THE SIZE DISTRIBUTION OF INCOME DURING INFLATION

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This paper analyzes the effects of inflation on the size distribution of income, making use of a microsimulation model. It goes beyond earlier analyses not only in the use of microdata but also in the types of inflation modeled. Two different income concepts are used, one the money income concept of the U.S. Census Bureau and the second, called Accrued Comprehensive Income, based on the concept of income as consumption plus the change in net worth. The results of the simulation inflations are presented graphically, as the ratio of real income with inflation to real income without, by income class. The analysis concludes that the income concept chosen is crucially important. While low income households suffer modest losses and middle income households are largely unaffected, whatever income concept is used, the effects on upper income households are extremely sensitive. With a simple money income concept, the well-to-do appear to benefit from inflation but a broader concept reverses this effect. A policy to negate the distributional effect of inflation would benefit primarily the upper income households. Similarly, macroeconomic policies designed to reduce inflation at the price of slower growth and greater unemployment would not aid lower income groups to a significant degree.

This paper describes a simulation of the effects of inflation on the size distribution of income among households. The simulation follows earlier efforts by Nordhaus, and Budd and Seiders[1], but extends the more customary analysis in several dimensions: (1) it uses a large sample microdata set, the Brookings 1970 MERGE file, that accurately represents the entire population and exhausts national income[2]; (2) tax liabilities are included in the analysis; (3) the adjustment of transfer payments to inflation is modeled[3]; (4) inflation-induced changes in the

*Edward M. Gramlich, John L. Palmer, Joseph A. Pechman, Emil M. Sunley, and two anonymous referees provided many useful comments. Todd E. Easton provided diligent and careful research assistance; Richard Booth, Mary Bell Hevener, Richard Marney, James G. McClave, Jr., and Laurent R. Ross also provided helpful research assistance for short periods of time. The research for this paper was supported by grants from the Department of Health, Education and Welfare and the RANN program of the National Science Foundation. Opinions expressed herein are those of the author and should not be attributed to the Brookings Institution, its officers, trustees or other staff members, or to the Department of Health, Education and Welfare or the National Science Foundation.

[1]Edward C. Budd and David F. Seiders, "The Impact of Inflation on the Distribution of Income and Wealth," *American Economic Review Papers and Proceedings*, May, 1971; William D. Nordhaus, "The Effects of Inflation on the Distribution of Economic Welfare," *Journal of Money, Credit and Banking*, February, 1973, Part 2.

[2]The MERGE file is a statistical match of responses from the U.S. Census Bureau's March, 1971 Current Population Survey, a uniform sample of about 50,000 American households; and the U.S. Internal Revenue Service's 1970 Individual Income Tax Model File, a stratified sample of 100,000 U.S. personal income tax returns, including a 100 percent sample of returns with adjusted gross income over $200,000. (Both samples are without individual identifying information, of course.) The MERGE file thus has detailed demographic information together with complete income and income tax data, permitting precise computation of income taxes and accurate estimation of all other taxes. See Joseph A. Pechman and Benjamin A. Okner, *Who Bears the Tax Burden?* (Brookings, 1974), Appendix A, for a complete description of the MERGE file; detailed working papers are available from the present author. The data file used for the earlier studies, the Federal Reserve Board's Survey of Financial Characteristics of Consumers, had some wealth data but was deficient in reporting of both wealth and income. See Projector and Weiss, *Survey of Financial Characteristics of Consumers* (Washington: Board of Governors of the Federal Reserve, 1966), p. 2.

[3]The earlier studies were completed before social security benefits were automatically indexed, and assumed that other transfers were fixed in money terms. See, for example, Budd and Seiders, p. 132.

corporate sector, including tax effects, are passed through to equity owners in the household sector; (5) uniform and food and fuel concentrated inflations, and short and long-term inflations are all simulated.

Section 1 explains the methodology used in this study, and section 2 presents the results.

SECTION 1: METHODOLOGY

The simulations described in this paper were performed by analyzing the effect of inflation upon an income and expenditure statement for each household. The response of each item on the statement to changes in the general price level was estimated, tax liabilities for all taxes affecting the household sector were computed, and the changes in the individual items were summed to find the total effect of inflation.

The first part of this section will explain the two income concepts used; the second and third will deal with income and expenditure items respectively; and the fourth will explain the types of inflations simulated. At the conclusion of that section is a table showing, in summary, how each income and expenditure item changes under each alternative simulated inflation[4].

Income Concepts

Two different income definitions are used in each of the simulated inflations. The first is the money income concept used by the U.S. Census Bureau in its surveys and published income distribution and poverty data. "Census income" includes cash income from wages, salaries and self-employment; interest, dividends, rents and royalties; cash government transfers from social security, welfare, unemployment compensation, workmen's compensation, supplemental security income and general assistance; private and government pensions; and regular cash receipts from any other private sources.

The second income concept, developed for this study, is called Accrued Comprehensive Income ("ACI"). ACI is conceptually based on the traditional Haig–Simons definition of income as consumption plus the change in net worth[5], and operationally follows the Adjusted Family Income measure used by Pechman and Okner[6]. ACI includes all of Census income, plus many sources of accrued income[7], in-kind income[8], and certain tax amounts necessary to comply with the national income accounts tax incidence assumptions[9]. ACI is net of all taxes paid

[4]A detailed appendix on the methods used is available from the author.

[5]Robert Murray Haig, "The Concept of Income—Economic and Legal Aspects," in Haig, ed., *The Federal Income Tax* (Columbia University Press, 1921); Henry C. Simons, *Personal Income Taxation: The Definition of Income as a Problem of Fiscal Policy* (University of Chicago Press, 1938).

[6]Pechman and Okner, op. cit.

[7]These fall into two classes. The first is employer contributions to public programs or private trust funds for future benefit to the worker: social security, unemployment insurance, workmen's compensation, government retirement, and private pension and welfare programs. The second class is accruals to the value of property: interest on life insurance; and the change in the value of corporate shares, farm assets, nonfarm real estate, corporate and noncorporate inventories, debt, and debt securities.

[8]These are the insurance value of medicare and medicaid benefits, the bonus value of food stamps, and imputed net rent on owner-occupied homes.

[9]These are the federal, state and local corporate income taxes on shareholders' firms, and the real property tax on land. See Pechman and Okner, op. cit.

by the household sector using those assumptions. The result is a measure approximating national income (at market prices) received in the household sector. The treatment of inflation-induced changes in the accruals, in keeping with the Haig–Simons definition, is to include them in income currently.

Income Items

The dominant income item in the United States is labor earnings[10]. An analysis of the behavior of labor earnings during inflation must abstract from all other influences; the method chosen for the current analysis was a time series regression on the share of labor in the corporate sector, controlling for the level and rate of change of the utilization of the economy and the rate of change and change of the rate of change in the price level on a quarterly basis, corrected for autocorrelation. The results of the regression indicate no independent influence of price behavior upon the labor share:

$$\ln(W/y) = -0.446 + 0.003\mathrm{U} - 0.346D\ln \mathrm{GNP}\,F - 0.136D\ln \mathrm{P} - 0.090DD\ln P$$
$$\qquad\qquad (2.269)\quad (6.850)\qquad\qquad (0.694)\qquad (0.744)$$
$$\mathrm{RHO} = 0.936 \quad \bar{R}^2 = 0.900 \quad F(4,101) = 238.043 \quad SE = 0.007 \quad DW = 1.806$$

(t statistics in parentheses)

$\ln(W/y)$ is the natural logarithm of earnings divided by gross corporate product;

U is the unemployment rate;

D ln GNP F is the change in the ratio of actual to potential gross national product;

D ln P is the change in the natural logarithm of the GNP deflator; and

DD ln P is the second difference of the natural logarithm of the deflator.

Data period 1948 through 1974

Given this evidence, the simulations were performed under the assumption that wages are perfectly indexed to the price level. This assumption explicitly ignores the possibility that inflation may cause policy decisions that would affect the real economy and thereby the labor share; because such policies would be taken at the discretion of government, in part perhaps because of inflation's assumed redistributional effects, it would be more useful to determine inflation's impact independent of those decisions[11]. Employers' contributions to workmen's compensation,

[10]Because of a complete lack of data on relative factor returns in small and unincorporated business, such income is considered here as entirely returns to labor, and to behave in the same fashion as labor earnings in the corporate sector. Wages in the government and nonprofit sectors are likewise assumed to follow those in the corporate sector.

[11]Also ignored is the lag of adjustment of wages of particular individuals to an increase in the rate of inflation. With no statistically demonstrable lead or lag of wages in the aggregate, it is probable that some individual wages lead and some lag the price level at particular times, whether due to nearly random factors (such as contract expiration dates) or systematic factors such as market power. To date, however, such leads and lags have been extremely difficult to quantify. See Daniel J. B. Mitchell, "Union Wage Determination: Policy Implications and Outlook," *Brookings Papers on Economic Activity*, 3, 1978, pp. 537–582.

pension and welfare programs were assumed to be a fixed percentage of wages.

Interest income is received from a number of different sources in the U.S., and so its simulation is complex. The general methodology used was to assume that long-term interest rates will increase by an amount equal to an additional increment of inflation through an exponential decay process over a period of five years, and that short term rates will make the same adjustment over one year[12]. Bank interest rates were constrained by regulatory ceilings. Data were then examined on the holdings and maturity structures of different types of debt instruments in the household sector, whenever possible by income class. Each household was then assumed to hold a portfolio of all of the types of instruments it was found likely to hold; this restricted low income households to time deposits in banks, and government short-term bonds and tax-free state and local bonds to upper income households. The yields were assumed to remain fixed until the instrument matured, and the maturation of the stock of each instrument was assumed to follow the time structure of the outstanding debt of that form. The result was that the adjustment of interest income receipts lagged behind that of market interest rates; receipts still far outpaced the price level, however[13]. Interest on life insurance policies was assumed fixed in money terms. The market value of debt securities was assumed to fall according to the increase in interest rates, and the change was added to ACI. Likewise, the reduction in the real value of household debt was added to ACI.

Corporate dividends have most successfully been estimated in the United States as a function of past dividends and corporate cash flow[14], and so the simulations use that technique. Corporate sales and production costs were assumed to increase with the price level; net interest payments were assumed to increase in the same fashion as household interest receipts from corporate debt[15]. Tax-free depreciation allowances were inferred from the actual figure, with an adjustment based on the assumptions that new capital goods purchased during the

[12]This involves two implicit assumptions. First, the assumed rate of adjustment is a middle ground estimate on the basis of earlier studies cited by Nordhaus, op. cit., Table D1. Since the Nordhaus compilation, William E. Gibson, "Interest Rates and Inflationary Expectations," *American Economic Review*, December, 1972, pp. 854–865, obtained estimates of a faster adjustment of interest rates.

Second, it is assumed that interest rates do not increase by an amount greater than the increment to inflation in order to provide the same after tax cost or income to borrower or lender. This assumption is made because interest rates are not observed to rise by sufficient amounts to justify a greater adjustment, and because the diversity of tax rates paid by borrowers and lenders (including governments, which pay no tax) makes such overadjustment unlikely. See Jack Carr, James E. Pesando and Lawrence B. Smith, "Tax Effects, Price Expectations and the Nominal Rate of Interst," *Economic Inquiry*, June, 1976, pp. 259–269, for an empirical examination of this question.

[13]This is so because a 2 percentage point increase in an interest rate from 5 to 7 percent, for example, to compensate for a 2 percentage point increase in inflation, would increase interest income flows by 40 percent. Thus interest from instruments with lower yields increases faster in percentage terms during inflation, as does interest from instruments with a shorter average time until maturity.

[14]John Lintner, "Distribution of Income of Corporations Among Dividends, Retained Earnings and Taxes," *American Economic Review*, May, 1956; and John A. Brittain, *Corporate Dividend Policy* (Brookings, 1966).

[15]The gains of debtor corporations and losses of creditor corporations are ignored here because corporate net interest is near zero in aggregate in most years, indicating that the corporate sector neither gains nor loses appreciably in aggregate. Losses due to the taxation of inventory profits are also ignored because the use of last-in first-out accounting provides approximate indexation in that regard.

year increased in price at the average rate of inflation[16], and that corporations used the double declining balance method with the average lifetime of new investments equal to the average lifetime of the existing stock. The federal corporate tax was then computed on new money profits at the pre-inflation average rate[17]; state and local corporate taxes, which are both income and property taxes, were assumed to increase at the rate of inflation. Aggregate dividends were then estimated from the usual equation:

$$D - D_{-1} = 0.358 + 0.123C - 0.489D_{-1}$$
$$(7.232) \quad (6.713)$$

$$\bar{R}^2 = 0.726 \quad F(2,21) = 31.518 \quad SE = 0.326 \quad DW = 1.950$$

(t statistics in parentheses)

Annual data, 1947–1970[18], where D is aggregate dividends; D_{-1} is aggregate dividends lagged one period; and C is corporate cash flow. On this basis, an additional dollar of inflationary cash flow would add \$0.123 to dividends; for the simulation year that yields an underadjustment of dividends to inflation.

Corporate retained earnings are assumed to directly increase equity prices and are included in the comprehensive definition of income. Retentions are the residual of revenues after dividends, interest, taxes and costs, but with an adjustment, presumed to be made by the equity market, for the shortfall of post-inflation depreciation allowances relative to actual capital consumption. Actual depreciation is assumed to be equal to pre-inflation depreciation allowances increased by the increment to inflation; retained earnings in comprehensive income are reduced by the shortfall of post-inflation depreciation allowances, as described above, relative to actual capital consumption.

Realized capital gains are not included in either of the income concepts, but their adjustment is necessary for tax computation purposes. The prices of assets are assumed to increase at the rate of inflation[19]; the cost bases as a fraction of sale prices were derived by income class from the most recent (nonetheless dated) capital gains study by the U.S. Internal Revenue Service[20].

Proportional adjustments of gains and losses were estimated by income class from the relationship of prices to cost bases. For assets purchased during the simulated inflation, the bases as well as the prices were adjusted.

Rental income was adjusted on the basis of a regression equation similar to that for labor earnings:

$$\ln(R/y) = -3.621 + 0.021U - 0.344D \ln \text{GNP}F - 0.594D \ln P + 0.463DD \ln P$$
$$(5.787) \quad (2.889) \qquad (1.263) \qquad (1.610)$$

[16]It is implicitly assumed that corporations will not change their investment plans because of the inflation. In the long run, given the increases in corporate tax liabilities due to inflation, firms may reduce their investment to raise the marginal rate of return after taxes to the pre-inflation level.

[17]This allows implicitly and inexactly for the investment tax credit and corporate profits taxed below the surtax rate.

[18]Later years omitted because of dividend controls instituted in the U.S. in 1971.

[19]This assumption was also used for farm assets, nonfarm real estate, and corporate and noncorporate inventories.

[20]*Statistics of Income, 1962, Supplemental Report: Sales of Capital Assets Reported on Individual Income Tax Returns*, U.S. Treasury Department, 1966.

RHO = 0.988 $\bar{R}^2 = 0.954$ $F(4,101) = 548.231$ $SE = 0.016$ $DW = 1.971$

(t statistics in parentheses)

Quarterly data, 1948 through 1974, where

$\ln (R/y)$ is the natural logarithm of the rent share of GNP;

U is the unemployment rate;

$D \ln \text{GNP}\, F$ is the change in the natural logarithm of the ratio of actual to potential GNP;

$D \ln P$ is the change in the natural logarithm of the GNP deflator;

$DD \ln P$ is the second difference of the natural logarithm of the GNP deflator.

This equation reveals a reduction in the rent share of total income in inflation at the 20 percent significance level, probably due to the setting of rental prices in part according to historical capital costs.

The various government transfer payments were treated in different ways. Three programs—social security, supplemental security income and food stamps—are automatically indexed and were adjusted according to the statutory formula[21]. Benefits under aid to families with dependent children were adjusted according to published figures on benefits per household, taking account of the fact that household size has been falling substantially in the program[22]. Medicare and medicaid benefits were increased at the average inflation rate. Unemployment and workmen's compensation benefits were increased according to the actual increases in maximum allowable benefits under the state programs from 1967 to 1975 (1974 for unemployment compensation); for the most part these programs are indexed to real wages and benefits grew faster then prices. Benefits under the small state programs of general assistance and emergency relief were assumed fixed in money terms for want of sufficient data to derive other estimates.

Benefits from private pension plans are largely fixed in money terms, and were so treated in the simulations.

Income from estates and trusts was assumed to be divided between interest and dividends in the same proportion as the remainder of aggregate household income, and was adjusted accordingly.

Expenditure Items

Prices of goods and services were generally assumed to increase at the average rate of inflation[23]. However, not all of a household's income should be

[21]The supplemental security income program was introduced in 1975; for the simulations incomes received under the three predecessor programs—aid to the blind, aid to the permanently and totally disabled, and old age assistance—were adjusted according to the supplemental security income formula.

[22]AFDC benefits are computed on the basis of family size. While benefits per household have been nearly constant, the falling household size in the program indicates that benefits for households of any given size are rising.

[23]For the sake of simplicity, the effect of housing costs on the overall rate of inflation is ignored; that is, the overall rate of inflation is assumed and applied to all goods other than housing, and then the housing rates are computed and used without a recomputation of the overall rate.

deflated by the average increase in the price index. Home mortgage or rental payments are contractually committed and do not increase at the average rate of inflation. Home mortgage payments are fixed, and home rental payments increase at a rate somewhat slower than the average. To account for these contractual arrangements, the amount of homeowners' mortgage payments was not deflated, and the amount of home rental payments was deflated by a separate price index for rent[24].

Taxes were recomputed after inflation. The facilities of the Brookings MERGE file permitted precise computation of the federal income and payroll taxes; the tax laws in effect in 1975 were used. Federal, state and local excise and sales taxes were separated into those usually specific and those usually *ad valorem*, with the *ad valorem* taxes assumed to increase at the rate of inflation and the specific taxes fixed. Local property taxes were also assumed to be perfectly indexed, as they would be if assessments were kept current or rates were increased to maintain the real yield of the tax, or a combination of both. State income taxes were increased in proportion to the increase in adjusted gross income on the federal income tax return.

Types of Inflation

The standard simulation presented here assumes a 2 percentage point increase in the annual inflation rate. In addition to this base case, three other inflations were simulated; each required certain alterations in the basic methodology.

A 5 percent uniform inflation required a greater increase in prices, incomes and interest rates, and a recomputation of taxes.

A 2 percent food and fuel concentrated inflation was designed by increasing the prices of food and fuel products by 4 percent, and all other prices by an amount sufficiently lower that the average for all consumer prices would be 2 percent. Real household income after inflation was then derived from the new income and price structure under the assumption that real food and fuel consumption remained fixed; thus, the result is a lower bound on real household income.

The effects of the base case were also estimated for the sixth year of inflation. This required greater adjustment of income and expenditure amounts. Home mortgages written over a six year period were adjusted for changes in market interest rates and prices of homes. Corporate depreciation allowances were increased to account for greater capital outlays over the six years; dividends therefore changed over the entire period. The cost bases of realized long term capital gains were increased.

A summary of the effects of inflation on individual income and expenditure items under each of the simulated inflations is presented in Table 1.

While the methodology used here is not immediately and completely transferable to other countries due to dissimilarities among available data sets, it is usable in part and provides an indication of what could be done with comprehensive microdata files.

[24]Mortgages judged to have been written during the simulation year (due to a high ratio of debt to equity) are recomputed at higher interest rates because of the inflation.

TABLE 1

PRICE AND INCOME ADJUSTMENT COEFFICIENTS FOR INFLATION[a]

Price or Income Item	Adjustment Coefficient			
	2% Uniform (Current)	5% Uniform (Current)	2% Food and Fuel (Current)	2% Uniform (After 5 years)
1. Prices (All) (Full adjustment)	1.010	1.025	1.010	1.115
2. Food and Fuel prices	1.010	1.025	1.020	1.115
3. Other prices	1.010	1.025	1.006	1.115
4. Wages, Salaries, Self-employment Income, Royalties	1.010	1.025	1.010	1.115
5. Rent	1.008	1.020	1.008	1.072
Interest on:[b]				
6. U.S. Bills	1.163	1.408	1.163	1.296
7. U.S. Bonds	1.012	1.030	1.012	1.287
8. U.S. Savings Bonds[c]	1.000	1.000	1.000	1.000
9. Corporate and Foreign Bonds	1.012	1.030	1.012	1.163
10. Loans and Mortgages	1.002	1.006	1.002	1.074
Savings and Time Deposits[d]				
11. Less than $100,000	1.008	1.008	1.008	1.008
12. $100,000 and greater	1.094	1.096	1.094	1.096
13. State and Local Bonds	1.003	1.008	1.003	1.124
14. Dividends	1.004	1.009	1.004	1.079
15. Corporate Retained Earnings	1.006	1.014	1.006	1.083
Corporate Taxes:				
16. Federal	1.016	1.039	1.016	1.165
17. State and Local	1.010	1.025	1.010	1.115
18. Income from Estates and Trusts	1.036	1.067	1.036	1.157
19. Social Security	1.002	1.004	1.002	1.097
20. Workmen's Compensation	1.008[e]	1.022[e]	1.008[e]	1.096[e]
21. Unemployment Compensation	1.008[e]	1.021[e]	1.008[e]	1.094[e]
22. Aid to Families with Dependent Children	1.009[e]	1.022[e]	1.009[e]	1.102[e]
23. Supplemental Security Income	1.002	1.004	1.002	1.097
24. Food Stamp Bonuses	1.002	1.004	1.004	1.103
25. Private Pensions	1.000	1.000	1.000	1.000

[a]Coefficients are derived according to assumptions and methodology described in the text and appendix.

[b]Interest coefficients do not include losses due to depreciation of principal; were such losses included, adjustment would only be full (i.e., equal to price coefficient) in the very long run (except for short-term assets, which adjust in one year).

[c]Government action to raise U.S. Savings Bond interest rates assumed not to occur.

[d]Interest rate ceilings assumed to remain unchanged.

[e]Weighted average of individual state factors which are available from the author.

SECTION 2: SIMULATION RESULTS

This section is a presentation of the simulated inflations described in section 1. The results are presented graphically, as the ratio of real income with inflation to real income without, by income class. Real income with inflation was computed by deflating money income with inflation by the increment to inflation, with the adjustments to home mortgage payments and home or apartment rental

payments, and (in the food and fuel inflation case) food and fuel expenditures, as described in section 1.

Base Case.

The first simulation is the uniform 2 percent inflation, measured in the current year. The effect of this inflation is shown in Figure 1.

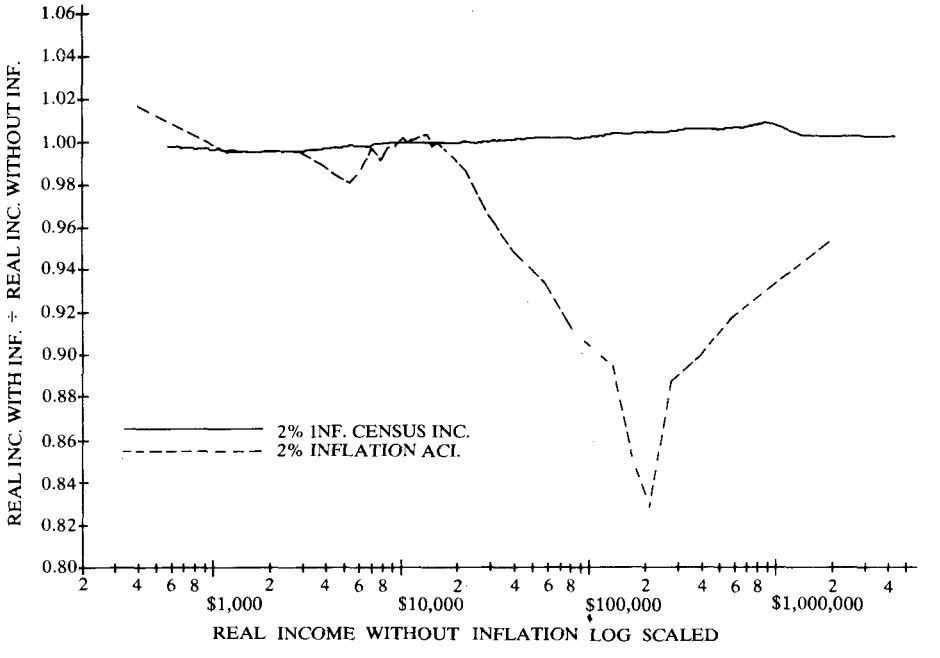

Figure 1. 2 Percent Uniform Inflation

Source: Brookings 1970 MERGE file. Results are in 1970 dollars. Population percentile rankings are as follows. Census income: $2,000: 8.6; $4,000: 21.2; $5,000: 27.1; $7,000: 39.3; $9,000: 51.6; $10,000: 57.4; $12,000: 68.1; $15,000: 79.9; $19,000: 89.4; $25,000: 95.3; $40,000: 98.7; $100,000: 99.9. Accrued comprehensive income: $3,000: 7.9; $5,000: 18.3; $8,000: 32.2; $10,000: 41.4; $12,000: 50.4; $14,000: 59.5; $17,000: 71.1; $20,000: 80.2; $25,000: 89.4; $30,000: 93.8; $75,000: 99.3; $200,000: 99.9.

The curve for Census income shows that below about $10,000 real incomes are reduced, with the greatest reduction about $\frac{1}{2}$ of 1 percent; this is because transfer income, some of which lags prices, is highly concentrated at low incomes. From about $10,000 to about $25,000 real incomes are virtually unaffected because of the predominance of earnings in that range. Above that level real incomes are increased by increasing proportions until $1,000,000, where the increase is about 1 percent; from that point the increase falls off to less than 0.5 percent. The increase in the $25,000–$1,000,000 range is due to a high concentration of interest income; above that level the reduced gains are due to increased relative amounts of dividend income.

The second curve shows changes in real ACI by income level in the 2 percent inflation. At the very lowest incomes, the ACI curve is higher (due to increases in home value swamping very small incomes), but above that level Census income shows modest gains while accrued comprehensive income shows sizeable losses—as great as 17 percent from $200,000 to $500,000 of income. The ACI result is almost diametrically opposite to that of Census income.

The difference between these two income measures produces these results. While Census income includes the increased interest income of the upper income households, it does not include the decline in market values which these higher interest receipts imply for those holding long term assets[25], or transfers from creditors to debtors. Accrued comprehensive income, as applied here, includes these losses. Census income includes dividends, which are underadjusted for inflation, but ACI also includes corporate retained earnings which are similarly underadjusted and thus further reduce measured after-inflation receipts of high income households. Low income households suffer to the extent that transfer payments are underadjusted, but gain because increases in home value swamp the very small (in dollar terms) losses from other sources.

The simulations on the accrued comprehensive income basis have some important implications. While a narrow income concept such as Census income may suggest that inflation redistributes income to those at the top of the distribution, a broader income concept reveals just the reverse. This contrast sheds some light on recent movements of Census income distribution statistics. With the recent burst of inflation, the distribution of Census income has generally become less equal[26]. This kind of effect has been ascribed to inflation[27]. The simulations here show that inflation may have caused these movements, but that the Census income measure includes the benefits but little of the costs of inflation to high income groups. It should be clear that accrued comprehensive income is a better measure of economic well-being for the purposes of these simulations, and that the "hidden" costs of inflation to high income groups far outweigh the visible benefits.

Faster Inflation

The second simulation, illustrated in Figure 2, replicates a 5 percent inflation. At the low end of the income scale the after-inflation Census income changes are about two and a half times the changes in the 2 percent inflation. Above about $25,000, although the shape of the 2 percent and 5 percent curves is very much the same, the deviation of the curve from 1.0 is damped by a greater lag of dividend receipts. Thus the real income gains of upper incomes in the 5 percent case are less

[25]These losses are one-time only decreases in net worth. Later simulations will abstract from these transient elements by measuring distribution effects in a long term inflation, after the rise in interest rates has worked its way through the securities markets.

[26]In particular, the income share of the highest quintile of households increased from 43.4 to 44.8 percent between 1967 and 1972, while the shares of the second and third quintiles fell from 17.5 and 10.6 to 16.9 and 10.0 percent respectively. These are rather dramatic changes compared to the normally glacial movements of income shares. U.S. Census Bureau, *Current Population Reports*, Series P-60, No. 105, Table 13.

[27]"There can be little doubt that poor people, or people of modest means generally, are the chief sufferers from inflation." Arthur Burns, "The Perils of Inflation," *Tax Review*, May 1968, p. 21.

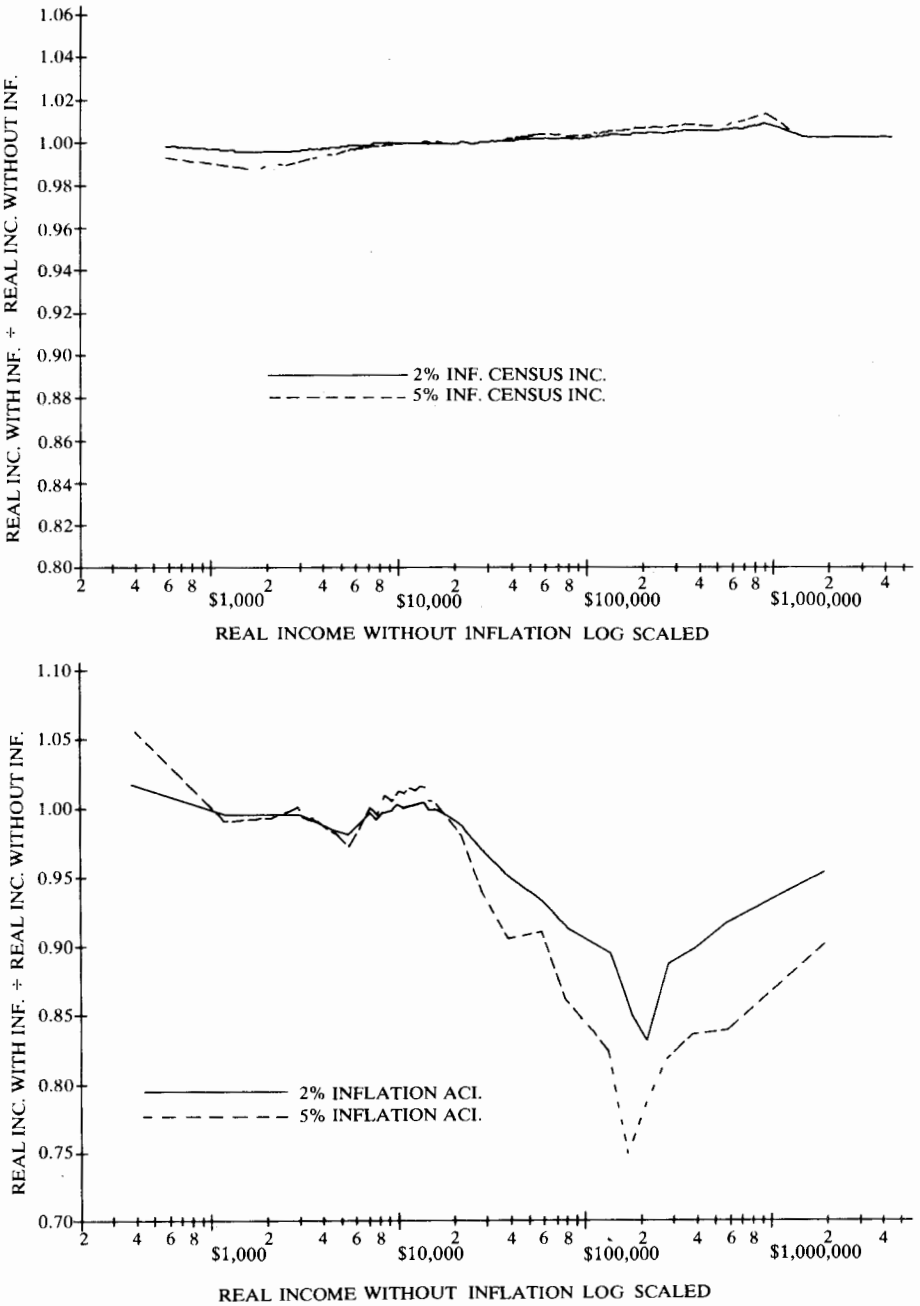

Figure 2. 2 and 5 Percent Uniform Inflations Compared

Source: Brookings 1970 MERGE file. Results are in 1970 dollars. Population percentile rankings are as follows. Census income: $2,000: 8.6; $4,000: 21.2; $5,000: 27.1; $7,000: 39.3; $9,000: 51.6; $10,000: 57.4; $12,000: 68.1; $15,000: 79.9; $19,000: 89.4; $25,000: 95.3; $40,000: 98.7; $100,000: 99.9. Accrued comprehensive income: $3,000: 7.9; $5,000: 18.3; $8,000: 32.2; $10,000: 41.1; $12,000: 50.4; $14,000: 59.5; $17,000: 71.1; $20,000: 80.2; $25,000: 89.4; $30,000: 93.8; $75,000: 99.3; $200,000: 99.9.

than two and a half times the gains in the 2 percent case. In general the ACI results show greater losses at the income extremes, with middle incomes largely maintaining their real levels. The general outcome of the 2 percent simulation, that upper incomes are by far the most adversely affected, is not altered.

Food and Fuel Inflation

The next simulation assumes that all food and fuel-based products (including food consumed both at and away from home, gasoline and utilities) inflate at twice the average rate (i.e., 4 percent) and all other prices increase at a lower rate which maintains the 2 percent average (i.e., approximately 1.2 percent using CPI consumption weights)[28].

Figure 3 shows the changes in real income due to the food and fuel inflation together with the results from the uniform 2 percent inflation. The margin between these curves is about $\frac{1}{2}$ percent at the lowest incomes; households at about $4,000 of income are equally well off under either inflation, while the highest incomes are about one percent better off under the food and fuel inflation.

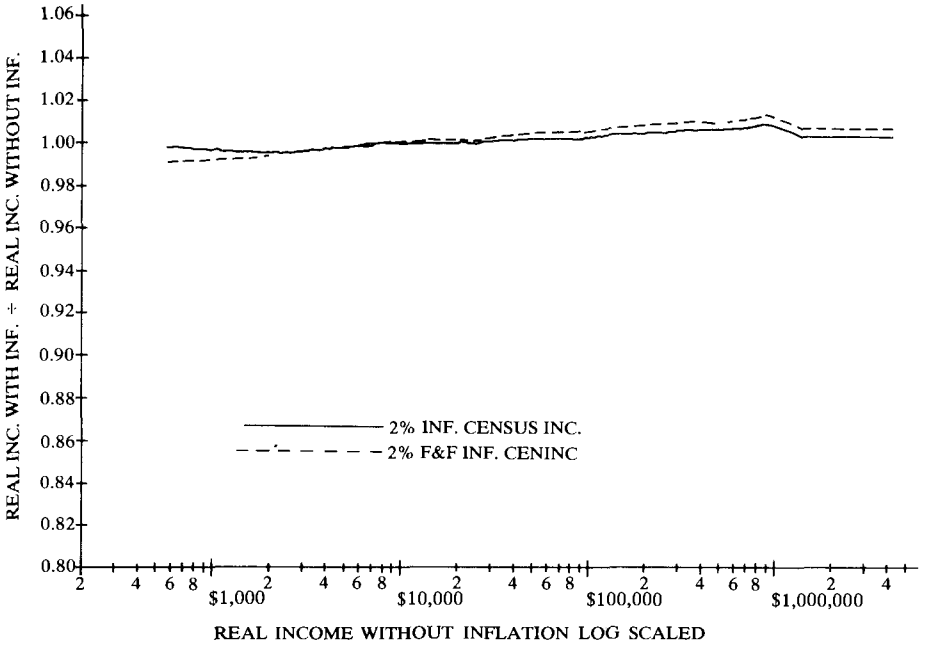

Figure 3. 2 Percent Food and Fuel Concentrated and Uniform Inflations

[28]Under Census income the post-inflation money income receipts of households are no different with a food and fuel than with a uniform inflation; the only difference in measured real income comes from the individual household deflator, which calculates an additional real income loss for intensive food and fuel consumers. Accrued comprehensive income increases slightly for recipients of food stamps, because the semi-annual cost-of-living adjustments in food stamp bonuses is based on the price index for food.

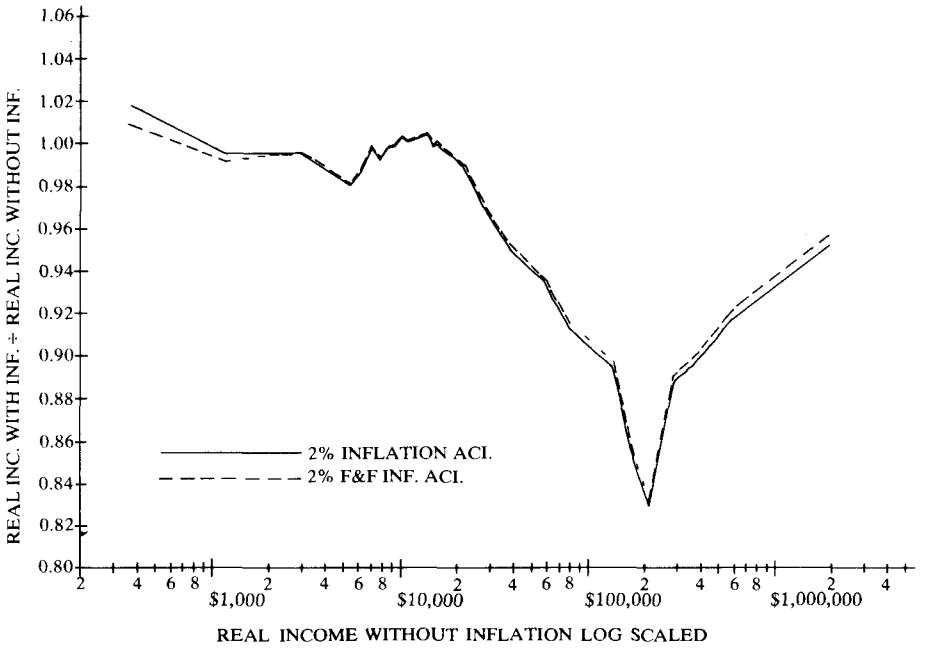

Figure 3 (continued). 2 Percent Food and Fuel Concentrated and Uniform Inflations

Source: Brookings 1970 MERGE file. Results are in 1970 dollars. Population percentile rankings are as follows. Census income: $2,000: 8.6; $4,000: 21.2; $5,000: 27.1; $7,000: 39.3; $9,000: 51.6; $10,000: 57.4; $12,000; 68.1; $15,000: 79.9; $19,000: 89.4; $25,000: 95.3; $40,000: 98.7; $100,000: 99.9. Accrued comprehensive income: $3,000: 7.9; $5,000: 18.3; $8,000: 32.2; $10,000: 41.1; $12,000: 50.4; $14,000: 59.5; $17,000: 71.1; $20,000: 80.2; $25,000: 89.4; $30,000: 93.8; $75,000: 99.3; $200,000: 99.9.

The pattern of these curves should not be surprising; low income households are intensive food and fuel consumers and will be worse off under a food and fuel inflation; higher income households are better off with a lower inflation rate for all other goods[29].

Long Term Inflation

The final simulations show the effects of an inflation which began five years prior to the income measurement year (i.e., inflation continuing from 1965 through 1970). After five years and by assumption, market interest rates have fully adjusted to the higher rate of inflation, although some long term instruments still have not matured since the acceleration. Income flows during the final year (not accumulating the effects of the five earlier years) are measured relative to incomes in the same year without inflation.

[29]The point of equal "well-offness" at $4,000 is lower than might be expected; because the consumption amounts were imputed from the 1960 Survey of Consumer Expenditures, still the latest data available; it is possible that they do not reflect 1970 consumption patterns adequately.

Figure 4 shows the curves for five year inflations in Census and accrued comprehensive income, together with the curves when the inflation and the measurement year began at the same time. Upper incomes under the Census concept show marked reductions after five years of inflation, in contrast to the gains in the current inflation case; this is due to the continued lag in real dividends and rent, and the interest rate ceilings on large bank deposits. Incomes from $10,000 to $20,000 again show very little change. Below $10,000 there are real income losses, but these are only slightly greater than they were in the first year of inflation; the worst case is at about $3,000 of income, where the real income loss is 1.3 percent.

The accrued comprehensive income results are similar. Real incomes up to about $20,000 are very much the same after five years of inflation as they were without inflation. From about $20,000 to about $500,000 real incomes are higher than in the first year of inflation but still below non-inflation levels; this is because interest receipts which are very important in this income range are progressively recovering to their pre-inflation real levels, and market values of debt securities have reached their new equilibrium. Above $500,000 real incomes are lower after five years because of the continuing lag of dividends. The superadjustment of federal income taxes is also reducing real incomes for the upper income groups; results for intermediate durations of inflation (not presented in Figure 5) indicate that real accrued comprehensive income for households over the $20,000 level will decline relative to pre-inflation income in the sixth and succeeding years of inflation because of increased real personal income taxes.

Section 3: Conclusions

This paper presented a methodological approach to the estimation of the distributional effects of inflation. A household income and expenditure statement was analyzed for expected change due to a basic inflation. Those results were broadened to three other types of inflations. The inflations were then simulated using a large sample U.S. microdata set, the 1970 Brookings MERGE file. This file has the facility of recomputing federal income tax liability on the basis of inflation-altered income amounts, and of producing income distributions under broadly based income measures.

Results were presented for the United States. The following conclusions can be drawn:

(1) The income concept chosen for the simulations is crucially important. A narrow money income base suggests a regressive distributional effect, but a broader income base including balance sheet effects and taxes shows a stronger progressive effect.

(2) Low income households suffer only modest real income losses during inflation, whatever the income concept. Some transfer programs (including those that are automatically indexed) lag inflation somewhat, and the money home appreciation due to inflation does not fully compensate. If inflation is concentrated in food and fuel products, as was the case in recent years, the losses to low income households are somewhat greater. The losses also increase modestly as inflation persists.

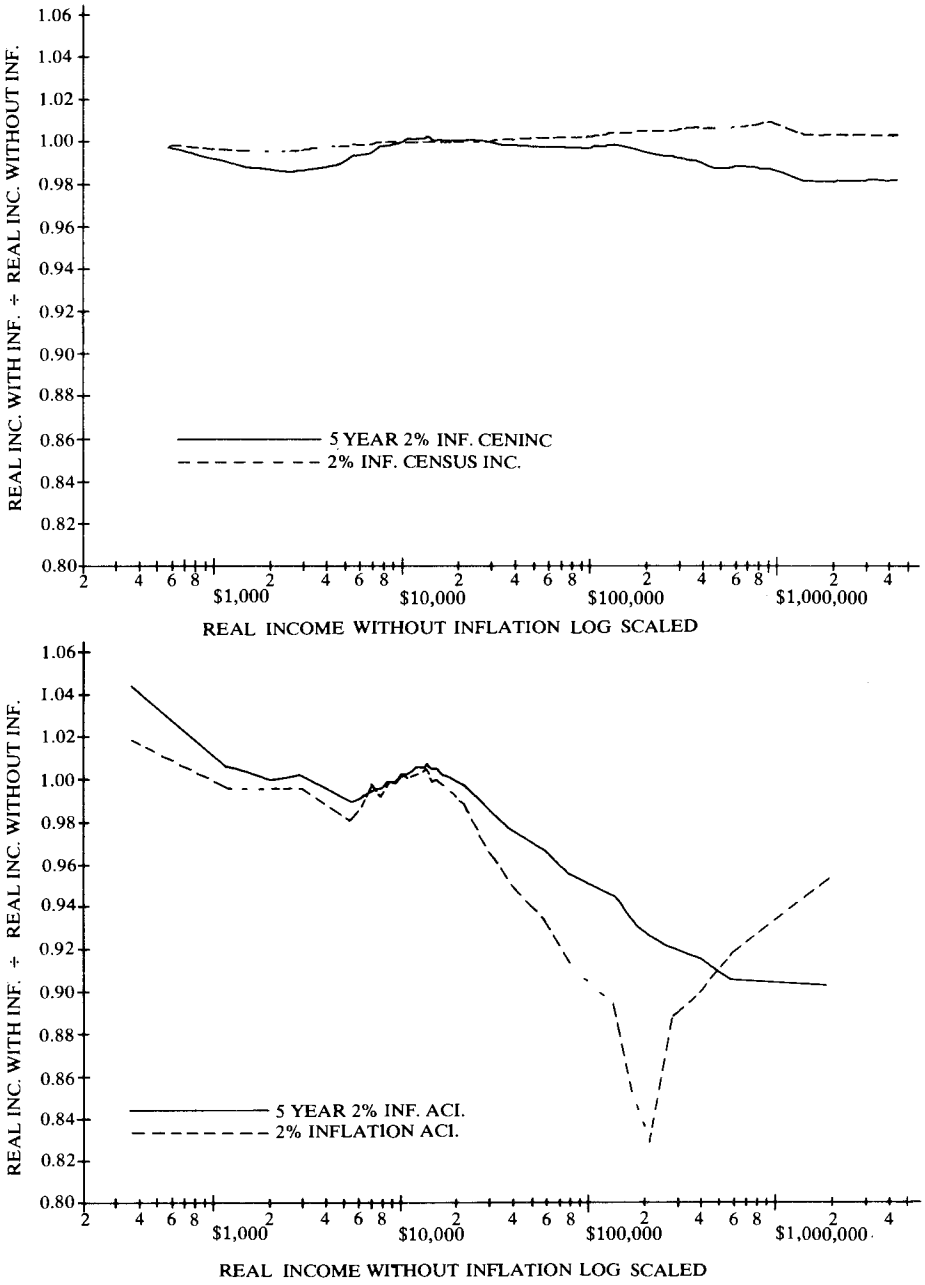

Figure 4. 2 Percent Uniform Inflation After 5 Years and Currently

Source: Brookings 1970 MERGE file. Results are in 1970 dollars. Population percentile rankings are as follows. Census income: $2,000: 8.6; $4,000: 21.2; $5,000: 27.1; $7,000: 39.3; $9,000: 51.6; $10,000: 57.4; $12,000: 68.1; $15,000: 79.9; $19,000: 89.4; $25,000: 95,3; $40,000: 98.7; $100,000: 99.9. Accrued comprehensive income: $3,000: 7.9; $5,000: 18.3; $8,000: 32.2; $10,000: 41.1; $12,000: 50.4; $14,000: 59.5; $17,000: 71.1; $20,000: 80.2; $25,000: 89.4; $30,000: 93.8; $75,000: 99.3; $200,000: 99.9.