of real balances actually held and the optimum quantity of money. If the marginal administrative and allocative cost of collecting alternative taxes is zero, so that society gains nothing from even partial reliance on the inflation tax, then the optimum market interest rate on bonds is zero and the optimum rate of inflation is the negative of the real interest rate, since money holdings are optimal only when their marginal benefit, i.e., the interest rate on bonds minus the interest rate on money, equals their zero marginal cost.<sup>13</sup>

Movement to the satiation level of real balances requires a reduction in government revenues from the inflation tax and an increase in



revenues from other taxes. To the extent that these increased taxes impose administrative or allocative costs, then efficiency requires that the marginal cost of lost liquidity when revenue is raised through the inflation tax ( $MC_{\pi}$ ) be equated to the marginal cost of raising revenue from other taxes ( $MC_T$ ). The marginal liquidity cost of inflationary finance per dollar of revenue raised can be written:

$$(1) \quad MC_{\pi} = \frac{a(\pi + r - i_m)}{1 - a(\pi + x)},$$

where  $\pi$  is the percentage rate of change of prices,  $a$  is the absolute value of the elasticity of the semilogarithmic slope of the demand for real balances with respect to its opportunity cost,  $r$  is the real interest rate on bonds,  $i_m$  is the nominal interest rate on money, and  $x$  is the rate of growth of real output.<sup>14</sup> The numerator is the social cost of a change in the inflation rate, i.e., the opportunity cost of holding money (i.e., the difference between the nominal interest rates on bonds and money) times the change in real money balances induced by a change in the opportunity cost. The first term in the denominator (unity) represents the one dollar of increased revenue the government would gain from that extra inflation if real money balances were interest-inelastic, and the second term subtracts the revenue lost through the shrinkage in the tax base. Equating  $MC_T$  with  $MC_{\pi}$ , we obtain:

$$(2) \quad \pi^* = \frac{-r + i_m + MC_T(1/a - x)}{1 + MC_T},$$

where  $\pi^*$  is the optimal inflation rate.

When other taxes are costless and no interest is paid on money, (2) reduces to the familiar statement that the optimum rate of inflation equals the negative of the real interest rate. Positive costs of levying other taxes and the payment of interest on money are both factors which raise  $\pi^*$ . In the extreme case of interest paid on money equal to the interest rate paid on bonds, the optimal rate of inflation is indeterminate, since satiation can occur at any inflation rate.

#### Wars, Postwar Reconstruction, and the Rationality of Money Creation

By itself the optimum inflation literature does not take us very far, because it is limited to fully anticipated inflations, it provides no explanation of accelerations or decelerations in inflation, and it takes the interest rate paid on money as a datum. It is possible, however, to develop a simple explanation of many episodes of excessive money creation and accelerating inflation from the basic idea that conventional taxes are costly to collect. Omitting bond finance from consideration to avoid unnecessarily complicating the paper, the government's budget constraint is:

$$(3) \quad G = \tau Y + \rho Y,$$

where  $G$  is nominal government spending,  $\tau$  is the average rate of conventional taxes levied on nominal income, and  $\rho$  is the share in nominal income of the government deficit, i.e., inflation tax revenue. Revenue from the inflation tax is a positive function of the rate of inflation ( $\pi$ ) up to the maximum-revenue inflation rate  $(\hat{\pi})$ :<sup>15</sup>

$$(4) \quad \rho = \rho(\pi), \begin{cases} \rho' > 0, & \pi < \hat{\pi}; \\ \rho' < 0, & \pi > \hat{\pi}. \end{cases}$$

From (1), we can write the marginal cost of collecting the inflation tax as a positive function of the rate of inflation:

$$(5) \quad MC_{\pi} = \phi(\pi), \phi > 0, \phi'' > 0.$$

The total social cost of collecting conventional taxes consists of both an allocative and an administrative component. In the simplest case with linear demand and supply schedules, the dead-weight allocative loss associated with conventional taxes increases as the square of the tax rate, and hence the marginal deadweight loss ( $MC_D$ ) is a function of the tax rate:

$$(6) \quad MC_D = \beta(\tau), \beta' > 0.$$

In a more general model  $MC_D$  might also depend on the investment each year by taxpayers in evading taxes, i.e., "tax avoidance capital."

The administrative cost of increasing tax rates depends inversely on the inherited investment by the tax-collection agency in offices, the development of procedures, and enforcement expenses (which depend on traditions of efficiency and honesty), and by taxpayers in "learning-by-doing" to file tax returns properly. These items may be lumped together and labelled "tax-collecting capital."<sup>16</sup> Several cases may be distinguished:

(a) Tax rates may be raised with zero extra investment in tax-collecting capital, so that the administrative component of the marginal cost of collecting conventional taxes is zero. This case is probably true of the U. S. today.

(b) Inherited capital is small, and any significant increase in  $\tau$  requires new and/or more complex taxes. In this case, the marginal administrative cost function starts at zero for modest increases in  $\tau$  above the initial level ( $\tau_0$ ), say to  $\hat{\tau}$ , then increases with  $\tau$  up to the

point where the tax-collecting apparatus for the major types of taxes is set up ( $\tilde{\tau}$ ), and decreases thereafter:

$$(7) \quad MC_A = \gamma(\tau), \begin{cases} \gamma = 0, & \tau_0 < \tau < \hat{\tau}; \\ \gamma' > 0, & \hat{\tau} < \tau < \tilde{\tau}; \\ \gamma' < 0, & \tau > \tilde{\tau}. \end{cases}$$

The total cost of financing a given increase in government expenditure is minimized when the marginal cost of increasing the inflation tax ( $MC_{\pi}$ ) is equated to the marginal allocative and administrative costs of increasing conventional tax rates. Substituting from (5), (6), and (7), we have:

$$(8) \quad \phi(\pi) = \beta(\tau) + \gamma(\tau) = \theta(\tau), \quad \theta'(\tau) > 0.$$

Substituting into (8) from (3) (the government budget constraint), and from (4), we obtain:

$$(9) \quad \phi(\pi) = \theta(g - \rho(\pi)).$$

where  $g = G/Y$ , the share of government spending in income.

The optimal rate of inflation ( $\pi^*$ ), net of the political considerations discussed below, is then the solution of (9):

$$(10) \quad \pi^* = \pi^*(\theta, \rho, \phi, g).$$

In Figure 1 marginal cost is measured along the vertical axis and the average tax rate along the horizontal. The marginal cost function for conventional taxes consists of two components,  $\beta(\tau)$  and  $\gamma(\tau)$ . The marginal cost of the inflation tax depends on the inflation rate, which depends in turn [by inverting (2)] on the portion of government spending not financed by conventional taxation, and is shown rising to the northwest

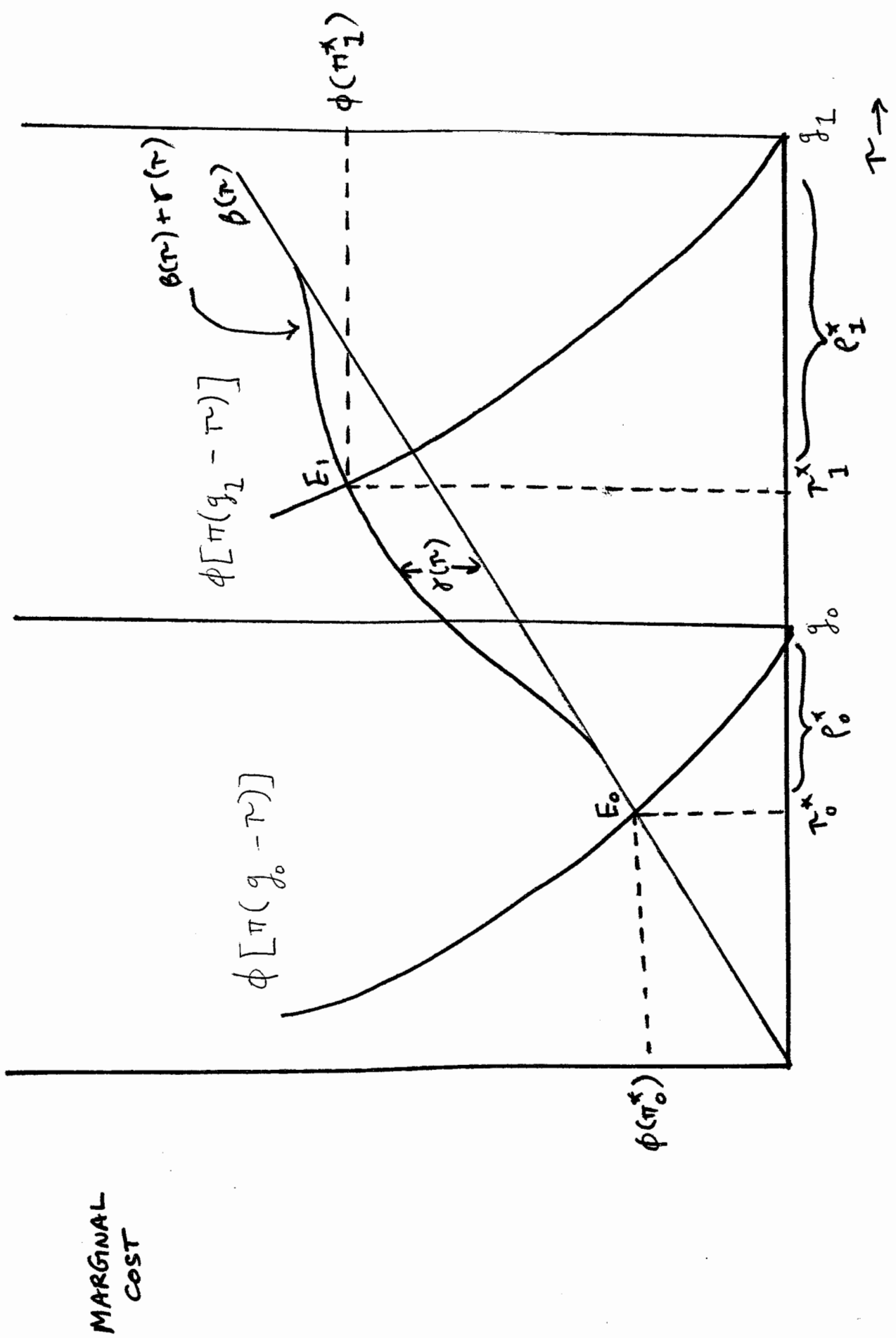


FIGURE 1

of the initial exogenous spending point  $g_0$ . The initial cost-minimizing position is  $E_0$ , where the two marginal cost schedules cross. If government spending should increase to  $g_1$ , as, for instance, during a war or postwar reconstruction, the new cost-minimizing position is at  $E_1$ , and the optimum share of nominal income raised in the form of the inflation tax--i.e., the optimum rate of inflation--increases.

Several general conclusions follow from this analysis:

(1) In general, it will be optimal for the government budget to be financed partially (rather than not at all or entirely) by money creation, and the rate of money creation will depend positively on the share of government spending in total income.

(2) Whether or not the share of government spending financed by money creation increases with  $g$  depends on the relative importance of administrative costs, and the relative slopes of the functions in Figure 1.

(3) A wartime increase in  $g$  is particularly likely to be financed by money creation because (a) the increase in  $g$  will be viewed as temporary, causing the investment in tax-collection capital to be amortized over a relatively short period, (b) wartime disruptions and mobility may make conventional taxes especially hard to collect, and (c) an unpopular war (Vietnam, not World War II) may raise the investment of the public in "tax avoidance capital." Each of these factors can be viewed as shifting up the  $\gamma(\tau)$  administrative cost function in Figure 1, and hence as shifting the minimum-cost point northwest of  $E_1$ .

(4) If the higher level of government expenditures is due not to a war but to peacetime activities which continue permanently, the

accumulation of tax-collection capital (including taxpayer "learning-by-doing") will eventually be completed, and the marginal administrative cost function  $[\gamma(\tau)]$  will shift down, perhaps as far as zero (in which case the marginal allocative cost function  $[\beta(\tau)]$  would be the sole consideration for movements of  $g$  away from  $g_1$ ).

#### Historical Evidence on Money Creation and Government Finance

In a time-series econometric study of the determinants of money creation in the U. S., Barro has found a significant positive effect of the ratio of Federal expenditures to adaptively-estimated "expected expenditures."<sup>17</sup> This result would be expected if acceleration of government spending above its recent average required accumulation of tax-collection capital and encouraged the financing of at least part of the spending by means of money creation. Barro's regressions do not include  $g$  as a separate variable, and their dependent variable includes bank-created money in addition to government-created money. Thus, they do not necessarily rule out the possibility of the increasing marginal allocative cost schedule assumed in (6) above and in Figure 1.

These time-series results are dominated by the explosions in the rate of monetary expansion which occurred during U. S. wartime episodes. Friedman's data on wartime finance during the Civil War, World War I, and World War II, show the three episodes ranked in chronological order according to average annual wartime value of  $g$ .<sup>18</sup> The episodes are also ranked in chronological order according to the average ratio of taxes to expenditure (.21, .43, .61), which is consistent with the theoretical

framework in Figure 1 if the slope of the  $\phi(\tau)$  function is steeper than that of  $\beta(\tau) + \gamma(\tau)$  above the initial point  $E_0$ . Another different but consistent interpretation would be that the marginal cost of increasing conventional taxes per dollar of revenue declines with the level of economic development; most nations have shifted away from excise and customs taxes toward income taxes as their per-capita incomes have grown (the income tax was illegal in the U. S. before 1916), reducing the allocative cost per dollar of revenue if individual labor supply curves are relatively inelastic.<sup>19</sup>

Individuals cannot be assumed to base their voting decisions on the government's success in achieving the social optimum of Figure 1, but may partially or entirely act in their own self interest if that diverges from the social optimum. The taxpayers who bear the burden of a government decision to finance wartime expenditures entirely from conventional taxation form a political group likely to back policies opposite to those supported by the holders of nominal-denominated assets who bear the burden of the inflation tax. Many voters are simultaneously taxpayers and asset-holders but may nevertheless be arrayed by their wealth-income ratios.

Inflation may or may not affect voters in their roles as managers or employees. To take a simple case, an inflation which proceeded without changing the relative prices of goods, and which maintained the real wage through implicit or explicit indexing, would leave employers and employees neutral. The supply of inflation provided by the government would then depend on the political strength of taxpayers relative to nominal-wealth-holders. An extreme case of the political weakness of wealth-holders is



provided by the Russian Civil War hyperinflation of 1918-21, which was justified (see the quotation at the beginning of this paper) as a method of expropriating the bourgeoisie; in 1920, 90% of Soviet government revenue was derived from currency creation.<sup>20</sup> Other examples of political alignments which have influenced the willingness of government to accommodate the pressure for inflation are considered below in our discussion of the supply of inflation.

### III. "COST-PUSH" AS A COMPONENT OF THE DEMAND FOR INFLATION

#### The Incentive to Push

Most American economists in the past decade have exhibited an understandable skepticism that "cost-push" has actually constituted a source of pressure for monetary accommodation, much less a source of inflation by itself without the cooperation of the monetary authorities. In the standard "expectational Phillips curve" model, the percentage rate of change of wages ( $w_t$ ) in a given time period ( $t$ ) equals the expected rate of inflation ( $\pi_t^e$ ) plus a function of the deviation of the unemployment rate ( $u_t$ ) from its "no-push" natural rate ( $u_t^{NPN}$ ). Adding in a hypothetical "push" factor ( $z_t$ ), we obtain:

$$(11) \quad w_t = \pi_t^e + f(u_t^{NPN} - u_t) + z_t, \quad f' > 0.$$

When combined with the simplest markup price equation for the case of zero productivity growth,

$$(12) \quad \pi_t = w_t,$$

the approach leaves no incentive for cost-push by unions, since the unitary elasticity of price change to wage change in the price-markup equation (12) prevents a positive value of  $z_t$  in (11) from raising labor's income

share. Combining (11) and (12) and rearranging, we obtain:

$$(13) \quad \pi_t = \pi_t^e - f(u_t) + [f(u_t^{\text{NPN}}) + z_t]$$

A positive value of  $z_t$  simply raises the natural rate of unemployment from  $u_t^{\text{NPN}}$  to  $u_t^{\text{NPN}} + f^{-1}(z_t)$ . Assuming that the rate of growth of velocity is zero, any effort by the monetary authority to maintain the unemployment rate fixed at  $u_t^{\text{NPN}}$  in the wake of a shift in  $z_t$  from zero to a positive value will make the size of  $z_t$  a determinant of the rate of growth of the money supply ( $m_t$ ):

$$(14) \quad m_t = \pi_t + \bar{x}_t = \pi_t^e + z_t + \bar{x}_t,$$

where  $\bar{x}_t$  is the output growth rate consistent with constant unemployment.

Labor leaders or others considering a push ( $z_t > 0$ ) presumably weigh the costs and benefits of pushing. The worst outcome for the union is a monetary authority which does not accommodate at all and causes the actual unemployment rate to rise, eventually settling down at  $u_t^{\text{NPN}} + f^{-1}(z_t)$ . The best outcome from the union view is a monetary accommodation which prevents an increase in unemployment, resulting in a continuous acceleration of inflation if  $z_t$  is maintained permanently above zero, and, according to (12), leaving the real wage of union members unaffected. If extra inflation at worst increases the unemployment rate, and at best leaves the real wage constant, why would labor leaders regard a push as worth the possible cost?

Progress toward an answer can be made if we drop the unrealistic price equation (12), which disguises several possible sources of income redistribution. Consider instead an open economy with three main types of goods--traded goods, nontraded "flexible price" goods, and nontraded "contract" goods produced by individuals paid under money-fixed short-term or medium-

term contracts, e.g., landlords, interest recipients, and college professors. Denoting the rates of inflation of the three goods as, respectively,  $\pi_t^F$ ,  $\pi_t^N$ , and  $\pi_t^C$ , we have:

$$(15) \quad \pi_t = \mu_1 \pi_t^F + \mu_2 \pi_t^N + \mu_3 \pi_t^C, \quad \mu_1 + \mu_2 + \mu_3 = 1.$$

The rate of change of the domestic price of traded goods is assumed under purchasing power parity to be equal to the sum of the rates of change of the "world price" ( $\pi_t^W$ ) and of the exchange rate ( $e_t$ ):

$$(16) \quad \pi_t^F = \pi_t^W + e_t.$$

Prices of nontraded flexible price goods are set by the markup assumption used above in (12):<sup>21</sup>

$$(17) \quad \pi_t^N = w_t.$$

The prices of nontraded contract goods depend on the rate of inflation which was anticipated when the wage contracts were made,  $\pi_t^e$ .

$$(18) \quad \pi_t^C = \pi_t^e.$$

The components of the change in the after-tax real wage consist of the rate of change in the nominal wage minus the average rate of change of prices plus the rate of change of the ratio of after-tax to pre-tax income ( $\lambda_t$ ):<sup>22</sup>

$$(19) \quad w_t - \pi_t + \lambda_t = (1 - \mu_2 - \mu_3)\pi_t^e + (1 - \mu_2)[f(u_t^{\text{NPN}} - u_t) + z_t] - \mu_1(\pi_t^W + e_t) + \lambda_t.$$

In the simple case of an economy consisting entirely of nontraded flexible-price goods,  $\mu_2 = 1$  and  $\mu_1 = \mu_3 = 0$ . If the tax rate is constant ( $\lambda_t = 0$ ), then (19) reduces to (12), leaving the real wage and labor's income share constant. But in the more general version (19)  $z_t$  appears with a positive coefficient; labor can raise its share of national income for two basic reasons:

(1) Labor can raise its share permanently by temporarily increasing  $z_t$  if the monetary authority fails to keep the unemployment rate continuously equal to  $u_t^{\text{NPN}} + f^{-1}(z_t)$ . While the prices of nontraded flexible price goods are instantly marked up, labor gains because its wage rate increases relative to the prices of nontraded contract goods and relative to the prices of traded goods (if the exchange rate remains constant).<sup>23</sup> As Reder first pointed out almost 30 years ago, the monetary authority is caught in a dilemma between its obligation to protect the fixed-income groups and its full-employment commitment.<sup>24</sup> Flexible exchange rates (or an eventual break in the pegged exchange rate forced by high domestic labor costs) can eliminate labor's ability to reduce the real price of traded goods but cannot solve the authority's problem of protecting the fixed-income group without raising the unemployment rate.

(2) The  $\lambda_t$  term in (19) reveals another incentive for cost-push pressure. Even if the exchange rate is flexible and there are no nontraded contract goods, a cost push which is accommodated by the monetary authority raises the rate of inflation and generates inflation-tax revenue, allowing the reduction of conventional tax rates (if real government spending

remains constant) and an increase in the after-tax real wage. If the monetary authority attempts to hold the unemployment rate constant permanently, the inflation rate will continuously accelerate, and  $\lambda_t$  will be positive until inflation has reached the maximum-revenue rate [ $\hat{\pi}$  in (4)]. All taxpayers, business and labor alike, have an incentive to join a political alignment against the holders of money-fixed assets (rentiers), particularly if taxpayers have a high rate of time preference and disregard the future cost of adjustment when the government (or its successor) is finally forced to stop the inflation.

#### Determinants of Changes in the Rate of Push

A traditional criticism of the cost-push approach is its inability to explain changes in the rate of inflation. Since the extent of unionization has not changed much during the postwar period in most industrialized countries, any cost-push pressure must have been identical throughout the period and therefore can, as Johnson has claimed, "play no role whatsoever in the problem" of explaining the worldwide acceleration of inflation in the late 1960s.<sup>25</sup> This line of criticism, however, is not logically airtight. The analysis of the last half of the paper implies that the inflation caused by cost-push could fluctuate across time periods and could differ across countries even if  $z_t$  were identical always and everywhere, since inflation depends not only on the pressure placed on the government by the demanders of inflation, but also by the supply of inflation provided by government in response to a given amount of pressure. One group of politicians or central bankers might insulate monetary growth from the influence of  $z_t$ , while

their successors might allow  $z_t$  to influence monetary growth, as in (14) above.

But those who suggest that cost push has contributed to the late 1960s acceleration of inflation have claimed that  $z_t$  has increased, not merely that the monetary authority has become more accommodating to a given value of  $z_t$ . The cost-push literature is rather thick on description and thin on the analysis of causation, as exemplified in Wiles' statement that the U. K. price level depends on which numbers British union leaders "pick out of the air."<sup>26</sup> One theme which does run through several discussions is the "communication-contagion" hypothesis. The postwar proliferation of mass media, particularly television, exposed union leaders and members everywhere to the U. S. student and racial unrest of the mid-1960s.<sup>27</sup> The French events of May, 1968 constitute the most credible example, particularly in terms of their timing, of an American-bred contagion. The root question then becomes, why did American students and blacks provide their widely publicized examples exactly when they did?<sup>28</sup> Once they had occurred, the French events of 1968 (like those of 1848) may have influenced worker behavior elsewhere in a further dynamic contagion process (see Perry's results cited below). Evidence of success may feed the desire for more success in cumulative fashion.

The export and government sectors have also been cited as the source of a higher  $z_t$ .<sup>29</sup> In the "Scandinavian" model foreign inflation raises the prices and profits of domestic exporters, giving them the ability to pay higher wage claims.<sup>30</sup> This model gives no attention to the source of the extra money needed to finance the higher price level; it is implicitly provided as needed and its availability does not constrain the speed at which wages (and hence the prices of nontraded goods) can rise. A superior

analysis is provided by Dornbusch within the framework of the monetary approach to balance of payments theory; the pace of increase in wage rates and nontraded goods prices depends on the inflow of reserves caused by the original increase in foreign demand.<sup>31</sup> But export-led wage increases hardly qualify under the heading "cost-push" when the underlying stimulus is excess foreign demand.

The unionization of public employees is sometimes cited as a source of inflation in the U. S. government wage bill and of the increasing relative wages of public employees, but there is no evidence that wage push in the U. S. public sector has been transmitted to the private sector. The extent of nationalized industry is cited by some writers as a source of wage push and for the intemperance of British and Italian unions as contrasted with those in Germany, Sweden, and the U.S.<sup>32</sup> Unions in private industry are constrained by the possibility that the monetary authority may not accommodate their wage demands, leading to unemployment when private profit-maximizing firms find themselves unable to pass on higher labor costs in the form of higher prices. But nationalized industries are much weaker opponents for unions: first, demand for their products (particularly public utilities) is relatively inelastic; second, there is no particular pressure to raise prices if the government stands ready to finance larger nationalized industry deficits; third, those deficits add to the pressure for more rapid monetary expansion along the lines of Part II above. All three of these factors have operated in the U. K. case.

Proper empirical tests of the existence of cost push require recognition of the endogeneity of the money supply. Gray and Parkin erroneously

conclude that statistical evidence of a stable relationship between prices and money is sufficient to reject the "push" or "sociological" hypothesis. But (14) above exhibits a perfect correlation between prices and money despite the fact that the push factor is operative. The proper approach is a direct test of econometric wage equations for evidence that wage rates in particular periods have increased faster than can be explained by "economic" variables, e.g., expected inflation, the excess demand for labor, and tax changes.<sup>34</sup>

The most striking evidence in favor of wage push is provided by Perry, who finds a wage-push dummy variable necessary to explain the wage "explosion" which took place in France and Japan in 1968, and in Italy, Germany, Sweden, and the United Kingdom in 1970.<sup>35</sup> The timing of these episodes appears to be consistent with the "communication-contagion" hypothesis, and the methodology is sufficiently robust to allow rejection of the monetary international transmission mechanism as a sole alternative explanation, even if it provides a partial complementary explanation.<sup>36</sup>

Given Perry's results, it is not surprising that European economists, especially the British, are so much more interested in wage-push than are the Americans. In U. S. wage data there are no puzzles which require the introduction of dummy variables; wage push does not appear to have had any influence at all, at least in the postwar period, although wage controls appear to have had a modest effect in the Korean and 1971-74 episodes.<sup>37</sup> The British literature contains a large number of papers which test the effect on wage determination of union "density" (the share of unionized workers in the labor force of various industries) and of strike activity (a proxy for "union militancy"). The results are controversial but not very robust.<sup>38</sup>



An extension by Ward and Zis and by Laidler of these results to the major industrialized countries fails, except for the single case of Italy, to reveal any strong or significant correlation between wage change and changes in union density or in strike activity.<sup>39</sup> These variables may not be adequate proxies for "the propensity to push" ( $z_t$  above); in particular, a union push may not necessarily be associated with an increase in strike activity if a cooperative monetary authority enables firms to accept rather than resist higher union wage demands. If not, there is no necessary contradiction between the Perry and Ward-Zis-Laidler results.

Further research is required on the timing and sources of the 1968 and 1970 European wage "explosions." Among the variables which might be included in an attempt to explain the degree of push across countries are (1) the degree of openness of an economy, which [in (19) above] increases the potential rewards to wage push under fixed exchange rates, (2) the extent of nationalization of industry, and (3) the ratio of average unemployment compensation (including supplementary payments, e.g., food stamps) to the average after-tax wage, since unemployment benefits reduce the expected cost of unemployment if a strike becomes necessary, and if the monetary authority fails to accommodate.<sup>40</sup> The past record of monetary accommodation may be important as well in forming the expectations of labor leaders regarding the probability of future monetary accommodation.

Union wage demands are not the only possible source of cost push. Business firms might attempt to increase their income share, introducing a push term in their price markup equation analogous to  $z_t$  in (11) above. The economic effects of "profit push" are just the same as those of wage

push and depend in the same way on the reaction of the monetary authority. Much less attention has been devoted in the literature, as in this paper, to profit push, because price mark-up equations appear to be adequate to explain price behavior in most countries without appeal to push variables. Episodes of increasing markups, which may appear at first glance to have been spontaneous, upon closer analysis can be attributed to economic factors, e.g., devaluations which have raised the price of traded goods relative to wage rates, and periods during which price controls have been lifted (e.g., the U. S. in 1946-47 and 1974).

One special form of cost push occurs when there is a crop failure at home or abroad, or when a domestic or foreign cartel is formed. In the case of a crop failure, expenditures on farm products increase if demand is price inelastic and, when the monetary authority holds aggregate nominal spending constant, expenditures on nonfarm products must decline. No problems arise if nonfarm prices are perfectly flexible, but sticky nonfarm prices cause the crop failure to have a "multiplier effect" on real nonfarm output and unemployment. As in the case of a wage push, the monetary authority is caught in a dilemma between a policy of nonaccommodation, which causes higher unemployment, and an accommodating policy, which may increase the rate of inflation.<sup>41</sup> The formation of the OPEC oil cartel in 1973-74 had cost-push effects which are formally identical to those of a permanent crop failure.

#### IV. THE SUPPLY OF INFLATION

##### Constraints Faced by the Political Authority

If government were an abstract forum for the achievement of the socially optimal rate of inflation, policy would attempt to equate the social marginal cost of the inflation tax with the social marginal allocative and administrative costs of collecting other taxes, as in Figure 1 above. Dollars of cost to each individual would be weighted equally, with no one individual able to influence policy out of proportion to the cost imposed on him. Cost-push pressure would not be accommodated, in order to prevent the inflation rate from rising above the optimum.<sup>42</sup>

In general, however, a democratically elected government is not an abstract forum, but an interested party which chooses partially or entirely with an eye on the next election. The government's ability to maximize votes by manipulating the inflation rate is subject to supply constraints analogous to those faced by a private firm attempting to maximize profits. A government contemplating an increase in government expenditure or a tax reduction to raise its vote share in an election year faces, first, the constraint that spending not financed by conventional tax revenue must be financed by monetary creation (the issuance of interest-bearing bonds is once again ruled out to simplify the discussion). Rewriting the previous budget constraint (3) with the percentage rate of monetary growth ( $m_t$ ) on the left-hand side, we have:

$$(20) \quad m_t = m(g_t, \tau_t).$$

Even if voters do not directly care about the rate of monetary growth, they are concerned with present and future values of the inflation and unemployment rates, which are influenced by the rate of monetary growth. Consider a simple version of the expectational Phillips curve,

$$(21) \quad \pi_t = \pi_t^e + b(x_t - \bar{x}_t),$$

which states that the actual current rate of inflation is equal to the rate expected at the beginning of the period plus a constant ( $b$ ) times the difference between the actual ( $x_t$ ) and "natural" ( $\bar{x}_t$ ) rates of output growth.<sup>43</sup>

Now we add the quantity identity, written for the special case in which the rate of growth of velocity is zero:

$$(22) \quad m_t = \pi_t + x_t.$$

Substituting from (22) into (21) and then back into (22), and assuming that the "natural" rate of growth of output is zero, we obtain expressions for the rates of growth of prices and output as functions of monetary growth:

$$(23) \quad \pi_t = \frac{bm_t + \pi_t^e}{1 + b},$$

and

$$(24) \quad x_t = \frac{m_t - \pi_t^e}{1 + b}.$$

More generally, (23) and (24) can be rewritten:

$$(25) \quad \pi_t = \pi(\pi_t^e, m_t, b); \pi_1 > 0, \pi_2 > 0, \pi_3 > 0,$$

$$(26) \quad x_t = x(\pi_t^e, m_t, b); x_1 < 0, x_2 > 0, x_3 < 0.$$

If the slope of the short-run Phillips curve ( $b$ ) is zero, a monetary acceleration has all of its effect on real output growth and none on inflation, whereas an infinite value of  $b$  causes a monetary acceleration to raise the rate of inflation by the same number of percentage points, leaving real output unchanged.

The effects of a monetary acceleration are not exhausted in the current period, but are assumed to continue. If the rate of monetary growth next period is expected to remain equal to  $m_t$ , and if we assume that the money-induced real business cycle has a two-period duration, so that the unemployment rate must return to the natural rate of unemployment by the end of the second period, we have:

$$(27) \quad x_{t+1}^e = -x_t,$$

and, from (22),

$$(28) \quad \pi_{t+1}^e = m_{t+1}^e + x_t = m_t + x_t.$$

Substituting (26) into (27) and (28), we can write general functions for expected output growth and inflation:

$$(29) \quad x_{t+1}^e = -x(\pi_t^e, m_t, b),$$

$$\text{and} \quad (30) \quad \pi_{t+1}^e = m_t + x(\pi_t^e, m_t, b) = \hat{x}(\pi_t^e, m_t, b),$$

$$\hat{x}_1 < 0, \hat{x}_2 > 0, \hat{x}_3 < 0.$$

If voters care about both output growth and inflation and have a zero rate of time preference ( $\delta = 0$ ), they will be left worse off by a permanent acceleration in the rate of monetary growth from, say, zero to a positive number, since inflation will be increased, while the temporary spurt in real output growth will be precisely offset in the second period. They might prefer a monetary acceleration, however, with a relatively high rate of time preference and a high weight on output growth in the utility function (where we temporarily assume that utility depends only on present and future output and price change):

$$(31) \quad U_t = U(x_t, \pi_t - \pi^*; x_{t+1}^e, \pi_{t+1}^e - \pi^*; \delta),$$

$$U_1, U_3 > 0; U_2, U_4 < 0,$$

where  $\pi^*$  is the optimum inflation rate determined above in (10).

#### Myopia and the Political Business Cycle

It is possible that in the real world, voters may have a sufficiently high discount rate to look with favor on an incumbent party which achieves a temporary spurt in output growth and an accompanying temporary reduction in the unemployment rate. Nordhaus has exploited this possibility in his theory of the political business cycle, which rests on the assumptions which voters (1) have a decaying memory of past events and (2) place zero weight on events expected to occur after the election. Thus, in contrast to our utility function above in which a limit on pre-election monetary expansion is set by the expected future inflation and reduction in output growth, in Nordhaus' model "...as an election approaches, the shadow price on future

inflation becomes nil . . ."44 The optimal Nordhaus policy consists of unemployment and deflation in the early years of an incumbent's term, followed by the creation of an inflationary boom as elections approach. The lower limit on the unemployment rate on election eve is determined by the purely myopic optimum, the value of which depends on the one hand, on the parameter (b) describing the short-run tradeoff between inflation and unemployment and, on the other hand, by the weight placed on current inflation in the voter's utility function [ $U_2$  in (31) above].

The most elaborate tests of the political business cycle model have been performed for the U. S. by Fair, who strongly confirms the hypothesis that what matters in Presidential elections is the direction in which the economy is moving, not the actual levels of unemployment and inflation on election day.<sup>45</sup> The growth rate of real per capita income in the year of the election ( $x_t$ ) not only is very significant in explaining the vote share of the incumbent party in time series regressions for 1892-1972, but no other measure of economic performance--even lagged values of  $x_t$ -- is significant when added to regressions already containing  $x_t$ .

An inspection of Fair's basic data reveals several examples of particular elections in which large deviations of  $x_t$  from normal help to explain vote shares: 1920, when the Democrats were swamped and  $x_t = -6.1$ , 1932, when the Republicans were swept out and  $x_t = -15.4$ , the three Roosevelt re-elections with above-average  $x_t$  equal respectively to 13.1, 7.6, and 5.9, the 1964 Johnson victory with  $x_t = 4.0$ , and the 1972 Nixon victory with  $x_t = 5.2$ . An important contribution to the statistical significance of the rate of growth of income, and the insignificance of the current unemployment and inflation rates, occurs in

the Roosevelt victory years of 1936 and 1940, when the level of unemployment remained high, but the economy was moving fairly rapidly in the right direction. These results may suggest not only that voters are myopic, disregarding the inflationary consequences and inherent transience of rapid current economic expansion, but also that they do not care simply about the level of unemployment, but rather how much the incumbents have improved the unemployment rate from the situation they inherited from the other party at the beginning of their term. Another complementary interpretation is that the level of the unemployment rate cannot sway an election, since even an abnormally high 10 percent unemployment rate would leave 90 percent of the electorate employed. Since the level of the layoff rate depends on the change in the unemployment rate, an increase in unemployment can cause a majority of the electorate nervously to raise the subjective probability that they will be the next to be laid off.<sup>46</sup>

While Fair's study of Presidential elections confirms the basic finding of Kramer's earlier study of Congressional elections, Stigler has questioned the stability of Kramer's results.<sup>47</sup> The finding by Stigler of instability not present in Fair's results depends partially on the difference between the sample of Presidential and Congressional elections, but also on Stigler's choice of two-year intervals for the measurement of  $x_t$ . The strength of the Fair and Kramer results for one-year intervals appears to confirm Nordhaus' strong myopia assumption, at least for the U. S. in this century.

It is not enough to argue, as does Stigler, that voters should be rational and should not allow themselves to be the gullible targets of the deliberately manipulative Nordhaus vote-maximizing policy. The point is rather whether voters are in fact myopic, as the Fair-Kramer regressions



appear to imply. But there is nevertheless a limit to voter innocence. Fair has calculated that strict adherence to a pure vote-maximizing policy would have required output growth rates of 20 percent per annum during postwar U. S. election years.<sup>48</sup> The actual behavior of incumbent governments was erratic, with booms in some election years (1964, 1972) but not others (1960); further, the booms that actually occurred were far below the pure vote-maximizing values. Voters may have failed rationally to learn about the political business cycle precisely because they have not been regularly manipulated on a clock-like schedule, and, if so, Stigler's position contains an important grain of truth. Total and regular adherence by governments to a Nordhaus policy would cause voters to be "burned" by regular steep increases in unemployment immediately after elections and would, sooner or later, lead voters to disregard election-year economic expansions. Keynes made the related point that British rentiers had been willing to purchase consols during World War I at negative real interest rates, not because they were myopic or stupid but rather because consols had always been such good investments in the past (at least for the long period between 1815 and 1896); wartime inflation did not dissuade them from this expectation because prices had always fallen after the end of previous wars.<sup>49</sup>

#### Short-run Wage and Price Inflexibility

A small response of future inflation to current monetary expansion [small  $b$  in (23)] encourages money creation, since it raises the current output benefit of current monetary expansion relative to its current inflation cost. Any increasing tendency for wages to remain rigid in the face of high unemployment in recessions would thus contribute to an explanation

of the contrast between the long centuries of average price stability before World War II and the tendency to secular inflation since then.<sup>50</sup>

Why have wages become more rigid? First, unemployment compensation, welfare benefits, and food stamps have set a rising floor under the wage rate which an unemployed worker will accept.<sup>51</sup> Second, workers have come to believe that Governments intend to keep their full-employment commitments and will not let unemployment rise high enough to pull down wages. Similarly, producers of durable goods have come to believe that recessions will be temporary, and that it will pay to hold inventories rather than cut prices.

Unemployment compensation and the full-employment commitment in turn require explanation. One hypothesis is that they demonstrate that voters do have memories in which the experience of the Great Depression still weighs heavily, just as the relatively weaker full-employment commitment and stronger anti-inflation commitment in Germany must reflect memories of the hyperinflation. Another explanation of government care for the unemployed and for the poor in general treats these expenditures as a "luxury good" which the population can afford as it rises further above subsistence. Yet another approach is suggested by Meltzer, who has traced a rising share of government spending in GNP back not just to the Depression, but all the way back to the founding of the American republic, and who attributes this inexorable historical process to the concentration of the benefits of government programs, facilitating the development of pressure groups to maintain and expand them, compared to the diffusion of the costs of any single program (this approach is developed further in Brunner's comments on this paper).<sup>52</sup>

The next decade or two will provide data able to distinguish between these explanations. If the "Depression memory" approach is basically correct, we should expect memories of the Depression to decay gradually and be replaced by memories of the Great Unanticipated Inflation of the late 1960s and 1970s, leading to a retreat from the government's full-employment commitment and to an end of the relative growth of welfare and unemployment benefits. The "luxury good" and "concentrated benefits" approaches would, in contrast, predict a continuing expansion of the share of transfer payments in GNP.

#### Visible and Invisible Tax Changes

The time available for incumbent legislators to provide services ( $S_t$ ) for their constituents and thereby influence their electoral support, is reduced by the amount of time spent debating changes in tax rates:

$$(32) \quad S_t = N(|\Delta\tau_t|), \quad N' < 0.$$

← Conventional tax changes thus involve a real negotiation cost which is not incurred when a change in expenditures is financed with the inflation tax. A more general statement of this point is that changes in conventional taxes are considerably more "visible" than in the inflation tax.

The U.S. during the Vietnam buildup may serve as an example of the refusal to increase tax rates when  $N'$  is large. The choice of monetary war finance during 1965-68 may also have reflected the high weight on tax increases and low weight on inflation for the labor unions, one of the main sources of finance of the then-incumbent Democratic party. Without negotiation costs or some source of political imbalance between rentiers and

others, it is hard to see that losses to taxpayers from higher tax rates during 1966-68 can explain the decision to impose such enormous losses on rentiers.<sup>53</sup>

A more clean-cut and dramatic example of the role of negotiation costs is provided by the 1924 French debate over a capital levy to pay the interest cost of debt charges which had accumulated since 1914. Maier has estimated that the 1924-26 inflation, which occurred in lieu of the capital tax, reduced real wealth by roughly the same amount as would have occurred with the capital tax.<sup>54</sup> Thus wealth holders revealed their preference for invisible rather than visible taxation, even though the total magnitude and distribution of the two was similar.

The nations which display an inbred tendency toward rapid inflation may be those with a cultural aversion to rational negotiation, i.e., with a high value of  $N'$ :

...Various groups maintain and prize an attitude and phraseology of unbending opposition and hostility...The Chilean situation appears to be weighted more heavily with the avoidance of agreement, with the maintenance of a militant stance on the part of all contending groups. In a sense, this stance is the desired benefit and inflation is its cost.<sup>55</sup>

The ideological orientation of the British and Italian labor movements may make nationalization and inflation indirectly the result of the same inbred cultural trait in those two countries. Argentina is another example in which inflation, price controls, and inefficiency have resulted from the ideological stance of urban workers.

The degree of institutional independence of the central bank from the incumbent politicians may also influence the visibility of changes in conventional taxes relative to changes in the inflation tax rate. When the central bank is directly controlled by the Treasury and is forced to peg the interest rate on government bonds, as in the U. S. between 1941 and 1951, and in the U. K. throughout most of the postwar period, voters may be more prepared to blame excessive monetary growth on politicians than in the case where the central bank is independent. Politicians might even try to blame an "untouchable" central bank for causing an inflation which in actual fact was made necessary by the deficit spending of the very same politicians.

#### V. THE MARKET FOR VOTES--INTERACTIONS BETWEEN DEMAND AND SUPPLY

If votes for incumbents depended only on their success in achieving the optimum inflation rate determined on purely economic grounds, i.e.,  $\pi^*$  in (10) above, then the incumbent vote share ( $V$ ) would depend only on the parameters in (10):

$$(33) \quad V = V(\pi, \tau; \theta, \rho, \phi, g), \quad V_1, V_2 < 0.$$

Here the arguments to the left of the semi-colon are the economic variables which voters care about, the rate of inflation ( $\pi$ ) and the conventional tax rate ( $\tau$ ). The arguments to the right of the semi-colon are the parameters on which the vote-maximizing levels of  $\pi$  and  $\tau$  depend, the marginal administrative and allocative cost functions for conventional taxes ( $\theta$ ), the inflation tax revenue function ( $\rho$ ), the marginal allocative cost function

for the inflation tax ( $\phi$ ), and the share of government spending in total income ( $g$ ). A generalization of (33) makes the government spending share a variable which voters care about, with the optimum level of  $g$  depending on the point of intersection of the marginal cost functions for the two taxes with the marginal benefit function for government expenditure ( $\psi$ ):

$$(34) \quad V = V(\pi, \tau, g; \theta, \rho, \phi, \psi), \quad V_1, V_2 < 0, \quad V_3 > 0.$$

A wartime emergency would, for instance, shift upward the marginal benefit function of government expenditure and lead to the choice of a higher level of spending, conventional tax rates, and inflation, as in Figure 1 above.

But there is nothing explicitly political in (34). To convert an economic theory of inflation into one which takes account of political factors, we must take account of several special features of the political market. The distaste of rentiers for inflation does not weigh against the taste for inflation of taxpayers and labor unions in proportion to the relative income and wealth of the two groups. Instead, rentiers may not find a pro-rentier political party available as an option, and formation of such a party may be precluded by the high organization costs required to publicize and elect a sufficient number of representatives to influence policy. In contrast to the continuum of traders and low cost of information assumed in much economic analysis, in the market for votes elections are infrequent, only a limited number of packages of promises of future policy are offered to voters for their consideration, and voters cannot "recontract" after the election until the next election, by which time circumstances may have changed.

Several political parameters can be introduced to summarize the power of the rentier group to inflict retribution on an incumbent politician or party which introduces policies which cause a current or expected future acceleration in inflation. First, rentier power is proportional to the existence ( $\Omega > 0$ ) of a party in which rentier interests dominate. Second, if rentiers are a distinct minority, their power may be substantial when the electoral system is based on proportional representation ( $\nu > 0$ ), but may be very small with single-member districts when minority rentiers are evenly spread across the country. Third, the life-cycle consumption hypothesis suggests that wealth is higher for the old than the young. Since the old tend to vote more than the young in countries like the U. S. where the young are mobile and voter registration laws are strict, one would expect the presence of these institutional features ( $\eta > 0$ ) to raise the political power of rentiers. Finally, since the pecuniary political contributions of an individual are likely to be proportional to his wealth, and wealth in nominal-fixed form is the distinguishing characteristic of a rentier, one would expect weak or nonexistent controls on political contributions, as in the U.S. before 1972 ( $\zeta > 0$ ), to raise the political power of rentiers.

The shift from political systems in which rentiers have a substantial weight to those where they have no weight, as in 1918-21 Soviet Russia, Peron's Argentina, and Allende's Chile, can very dramatically increase the vote-maximizing and politically optimal rate of money creation. The disenfranchisement of rentiers also occurs during wartime periods when there is no drastic change in the political balance, reflecting simply the war-

time increase in  $\psi$ , the marginal benefit of an extra dollar of government expenditure, which in turn requires a combination of tax and money finance unless negotiation costs ( $N'$ ) are prohibitive.

When we ignore the short-run structural economic constraints of Sections III and IV, and the special features of the political marketplace, as represented by the five political parameters ( $N', \Omega, \nu, \eta, \zeta$ ), the incumbent party simply attempts to achieve the "public interest" inflation rate, i.e., the inflation rate which is optimal on purely long-run economic grounds. In this extreme case the value of  $\pi^*$  calculated in (10) above is the vote-maximizing solution of (33), which takes the government expenditure share ( $g$ ) as exogenous. Similarly, a "public interest" solution of (34) makes  $g$  endogenous but takes no account of political or short-run economic factors. If we continue to ignore for the moment the short-run structural economic constraints of Sections III and IV and consider only the five "political parameters," we can write a new vote-share function which incumbents attempt to maximize:

$$(35) \quad V = V(\pi, \tau, g; \theta, \rho, \phi, \psi, N', \Omega, \nu, \eta, \zeta), \quad V_1, V_2 < 0; \quad V_3 > 0.$$

Once again the arguments to the left of the semi-colon are, as in (34), the economic variables which voters care about--the rate of inflation, the conventional tax rate, and the share of government spending in total income. But the parameters on which the vote-maximizing solutions for  $\pi, \tau$ , and  $g$  depend, listed to the right of the semi-colon, now include not only the long-run economic parameters of section I, but also the five political parameters. For instance, the vote-maximizing inflation rate is now:



$$(36) \quad \tilde{\pi} = \tilde{\pi}(\theta, \rho, \phi, \psi, N', \Omega, \nu, \eta, \zeta).$$

(36) reduces to the long-run economic optimum inflation rate ( $\pi^*$ ) only when the five political parameters are ignored. The solution to (34), the "public interest" inflation rate ( $\pi^*$ ) net of political considerations, might be relatively rapid, suggesting that a wartime or postwar increase in the benefits of government spending should induce an increase in spending financed almost entirely by money creation, but in contrast the "vote maximizing" inflation rate in (36) might be relatively low when the political parameters are favorable to rentiers (a low value of  $N'$  and high values of  $\Omega, \nu, \eta$ , and  $\zeta$ ), indicating that the same wartime or postwar situation should be financed largely by conventional taxation. The motivation for the battle between taxpayers and rentiers is contributed by Section I above, while the inflation outcome of their battle depends both on the long-run economic parameters of Section I, and on the political parameters of this section.

But the willingness of the incumbents to inflate will depend as well on the short-run economic constraints introduced in the analysis of Sections II and III. In Section II a proportional cost-push factor ( $z$ ) acted to raise the inflation rate relative to anticipated inflation at any given unemployment rate. The magnitude of  $z$  depended inversely on the proportion of output consisting of nontraded flexible-price goods ( $\mu_2$ ), and on other factors determining union "aggressiveness" ( $\alpha$ ):

$$(37) \quad z = z(\mu_2, \alpha), \quad z_1 < 0, \quad z_2 > 0.$$

We speculated above that "aggressiveness" might in turn depend on the extent of past monetary accommodation, on the degree of nationalization of industry, on the size of unemployment benefits, and on the "ideological stance" of workers.

The cost-push analysis of Section II can be combined with the Phillips Curve constraint of Section III simply by introducing the cost-push factor ( $z_t$ ) into (21), just as it appears in (13):

$$(38) \quad \pi_t = \pi_t^e + b(x_t - \bar{x}_t) + z_t.$$

When voters care about the present and future rate of output growth ( $x$ ), as in the utility function (31), then  $x$  becomes a fourth argument to the left of the semi-colon in the vote function:

$$(39) \quad V = V(\pi, x, \tau, g; \theta, \rho, \phi, \psi, N', \Omega, \nu, \eta, \zeta, b, \delta, \mu_2, \alpha);$$

$$V_1, V_3 < 0; V_2, V_4 > 0.$$

The parameters listed to the right of the semi-colon, once again, are those on which the vote-maximizing values of  $\pi, x, \tau$ , and  $g$  depend. For instance, the vote maximizing inflation rate is now

$$(40) \quad \tilde{\pi} = \tilde{\pi}(\theta, \rho, \phi, \psi, N', \Omega, \nu, \eta, \zeta, b, \delta, \mu_2, \alpha).$$

(40) is an expanded version of (36) above and adds in four additional inflation-determining parameters:

1. The short-run Phillips Curve tradeoff [(38) above] between inflation and output growth, which depends both on the tradeoff slope coefficient (b) and on the degree of cost-push ( $z_t$ ).
2. The "myopia" factor, i.e., the rate of time preference [ $(\delta)$  in (31) above], which determines the weights used by voters in comparing present and future rates of inflation and output growth.
3. The determinants of the degree of cost-push in (37) above, i.e., the parameters  $\mu_2$  and  $\alpha$ .

The symbols and signs of the parameters of the final vote-maximizing inflation solution are identified and explained in Table 1. The political, cost-push, and short-run economic factors can help to identify the circumstances under which politicians may choose an inflation rate different from that which is optimal on purely long-run economic grounds.

Table 1  
Parameters Which Influence the  
Vote-Maximizing Rate of Inflation ( $\bar{\pi}$ ) in Equation (40)

Parameter Symbol	Description	Introduced in Equation(s)	Sign of Effect on $\bar{\pi}$
<u>1. Long-run Economic Factors</u>			
$\theta$	Marginal administrative and allocative cost schedule for conventional taxes	(6),(7),(8),	+
$\rho$	Revenue raised from money creation per unit of inflation	(4)	- <sup>a/</sup>
$\phi$	Marginal allocative cost schedule for an increase in inflation.	(1),(5)	-
$\psi$	Marginal benefit schedule for an increase in the share of government spending.	(34)	+
<u>2. Political Factors</u>			
$N'$	Negotiation cost of changing conventional tax rates (visibility of conventional tax changes relative to the inflation tax).	(32)	+
$\Omega$	Existence of <u>rentier</u> party.	(35)	-
$\nu$	Existence of proportional representation	(35)	-
$\eta$	Mobile young voters and strict voter registration	(35)	-
$\zeta$	Existence of weak controls on campaign spending	(35)	-
<u>3. Short-run Economic Constraints</u>			
$b$	Slope of the short-run Phillips Curve (a steep curve cuts the output gain from raising monetary growth and the output loss from reducing monetary growth).	(21),(38)	-
$\delta$	Discount rate; myopic voters create an incentive for expansive policy if $b < \infty$ .	(31)	+
$\mu_2$	Share of non-traded flexible price goods; a higher share reduces the incentive for cost push.	(15),(19)	-
$\alpha$	Worker "aggressiveness"; affects short-run Phillips Curve via cost-push.	(37)	+

Note: a. Up to the point of maximum revenue.

## VI. CONCLUSION

Inflation and excessive money creation do not result from the capricious folly of governments. Instead, too much money tends to be created when governments are faced with a "demand for inflation," i.e., pressures to raise the rate of money creation either when increased marginal benefits of government expenditures call for a spending increase which must be financed, as during a war, or when pressure groups in society negotiate increases in wages or in other costs which raise the unemployment rate if not accommodated by more rapid monetary creation. The "supply of inflation," i.e., the extent to which the government bows to these pressures, depends on the future electoral gains of accommodation weighed against the future electoral losses of resistance. Accommodation yields a vote harvest when institutional arrangements minimize the political power of rentiers, when the incumbent party is one which relies on campaign contributions from groups or organizations which give heavy weight to taxes and unemployment rather than to inflation, when the perceived negotiation cost of "visible" compromise on tax changes is high relative to the "invisible" compromise available through monetary accommodation, when voters are myopic, and when wages have been relatively rigid in the short run, at least partly as a result of unemployment compensation and government full-employment guarantees.

These major determinants of the demand for and supply of inflation in turn require explanation. Although wars and postwar reconstruction can safely be predicted to raise the share of government spending in GNP, which in turn raises the optimal rate of money creation (if not the share of government

spending financed by money creation ), economists may not have much to contribute on the determinants of the wartime share of government spending in GNP, i.e., on the "totality" of some wars relative to others. Similarly, although an economist can deduce that aggressive cost-push wage demands are relatively likely in an open economy when exchange rates are fixed and when the monetary authority has a past history of accomodating wage push rather than allowing unemployment to rise, an appeal to cultural differences may be required to explain why some economies appear to exhibit more evidence of wage push than others. Cultural attitudes about the relative appeal of rational negotiation as opposed to open confrontation may make a militant stance a virtue for some groups in some countries, and may explain inter-country differences in the degree of monetary accomodation in terms of the conservation of real negotiation resources. Are there countries in which labor relations are dominated by present-oriented "lower class" attitudes analogous to Banfield's U. S. urban lower class?<sup>56</sup>

The steady historical increase in the share of government spending in GNP in real terms tends to increase the rate of inflation through both the demand and supply side. More government spending must be financed and, if the allocative, administrative, and negotiation costs of raising conventional taxes are taken into account, some extra money creation is optimal from the point of view of society as a whole. Further, to the extent that the higher government spending share results not from wars but rather from peacetime transfers to the unemployed and the poor, wage rates will become more rigid, which in turn will increase the political cost to incumbents of the refusal to accomodate inflation pressures.

Much systematic empirical work will be required to test the contribution of these hypotheses to differences in the inflation rate over time in given countries, in particular to the explanation of the postwar phenomenon of secular inflation, as well as to differences in inflation across countries at a given time. A prediction of the likely future course of inflation requires a judgment on the continuation of the past historical behavior of the share of government spending in GNP, and of the share of transfer payments to earned labor income. Will the traumatic inflation of recent years cause a retrenchment of transfer spending or of the government's full-employment commitment, as suggested by the "Depression memory" hypothesis, or do we face more of the same, as implied by the "luxury good" and "concentrated benefits" approaches?

- 1976, and D. Meiselman, "Worldwide Inflation; a Monetarist View," in The Phenomenon of Worldwide Inflation (Washington: American Enterprise Institute, 1975).
5. English consumer prices were roughly the same in the 1930s as in 1625; see the time series displayed in "Is Depression the Only Cure for Inflation?" Forbes (March 1, 1975), pp. 20-21. An earlier era of a stable average level of prices extended from the earliest date of record, 1275, to 1500. Between 1500 and 1625 the price level rose to a new plateau in the aftermath of the New World gold discoveries.
  6. The applicability of the model to monarchies and dictatorships depends on the king's or the dictator's fear of revolutions and coups by their "constituents."
  7. William D. Nordhaus, "The Political Business Cycle," The Review of Economic Studies, v. 42 (April, 1975), pp. 169-190.
  8. Harry G. Johnson, "Panel Discussion: World Inflation," in Emil Claassen and Pascal Salin, Stabilization Policies in Interdependent Economies (Amsterdam: North-Holland, 1972), pp. 310-11. See also Harry G. Johnson, Inflation and the Monetarist Controversy, Professor Dr. F. DeVries Lectures (Amsterdam: North-Holland, 1972). Typical of the refusal of monetarists to consider monetary and cost-push theories as complementary rather than competitive is G. Zis, "Inflation; An International Monetary Problem or a National Social Phenomenon?" Manchester Inflation Project, working paper 7508, March, 1975.
  9. Stephen Marris, "Panel Discussion: World Inflation," in Claassen and Salin, op. cit., pp. 303-6.
  10. Peter Wiles, "Cost Inflation and the State of Economic Theory," Economic Journal, v. 83 (June, 1973), pp. 377-98.
  11. A hard line on this issue is taken by Aubrey Jones, The New Inflation (London: Penguin, 1973), who argues (p. 40) that "a tightening of the supply of money is not, therefore, a solution to the problem of



rising prices." Assar Lindbeck, "World Inflation: Panel Discussion," in Claassen and Salin, op. cit., p. 314, concurs that "velocity, regardless of how we define it, is so flexible that there is much leeway between a given change in international reserves and the price development in various countries."

12. The "monetary theory of the balance of payments," as set forth in Harry G. Johnson, "The Monetary Approach to Balance of Payments Theory," in his Further Essays in Monetary Economics (London: George Allen and Unwin, 1972), pp. 229-49, constitutes an explanation of inflation in individual open economies only when exchange rates are fixed.
13. The two basic references are Martin J. Bailey, "The Welfare Cost of Inflationary Finance," Journal of Political Economy, v. 64 (April, 1956), pp. 93-110; and Milton Friedman, "The Optimum Quantity of Money," in his The Optimum Quantity of Money and Other Essays (Chicago: Aldine, 1969).
14. Equation (1) is obtained from E. Tower, "More on the Welfare Cost of Inflationary Finance," Journal of Money, Credit, and Banking, November, 1971, p. 859, with an added term to allow for interest payments on money, and with Tower's incorrect signs changed.
15. For the specification of  $\hat{\pi}$  see Milton Friedman, "Government Revenue from Inflation," Journal of Political Economy, v. 79 (July/August, 1971), pp. 846-56.
16. This term is taken from Robert J. Barro, "Unanticipated Money Growth and Unemployment in the United States," unpublished working paper, University of Rochester, July, 1975, Appendix I.
17. Barro, "Unanticipated Money Growth and Unemployment in the United States," op. cit. The equation is fit for a number of sample periods, the longest of which is 1861 to 1973.

18. Friedman, "Price, Income, and Monetary Changes in Three Wartime Periods," op. cit., Table 1. Total wartime spending ( $\Sigma G$ ) divided by average annual income ( $Y$ ) can be derived by dividing the share of expenditures financed by deficits ( $\Sigma D/\Sigma G$ ) by the share of deficits in annual income ( $\Sigma D/Y$ ). Dividing  $G/Y$  by the approximate length of each war in years (respectively--4,2,5) yields annual average  $G/Y$ : .155, .342, .580.
19. The regressions in Barro, op. cit., fail to explain why money growth was faster during the Civil war than in the two World Wars.
20. Charles Maier, "The Political Contexts of Inflation: A Comparative Analysis," unpublished paper presented at Cliometrics Conference, Madison, April 10-12, 1975, p. 9.
21. We could also allow the markup fraction to depend on a demand factor, e.g., the level of output or employment, but this would add extra notation without making any substantive difference, since the wage equation (11) already contains a demand factor.
22. If  $\tau_t$  is the tax rate, then  $\lambda_t$  is the rate of change of  $(1-\tau_t)$ .
23. If there are lags in the nontraded flexible price sector, i.e., if (17) is replaced by  $\pi_t^N = w_{t-1}$  the incentive for cost-push is further increased.
24. Melvin W. Reder, "The Theoretical Problems of a National Wage-Price Policy," Canadian Journal of Economics and Political Science, (February, 1948), pp. 46-61.
25. Harry G. Johnson, "World Inflation: Panel Discussion," op. cit.
26. Wiles, op. cit., p. 392.

27. Lindbeck, op. cit., pp. 308-9.
28. The black riots and the dominant black participation in the increase in the U. S. crime rate in the 1960s are perceptively linked by Banfield to the growing divergence between black socio-political and economic status. See Edward Banfield, The Unheavenly City Revisited (Boston: Little-Brown, 1975), Chapter 6.
29. See A. Jones, op. cit., p. 20.
30. G. Edgren, K. O. Faxen, and G. E. Odhner, "Wages Growth and the Distribution of Income," Swedish Journal of Economics, v. 71 (September, 1969), pp. 133-60; O. Aukrust, "Inflation in the Open Economy: The Norwegian Model," Central Bureau of Statistics of Norway, Working Paper 75/12, March, 1975.
31. R. Dornbusch, "Devaluation, Money, and Nontraded Goods," American Economic Review, v. 63 (December, 1973), pp. 871-80.
32. Jones, op. cit., p. 21. In an extensive investigation of labor relations in Europe, Flora Lewis concluded that: "It is striking that the countries with the least inflation and labor friction not only are those with the most advanced systems of welfare and labor rights (West Germany and Sweden), but they also have the least Government-owned industry. The most ailing industrial countries, notably Britain and Italy, have tended to argue their problems and seek their solutions in more ideological terms--nationalization, a largely political organization of labor, a persistent sense of class in the blueprint of social structure." See Flora Lewis, "Labor Relations in Europe: Key to Gaps in Growth Rates," New York Times (March 25, 1975), pp. 1, 14.

33. Malcolm Gray and Michael Parkin, "Discriminating Between Alternative Explanations of Inflation," unpublished working paper, Manchester, December, 1974.
34. The role of income and payroll taxes in wage determination receives particular emphasis in Robert J. Gordon, "Inflation in Recession and Recovery," Brookings Papers on Economic Activity, v. 2 (1971, No. 1), pp. 105-58.
35. George L. Perry, "Determinants of Wage Inflation Around the World," Brookings Papers on Economic Activity, v. 6 (1972, No. 2), pp. 403-35.
36. Perry's regressions include significant effects for export and/or import prices, the channel by which a foreign monetary stimulus affects domestic wages in the Dornbusch paper cited above. Further evidence against the pure monetarist hypothesis is provided by Zis, who shows that the 1969-72 acceleration of money growth in the Group of Ten countries is far greater than can be accounted for by U. S. behavior; indeed, U. S. monetary growth in 1969 and 1970 was lower than in any year of the 1960s. See G. Zis, op. cit.
37. Robert J. Gordon, "Wage-Price Controls and the Shifting Phillips Curve," Brookings Papers on Economic Activity, v. 3 (1972, No. 2), pp. 385-421. The influence on wages in the 1930s of the NRA and unionization has not yet been adequately quantified.
38. R. Ward and G. Zis, "Trade Union Militancy as an Explanation of Inflation: an International Comparison," Manchester School, v. 42 (March, 1974), pp. 46-65.
39. Ibid, pp. 49-55. Also David Laidler, "Alternative Explanations and Policies Towards Inflation; Tests on data drawn from six countries," Manchester Inflation Project, Working Paper 7513, April, 1975.
40. Martin S. Feldstein, "Temporary Layoffs in the Theory of Unemployment," Journal of Political Economy, v. 84 (June, 1976).

41. I have shown that the inflation resulting from a crop failure, and hence the incentive for the monetary authority to resist accommodation, depends on whether the failure is expected to be temporary or permanent. See Robert J. Gordon, "Alternative Policy Responses to External Supply Shocks," Brookings Papers on Economic Activity, v. 6 (1975, No. 1), pp. 183-204.
42. This assumes that the social rate of time preference is zero. With a positive social rate of time preference, even if initially the inflation rate is equal to the optimum rate, a period of unemployment below the natural rate can be enjoyed temporarily, so that the benefit of sub-natural unemployment in the near future is equated with the present value of the permanent legacy of an inflation rate greater than the optimum in the far future. See Edmund S. Phelps, Inflation Policy and Unemployment Theory (New York: Norton, 1972), and Robert E. Hall, "The Phillips Curve and Macroeconomic Policy," Journal of Monetary Economics, V. 0 (January 1976 Supplement), pp. 000-00.
43. Beginning from the conventional statement of the expectational Phillips curve,
- $$(a) \quad \pi_t = \pi_t^e + \frac{b}{k}(\bar{u}_t - u_t),$$
- where  $\bar{u}_t$  is the natural and  $u_t$  is the actual rate of unemployment, we substitute into (a) the regular empirical relationship known in the U. S. as "Okun's Law":
- $$(b) \quad u_t = u_{t-1} - k(x_t - \bar{x}_t).$$
- Equation (21) in the text is obtained if we assume that we start from an equilibrium in which  $u_{t-1} = \bar{u}_t$ .
44. William D. Nordhaus, op. cit., p. 184

45. Ray C. Fair, "On Controlling the Economy to Win Elections," Cowles Foundation Discussion Paper No. 397, August, 1975, especially Table 2.
46. In each of the most severe postwar recessions, the layoff rate has declined very rapidly from its peak values to a more "normal" level at approximately the date of the peak level of the unemployment rate (mid 1954, mid 1958, early 1961, and spring 1975). See Business Conditions Digest, series 3.
47. Gerald H. Kramer, "Short-term Fluctuations in U. S. Voting Behavior," American Political Science Review (March 1971), pp. 131-43; George J. Stigler, "General Economic Conditions and National Elections," American Economic Review, v. 63 (May 1973), pp. 160-7.
48. Fair, op. cit., p. 28.
49. J. M. Keynes, A Tract on Monetary Reform (London, 1923), chapter 2.
50. For empirical evidence on the increasing rigidity of wages, see Michael Wachter, "The Flexibility of Wages in Postwar Recessions," American Economic Review, v. 66 (May 1976), and Gordon, "Wage-Price Controls and the Shifting Phillips Curve," op. cit.
51. For formal models which relate rigid wages to the rate of unemployment compensation, see Martin Baily, "Wages and Employment Under Uncertain Demand," Review of Economic Studies, v. 41 (January 1974), pp. 37-50, and Feldstein, op. cit.
52. Allan H. Meltzer, "Too Much Government?" revised version of a lecture presented at the University of Chicago Law School, May 1975.
53. Bach and Stephenson estimate that the 1950-71 postwar inflation transferred about \$600 billion from households, the major net creditors, to the federal government and to business firms, the major debtors. See G. L. Bach and J. B. Stephenson, "Inflation and the Redistribution of Wealth," Review of Economics and Statistics, v. 56 (February, 1974), pp. 1-13.