An Ebbing Tide Lowers All Boats: Monetary Policy, Inflation, and Social Justice

by David Altig

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It is essential that the direction of public policy be well targeted to the nature of the problem it is seeking to ameliorate.... But only in the context of prudent, noninflationary expansion of money and credit are such improvements likely to be lasting.

—Alan Greenspan, December 18, 1991

Introduction

During periods of slow growth and rising unemployment, the dynamics of the economic policy debate inevitably reveal an almost irresistible sentiment for stimulative monetary policies. To cite a current example, the steady march of the unemployment rate from 5.3 percent in mid-1990 to 7.3 percent as of April 1, 1992 has been matched on the monetary policy front by persistent calls for the Federal Reserve to take action that would ensure an economic recovery regardless of any longer-term price-level consequences. The dual circumstances of lower-than-expected inflation and slow growth of the M2 monetary aggregate have reinforced this pressure. At the same time, the reluctance of private-market participants to fully incorporate recent inflation outcomes in their inflation expectations, coupled with the persistent steepness of the yield curve, suggests that inflation fears are very real to the decision-makers whose behavior ultimately determines the course of the economy.[1]

Still, at times like this, there are always many who feel that the inflationary risk inherent in an aggressive monetary policy is worth taking if such a policy can effectively stimulate economic activity, especially since the costs of recessions and slow-growth periods are unequally distributed throughout the population. This sentiment is forcefully expressed in the book *Hard Minds, Soft Hearts: Tough-Minded Economics for a Just Society,* written by economist Alan Blinder of Princeton University (see Blinder [1987]). As the evidence presented in the next section makes

■ 1 The spread between three-month T-bill and 30-year Treasury bond yields reached a record high of 436 basis points in the week ended April 24, 1992. With respect to inflation expectations, the following quote is from the April 1992 issue of the Federal Reserve Bank of Cleveland's *Economic Trends:* "The P-Star model, which links the trend in M2 growth to future inflation, projects continued downward pressure on the inflation rate through 1993.... Apparently, private forecasters are not as optimistic about the near-term inflationary trends. The Blue Chip consensus forecast shows the GDP implicit price deflator edging up to slightly more than 3 percent next year." The first-quarter 1992 number for the deflator indicates that these forecasts are well founded.

clear, unemployment disproportionately burdens lower- and middle-class workers relative to more affluent Americans, while inflation, to the extent that it affects income distribution at all, appears to do just the opposite. In Blinder's words:

> Sometimes inflation is piously attacked as the "cruelest tax," meaning that it weighs most heavily on the poor.... On close examination, the "cruelest tax" battle cry is seen for what it is: a subterfuge for protecting inflation's real victims, the rich.... [E]very bit of evidence I know of points in the same direction: inflation does no special harm to the poor.... The meager costs that inflation poses on the poor are dwarfed by the heavy price the poor are forced to pay whenever the nation embarks on an anti-inflation campaign.... (p. 54)

Two important features of the evidence to which Blinder refers deserve further comment. First, most of the evidence points to the *distribution* of income rather than to the *level* of income. The former is a somewhat strange measure of welfare: I would gladly see you gain a zillion dollars of real output if doing so would obtain a billion for me, even if the distribution of our incomes becomes more unequal in the process.

Second, and more critically, the evidence cited by Blinder focuses on *cyclical* fluctuations in economic activity. Few economists believe that lower unemployment can be "traded" for higher inflation in the long run. Consequently, a more accurate statement would be that the meager costs inflation poses on the poor are dwarfed *in the short run* by the heavy price this segment of the population is forced to pay when the nation embarks on an anti-inflation campaign.

Some empirical and theoretical arguments for factoring the long-run costs of inflation into calculations of the "fairness" of anti-inflation policies are presented in section II. These arguments refer primarily to the resource cost to the average individual and thus do not directly address the fairness issue. However, the arguments do relate inflation to reductions in the overall level of GDP and hence indirectly bear on welfare considerations, to the extent that the burden of falling income is in the long run shared by the less-than-wealthy.

A more direct argument is presented in sections III and IV, by way of a simple model that illustrates how the long-run costs of inflation arise due to distortions created by a tax system based on nominal income. Although the world I consider is highly stylized, it captures some key elements of the real world: The tax system is imperfectly indexed for inflation. There are "rich" people and "poor" people. Rich people own capital; poor people do not. The share of the economic pie earned by rich people is larger than the percentage of the total population they represent. Also, inflation raises the tax burden of the rich relatively more than that of the poor and, consistent with empirical evidence, does little to change the distribution of income.

Within this model, inflation-induced tax increases on capital definitely hurt the poor. Because inflation effectively raises the tax on capital, a sustained increase in price-level growth ultimately results in a lower capital stock, reduced output, and lower productivity for all workers. Declining output and productivity can be expected to fall especially hard on the poor because they start from a lower standard of living to begin with.

The example given by this simple model is not provided as an argument for eschewing discretionary, short-run stabilization policies as rationalized by variants of the Phillips curve model that serve as the foundation of Keynesian economics — even in its more recent incarnations.[2] Although I am skeptical of the Keynesian framework, neo or otherwise, as a useful guide for policymaking, the purpose of this paper is not to engage in a theoretical or philosophical quarrel with the proponents of activist monetary policy.[3] Instead, I attempt to show that the "fairness" objectives that motivate people to urge the Federal Reserve to "do something" when economic activity drags also dictate that the Fed achieve a long-run goal of maintaining price stability. In broad terms, I am arguing that, if we adopt Blinder's arguments as a guide to short-run monetary policy, we should symmetrically adopt procedures that provide a long-run anchor to the price level in order to ensure against the possibility of making the cure worse than the illness.

I. Inflation, Unemployment, and the Size Distribution of Income

The perception that inflation does no special harm to the poor arises from studies that

■ **2** The volumes edited by Mankiw and Romer (1991) are an excellent introduction to some of the important works in the "New Keynesian" literature.

■ **3** Those readers who are interested in such a quarrel are referred to Barro (1989).

TABLE 1

The Effect of Unemployment and Inflation on Income Shares

Quintile	Real Per Capita GNP	Inflation	Unemployment	Post-1983 Trend	Lagged Dependent Variable	Adjusted R^2
1	0.111	0.016	−0.076	−0.043	0.694	0.8034
	(1.3)	(1.1)	(3.3)	(1.0)	(6.7)	
2	−0.122	0.012	−0.082	−0.052	0.610	0.9426
	(1.8)	(1.0)	(4.7)	(1.5)	(6.8)	
3	−0.088	0.014	−0.038	−0.018	0.669	0.8140
	(1.2)	(1.0)	(2.0)	(0.5)	(6.4)	
4	0.254	−0.022	−0.018	−0.070	0.396	0.8143
	(2.8)	(1.7)	(1.0)	(2.2)	(2.9)	
5	0.003	−0.041	0.175	0.123	0.700	0.8501
	(0.01)	(1.2)	(3.5)	(1.2)	(7.5)	

NOTE: Standard errors are in parentheses.
SOURCES: U.S. Department of Commerce, *Statistical Abstract of the United States*, 1990, and *Economic Report of the President*, 1991.

examine the effects of macroeconomic variables on the share of income received by distinct population quintiles. These share data, collected and reported by the U.S. Department of Commerce, are obtained by ranking the income of all households from lowest to highest and calculating the percentage of total income that accrues to the first (lowest-income) one-fifth of households, the second one-fifth of households, and so on, up to the last one-fifth, who have the highest incomes in the population.

The effect of macroeconomic activity on these income shares can be seen by examining the results of the regressions reported in table 1. The regressions measure the effect of unemployment and inflation on the income share of each population quintile after controlling for the level of per capita income, lagged share values (essentially a catchall for the effects of omitted variables), and a shift in the income distribution that appears to have occurred subsequent to 1983.[4]

The results in table 1 indicate that the burden of unemployment clearly falls on the lower-income quintiles. The jobless rate is negatively related to the share of income received by the three lowest-income quintiles and is positive for the upper two.[5] Inflation, on the other hand, has no statistically significant effect on the distribution of income.

As indicated by the Blinder quotation in the introduction, these results are consistent with the bulk of the evidence on income inequality in the United States.[6] However, the information provided by studies of this sort is of a very particular type. Specifically, the regression results indicate only that, on a year-to-year basis, inflation does not reduce the relative share of income received by the lower-income quintiles. They do not tell us anything about the long-run effects of sustained inflation on the *level* of income for any particular income class.

In fact, if inflation has adverse effects on the long-run level of income, the poor may indeed be hurt — and perhaps hurt disproportionately in utility terms — even though their *relative*

■ **4** This regression model follows that reported in a recent paper by Cutler and Katz (1991). Although I use a different sample period than they do, the results in table 1 are qualitatively similar to their findings. The post–1983 shift toward greater inequality in income distribution is an interesting phenomenon that appears to have resulted from a significant structural shift in the employment patterns of skilled versus unskilled labor. I recommend the Cutler–Katz paper to those readers interested in a thorough discussion of this change.

■ **5** Note that, by construction, the income shares over all five quintiles must sum to one. Thus, a significant negative effect of some variable on the income share of one group must be offset by positive effects on one or more other quintiles.

■ **6** Buse (1982) finds a similar result for Canada. Specifically, he discovers that inflation does not significantly affect the share of income received by different income quintiles. Interestingly, neither does he find a significant effect arising from unemployment rates. However, other labor market variables, specifically the employment and labor participation rates, are found to influence income distribution, with greater employment and participation related to less income inequality.

income shares are not reduced. I turn now to a brief overview of the empirical evidence on the relationship between inflation and the long-run level of output.

II. Is Inflation Harmful to the Economy in the Long Run?

A recent study by Charles T. Carlstrom and William T. Gavin of the Federal Reserve Bank of Cleveland attempts a direct comparison of the welfare implications of the effects of disinflationary policies in both the short and long run (see Carlstrom and Gavin [1991]). The authors argue that, in terms of forgone output for the average individual, the long-run "shoe-leather" costs of a steady 4 percent inflation rate are similar in magnitude to the short-run costs that would typically be attributed to a tight-money policy that reduced the rate of inflation from 4 percent to zero.[7]

More generally, simple correlations do suggest that economic growth is negatively related to inflation. Using data from the International Financial Statistics, Gomme (1991) reports that "...62 of 82 countries exhibit a negative correlation between inflation and per capita real output growth." More complicated statistical examinations — essentially regressions of cross-country growth rates on a variety of political and economic variables — yield mixed conclusions. But, as convincingly argued by Levin and Renalt (1991), nonrobustness appears to be a generic weakness of the methodology employed in such studies.

Two features of these cross-country studies may help to explain this nonrobustness. First, there is a subtle point to be made here about the correlations between growth and inflation. In standard neoclassical growth models, the growth rate of the economy is exogenous and constant. In particular, the growth rate of income is not affected by inflation even though the *level* of income is.[8] Thus, the absence of a significant correlation between inflation and the long-run growth rate of the economy does not necessarily imply that a particular level of inflation will fail to reduce per capita income below the level attainable at lower inflation rates.

Second, the relationship between inflation and long-run economic performance may operate through indirect and complicated channels. One such possibility is the interaction between inflation and the tax system. Although indexing has been partially implemented in many countries, including the United States, extant indexing schemes are generally insufficient to remove the distortions created by inflation/tax interactions.[9] Although it is true that such interactions provide revenue that might be channeled to productive uses by funding desirable government expenditures or by reducing the level of government debt, research in progress by Charles Carlstrom and me suggests that allowing inflation to interact with the structural tax system is not an efficient way to raise revenue.[10]

In the next section, I examine a simple model economy in which inflation distortions arise through exactly this channel. Specifically, inflation is allowed to interact with a tax system based on nominal wage and capital income. The model is chosen to illustrate a rather straightforward point — that inflation can have deleterious long-run effects on the economic well-being of both the rich and poor, without affecting either the growth rate of the economy or the distribution of income.

■ **7** Shoe-leather costs are defined as the value of real money balances that would be held by individuals if the inflation rate were zero instead of 4 percent. An even more dramatic comparison of the welfare costs of short-run versus long-run changes in economic resources, although one not directly related to inflation, was given by Robert E. Lucas, Jr. in his 1985 Yrjö Jahnsson Lectures (see Lucas [1987], section III). He posed the following question: What is the maximum percentage of per-period consumption a representative individual would willingly give up in exchange for 1) a complete smoothing of short-run (or cyclical) fluctuations in consumption or 2) an increase in the long-run (or trend) growth rate of consumption from 2 to 3 percent? Using plausible values for individual risk preferences, volatility in consumption, and so on, Lucas argues that the amount of consumption that would be forgone in exchange for higher long-run consumption growth is several hundred times the amount that would be given up to eliminate short-run fluctuations.

■ **8** The assumption of exogenous, or policy-invariant, growth rates typical of the neoclassical growth framework presented here has recently been challenged by proponents of so-called endogenous growth models. Good overviews of the neoclassical and endogenous growth frameworks can be found in two papers by Sala-i-Martin (1990a, 1990b). A short and informal presentation of the issue is provided in an article entitled "Economic Growth: Explaining the Mystery," published in the January 4, 1992 edition of *The Economist*. See also Mankiw, Romer, and Weil (1990) for a skeptical empirical assessment of the endogenous growth framework.

■ **9** See Altig and Carlstrom (1991b).

■ **10** This message is implicit in Altig and Carlstrom (1991a). Bear in mind that we are not referring to issues related to seigniorage, or the "inflation tax," per se. See Cooley and Hansen (1989, 1991) and Gomme (1991) for recent analyses of the welfare implications of revenue collection through seigniorage.

III. A Simple Model[11]

To illustrate the argument, I present a simple general-equilibrium framework that admits two types of individuals: those who earn income solely through wages and those who earn both labor and capital income. Each of the groups arises endogenously as a result of its preferences. Members of the first group, who earn only labor income in equilibrium, allocate their earnings according to their own life-cycle consumption needs. Those in the second group care not only about their own life-cycle consumption, but also about their children's consumption. These altruistic impulses effectively make the planning horizon of this group infinite. They therefore have a much stronger motive for saving than the first group and, in equilibrium, end up owning the entirety of the economy's capital stock. For simplicity, and with obvious motivation, the first group will be referred to as "poor" and the second will be referred to as "rich."[12]

Each generation in this model lives, with absolute certainty, for two periods, which I refer to as the young and old phases of life. Labor is inelastically supplied in each period, and the productivity of labor, identical for rich and poor, is the same when young and old. I assume that a fraction ε of each generation is rich and $1-\varepsilon$ is poor.[13] The population growth rate is assumed to be zero, and the aggregate capital stock, wages, and the interest rate are determined by 1) the aggregate production technology, 2) the government's tax and expenditure policy, and 3) the saving and consumption decisions of the two groups.

The government raises revenue by applying a uniform flat tax rate, ρ, to *nominal* labor and capital income. In other words, the tax code is not indexed for inflation. Although the actual U.S. personal tax code is partially indexed, adjustments for inflation are far from perfect. In particular, the indexing provisions in the current tax code would not vitiate the overstatement of capital income that is critical for the results reported here.[14]

Denoting variables associated with the rich by superscript R and those for the poor by superscript P, the government's budget constraint is

$$(1) \quad G_t + T_t^R + T_t^P = \rho\,[\,(r_t + \pi_t)\,A_t + (1+\pi_t)\,w_t L_t\,],$$

where G_t represents government purchases of output, T_t^R and T_t^P are transfer payments to the rich and poor, respectively, r_t is the real return to capital (the interest rate), w_t is the real wage, π_t is the exogenously determined inflation rate, A_t is aggregate capital holdings, and L_t is aggregate labor supply.[15] Government spending is not productive, nor does it substitute for private consumption.

In what follows, I examine the steady-state, or long-run, effects of a change in the inflation rate on the level of income and lifetime consumption of the rich and poor. Subscripts indicating time periods will therefore be dropped. To further streamline the presentation, superscripts denoting rich and poor will be suppressed except when necessary. Readers who have no special interest in the details of the model can, without loss of continuity, skip to the next section, which presents the numerical results.

The utility function of each individual who, in equilibrium, is rich is given by

$$(2) \quad U(c_1, c_2, U_k) = ln(c_1) + \beta ln(c_2) + \gamma U_k^*,$$

where c_1 and c_2 denote own consumption in the first and second period of life, β is a subjective time-discount factor, U_k^* is the maximum attainable utility of the individual's child, and γ is the rate at which a parent discounts his or her

■ **11** The model developed in this section is similar to that presented in section V(b) of Altig and Davis (1992).

■ **12** Some readers may be uncomfortable with the model's implication that rich people "care" about their children but poor people do not. Such an implication, however, is more apparent than real. First, the group I have designated as poor (because they have no capital income) is presented as nonaltruistic for convenience only. As long as the degree of altruism is lower for one group than the other, the equilibrium outcome will be such that the group with the higher degree of altruism will own the entire capital stock, even if it is more altruistic by an infinitesimally small amount. Second, a more general model than the one I use here could allow the effective degree of altruism to be related to an individual's level of wealth. Thus, a framework in which bequest levels depend on the serendipitous mortality history of a given family line could result in the same type of sorting I exploit here, even though the utility functions of all individuals are identical.

■ **13** Mankiw and Zeldes (1991) report that, in 1984, some portion of wealth was held as stock for approximately 25 percent of the families surveyed in the University of Michigan's Panel Study of Income Dynamics. (This figure does not include equity implicitly held through pension plans.) These families accounted for approximately 40 percent of total disposable income. As described below, our model will be parameterized such that 25 percent of the population holds capital, with the shares of income accruing to the rich and poor according fairly closely with this evidence.

■ **14** See Altig and Carlstrom (1991b) for a more detailed discussion of inflation indexing in the U.S. personal tax code. The corporate tax code contains no indexing provisions.

■ **15** There is no "money" in the model. Inflation is introduced as the exogenous rate of depreciation of an arbitrary unit of account.

child's utility. If $\gamma = 1$, parents weight their child's utility equally to their own. Using analogous notation, the utility function of each individual who, in equilibrium, is poor is

$$(3) \quad U(c_1, c_2) = ln(c_1) + \beta ln(c_2) .$$

Equations (2) and (3) are maximized subject to the budget constraints

$$(4) \quad c_1 + g + T_1 = w[1 - \rho(1 + \pi)] + a$$

and

$$(5) \quad c_2 + T_2 + b = w[1 - \rho(1 + \pi)] + \{1 + r[1 - \rho(1 + \pi)]\} a ,$$

where g represents transfers received by children, b represents transfers given by parents, and a represents asset holdings. Note that $b = g = 0$ for individuals with preferences given by equation (3). Also, recall that $a^P = 0$ in equilibrium.

Production is undertaken by profit-maximizing, competitive firms that apply competitively obtained capital and labor inputs to a Cobb–Douglas technology, given by

$$(6) \quad y = \kappa^{\theta},$$

where y and κ are, respectively, per capita output and the per capita capital stock, and θ is a parameter that measures capital's share of total output. The profit-maximizing conditions of firms imply that the aggregate wage and interest rate are given by

$$(7) \quad r = \theta\kappa^{\theta - 1}$$

and

$$(8) \quad w = (1 - \theta)\kappa^{\theta} .$$

Along with the government's budget constraint given in equation (1), the specification of the model is completed by the goods-market and capital-market clearing conditions. Because capital does not depreciate and the population is stationary, government purchases and aggregate consumption, C, exhaust total output. The capital stock is simply the sum of asset holdings by the rich and poor, with the latter, once again, being zero in equilibrium. The two market-clearing conditions are thus given by

$$(9) \quad y = G + C$$

and

$$(10) \quad \kappa = \varepsilon a^R + (1 - \varepsilon) a^P .$$

For both groups, the intertemporal first-order condition for utility maximization is given by

$$(11) \quad c_2 = \beta(1 + r) c_1 .$$

For the group with preferences given by equation (2), the first-order condition governing intergenerational transfers, g, is

$$(12) \quad c_2 = \gamma c_{1,k} ,$$

where $c_{1,k}$ is the children's first-period consumption. Because every generation's consumption is the same in a steady-state equilibrium, $c_{1,k} = c_1$. Equations (12) and (13) thus imply that $\beta(1 + r) = \gamma$ when the transfer motive is operative for the group with preferences indicated by (2). Combined with equation (7), this condition implies that the per capita capital stock is given by

$$(13) \quad \kappa = \left[\frac{1 - \beta\gamma + \beta\gamma\rho\pi}{\theta\beta\gamma(1 - \rho)} \right]^{\frac{1}{\theta - 1}}$$

IV. How Inflation Hurts the Poor

The model is constructed so that the effects of inflation work through interactions with the tax system. Thus, as is clear from equation (1), an increase in the inflation rate (π) raises the amount of revenue collected by the government even when real income ($rA + w$) is unchanged. Because the model does not incorporate government debt, satisfaction of the government budget constraint requires either an increase in government expenditures, an increase in transfer payments, or some combination of the two. Aggregate and individual consumption levels thus depend on the nature of the fiscal policy regime.

The results of three distinct fiscal policy experiments are presented in this section. In the "benchmark" model, tax revenues and government purchases of real output are endogenously determined. A second case, which I refer to as the "progressive-transfer" model, maintains a constant, exogenous level of government purchases, transferring all surplus revenues to the poor. Results in the third case, which I call the "revenue-neutral" model, are obtained by assuming a constant level of government purchases, with all surplus revenues used to increase transfer payments such that the net tax payments of each cohort remain constant. Equations (4) to (13) can be combined to obtain consumption levels under each of the fiscal regimes. The solutions are given in the appendix.

TABLE 2

Simulated Steady-State Effects of Inflation/Tax Interactions

	Income Share		Consumption Loss from Inflation (percent)	
Model	Rich	Poor	Rich	Poor
Benchmark model, zero inflation	0.44	0.56	—	—
Benchmark model, 4 percent inflation	0.44	0.56	3.1	2.2
Progressive transfer, 4 percent inflation	0.43	0.57	3.1	0.0
Revenue neutral, 4 percent inflation	0.44	0.56	1.5	1.3

SOURCE: Author's calculations.

The results of the three distinct fiscal policy experiments, presented in table 2, are obtained assuming that capital's share of output is 25 percent ($\theta = 0.25$), the productivity factor in each period of life (α_1^P, α_1^R, α_2^P, and α_2^R) equals 0.25, the subjective discount factor (β) equals 0.778, the income tax rate is 20 percent ($\rho = 0.20$), 75 percent of the population is poor and 25 percent is rich ($\varepsilon = 0.25$), and the rich weight the utility of their children equally to their own ($\gamma = 1$).[16]

For each of the experiments, I calculate the relative share of income received by the rich and poor populations, as well as the change in lifetime consumption for each group in a steady state as the rate of inflation is increased to 4 percent from the benchmark case with zero inflation. The results in the second row of table 2 are obtained from the benchmark model (with 4 percent inflation), the results in the third row correspond to the progressive-transfer model, and the results in the fourth row are obtained from the revenue-neutral model.

Table 2 conveys the central message of this paper: The distribution of income, as measured by relative shares of personal income (total output less government purchases), is virtually invariant to the rate of inflation. Despite this, the lifetime consumption opportunities of the poor fall by as much as 2.6 percent. Only when all surplus revenues from inflation are transferred to the poor is this group unharmed by inflation. And even in this case, their lot is not improved. It is clear, then, that evidence regarding income distribution is of limited value as a measure of the welfare consequences of inflation on the poor.[17]

More directly, the poor are decidedly hurt by inflation, even though these adverse consequences do not manifest themselves in lost income shares. It is possible that in a more fully articulated model, the poor might actually gain in the short run. However, if the effects of inflation emphasized here capture some important part of economic reality, such a gain would be transitory. If inflation is harmful in the long run, the less affluent will not be exempt.

V. The Moral of the Story

This paper is a cautionary tale for the "soft hearted": Attempts to alleviate the burden of unemployment on the less well-to-do through expansionary monetary policy may hurt the clientele it is supposed to serve if, ultimately, the policy leads to higher long-run rates of inflation. This study is not, however, a criticism of fine-tuning attempts per se. Current Fed policy may or may not fall victim to the "too much, too late" syndrome (that is, too rapid an expansion of the money supply at too late a stage in the slowdown to prevent upward pressure on the price level once the recovery begins in earnest). But if policy mistakes do occur, short-run monetary medicine could further harm those who are most affected by recession, slow growth, and diminished income levels.

Fortunately, the presumed trade-off between a monetary policy that responds to short-run economic circumstances and one that maintains price stability in the long run is a false exchange. By setting long-run price-level targets collateralized with credible and clearly articulated enforcement mechanisms, the Fed would be free to pursue stabilization efforts aggressively without destabilizing inflation expectations or ultimately risking higher-

■ **16** Although the results are sensitive to the choice of ε, this value accords fairly well with evidence concerning the actual distribution of income. The poor segment of the model population receives a higher share of total personal income than the rich, but the poor represent three-quarters of the population. The rich, who make up only one-quarter of the population, receive almost 44 percent of personal income. See footnote 13.

■ **17** A 2.6 percent reduction may not seem like much, especially when stacked against the potential costs of unemployment. But 2.6 percent of *lifetime* consumption may be larger than you think. With a sustainable real consumption level of $20,000 per year, a 55-year planning horizon, and a 5 percent real rate of return, a loss of this magnitude would be equivalent to a current lump-sum tax on the order of $10,000, or half a year's consumption.

than-desired inflation paths that are difficult to reverse after the fact.

Creating such a policy environment is, of course, easier said than done, but certainly no more difficult than determining an effective way to exploit notoriously slippery Phillips curve trade-offs. Furthermore, institutional rules that advance price stability while maintaining flexibility over monetary policy choices in the short run do exist. William Gavin, of the Federal Reserve Bank of Cleveland, and Alan Stockman, of the University of Rochester, have recently presented such a proposal (see Gavin and Stockman [1992]). This, and related work, deserves the attention of anyone interested in the long-run welfare of rich and poor alike.

Appendix

Consumption Solutions for the Alternative Fiscal Regimes

This appendix presents steady-state consumption solutions for the rich and poor when young (that is, for c_1^P and c_1^R). Solutions for old-age consumption are given by these expressions and equation (11). Asset levels are then given by equations (4) and (5). Superscripts indicating rich and poor are suppressed except where absolutely necessary.

Benchmark Model

In the benchmark model, government expenditures are endogenous. The poor's first-period consumption is

$$c_1 = \frac{(\alpha_1 + \alpha_2)\,[1 - (1+\pi)\,\rho]\,w}{\varphi\,(1+\beta)},$$

where $\varphi = 1 + r(1-\rho) - \rho\,\pi$.

The consumption solution for the rich is

$$c_1 = \gamma \left\{ \frac{(1-\varphi)\,[L\,\kappa^{\theta} - (1-\varepsilon)\,C^P]}{\varepsilon\,(1+\gamma)\,[1-\varphi-\rho\,(r+\pi)]} \right.$$

$$\left. - \frac{\varepsilon\,\rho\,\varphi\,(\alpha_1+\alpha_2)\,(\rho+\pi) - \tau_{NET}}{\varepsilon\,(1+\gamma)\,[1-\varphi-\rho\,(r+\pi)]} \right\},$$

where τ_{NET} is all tax revenues net of capital income taxes paid by the rich, C^P is the total consumption by the poor, and L is the (exogenous) aggregate labor supply. Note that C^R is obtained by first solving for consumption by the poor.

Progressive-Transfer Model

For the poor:

$$c_1 = \frac{(\Gamma_1\,\alpha_1 + \alpha_2\,\Gamma_2)\,w}{\Gamma_1 + \beta\,\varphi\,\Gamma_2}$$

$$+ \frac{\Gamma_1\left[\dfrac{\varepsilon\,\tau + \rho\,L\,\kappa\,(r+\pi)}{2\,(1-\varepsilon)} - \tau_1\right]}{\Gamma_1 + \beta\,\varphi\,\Gamma_2}$$

$$+ \frac{\Gamma_2\left[\dfrac{\varepsilon\,\tau + \rho\,L\,\kappa\,(r+\pi)}{2\,(1-\varepsilon)} - \tau_2\right]}{\Gamma_1 + \beta\,\varphi\,\Gamma_2},$$

where

$\Gamma_1 = (1+r) - \dfrac{\rho\,(r+\pi)}{2}$, $\Gamma_2 = 1 + \dfrac{\rho\,(r+\pi)}{2}$, τ_1 is an exogenous lump-sum tax payment of the poor when young, and τ_2 is an exogenous lump-sum tax payment of the poor when old.

Consumption by the rich is

$$c_1 = \frac{\gamma\,[L\,\kappa^{\theta} - (1-\varepsilon)\,C^P - G]}{\varepsilon\,(1+\gamma)}.$$

Revenue-Neutral Model

For the poor:

$$c_1 = \frac{1 + \dfrac{\beta\varphi}{1+\rho}}{\left(\alpha_1 + \dfrac{\alpha_2}{1+r}\right) w - \left(\tau_1 + \dfrac{\tau_2}{1+r}\right)}.$$

Given the consumption solutions for the poor, the consumption solutions for the rich have the same form as in the progressive-transfer model.

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