IMF WORKING PAPER

WP/96/97

INTERNATIONAL MONETARY FUND

Western Hemisphere Department

Income Distribution and Macroeconomic Performance in the United States

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August 1996

Abstract

The factors underlying the rise in U.S. income inequality since the mid-1970s are examined. The results suggest that the trend increase in income inequality has not been related to macroeconomic developments, such as income growth or import penetration, but that the income distribution is sensitive to the cycle. Important factors that do help explain the widening of the income distribution include the increased investment in technology and the decline in the minimum wage. The rise in the share of single female-headed households, the increased proportion of households headed by someone over the age of 35, and the fall in the child-dependency ratio also help explain movements in income shares.

JEL Classification Numbers:
D31, E24, J38

1/ Helpful comments from Steven Dunaway, Charles Kramer, and Alun Thomas are acknowledged, subject to the usual disclaimer. The views expressed in this paper do not necessarily represent those of the IMF or its member countries.

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Summary

While the U.S. income distribution has become more skewed since the mid-1970s, the significance of this trend is subject to considerable debate. For example, the usual income-based measures of inequality are criticized because they do not take into account the distribution of consumption, noncash income, and the effect of taxes. Moreover, the aging of the baby-boom generation, a steepening of the age-earnings profile, and increases in economic mobility may have contributed to increases in annual measures of income inequality but with a lesser effect on the distribution of lifetime earnings.

The paper examines trends in U.S. income distribution and considers the macroeconomic and other factors that have affected the distribution of income in recent decades. Regression results confirm that the trend increase in income inequality in the United States began around 1976 and that the income distribution tends to widen during economic downturns. Other macroeconomic variables, including real GDP per capita, the inflation rate, short-term interest rates, and imports as a share of GDP do not appear to affect significantly the income distribution.

The results suggest that a number of other factors can explain the rise in U.S. income inequality since the mid-1970s. These include the decline in the real minimum wage, which adversely affected the incomes of the lower quintiles, and the rise in investment in high technology equipment, which explains well over half the rise in the Gini coefficient during the past two decades. Other factors that help explain rising U.S. income inequality include the steepening of the age-earnings profile, the rise in the number of households headed by a single female, the increased proportion of households headed by someone over the age of 35, and the decline in the child-dependency ratio.

I. Introduction

A number of indicators point to a widening in U.S. income distribution since the mid-1970s, while the proportion of households below the poverty line has increased. These developments have attracted a great deal of attention in the United States and have contributed to a critical reappraisal of government social welfare programs and tax policies. 1/

This paper examines trends in income distribution and considers the macroeconomic and other factors that have affected the distribution of income in recent decades. It finds that cyclical developments have an important effect on the income distribution, but that the increased skewness in the distribution since the mid-1970s is hard to explain on the basis of cyclical and macroeconomic factors alone.

Other factors that seem to help explain the widening of the distribution include the decline in the minimum wage relative to the average wage and the growth of information-technology investment, which has increased the wage premium paid to relatively skilled labor and possibly contributed to a steepening of the age-earnings profile. Other factors that also may have played a role include the aging of the baby-boom generation, the rise in single female-headed households, and the decline in the child-dependency rate. Moreover, the paper cautions that the income-based measures of skewness used in this study may exaggerate the extent of the increase in inequality and poverty, since they do not factor in changes in consumption expenditures, living standards, and economic mobility.

The paper is organized as follows. Chapter II illustrates the behavior of the most often cited measures of U.S. income equality and briefly compares them to data for other industrial countries. Chapter III highlights findings from alternative measures of income distribution and discusses the factors that may have influenced income trends since the 1960s. Chapter IV presents an empirical analysis of family-income shares and tests the extent to which these shares have been affected by macroeconomic and other developments. Chapter V contains a summary of the principal conclusions.

1/ While a number of studies have addressed the issue of whether the income distribution affects economic performance, this question is beyond the scope of the present study. Recent papers on the issue include Persson and Tabellini (1994), who identify a negative correlation between growth and the income distribution. They suggest that a skewed income distribution creates a demand for redistributive policies, which reduce economic efficiency. Galor and Zeira (1993) suggest that a skewed income distribution can stem from market inefficiencies (e.g., limits on access to credit markets), which also may limit growth.

II. Recent Trends in the Income Distribution 1/

Real median income per family in the United States increased by over 200 percent between 1950 and 1979, before falling 1 percent between 1979 and 1994. 2/ Over the same 1979-94 period, the income distribution appears to have become more skewed. The Gini ratio, which measures the extent to which the income distribution deviates from perfect equality, fluctuated narrowly around an average of 0.36 between 1947 and 1976. 3/ Subsequently, the Gini coefficient has increased, rising by 17 percent to reach 0.43 in 1993 (Chart 1).

The upward trend in the Gini ratio since the mid-1970s appears to have mainly been the result of a rise in the average real incomes of the top quintile and a decline in the average real income of the bottom quintile. Between 1976 and 1993, the real mean income of households in the top quintile rose by 35 percent, while the real mean income of households in the bottom quintile fell by 12 percent. At the same time, the share of income accruing to the top quintile has increased sharply, while the income share of the bottom quintile fell. The top quintile's income share reached 47 percent in 1993 compared to 43 percent in 1947, while the lowest quintile's share fell to 4 percent in 1993 compared to 5 percent in 1947. The poverty rate--the share of households below the poverty line--increased from a historical low of 9 percent in the 1970s to 12 percent in 1993. 4/

Other major industrial countries appear not to have experienced the same steady widening of the income distribution since the 1970s. Atkinson (1996) compares trends in the income distribution (defined on the basis of the Gini ratio) for the United States and Europe. He finds that, unlike in the United States, income inequality tended to decline in many European countries during the 1970s. A notable exception was the United Kingdom, in

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1/ The data on income distribution described in this section are derived from the Current Population Survey (CPS), which is published by the Bureau of the Census. The data are based on a survey of the civilian noninstitutional population of the United States, i.e., excluding members of the armed forces living on military bases, and provide estimates of income before taxes received by each quintile of families ranked by income. The discussion focuses on data up to 1993, since changes in data-collection methods are said to affect the comparability of the 1994 data to those of previous years. See also Barrionuevo (1993) for a description of recent trends in income distribution.

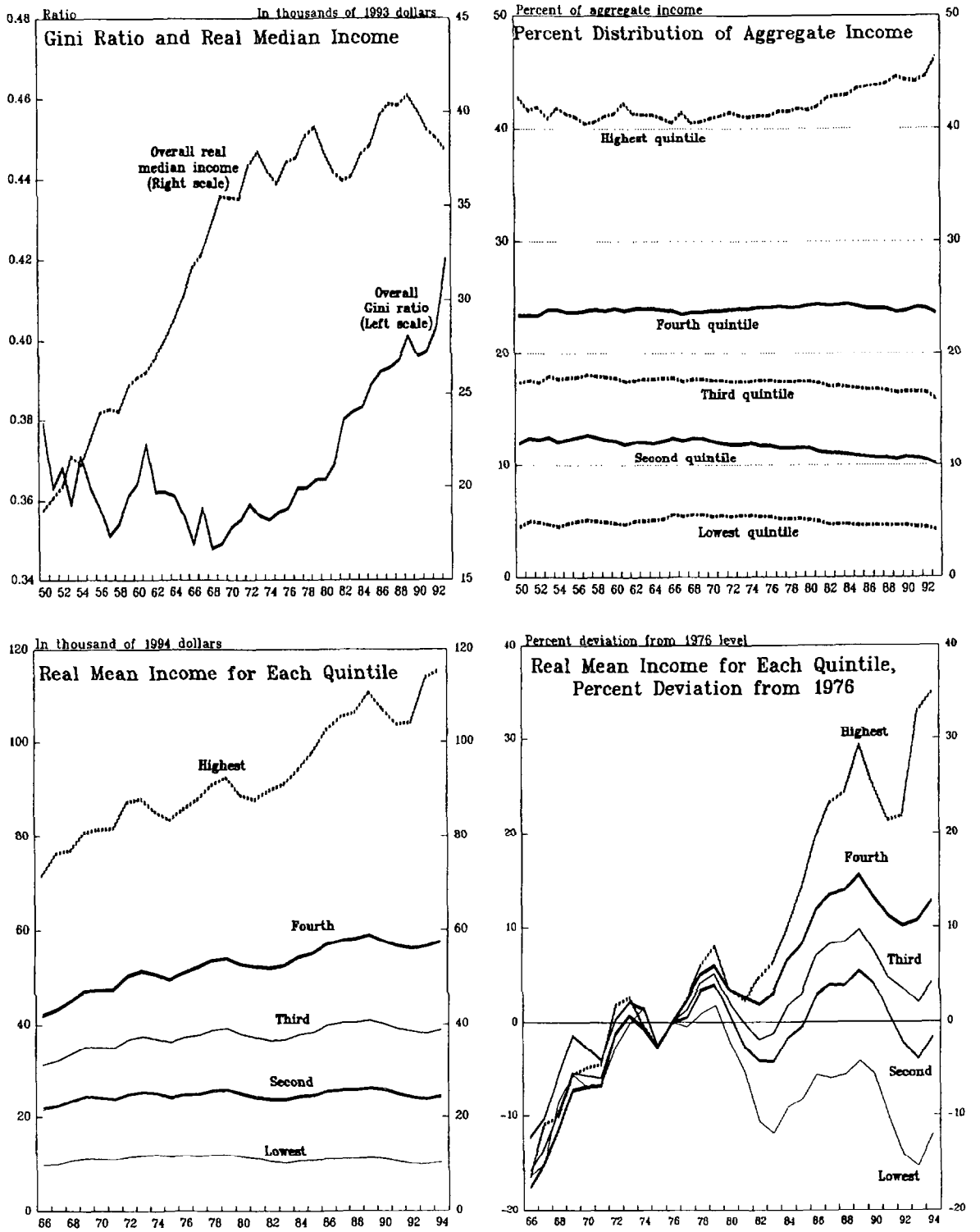
2/ The Census data are deflated using the consumer price index, which has an upward bias. Nevertheless, using alternate price indices, such as the national accounts deflator for consumption expenditures, would still show a marked decline in the growth of real median income since the 1970s.

3/ A Gini ratio of 1 indicates perfect inequality, i.e., one family has all the income and the rest have none. A measure of 0 indicates perfect equality, i.e., all families have equal shares of income. For a more detailed description, see the Appendix.

4/ The poverty rate hit a cyclical peak of 12.3 percent in 1983.

CHART 1

INCOME DISTRIBUTION TRENDS



Source: Bureau of the Census, U.S. Department of Commerce.

which income inequality rose sharply during the 1980s. 1/ Deininger and Squire (1996), using a consumption-based Gini ratio, suggest that on average the inequality has been relatively stable among other OECD and more developed countries since the 1960s. The OECD (1996) examines the dispersion between the incomes of those at the top and bottom deciles, and also finds that the increase in U.S. inequality is atypical compared to other OECD countries, particularly in the early 1990s.

III. Factors Affecting the Income Distribution

A prevalent explanation for the rise in U.S. income inequality has been the widening wage differential for unskilled and skilled labor. For example, Buckberg and Thomas (1996) note that the differential between wages paid to college graduates and those paid to high school graduates rose sharply from 38 percent in 1980 to 53 percent in 1990. Competing explanations for this shift include the decline in the size of the U.S. manufacturing sector relative to the service sector, the effect of technological changes on the types of skills demanded in the labor market, and the increased penetration of imports from low-wage countries into the United States. 2/

Buckberg and Thomas find that the increase in the wage gap was mainly the result of the decline in the demand for relatively high-wage, low-skilled labor in the durable goods manufacturing sector and the effect of increased technological change (as proxied by business investment in computers). These factors were only partially offset by the rise in the supply of skilled workers (as proxied by college-educated workers) relative to less-skilled workers (as proxied by high school-educated workers). The authors reject the hypothesis that import penetration had a direct effect on wage differentials. However, they do find that the wage gap tends to be positively correlated with an increase in the real effective exchange rate, suggesting that a deterioration in U.S. competitiveness tends to adversely affect the wages of less-skilled workers. They also find that increases in

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1/ For example, the Gini ratio rose from about 0.23 in 1978 to about 0.32 in 1991, an increase of roughly 40 percent. For an empirical examination of the macroeconomic factors affecting the income distribution across countries see Bulir and Gulde (1995).

2/ For example, Katz and Murphy (1992) examine the effect of the decline in importance of the manufacturing sector in the United States on wage differentials and Krugman and Lawrence (1993) test whether trade has led to a reduction in U.S. wages relative to its low-wage trading partners. Richardson (1995) reviews the literature and concludes that import penetration caused a small but significant part of the increased income inequality in recent decades. However, he notes that the effect on economic well-being may have been offset by the effect of increased trade on economic growth. Blanchard (1995) notes that if the income distribution has been affected by an increase in the demand for skilled versus unskilled workers, the effect would be to increase overall unemployment.

the female participation rate had the effect of widening wage differentials across industries, possibly by increasing the relative supply of less-skilled workers.

Another factor that may help to explain income distribution trends is changes in lifetime-earnings profiles. 1/ Census data suggest that the age-income profile has steepened sharply since the 1960s (Chart 2). The median income of householders aged 45 to 54 was only 18 percent higher than the median income of those aged 25 to 34 years in 1964; by 1994, however, the difference had increased to 60 percent. This development offers a possibly benign explanation of income-distribution trends. The change in the lifetime earnings profile may reflect increasing returns paid to skills acquired on the job. In that case, the increased skewness of the income distribution may simply reflect the aging of the population and not necessarily be associated with a skewness in lifetime earnings.

Changes in the distribution of wealth may have affected the income distribution by affecting the distribution of nonwage income. 2/ However, Weicher (1995) notes that between 1983 and 1989 the Gini ratio for the wealth distribution increased markedly, but by less than the income-based index. He suggests that, while household wealth is highly correlated with household income, the relationship seems to have weakened between 1983 and 1989. Wolff (1994) examines household survey data in 1962, 1983, and 1989 and suggests that the wealth distribution was relatively unchanged between 1962 and 1983, but confirms the increase in inequality between 1983 and 1989. He concludes that the increase over the latter period was the result of a rise in income inequality, an increase in stock prices relative to the price of housing, and low inflation. 3/

Concerns regarding income distribution trends have been mitigated by evidence suggesting that distributional mobility has been high. Cox and Alm (1996) analyzed mobility using University of Michigan survey data for the period from the mid-1970s to the early 1990s. The data suggest that a substantial proportion of those individuals in the lowest income quintile in 1975 had moved to the 4th or 5th quintile by 1991 (see tabulation below). The data also indicate that average income gains over the period were considerably greater for those individuals who were in the lower end of the income distribution in 1975. The authors also show that, while the most rapid rise in incomes was correlated with educational attainment, even those

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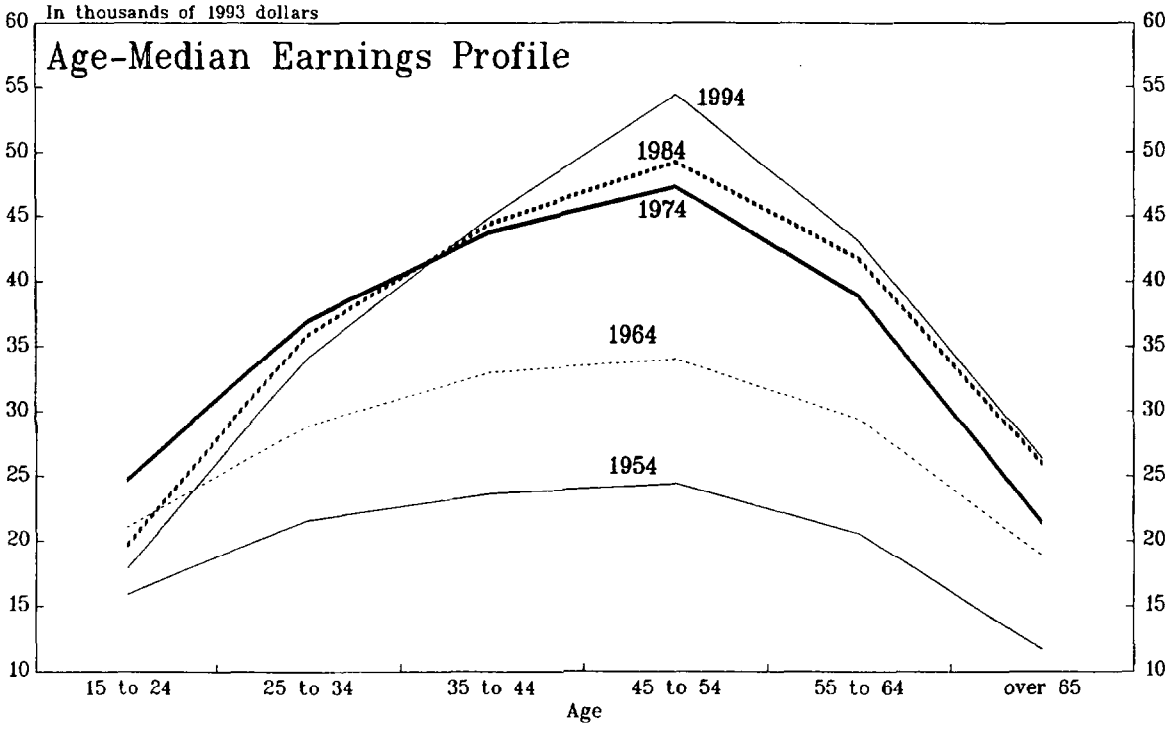
1/ For example, see Cox and Alm (1996).

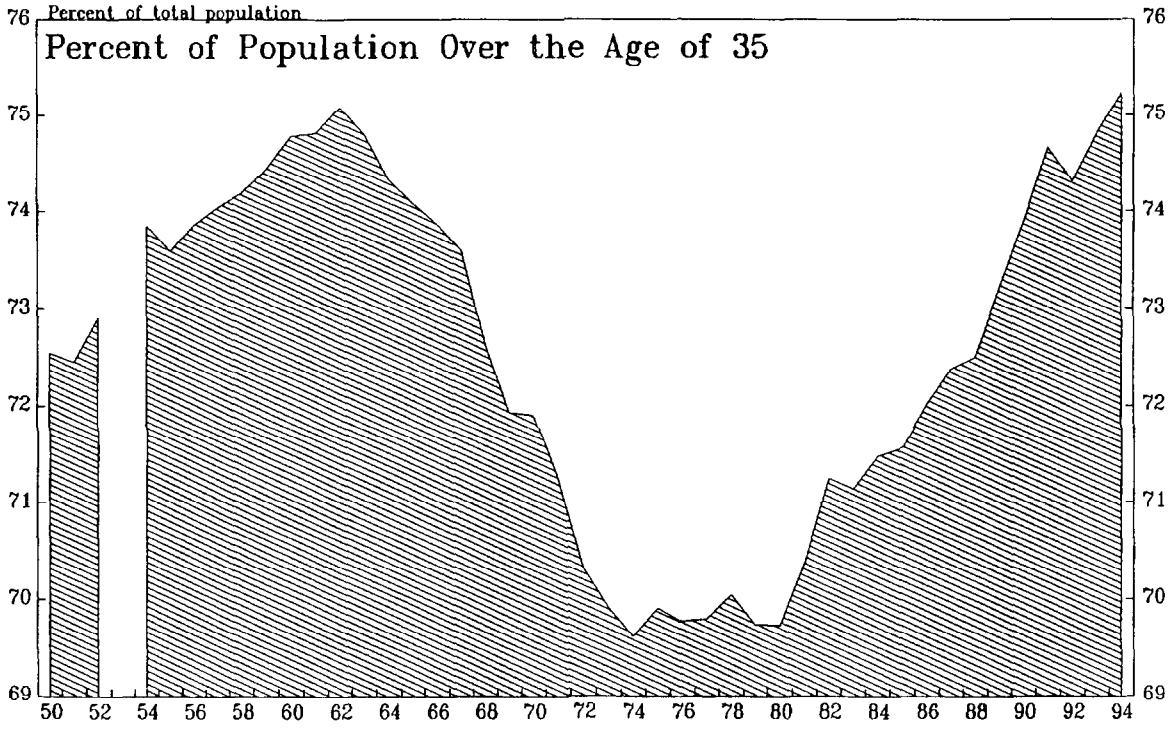
2/ Moreover, wealth may be a more appropriate measure of economic well-being since it may better proxy households' permanent income, as well as their access to educational and other opportunities.

3/ Wolff also reports that the wealth gap between the races also widened considerably during the latter period. However, income distribution trends for the black and white populations seem to have been broadly similar.

CHART 2

INCOME AND AGE DEMOGRAPHICS





Source: Bureau of the Census, U.S. Department of Commerce.

with high school diplomas or less education achieved real income gains during the period. 1/

Distributional Mobility 2/

(Percentage of households)

1975 Income Distribution Quintile	1991 Income Distribution				
	1st	2nd	3rd	4th	5th
5th (highest)	0.9	2.8	10.2	23.6	62.5
4th	1.9	9.3	18.8	32.6	37.4
3rd	3.3	19.3	28.3	30.1	19.0
2nd	4.2	23.5	20.3	25.2	26.8
1st (lowest)	5.1	14.6	21.0	30.3	29.0

By contrast, Gittleman and Joyce (1995) examine mobility over two-year periods between 1967 and 1991 and find that economic mobility has been remarkably constant. Notwithstanding the relatively short periods they consider, they conclude that their results "do not suggest that mobility patterns have changed in such a way to offset the recent rise in inequality." The OECD (1996) also examines income mobility over the 1986-91 period in the United States and a number of other industrial countries. It concludes that while income mobility was somewhat higher in the United States, United Kingdom, and Denmark than the other countries surveyed, income mobility was generally similar across countries, particularly if the sample is restricted to full-time workers.

A number of authors have examined the distribution of consumption as an alternative proxy for the relative well-being of the U.S. population. The results show the consumption distribution to be considerably less skewed than the income distribution. For example, Cox and Alm (1996) note that average household income in the top quintile was 13 times higher than the average income in the lowest quintile, but that consumption per person in the top quintile was only twice that of the bottom quintile. This was partly due to the fact that the size of households was greater at the top end of the income distribution and the redistributive effects of the tax system, as well as the fact that lower-income households benefitted from

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1/ Cox and Alm also note that in 1994, 80 percent of the 400 richest Americans were self-made, i.e., they did not inherit their fortunes, while in 1984 only 63 percent of the richest individuals had created their own fortunes.

2/ Source: Cox and Alm (1996). The tabulation shows the movement of households from 1975 quintiles to 1991 quintiles. For example, 0.9 percent of households that were in the fifth quintile in 1975 moved to the first quintile in 1991.

government noncash transfer programs, which are not included in the Census data on income distribution.

Chart 3 suggests that trends in the distribution of consumption are less pronounced but similar to those for the income distribution. In 1972-73, the top quintile consumed 1.7 times as much as the average family; by 1993, the ratio had increased to 1.9. The data suggest that this trend was principally due to a relative worsening of the positions of the second and third quintiles. By contrast, consumption of the bottom quintile actually increased slightly relative to the average family between 1972-73 and 1993.

Slesnick (1993 and 1994) notes that the official Census data, which show a rise in poverty rates since the late 1970s and an increase in inequality since the 1970s, are distorted because they are income and household based. As a result, they do not account for demographic changes that have tended to reduce the size of households or for the effect of government tax and transfer programs. 1/ Slesnick shows that a consumption-based poverty rate, which takes into account the service flows from consumer durables, does not show a decline during the 1980s and 1990s. He also shows that consumption inequality has been relatively stable since the 1960s. Also, Cox and Alm (1996) show that the poor's access to consumer durables has increased, while their discretionary income has reached all-time highs. For households in the bottom quintile, spending on food, clothing, and shelter was 45 percent of consumption in 1993, compared with 52 percent in 1973, 57 percent in 1950, and 75 percent in 1920. By contrast, Cutler and Katz (1991) argue that the distribution of consumption has been less skewed than the distribution of income, but that a trend toward greater inequality is evident.

Sociological factors also could be important in explaining the widening income distribution during the 1980s and 1990s. Only dual-income families have experienced relative income gains since the 1950s. In 1993, the median income for dual-income families was almost 1.4 times greater than the overall median household income, compared to a ratio of 1.2 in 1950. At the same time, the share of households with dual incomes rose from less than 20 percent in 1950 to almost 50 percent in 1993. By contrast, the median income of one-income married couples and single-parent households reached a historical low in 1993 as a share of the overall median household income (Chart 4). The effect of these trends on the income distribution was exaggerated by the fact that the share of households headed by a single female rose from less than 10 percent in 1950 to almost 20 percent in 1993.

Macroeconomic conditions are also thought to play a role in shaping the income distribution. Cutler and Katz (1991) examine the effect of the

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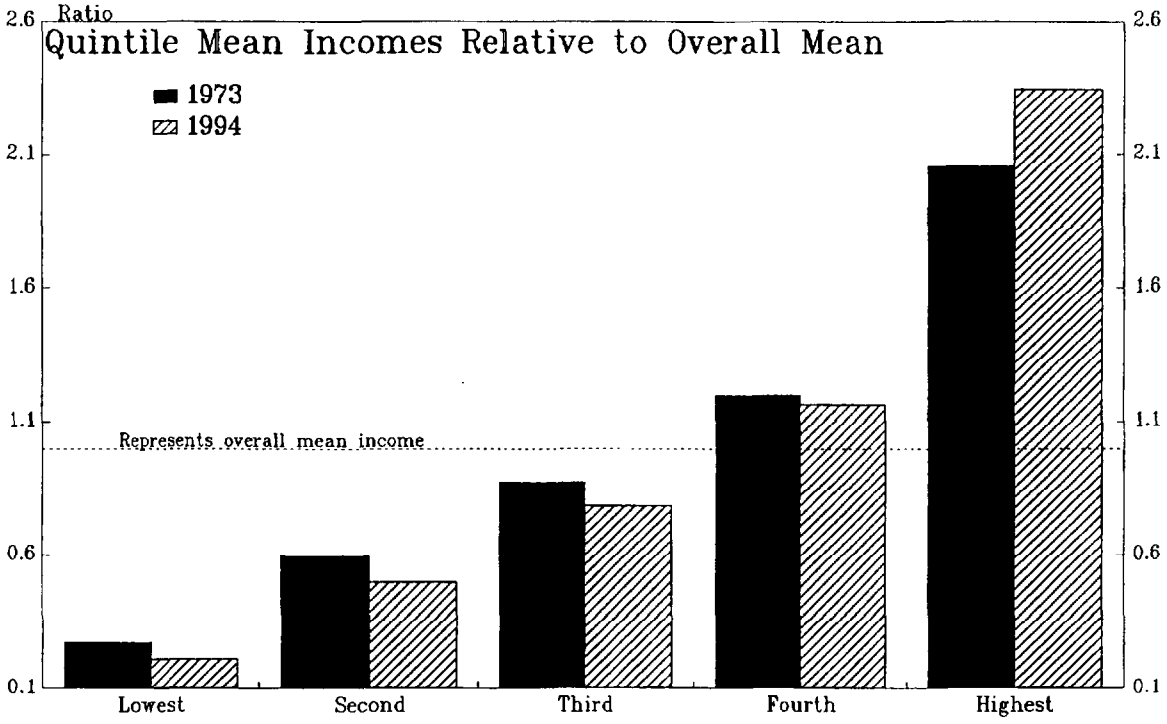
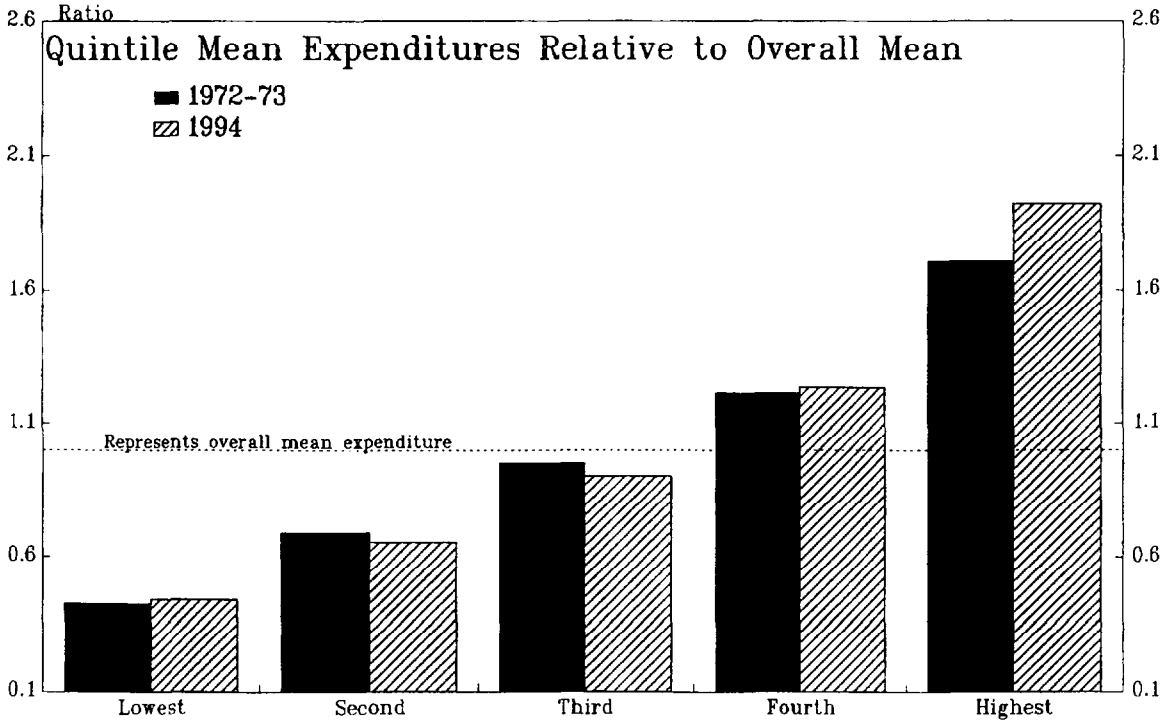
1/ Slesnick also shows that poverty rates and measures of the change in income inequality have been biased by the use of the CPI index, whose consumption bundle is not representative of the consumption pattern of the poor.

CHART 3

DISTRIBUTION OF INCOME AND CONSUMPTION

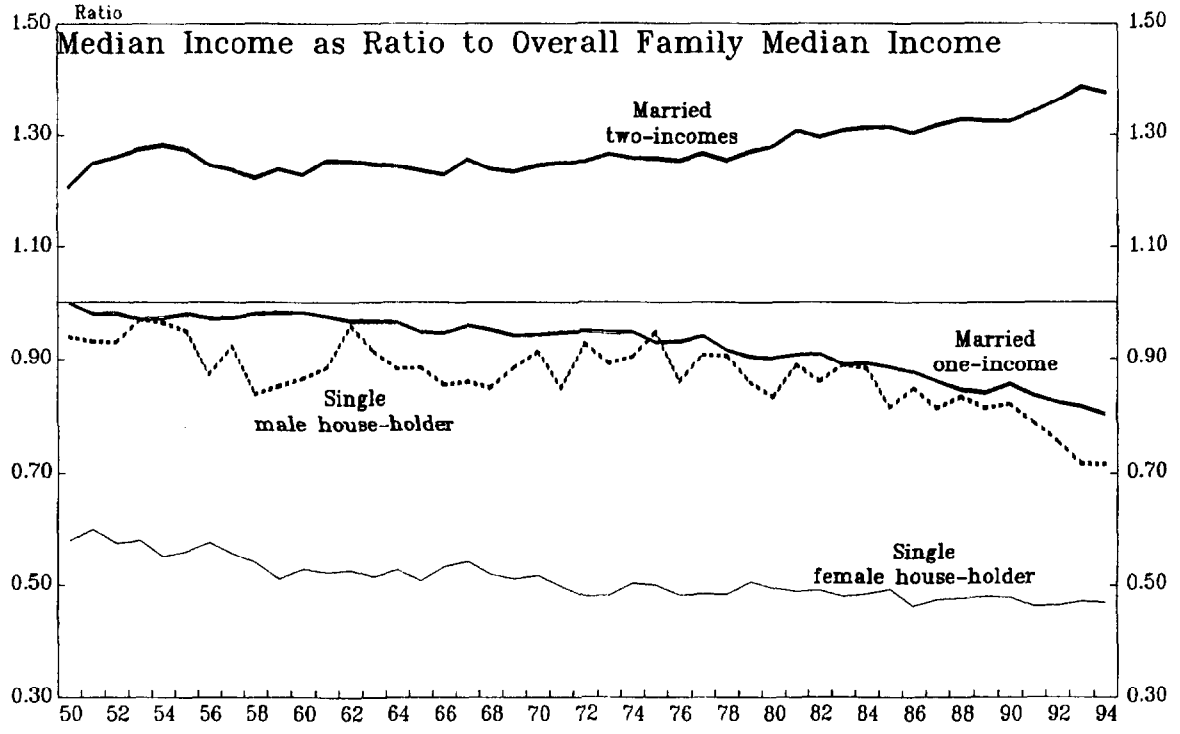


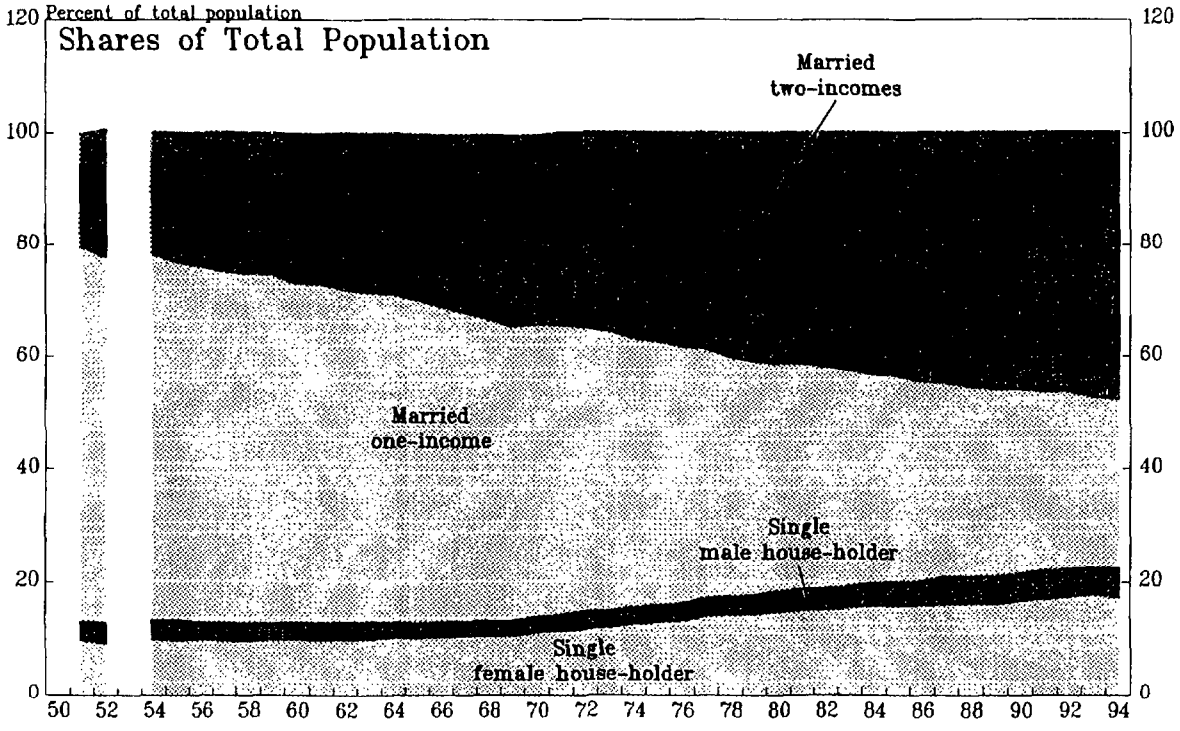


Sources: Bureau of the Census, U.S. Department of Commerce; and Bureau of Labor Statistics, U.S. Department of Labor.

CHART 4

INCOME AND FAMILY STRUCTURE





Source: Bureau of the Census, U.S. Department of Commerce.

expansion during the latter half of the 1980s and find that the decline in poverty rates was less than would have been expected on the basis of historical relationships. They conclude that this was not the result of demographic changes or the effect of generally weak wage growth. Instead, they attribute it to the secular decline in the relative size of the U.S. manufacturing sector, which reduced opportunities for the less skilled.

IV. Empirical Analysis of Factors Affecting Income Distribution

The study by Cutler and Katz provides a convenient framework for analyzing the effects of various factors on income distribution. Their work is extended below by re-estimating their equations for the period 1948 to 1993 in order to determine whether their conclusions continue to hold when the effects of the 1989-90 economic downturn and subsequent recovery are included. In addition, their analysis is extended to consider the extent to which demographic and other variables might have explained the widening of the income distribution since the mid-1970s.

Table 1 replicates Cutler and Katz's regressions for the period 1948 to 1993. It contains estimates of equations using household income shares for each quintile and the Gini ratio as dependent variables. The independent variables include the log of GDP per capita, the inflation rate, and the unemployment rate. 1/ In addition, a lagged dependent variable and a time trend are also included. The time trend was assumed to begin in 1976 on the basis of a Chow test, which suggested a structural break in that year. 2/

The results are similar to those reported by Cutler and Katz. The unemployment rate appears to be a dominant cyclical predictor of changes in the overall index of the income distribution. Increases in the unemployment rate tend to widen the income distribution, lowering the income shares of the bottom three quintiles and increasing the share of the top two quintiles. Increases in per capita real GDP tend to narrow the income distribution. However, the effect on the quintile shares was less even. An increase in GDP per capita tends to improve the position of the bottom and

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1/ The equation for the Gini coefficient is estimated using ordinary least squares, and the income share equations are estimated using the Seemingly Unrelated Regression Estimator (SURE). In some cases, augmented Dickey-Fuller tests reject the hypothesis that the dependent variables are stationary. However, since the dependent variables are bounded by zero and one, it is assumed that the evidence of nonstationarity is spurious. The fixed-weight GDP data are used as the proxy for real GDP, since chain-linked series are unavailable prior to 1959. For a detailed description of the data, see the Appendix.

2/ Chow tests were performed using sample break points between 1973 and 1983. The absence of a structural break in the relationship could only be rejected in the years 1973 through 1979, with a sample break point in 1976 providing the largest F-statistic (equal to 4.21). The regressions reported by Cutler and Katz used a time trend that began in 1983.

fourth quintiles at the expense, mainly, of the top and second quintiles. The inflation rate was not found to be a significant determinant of the Gini coefficient or the quintile shares.

The size and significance of the coefficients on the lagged dependent variable suggest that macroeconomic shocks have a persistent effect on the income distribution. 1/ The trend variable, which began in 1976, also is highly significant, suggesting that other noncyclical factors contributed to the widening of income differentials since the mid-1970s. Chart 5 illustrates the importance of the trend variable. In particular, it shows that the out-of-sample forecasts of an equation that excludes the trend considerably underpredicts the Gini ratio after 1976.

In order to examine the factors that might have contributed to the widening of the income distribution, additional variables are added to the regressions in order to proxy for demographic, sociological, and other developments. These variables are: the minimum wage as a ratio to average hourly earnings in the manufacturing sector, the share of families headed by single mothers, the proportion of families headed by people over the age of 35, the child-dependency ratio, and the age-earnings profile.

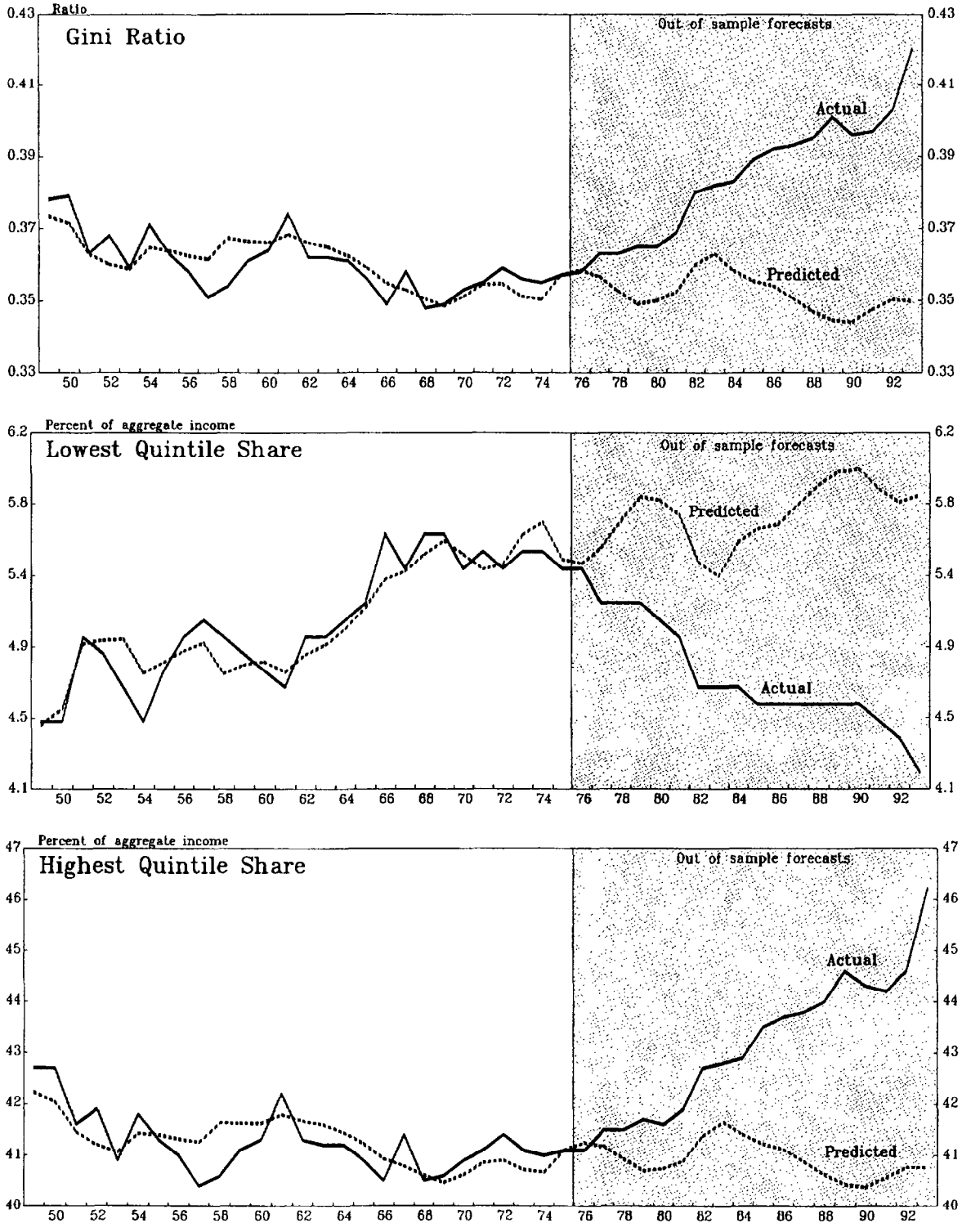
The decline in the real minimum wage rate that has occured since the mid-1960s would be expected to have widened the income distribution, but the effect would also depend on whether changes to the minimum wage had large, permanent effects on employment. The effect of the increased share of families headed by single women would also be expected to widen the income distribution, possibly owing to the effect on overall household income. As discussed above, the rise in the proportion of families headed by people aged 35 and above and the increase in the age-earnings profile would also tend to increase income inequality measured at a point in time. However, the effect of the decline in the child dependency rate on the income distribution is uncertain, ex ante. It would depend on the whether the effect on female participation was disprortionately felt at one end of the income distribution or another, and whether new entrants to the labor market from high-income households received higher-than-average incomes. 2/

1/ While the χ^2 test did not reject the hypothesis of first-order autocorrelation of the residuals in some cases, the hypothesis of autocorrelation was rejected in the subsequent regressions that included additional explanatory variables.

2/ See the Appendix for a detailed description of the variables used. A number of other variables were also examined but found not to be significant. These included the female participation rate, the proportion of two-income households, the real three-month treasury bill rate, imports as a percent of GDP, the percentage of household income earned from wages and salaries, and government transfer payments as a percent of GDP. Variables were excluded from the analysis on the basis of a Wald test of their joint significance in the income-share equations.

CHART 5

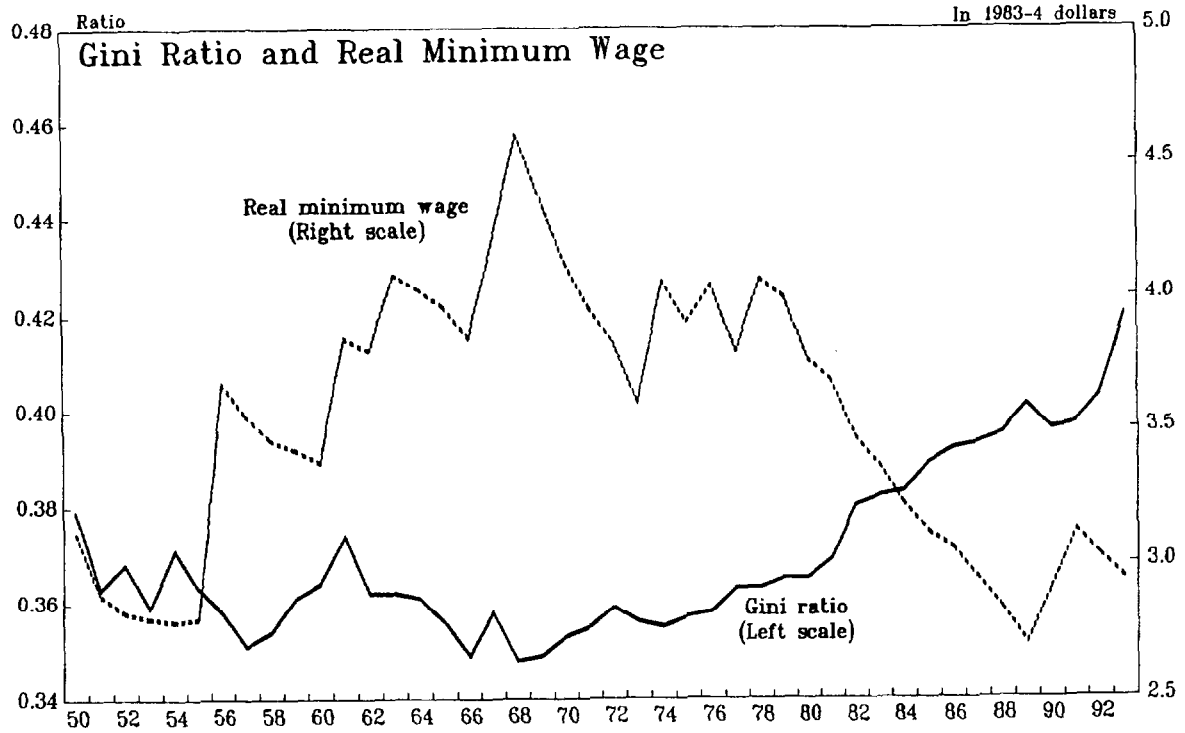
ACTUAL AND PREDICTED VALUES USING HISTORICAL MACROECONOMIC RELATIONSHIPS

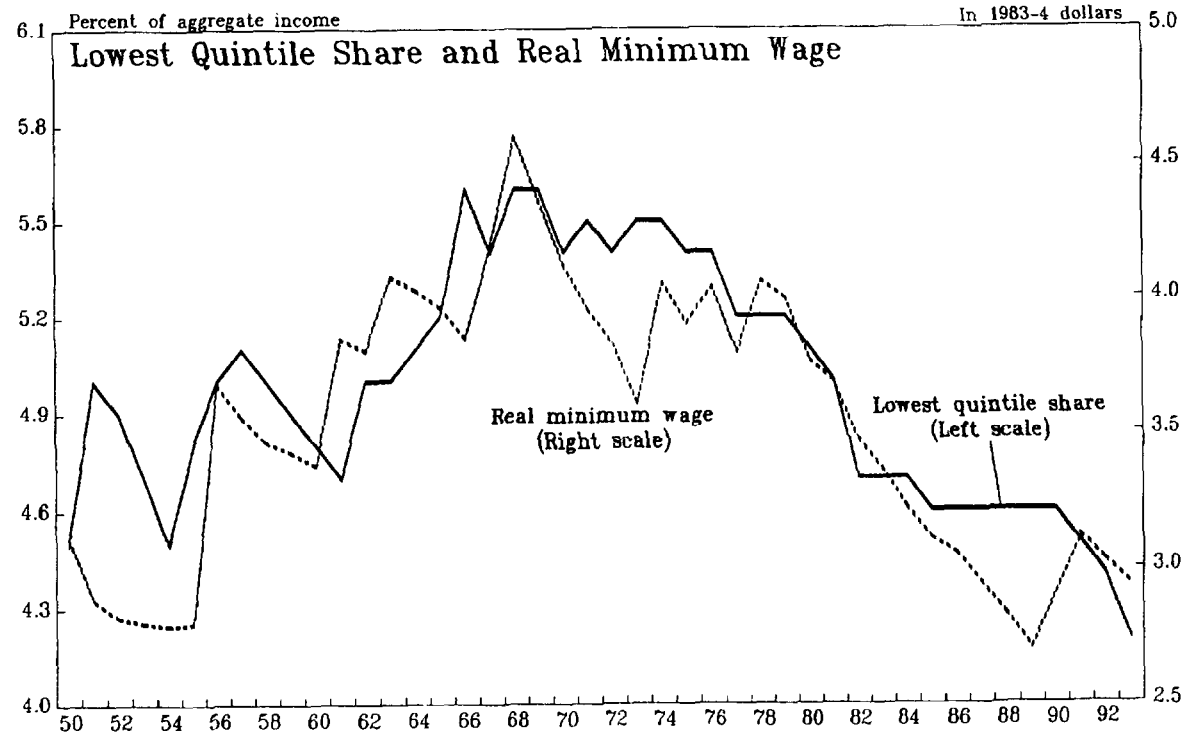


Sources: Bureau of the Census, U.S. Department of Commerce; and Fund staff estimates.

CHART 6

INCOME DISTRIBUTION AND THE MINIMUM WAGE





Sources: Bureau of the Census, U.S. Department of Commerce; and Bureau of Labor Statistics, U.S. Department of Labor.

Besides the addition of a broader range of explanatory variables, the analysis below also addresses an econometric issue raised by the fact that the dependent variables above--the income shares--are constrained to be between zero and one. Fry et al. (1996) have observed that this constraint implies that estimates of a system of equations, such as those summarized in Table 1, implicitly violate the usual assumption that the equation errors are normal. To overcome this problem, they recommend the adoption of a compositional data analysis framework and the assumption that the errors are distributed according to an additive logistic normal distribution. For example, if s^i is the share of the ith quintile, which is assumed to be a function of a set of variables **X** according to $s^i = s^i(\mathbf{X})$, then Fry et al. suggest estimating the system as log ratios, so that the equations estimated would be $\log(s^i/s^N) = \log(s^i(\mathbf{X})/s^N(\mathbf{X}))$. Accordingly, Table 2 contains the results from estimating the equations in levels and as log ratios.

In the revised specification, the trend variable no longer is a significant determinant of the income distribution, indicating that the additional variables explain the increased skewness of the income distribution since the mid-1970s. 1/ In particular, the minimum-wage ratio is negatively correlated with the Gini ratio and the top quintile's income share and positively correlated with the income share of the lowest three quintiles. Chart 6 illustrates the strong correlation between the real minimum wage and the income distribution. In addition, the increased proportion of the population aged 35 and above also appears to have contributed to the widening of the income distribution, by raising the top quintile's share of income and reducing the share of the lower four quintiles.

The growing proportion of families headed by single females is not a significant explanatory variable for the overall Gini ratio, but explains a significant proportion of the improved position of the fourth quintile, possibly at the expense of the position of the second lowest quintile. 2/ The child-dependency ratio is a marginally significant determinant (at the 90 percent confidence level) of the Gini ratio, suggesting that the decline in the dependency ratio since the mid-1960s was associated with a widening of income inequality. This is confirmed in the share equations, which indicate that the decline in the dependency ratio is associated with a decline in the lowest quintile's income share, possibly related to the effect of increased labor force participation by women at the top end of the income distribution. The increase in the age-earnings profile also is

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1/ The regressions were run over a shorter time period (1953 to 1993) than the previous regressions because observations on a number of the independent variables were not available prior to 1953 (see the Appendix for a description of the variables). Chow tests confirmed the absence of a structural break.

2/ The significance of the variables in the income-share equations and their lack of significance in the equation for the Gini ratio likely reflects the disadvantage of using a summary index of the income distribution.

associated with a rise in the Gini ratio, principally through its positive effect on the share of earnings at the top end of the income distribution.

The results summarized in Table 2 indicate a more muted effect of cyclical and macroeconomic factors on the income distribution than in the original regressions. In particular, while the unemployment rate remains a significant determinant of the Gini coefficient, the level of real per capita GDP was no longer significant and was dropped from the regressions. In addition, other macroeconomic variables including the real three-month treasury bill rate, the inflation rate, imports as a percent of GDP, and the real stock market index also were found not to be significant on the basis of a Wald test of their joint significance in the income-share equations. 1/ Moreover, the assumption of the additive log normal distribution seemed not to have a large effect on the equation estimates; the coefficient estimates were similar to those from the untransformed regressions.

The discussion in the previous section suggests that technological changes may have increased the premium paid to skilled labor and contributed to the skewing of the income distribution. This observation is supported by the apparent correlation between the Gini ratio and a proxy for technological change--the share of business-fixed investment devoted to information technology (Chart 7). 2/ This hypothesis is examined more formally by including this variable in the regression equations described above.

The results are summarized in Table 3 and these indicate a significant role for technology in explaining U.S. income distribution developments. In particular, the rise in the share of business investment devoted to information technology is positively correlated with the Gini coefficient. Indeed, the estimates suggest that the 24 percent increase in the share of business investment devoted to information technology since 1976 explains just over 60 percent of the overall increase in the Gini ratio. The coefficient estimates also indicate that the effect of the increase in technology investment was to raise the income share of the top (fifth) quintile and to lower the share of the bottom four quintiles.

The unemployment rate remains a significant determinant of the Gini ratio; a rise in the unemployment rate tended to improve the relative position of the top quintile, mainly at the expense of the middle three quintiles. The minimum wage also remained negatively correlated with the

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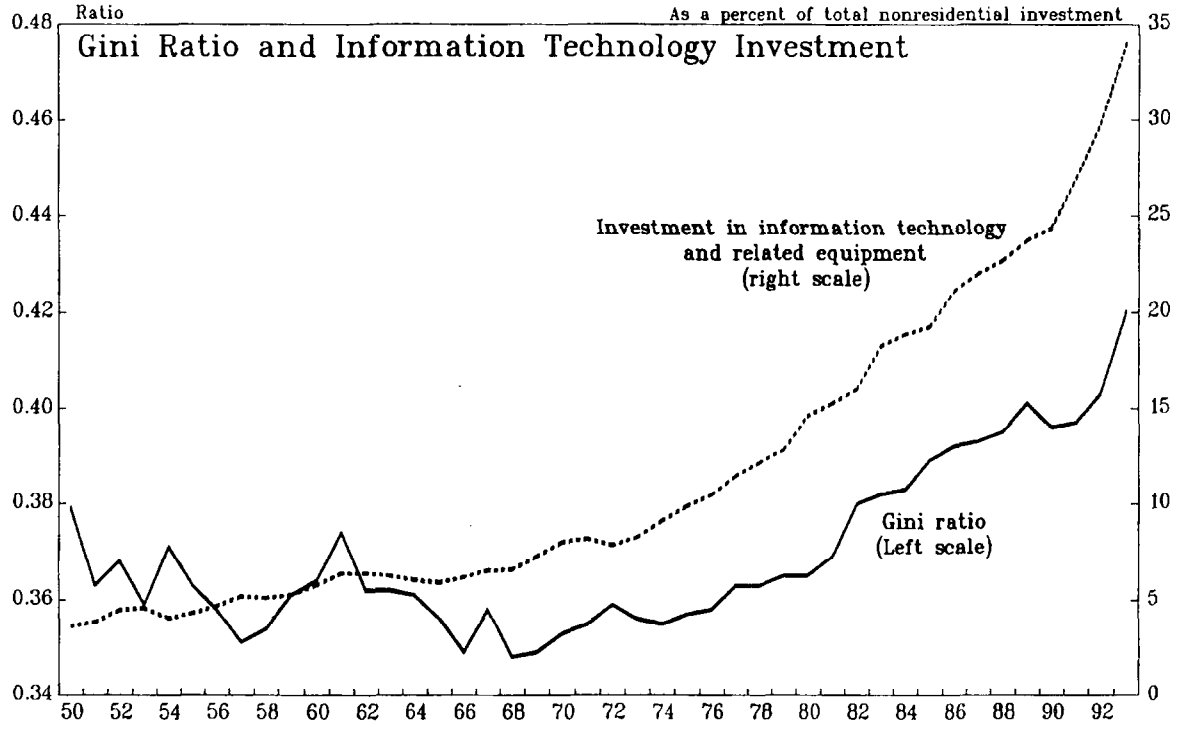
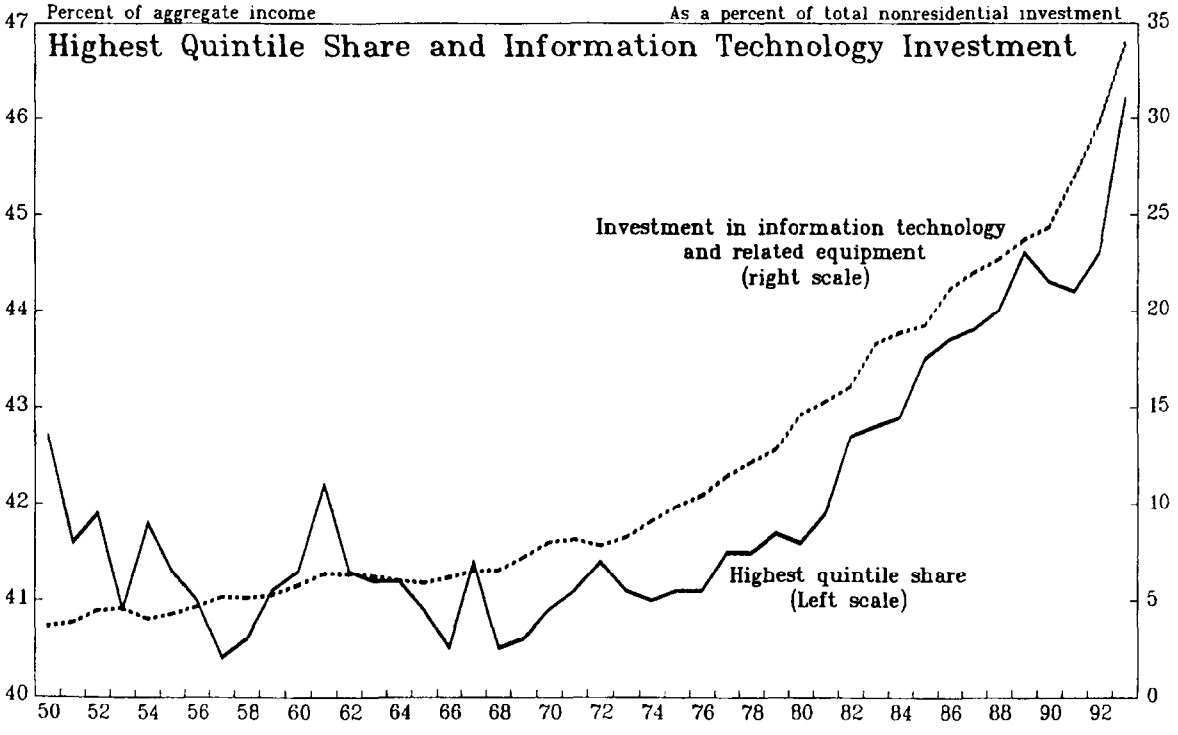
1/ Other variables examined, but excluded on the basis of their lack of explanatory power included the female participation rate, the proportion of two-income households, the percentage of household income earned from wages and salaries, and government transfer payments as a percent of GDP.

2/ This proxy is comparable to the one used by Buckberg and Thomas (1995). The ratio was constructed from estimates of real magnitudes from the fixed-weight national accounts series, due to the unavailability of the chain-linked data prior to 1959.

CHART 7

INCOME DISTRIBUTION AND TECHNOLOGICAL INVESTMENT





Sources: Bureau of the Census, U.S. Department of Commerce; and Bureau of Economic Analysis, U.S. Department of Commerce (supplied by Haver).

Gini ratio and explain 10 percent of the rise in the Gini ratio between 1976 and 1993. The number of families headed by a single female and by someone aged over 35 years also are not significant determinants of the Gini ratio, but appear to be positively correlated with the fourth quintile's income share. The decline in the child-dependency rate is associated with a decline in the lowest quintile's share, while the increase in the age-earnings profile is not a significant determinant of the Gini ratio but seems negatively correlated with the third quintile's income share.

V. Summary and Concluding Remarks

While there is substantial evidence that the income distribution in the United States has become more skewed since the mid-1970s, the significance of this trend is subject to considerable debate. In particular, income-based measures, such as those used in the analysis above, suffer from a number of drawbacks that may limit their usefulness in gauging trends in inequality. For example, the Census Bureau data excludes noncash income, does not take into account the effect of taxes on the distribution of income, and does not consider the effect of changes in family size. As a result, the data provide an imperfect measure of the distribution of consumption. The studies that have attempted to address these issues are not conclusive, but seem to suggest that the increase in inequality has been less than suggested by the income-based measures.

In addition, as is noted in Chapter III, a number of other trends also suggest that the distribution of lifetime income and wealth may be less skewed than suggested by the income-based data. These include the aging of the baby-boom generation, a steepening of the age-earnings profile, and increases in economic mobility, which may have contributed to an increase in annual measures of income inequality but may have meant a lesser effect on the distribution of lifetime earnings. However, a comprehensive study of these issues would require examination of more disaggregated, consumption-based data, which is beyond the scope of the present exercise.

Subject to these caveats, the results presented here confirm that the trend increase in income inequality in the United States began around 1976 and that the income distribution is sensitive to the business cycle and tends to widen during economic downturns. In particular, the income shares of the top two quintiles tend to rise with the unemployment rate, while the share of the bottom three quintiles tend to fall. Other macroeconomic variables, including real GDP per capita, the inflation rate, short-term interest rates, and imports as a share of GDP do not appear to affect significantly the income distribution.

The results indicate that the trend increase in the U.S. income distribution can be explained by a number of factors. The decline in the minimum wage relative to average hourly earnings appears to have contributed to the rise in income inequality, chiefly through its adverse effects on the income share of the lower quintiles. Evidence also suggests that technological factors have been a major source of the widening of the income

distribution. In particular, the share of investment in information technology explained well over half the rise in the Gini coefficient during the past two decades.

In addition, a number of demographic and sociological variables seem to be significant in explaining income distribution trends. In particular, the steepening of the age-earnings profile, the rise in the number of single female-headed households, the increased proportion of households headed by someone over the age of 35, and the decline in the child-dependency ratio also help explain movements in income shares.

Caution should be used in interpreting these results, however. In particular, the possibility that a causal relationship exists between the explanatory variables was not considered. A case could be made that technological changes may have contributed to the trend in some of the sociological variables considered (e.g., number of dual-income households, the number of single female-headed households, etc.), or may have been a factor in explaining the steepening of the age-earnings profile. Similarly, the gap between the minimum wage and average hourly earnings would possibly be correlated with the cyclical position of the economy. The analysis also did not include a number of other variables that might also be significant determinants of the income distribution, including the distribution of the supply of skilled labor, wealth, etc. Again, a comprehensive study of these issues would require the use of disaggregated survey data.

APPENDIX

Data Appendix

Gini ratio - Defined as a ratio of the area bounded by the linear diagonal and the Lorenz curve, for a particular income distribution, over the total area below the 45 degree line. 1/ The Gini coefficient ranges in value between 0 and 1 and a ratio of 0 indicates perfect equality, i.e., families have an equal share of total income. A measure of 1 indicates perfect inequality, i.e., one family has all the income and the rest have none. The Gini ratio was taken from the Census Bureau's Current Population Survey (CPS), Table F-1.

Income shares - Income shares are defined as the percentage of aggregate income that is received by each quintile. All income shares were taken from the Census Bureau's CPS, Table F-1.

GDP per capita - Real gross domestic product per capita in logs. The GDP data were taken from the U.S. national income and product accounts (Bureau of Economic Analysis, U.S. Department of Commerce) and were based on the 1987-dollar fixed-weight series, rather than the new chain-linked series, since the new series is available only from 1959.

Inflation rate - Annual percentage change in the Consumer Price Index (all items).

Unemployment rate - The unemployment rate, as reported by Bureau of Labor Statistics.

Trend variable - A linear trend starting in 1976, and equal to zero before that date.

Minimum wage - The federal minimum hourly wage deflated by the consumer price index as a ratio to real average hourly wages in the manufacturing sector. Data on the federal minimum wage were supplied by the U.S. Department of Labor.

Single mothers - The share of families in the CPS survey population headed by an unmarried female (CPS, Table F-4a).

Over age 35 - The share of families in the CPS survey population headed by a person over the age of 35 (CPS, Table F-8).

Age-earnings profile - The ratio of the average income of households headed by someone aged 45 to 54 to the average income of households headed by someone aged 25 to 34 (CPS, Table F-8).

Child dependency - The number of children under the age of 16 as ratio to the number of women between the ages of 20 and 55, as reported by the Bureau of the Census.

Technology - Real investment in information processing and related equipment as a percent of real total nonresidential fixed investment. Data were taken from the U.S. national income and product accounts (Bureau of Economic Analysis, U.S. Department of Commerce). The 1987-dollar, fixed-weight series were used, since the chain-linked data were not available prior to 1959.

1/ The Lorenz curve graphs the cumulative percentage of families against the cumulative percentage of income. A 45-degree line represents perfect income equality, i.e., each family earns the same income.

Table 1. Macroeconomic Factors and the Income Distribution 1/

Dependent Variable	Independent Variables: Constant	Lagged Dependent Variable	GDP Per Capita	Inflation	Unemployment Rate	Trend	Descriptive Statistics 2/: R^2	χ^2	Obs
Gini ratio	0.1242 (3.24)*	0.4309 (3.40)*	-0.0165 (2.37)*	-0.0003 (1.20)	0.0018 (3.49)*	0.0022 (4.22)*	0.93	0.23	46
Lowest quintile share	7.8372 (9.37)*	0.3973 (7.86)*	1.0144 (6.75)*	0.0076 (1.21)	-0.0609 (5.07)*	-0.0580 (8.39)*	0.91	1.53	46
2nd quintile share	6.2580 (6.68)*	0.4089 (7.25)*	-0.2943 (1.99)*	0.0058 (0.83)	-0.0775 (5.77)*	-0.0527 (6.55)*	0.96	1.64	46
3rd quintile share	10.5493 (7.19)	0.4047 (6.31)	-0.0145 (0.09)	0.0018 (0.23)	-0.0182 (1.19)	-0.0516 (5.86)*	0.91	10.37*	46
4th quintile share	15.1035 (8.35)*	0.4237 (7.23)*	0.3770 (2.22)*	0.0011 (0.14)	0.0590 (3.89)*	-0.0172 (2.58)*	0.75	0.02	46
Highest quintile share	19.3960 (7.35)*	0.4028 (7.69)*	-1.0826 (2.28)*	-0.0164 (0.76)	0.0976 (2.37)*	0.1795 (7.43)*	0.92	0.04	46
Joint significance 3/	148.10*	127.83*	99.85*	1.86	63.94*	75.98*			

1/ Gini-ratio equation estimated using ordinary least squares (OLS); income-share equations using Seemingly Unrelated Regression Estimates (SURE) subject to the constraint that the sum of coefficients is equal to zero; T-statistics are in parenthesis; statistics that are significantly different from zero at the 95 percent confidence level are noted with an asterisk.

2/ The χ^2 statistic is the result of the Lagrange-multiplier test for first order serial correlation.

3/ Wald test of the joint significance of the independent variables in the SURE system, which is distributed chi-squared.

Table 2. Macroeconomic and Other Factors Affecting the Income Distribution 1/

Dependent Variable		Independent Variables: Constant	Lagged Dependent Variable	Unemployment Rate	Minimum Wage	Single Mothers	Over Age 35	Child Dependency Ratio	Age Earnings Profile	Descriptive Statistics 2/: R^2	χ^2	Obs
Gini ratio		0.0421 (1.16)	0.2179 (1.38)	0.0012 (2.05)*	-0.0710 (2.56)*	--	0.0039 (4.42)*	-0.0214 (1.69)	0.0004 (2.75)*	0.95	1.79	40
Lowest quintile share	(i)	10.4027 (7.38)*	0.3082 (5.30)*	-0.0699 (5.34)*	1.1480 (1.95)	0.0385 (0.75)	-0.1280 (8.48)*	1.4048 (3.23)*	0.0055 (0.92)	0.94	0.23	40
	(ii)	9.9080 (6.92)*	0.3100 (4.17)*	-0.0633 (5.09)*	1.0972 (1.94)	0.0333 (0.71)	-0.1228 (7.45)*	1.3067 (3.15)*	0.0045 (0.84)	0.93	0.00	40
2nd quintile share	(i)	12.8632 (7.30)*	0.2996 (4.44)*	-0.0427 (2.98)*	2.2871 (3.53)*	-0.1103 (1.91)	-0.0414 (3.34)*	-0.5818 (1.25)	-0.0111 (1.73)	0.98	0.16	40
	(ii)	10.8041 (6.13)*	0.3779 (4.84)*	-0.0372 (2.73)*	2.1221 (3.44)*	-0.0801 (1.49)	-0.0432 (3.52)*	-0.3862 (0.88)	-0.0118 (1.96)	0.96	0.07	40
3rd quintile share	(i)	14.3407 (6.84)*	0.3481 (4.28)*	0.0002 (0.01)	1.3548 (2.13)*	0.0010 (0.02)	-0.0373 (3.05)*	-0.2341 (0.50)	-0.0226 (3.31)*	0.96	1.31	40
	(ii)	13.4956 (...)	0.3820 (17.41)*	0.0051 (0.13)	1.4701 (6.06)*	0.0091 (0.03)	-0.0495 (13.28)*	-0.1510 (0.12)	-0.0212 (10.21)*	...	...	40
4th quintile share	(i)	16.0630 (7.83)*	0.2946 (4.17)*	0.0609 (3.83)*	0.0320 (0.05)	0.1382 (2.27)*	-0.0204 (1.63)	0.5981 (1.20)	-0.0191 (2.71)*	0.74	0.29	40
	(ii)	14.9924 (5.24)*	0.3533 (2.99)*	0.0618 (4.00)*	0.4111 (0.64)	0.1044 (1.82)	-0.0421 (2.51)*	0.6282 (1.38)	-0.0186 (2.76)*	0.97	0.21	40
Highest quintile share	(i)	14.9367 (3.60)*	0.3157 (5.30)*	0.0514 (1.12)	-4.8219 (2.40)*	-0.0675 (0.38)	0.2271 (5.54)*	-1.1871 (0.81)	0.0474 (2.30)*	0.95	2.88	40
	(ii)	22.7988 (3.41)*	0.0194 (0.10)	0.0336 (0.78)	-5.1004 (2.73)*	-0.0484 (0.30)	0.2576 (6.01)*	-1.3978 (1.03)	0.0471 (2.42)*	0.95	1.29	40
Joint significance 3/	(i)	85.65*	44.04*	51.36*	14.24*	19.56*	85.86*	39.52*	24.13*			
	(ii)	113.97*	39.02*	53.09*	12.66*	13.18*	65.13*	33.91*	24.70*			

1/ Gini-ratio equation estimated using OLS. Income-share equations estimated (i) in levels and (ii) as the log ratio of the ith share to the 3rd share. The income-share equations were estimated using SURE, subject to the constraint that the sum of coefficients is equal to zero. T-statistics are in parenthesis; statistics that are significantly different from zero at the 95 percent confidence level are noted with an asterisk (chi-squared statistics are reported for the 3rd income share equation).

2/ The χ^2 statistic is the Lagrange-multiplier test for first-order serial correlation.

3/ Test of the joint significance of the independent variables in the SURE systems using the Wald test, which is distributed chi-squared.

Table 3. Technology and the Income Distribution 1/

Dependent Variable		Independent Variables: Constant	Lagged Dependent Variable	Unemployment Rate	Technology	Minimum Wage	Single Mothers	Over Age 35	Child Dependency Rate	Age Earnings Profile	Descriptive Statistics 2/: R^2	χ^2	Obs
Gini ratio		0.1853 (2.13)*	0.2424 (1.60)	0.0015 (2.52)*	0.0016 (2.46)*	-0.0721 (2.65)*	-0.0028 (1.10)	0.0022 (1.90)	-0.0193 (1.15)	--	0.96	2.83	40
1st quintile share	(i)	9.4268 (4.40)*	0.2665 (4.42)*	-0.0744 (5.54)*	-0.0165 (0.97)	1.2652 (2.15)*	0.0733 (1.20)	-0.1182 (5.04)*	1.4843 (3.42)*	0.0093 (1.36)	0.94	0.23	40
	(ii)	8.9197 (4.38)*	0.3149 (4.04)*	-0.0703 (5.28)*	-0.0167 (1.07)	1.1930 (2.02)*	0.0677 (1.14)	-0.1124 (4.98)*	1.3764 (3.18)*	0.0083 (1.31)	0.93	0.00	40
2nd quintile share	(i)	12.0298 (4.64)*	0.2632 (3.95)*	-0.0446 (3.05)*	-0.0157 (0.85)	2.3933 (3.73)*	-0.0884 (1.28)	-0.0265 (1.12)	-0.6143 (1.34)	-0.0081 (1.08)	0.98	0.02	40
	(ii)	9.7189 (3.78)*	0.3724 (4.33)*	-0.0432 (2.97)*	-0.0213 (1.21)	2.3070 (3.59)*	-0.0497 (0.74)	-0.0232 (1.02)	-0.4455 (0.99)	-0.0077 (1.09)	0.96	0.03	40
3rd quintile share	(i)	10.6027 (4.03)*	0.3213 (3.98)*	-0.0071 (0.50)	-0.0442 (2.55)*	1.4330 (2.44)*	0.0906 (1.45)	0.0087 (0.40)	-0.2177 (0.51)	-0.0146 (2.01)*	0.96	1.42	40
	(ii)	10.4504 (...)	0.3857 (15.72)*	-0.0032 (0.05)	-0.0414 (5.44)*	1.5964 (7.36)*	0.0696 (1.22)	-0.0072 (0.10)	-0.1868 (0.19)	-0.0137 (3.51)*	...	...	40
4th quintile share	(i)	10.9625 (4.56)*	0.2527 (3.91)*	0.0518 (3.64)*	-0.0623 (3.62)*	0.0630 (0.11)	0.2720 (4.30)*	0.0454 (2.15)*	0.6526 (1.52)	-0.0077 (1.10)	0.80	0.26	40
	(ii)	11.9554 (...)	0.3022 (2.44)*	0.0574 (3.86)*	-0.0544 (3.06)*	0.4076 (0.67)	0.2263 (3.40)*	0.0149 (0.58)	0.6798 (1.59)	-0.0094 (1.31)	0.97	0.06	40
5th quintile share	(i)	26.0431 (4.47)*	0.2834 (4.84)*	0.0744 (1.01)	0.1386 (2.55)*	-5.1545 (2.77)*	-0.3476 (1.77)	0.0905 (1.31)	-1.3050 (0.96)	0.0211 (0.96)	0.95	3.07	40
	(ii)	36.0937 (4.19)*	0.0336 (0.18)	0.0593 (1.37)	0.1339 (2.43)*	-5.5040 (2.98)*	-0.3139 (1.60)	0.1278 (1.79)	-1.4239 (1.07)	0.0225 (1.05)	0.96	1.29	40
Joint significance 3/	(i)	158.05*	25.23*	47.40*	14.73*	15.00*	30.81*	43.83*	43.44*	15.19*			
	(ii)	96.42*	29.31*	49.84*	9.96*	13.86*	17.80*	30.96*	36.49*	14.42*			

1/ Gini-ratio equation estimated using OLS. Income-share equations estimated (i) in levels and (ii) as the log ratio of the ith share to the 3rd share. The income-share equations were estimated using SURE, subject to the constraint that the sum of coefficients is equal to zero. T-statistics are in parenthesis; statistics that are significantly different from zero at the 95 percent confidence level are noted with an asterisk (chi-squared statistics are reported for the 3rd income share equation).

2/ The χ^2 statistic is the Lagrange-multiplier test for first-order serial correlation.

3/ Test of the joint significance of the independent variables in the SURE systems using the Wald test, which is distributed chi-squared.

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