ACCOUNTING FOR INCOME CHANGES OVER THE GREAT RECESSION (2007-2010)
RELATIVE TO PREVIOUS RECESSIONS
THE IMPORTANCE OF TAXES AND TRANSFERS

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Recessions: The Importance of Taxes and Transfers
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NBER Working Paper No. 19699
December 2013
JEL No. D31,H24,J3

ABSTRACT

With data from the March CPS and using shift-share analysis, we analyze the factors that account
for changes in post-tax post-transfer income during each of the past four recessions. What distinguishes
the Great Recession is that drops in employment rather than wage earnings drove income declines.
In addition, taxes and transfers played a much greater role in offsetting market income losses —a result
largely missed in analyses that do not account for taxes and transfers. This is particularly so among
the bottom quintile of the distribution where lower and increased transfers offset more than one-half
of the market income declines.

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Median pre-tax in-cash income fell more over the first three years of the Great Recession (2007-2010) and its aftermath than over the first three years of any other recession since the March Current Population Survey (CPS) first enabled this statistic to be measured annually in 1968. However, there was an unprecedented governmental response in the form of tax cuts and government transfer increases, including both in-cash (Unemployment Insurance, etc.) and in-kind (Supplemental Nutrition Assistance Benefits (SNAP) or Food Stamps, etc.) benefits. These tax and transfer responses substantially offset this loss of market income for middle- and lower-income Americans. Here we estimate the importance of these government actions and other factors that account for trends in median income as well as mean income in the bottom and top quintiles over the Great Recession and compare it to previous recessions. In accounting for income trends, we not only consider government tax and transfer policies, but also the importance of employment, demographics and source-specific income. Doing so provides a more complete understanding of why the Great Recession and its aftermath presented policymakers with a different type of economic crisis and the way they responded to it.

Using a shift-share analysis to compare the factors underlying income trends in each of the past four recessions, we show that the falling real earnings of those who remained employed played a relatively minor role in household income declines during the Great Recession. Instead, drops in employment primarily drove these income declines, which would have been much greater, except for the unprecedented role of public tax and both in-cash and in-kind transfer policies. Because previous decomposition studies have not included the role of either tax policies or in-kind transfers, they will greatly understate the increasing role that government policies have played in mitigating median income declines and understate the resources that were available to Americans over the Great Recession.

Data

We primarily use the public use March Current Population Survey (CPS) supplemented with cell-means for top-coded incomes from Larrimore *et al.* (2008) in our analyses.[1] Although the public use CPS data is commonly used for evaluating U.S. income and income inequality trends (see e.g. Gottschalk and Danziger 2005, Daly and Valetta 2006, and Blank 2011), it measures income on a pre-tax basis and only includes transfers when they are received in cash form. We will refer to this basic Census Bureau measure of income as "pre-tax" income. Since policymakers are increasingly using tax policies and in-kind transfers to mitigate income declines during recessions, it is necessary to supplement the CPS data with data on taxes and in-kind transfers. We will refer to this enhanced income measure which also accounts for taxes and in-kind transfers as "post-tax" income.

We generally use the same procedures for estimating the value of in-kind transfers, tax credits, and tax liabilities as in Armour, Burkhauser, and Larrimore (2013). The Census Bureau imputes the value of SNAP (food stamps), housing subsidies, and school lunches on an annual basis. We use these values in our estimates. Each are now generally recognized as important resources primarily available to low income households, and the Census Bureau now includes them as resources in their Supplemental Poverty Measure (Interagency Technical Working Group, 2010).[2] We impute the value of tax credits and liabilities using the NBER TaxSim 9.0.

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[1] Larrimore et al. (2008) demonstrates that the public use CPS data supplemented with cell-means for top-coded incomes produces results for income and income inequality trends that closely match those found in the internal CPS data used by the Census Bureau to produce their official income statistics (DeNavas-Walt, Proctor, and Smith 2013).

[2] While there is general agreement that the full market value of these in-kind transfers should be included in any measure of income, including employer- or government-provided health insurance benefits at their full market value is more controversial. Some researchers, including Armour, Burkhauser, and Larrimore (2013) and CBO (2012) include health insurance benefits at their full market value, but they are not included as resources in the Census Bureau's Supplemental Poverty Measure or at their full market value for those in poverty in Census Bureau studies (DeNavas-Walt, Proctor and Smith 2013, Interagency Technical Working Group 2010, and Short, 2012). Here we take the most conservative approach and value them at zero in our analysis, as the Census Bureau (DeNavas-Walt, Proctor and Smith 2013) and CPS-based researchers (see e.g. Gottschalk and Danziger 2005) have traditionally done. Including them at their full market value would substantially increase the level of government in-kind transfers and their growth would offset a portion of the declines in market income over the years of our analysis.

These tax credits and liabilities include federal and state tax liabilities as well as FICA and

SECA taxes based on the tax laws in effect in each year (Feenberg and Coutts 1993, provide an

overview of the NBER TaxSim program). Since the CPS samples households, which may

include multiple tax filing units, we divide each household into tax units prior to imputing tax

liabilities using the same procedure in Burkhauser et al. (2012), which is based on the same

assumptions regarding potential tax units as first used in Piketty and Saez (2003).

Our unit of analysis is the individual and we adjust our measure of post-tax household

income to account for economies of scale in household consumption by dividing total income by

the square-root of household size and assigning this value to each member of the household.[3] All

income is adjusted for inflation using the Consumer Price Index Research Series (CPI-U-RS)

(Stewart and Reed 1999).

Long-term trends in median income

Figure 1 shows the trends in the median size-adjusted household income of persons

between 1979 and 2012, both using our pre-tax (dashed-line) and post-tax (solid line) income

measures. We normalize income to 1.00 in 1979 to show percentage change since 1979 for all

other years. We denote peaks of each business cycle (1979, 1989, 2000, and 2007) with solid

vertical lines, and troughs (1983, 1992, and 2004) with dashed vertical lines.[4]

Regardless of whether it is measured on a pre-tax or a post-tax basis, median income

traditionally has risen over time when compared at equivalent points in the business cycle,

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[3] This size-adjustment is commonly used in U.S. and cross-national studies of inequality (see e.g. Gottschalk and Smeeding 1997, Atkinson and Brandolini 2001, Burkhauser et al. 2011) as well as by the Organisation for Economic Co-operation and Development (OECD) in its official measures of income inequality and poverty (d'Ercole and Förster 2012). It also closely matches the adjustments for household size implied by the Census Bureau poverty thresholds (Ruggles 1990).
[4] Official NBER macroeconomic business cycle recession years are denoted in gray vertical bars in Figure 1. In our analyses peak and trough business cycle years are defined by peaks and troughs in median income with one exception. Because median income only slightly increased in 1983 and unemployment rates persisted above 10 percent for half of that year, we consider 1983 rather than 1982 to be the last year of that recession. In addition, because median income declined continuously in the early 1980s we consider the 1979-1983 double-dip recession as if it was single continuous recession.

although it is sensitive to business cycle variations. This is the case for both the 1979-1989 business cycle—pre-tax income rises by about 9 percent—and the 1989-2000 business cycle—it increases by about 13 percent. Post-tax income rises by similar amounts over these two business cycles.

However, over the 2000-2007 business cycle median pre-tax income stagnates. In contrast, post-tax median income rises by 2 percentage points over this period. Hence, while both series record slower growth in median income in the early 2000s, for the first time accounting for government taxes and in-kind transfers substantially increases the rate of median income growth over a full business cycle.

Moreover, the divergence between our pre-tax and post-tax series continues through the Great Recession. Between 2007 and 2008, while pre-tax median income fell by almost 4 percentage points, post-tax median income fell by less than 1 percentage point. As we will argue below, this largely reflects the enactment of the Economic Stimulus Act of 2008 and subsequent temporary tax measures enacted in response to the Great Recession. The Economic Stimulus Act provided a tax rebate of up to $1,200 for a married couple plus $300 for each dependent child. The tax rebate in the Economic Stimulus Act was a one-time payment, but it was replaced in subsequent years by the Making Work Pay Tax Credit in 2009 and 2010, as part of the American Recovery and Reinvestment Act ("ARRA") of 2009, and by a 2 percent payroll tax holiday starting in 2011 as part of the Tax Relief Unemployment Insurance Reauthorization and Job Creation Act of 2010. We will show that these tax policy interventions, together with increases in in-kind transfers—both of which are missed by conventional measures of pre-tax income—substantially cushioned the decline in resources actually available to the average American during the Great Recession and did so to a much greater extent than in previous recessions.

Hence these interventions and increases should be included in any income measure when attempting to show the role of government policy in mitigating income losses, or simply tracking the resources available to American households.

Median income trends during economic declines

Researchers commonly compare business cycle peaks to peaks or troughs to troughs, as we did above, to strip income trends of business-cycle variations. But it is also possible to focus on the relative severity of economic downturns across business cycles by examining similar periods in each business cycle. This can be done by comparing a fixed length of time after each peak year. Since two of the last four economic declines lasted just three years, we examine the recessions by comparing the first three years of economic decline following each business-cycle peak.

The first column of Table 1 reports the percentage changes in median pre-tax income (household size-adjusted pre-tax, post in-cash income of persons) during the first three years of each recession since 1979. This closely matches the income definition used by the Census Bureau in their official economic reports (DeNavas-Walt, Proctor, & Smith, 2013). Using this income measure, the severity of the most recent recession is evident as median income fell by almost seven percentage points in real terms from 2007 through 2010. This is more than one percentage point greater than over the severe 1979-1982 recession and is more than double the 2.59 percentage point decline in median income that followed the peak of 2000.

But as Column 2 shows this is no longer the case once we include taxes and in-kind transfers. While doing so adds to the measured drop in median income in the 1980s recession, it reduces the drop in income over all other recessions. As a result, while the drop in median post-tax income during the Great Recession remains greater than in the previous two recessions, it is a

less severe decline than that seen over the 1979-1982 recession.

This pattern is even starker when we focus on the change in the mean income of the bottom quintile of the distribution in columns 3 and 4. Using a traditional pre-tax measure of income, the drop in mean income for the bottom quintile is slightly greater over the 1979-1982 recession (-13.96 percent) than over the Great Recession (-12.26 percent), but once taxes and in-kind transfers are included the gap widens (-13.23 percent vs. -4.10 percent). Once taxes and in-kind transfers are included, the decline in the post-tax income of the bottom quintile of -4.10 percent during the Great Recession is no greater than they experienced in the previous two recessions and is the same as the decline experienced during the Great Recession for the median American (-4.10 percent).

Government tax and transfer policies during recessions are often thought to account for less of the change in mean income for the top quintile of the distribution. But given the progressive income tax structure and the increased use of tax cuts to offset the effects of recessions on income, this is not always the case. As can be seen in columns 5 and 6, this was most evident in the 2000 recession, where the passage of the Economic Growth and Tax Relief Reconciliation Act ("EGTRRA") in 2001 and the Job Growth and Tax Relief Reconciliation Act ("JGTRRA") in 2003 reduced tax liabilities for higher income households and pushed their income trends positive during this recession. (Appendix Table 1 provides a summary of major tax policy changes enacted in each year of economic downturns, including those from EGTRRA and JGTRRA. See Tax Policy Center 2011a and 2011b for a more detailed description of tax policy changes in each year.) But reductions in tax liabilities also improved mean income trends for the top quintiles in the 1989 recession and the Great Recession, while increases in tax liabilities slightly exacerbated their income declines in the 1979 recession. Once again focusing

on pre-tax income, the most basic Census Bureau income measure and the one most often used by CPS-based researchers, will inaccurately measure actual trends in the resources of Americans that incorporate taxes and in-kind transfers (post-tax income).

In what follows, we focus solely on post-tax income and more precisely measure what sources of income are accounting for changes in median post-tax income and changes in the mean income of the bottom and top quintiles of the post-tax income distribution.

Method of accounting for shifts in income distributions

To isolate the factors that account for these changes over the last four recessions, we use a shift-share analysis similar to Burtless (1999), Iceland (2003), Daly and Valetta (2006), and Larrimore (forthcoming). Shift-share analysis does not demonstrate causality but it is a common method for accounting for changes in household income via changes in demographic and source-level income. It does so by allowing the demographic composition (age, race and marital status) and the sources of income of our population to change, one factor at a time, thus separately accounting for changes in income and income inequality. To avoid double counting, we consider the impact of each factor conditional on previously considered factors. For example, we account for the importance of declining marriage rates on changes in income, conditional on the age and race of the individual.

Embedded within this approach are four distinct techniques for decomposing income distribution changes. The first considers changes in the fraction of the population in subpopulation groups, including demographic groups or employment statuses. The second considers changes to source-level income distributions within these subpopulation groups, but keeps the rank-correlation of income sources constant. The third considers changes in the correlation of income sources over time. The fourth and most important for this paper, for

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analyzing tax changes, separates the policy-neutral tax liability changes that occur as a result of changes to underlying taxable income in a progressive tax system from those that occur from new tax policies.

The first three of these decomposition techniques are employed in Larrimore (forthcoming) and Burkhauser and Larrimore (forthcoming). Larrimore (forthcoming) also provides a further discussion of the decomposition approach, including discussions of robustness to order of analysis and variants to the sharing unit definition.[5]

Changes in the prevalence of subpopulation. Our first decomposition technique is based on Atkinson (1998) and Burtless (1999). It accounts for changes in the frequencies of categorical characteristics in the population—including demographic trends. For example, it considers how an increase in the share of Hispanics in the total population will change the overall income distribution, holding the income distribution of whites, blacks, and Hispanics unchanged.

This technique reweights observations from the base year, *t,* such that the weighted fraction of the population in each demographic group matches that in future years, *t'*. We increase the weight of individuals with characteristics (e.g. Hispanic) that are more prevalent in year *t'* than in year *t*. This allows us to estimate the impact of changing the prevalence of those in the total population with this characteristic without altering the underlying income distributions within each group. In all cases, the base year, *t*, is the starting year of the business cycle. The comparison year, *t'* , is the comparison year during the trough of the business cycle.

Changes in source-level income distributions within population groups. The second

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[5] As with all shift-share analyses, a potential concern is that the order of analysis may impact the results due to the interaction between the considered factors. While this concern cannot be completely eliminated without analyzing all possible analysis orders, it is mitigated here for several reasons. First, in a similar analysis of inequality changes over the past 30 years, Larrimore (forthcoming) analyzed effects in both the order of those presented here and its reverse and found that the results were largely consistent. Second, since interaction effects should increase with longer time periods, this concern is smaller for our analysis of just the recession periods. Additionally, since our primary analysis is comparing effects in the same way across different recessions, the comparison will be impacted only if interaction effects differ substantially from one recession to the next. Since there is no reason to expect this to be the case, we do not expect the order of analysis to impact our findings greatly.

decomposition technique is based on Burtless (1999) and Daly and Valetta (2006). It incorporates the fact that the income distribution within each subpopulation group is changing as well. These changes can result from any income source.

In doing so, note that each individual's income, Y_{ik}^t can be represented as the sum of their incomes from each income source, f_{1ik}^t through f_{Nik}^t:

$$Y_{ik}^t = f_{1ik}^t + f_{2ik}^t + \cdots + f_{Nik}^t \tag{1}$$

We assign individuals a percentile rank, p_{fik}, for each income source based on the rank of their source-level income within their subpopulation group k. For now, the correlations of individuals' positions in the distribution of source-level incomes (rank-correlations) within each subpopulation group are assumed to be constant. This allows us to separate the importance of changes to income from a given income source from the change in the relationship between separate income sources.

To estimate the impact that changes to the distribution of source f_1 have on income inequality, each individual's income from the source f_1 in year t is replaced with the income of the individual at the same percentile rank of the source f_1 income distribution in year t':

$$\hat{Y}_{ik}^{t'}(p_{1ik}) = f_{1ik}^{t'}(p_{1ik}) + f_{2ik}^t + \cdots + f_{Nik}^t \tag{2}$$

This preserves the conditional earnings rank of each individual from source f_1 and the rank-correlation of earnings from source f_1 with other income sources, while capturing changes in the source-level income distribution of source f_1 within each population group. Since this procedure combines income across years, prior to the analysis all income is adjusted for inflation using the CPI-U-RS.

Changes in income-source rank correlations within subpopulation groups. The previous techniques hold the rank-correlation of income sources constant. That is, if the male and female

at percentile-ranks p_{1ik} and p_{2ik} in their conditional earnings distributions are married to each other in one year, we assume the same rank pairing will continue in all future years. By performing these rank-preserving income exchanges for sources f_1 and f_2 separately, we are able to analyze the impacts of the separate earnings distributions without impacting the correlation between the two:

$$\hat{Y}_{ik}^{t'}(p_{1ik}, p_{2ik}) = f_{1ik}^{t'}(p_{1ik}) + f_{2k}^{t'}(p_{2k}) + f_{3ik}^{t} + \cdots + f_{Nik}^{t} \qquad (3)$$

To update the correlation between sources f_1 and f_2, rather than dividing income into N separate sources, we divide income into $(N-1)$ sources such that $g_1 = f_1 + f_2$ while f_3 through f_N are unchanged. We capture the rank-correlation change of sources f_1 and f_2 by combining these sources before the rank-preserving income exchange rather than after. Thus, calling each individual's percentile-rank in the g_1 distribution q_{fik}, we calculate estimated incomes as:

$$\hat{Y}_{ik}^{t'}(q_{1ik}) = g_{1ik}^{t'}(q_{1ik}) + f_{3ik}^{t} + \cdots + f_{Nik}^{t} \qquad (4)$$

This updates the correlation between sources f_1 and f_2 along with their income distributions. We capture the impact of the changing correlation between sources f_1 and f_2 by comparing the results in the case where only their separate income distributions change (Equation 3) with the case where their joint distribution changes (Equation 4).

Changes in tax policies. Even in the absence of new tax policies, individuals' tax liabilities will change over time in response to income changes. If taxable income increases, then tax liabilities should as well, partially offsetting the increase in resources from those pre-tax income gains. Conversely, if taxable income declines then the reduction in tax liabilities partially offsets the fall in pre-tax income. However, tax liability changes may also result from new tax policies. Since this distinction is important for interpreting the relationship between taxes and income trends, we separate these two effects.

We first consider the policy-neutral tax change. In the sequential analysis, changes to tax liabilities are recomputed separately from changes to the underlying incomes that feed into tax computations. The policy-neutral tax change uses the NBER TaxSim program with the tax laws from year *t* but the incomes from year *t'* to observe how much tax liabilities would have increased or fallen if tax policies were left unchanged over the period of analysis, given the income changes previously observed in the analysis. This method for isolating policy-neutral tax changes is similar to those previously employed in the U.K. by Clark and Leicester (2004), in European countries by Bargain and Callan (2010), and in the U.S. by Kasten, Sammartino, and Toder (1994) and Bargain et al. (2011).[6] In all cases, constant policy taxes are based on inflation-adjusted tax brackets, where the brackets from year *t* are adjusted using the CPI-U-RS up to price levels from year *t'* (see Kasten, Sammartino, and Toder, 1994, for an illustration of how failing to do so dramatically increases policy-neutral tax liabilities due to inflation pushing individuals with unchanged real incomes into brackets with higher marginal tax rates).[7]

We then rerun the NBER TaxSim program using the actual tax laws in effect in year t' to determine the portion of tax changes attributed to new tax policies. The increase or decline in tax liabilities from this second NBER TaxSim analysis relative to that observed in the policy-neutral analysis is the change attributed to the new policies.

Accounting for shifts in median income during economic declines

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[6] This approach approximates a "constant policy" baseline where tax changes scheduled to take effect in the future are not part of current policy, rather than a "constant law" baseline, where they are. For example, under the policy-neutral approach the Economic Growth and Tax Relief Reconciliation Act (EGTRRA) and the Jobs and Growth Tax Relief Reconciliation Act (JGTRRA) were assumed to continue to follow the policies from 2007 and would not expire after 2010. Had they expired, this would have been treated as a policy change even though it would have been due to inaction rather than new legislation.

[7] This is critically important with respect to the period prior to 1985 when income tax brackets were not automatically indexed to inflation—that is, when inaction on the part of government allowed inflation to lower the "bend point" in the real income distribution where the marginal tax rate increased, effectively increasing average and marginal taxes for many individuals. Our approach to inflate tax brackets using price inflation when separating constant policies from new policies matches that of Bargain et al. (2011) and Clark and Leicester (2004). Kasten, Sammartino, and Toder (2004) and Bargain and Callan (2010) also inflate tax brackets, but base inflation on income growth rather than price growth. We are not aware of any previous research that does not incorporate an inflation adjustment for tax brackets when isolating policy-neutral tax effects.

The values in Row 1 of Table 2 repeat values first reported in the second column of Table 1—the decline in median post-tax income during the first three years of each economic downturn since 1979. The rest of the rows in Table 2 show how much each factor accounts for these trends using the shift-share method described above.

This analysis starts with three major demographic trends: an aging population, a more racially and ethnically diverse population, and the decline in the rate of marriage in the population.[8] Rows 2 through 4 of Table 2 illustrate the change in median income accounted for by changes in the demographic makeup of the country. These estimated effects focus exclusively on changes in the number of people in the demographic groups and not on changes in the income gaps between these groups over the various recession years. We will capture this latter change in the decomposition of changing source-level income distributions below.

Given that demographic factors generally do not change substantially over the 2- to 4-year period of a recession, we include these factors largely as controls for demographic patterns which can influence long-term income distribution trends. These demographic trends, especially with respect to the growing Hispanic population who typically have lower mean incomes, provide a baseline level of median income decline in all recessions. Furthermore, this baseline median income decline is greater in the last two recessions than in the first two. However, with the exception of the early 2000s recession these factors account for less than 16 percent of median income declines in each recession and generally cannot explain differences in the severity of income declines across the recessions.[9]

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[8] Aging patterns are considered using four categorical age groups: children (0-18), young adults (19-44), older adults (45-64) and the aged (age 65 and older). Races and ethnicities considered are white non-Hispanic, black, and Hispanic. Other races are included with white non-Hispanics because the small size of these groups prevents analyzing them separately. Marital status is the marital status of the household head, who can either be married, a single male, or a single female.

[9] See Burkhauser and Larrimore (forthcoming) for a further discussion of the impacts of changing demographics and the large racial income gap on long-run income trends, including their expected impacts in future decades.

The differences between the Great Recession and previous recessions become apparent when considering the changes in specific income sources. In doing so, we first focus on the primary members of a household. We separate them into male household heads or the spouses of household heads, which for short we call "primary males," and female household heads or the spouses of household heads, which for short we call "primary females." (In the CPS data, individuals are defined as household heads if they are the primary owners or primary renters of the dwelling.) This separates the impact of working children and other secondary earners from that of primary males and primary females in our analysis. In rows 5 and 6 of Table 2 we focus on the employment and earnings of primary males. In rows 7 and 8 we focus on the employment and earnings of primary females. Together, we observe that the labor earnings of these primary members of households represented 86 percent of all labor earnings in the United States in 2010.

During each recession since 1979, the employment rate of primary males declined, which accounts for a portion of the reduction in median household income (Row 5 of Table 2). However, the decline in median income that their declining employment accounts for was greater during the 2007-2010 recession (2.32 percentage points) than any of the previous three recessions and over one-third of a percentage point greater than during the first three years (1979-1982) of the 1980s recession.

In contrast, as can be seen in Row 6 of Table 2, the decline in median income accounted for by changes in the earnings distribution of primary males who were still employed during the 2007-2010 recession (1.98 percentage points) was substantially smaller than the 4.01 percentage point decline during 1979-1982. Thus, declining male employment rates—not declining male wage earnings—was the most important factor accounting for the severity of the first three years of the Great Recession: a dramatic difference from the first three years (1979-1982) of the last

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great recession.

The first four columns of Table 3 provide an explanation for the changing importance of primary male earnings and employment on median size-adjusted post-tax income. Over recession years 1979-1982, the decline in primary male full-time employment (5.51 percentage points) was much smaller than over 2007-2010 (6.85 percentage points). Consistent with findings of Sum and Khatiwada (2010) of substantial underemployment in the Great Recession, there was also a concurrent increase in part-time work between 2007 and 2010 exceeding that of other recessions. However, the mean earnings of full-time primary male workers over recession years 1979-1982, dropped by 3.90 percent. This compares to a 0.93 percent increase in earnings of full-time primary male workers for 2007-2010. This may, in part, be because layoffs and reduced hours in the Great Recession impacted low-wage workers to a greater extent than that seen in earlier recessions. But it also may reflect more real wage stability in the Great Recession than in earlier periods of economic decline.

One potential explanation for this relative decline in the importance of falling earnings over the Great Recession relative to the early 1980s recession is the different influence of inflation over the two periods. Over 2007-2010, inflation was at historic lows (1.6 percent annually) while over 1979-1982 inflation was very high (9.4 percent annually). Given the evidence of moderate downward nominal wage rigidity, real wages may be less likely to decline in periods of low inflation (see Kahn 1997 and Card and Hyslop 1997 and Altonji and Devereux 2000 for further discussions of sticky nominal wages). To the extent that wages are sticky and preventing downward adjustments, this may lead firms to increase their reliance on layoffs to cut costs during an economic decline. In contrast, during periods of high inflation real wages can fall more easily without lowering nominal wages. This can then reduce employers' reliance on

reducing employment to cut costs during the downturn.

A similar picture emerges when considering the employment and earnings of primary females (Rows 7 and 8, Table 2). During the 1979-1982 and 1989-1992 periods, their full-time employment grew despite the recession and therefore offset other factors accounting for declining median income. The strength of the long-term secular movement of women into the work force during the 1970s and 1980s overwhelmed any cyclical employment declines during recession years. However, by the 2000s, the secular movement of women into the work force slowed and no longer offset cyclical declines in female employment during recession years.[10] This change in secular patterns, along with the severity of the Great Recession, resulted in primary female employment declines from 2007 to 2010. Over this period, their employment declines accounted for a 0.89 percentage point decline in median income, which is a reversal from 1979-1982. The combined decline in primary male and primary female employment in rows 5 and 7 of Table 2 accounted for a 3.21 percentage point decline (2.32 plus 0.89) or 78 percent of the 4.10 percentage-point decline in median income over the first three years of the Great Recession. Thus, while the median income declines in the 1979-1982 recession were driven by the substantial drop in real earnings of working primary men, the median income declines in the Great Recession were driven by the declines in employment of primary men and primary women.

Row 10 of Table 2 looks at the earnings of all other workers in the household. Although primary men and women comprise the vast majority of workers, earnings of other members also fell, accounting for 0.99 percentage points of the fall in median income in the Great Recession.

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[10] Blau and Kahn (2007) document the slowdown in female labor supply growth in the 1990s. More recent statistics from Macunovich (2010) and the Bureau of Labor Statistics (2011) indicate that female labor force participation for adults age 16 and over peaked in 2000 and fell over the past decade.

This is less than any of the previous recessions. However, this may actually reflect the severity of the recession if households combine to weather the economic storm, thereby increasing the number of employed adults in a household.[11] Nevertheless, there is much less variation in its importance in accounting for changes over the four recessions and these secondary labor earnings declines reduce household income in all periods.

Row 11 of Table 2 looks at private non-labor income. It declines in all recession periods except the recession of 1979-1982 where an increase in this income source offsets the decline in other sources of private market income. Part of the explanation for this increase may be the high real rate of return on bonds over this period due to inflation expectations. In contrast, the average rate of return on bonds during the Great Recession was much lower.

As we alluded to earlier, market income is only part of the story when considering income trends during recessions. Tax policies along with public in-cash (e.g. Unemployment Insurance, etc.) and in-kind (e.g. SNAP, etc.) transfers are important components of many households' incomes—especially among those who experience earnings declines or job losses during the economic downturn. Burtless (2010) observed that the stimulus spending in the American Recovery and Reinvestment Act represented about 2.5 percent of the national economy in 2010, so one may expect tax and transfer policies to have played a particularly large role during the Great Recession. This was the case.

The first 5 columns of Table 4 report the mean value of public in-cash and in-kind transfers by their source during each recession. Column 6 reports their sum. While public transfers increased during each recession, their increase over the Great Recession greatly

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[11] For example, during the recession years 1979-1982, the mean household size for the middle quintile of the income distribution fell from 3.78 to 3.68 people. In contrast, during the recession years 2007-2010 the mean household size of the middle quintile of the income distribution grew from 3.43 to 3.50 people.

exceeded previous recessions. Mean household size-adjusted public transfers per person increased by 24.80 percent from 2007 to 2010, more than twice the 10.33 percent increase during recession years 1979-1982. Over half of the increase in public transfers during the Great Recession came from increased unemployment, workers' compensation, and veterans' benefits. This reflects the well-documented extension of Unemployment Insurance benefits to 99 weeks as well as a loosening in eligibility criteria, which greatly increased the availability of benefits to unemployed individuals (Farber and Valletta, 2013).

Column 6 of Table 4 also includes the value of in-kind transfers (SNAP or Food Stamps, housing subsidies and school lunches) that are not included in the Census Bureau's measure of pre-tax income discussed in Table 1. SNAP eligibility requirements were relaxed as part of the Food, Conservation, and Energy Act of 2008 and their maximum benefits were increased as part of the American Recovery and Reinvestment Act of 2009 (Andrews and Smallwood 2012). As a result of these policy changes and the depth of the recession, in-kind transfers increased by 72 percent during the Great Recession, compared to a slight fall in the early 1980s. While we are unable to separate the cause of transfer increases into that due to the economic downturn relative to policy changes, Ziliak (2013) estimates that approximately half of the increase in food stamp usage during the Great Recession is due to economic factors and about a third is due to food stamp policy changes.

As can be seen in Row 12 of Table 2, even though these transfer programs were primarily targeted at low income groups, their increase during the Great Recession had a noticeable impact on median post-tax income trends. During the first three years of the Great Recession, increases in transfers offset private sector income declines to a much greater extent than that seen in earlier recessions. While public transfer growth during recession years 1979-1982 only offset declines

in median income by 0.34 percentage points, or 5 percent of the total change, public transfers mitigated median income declines by 1.70 percentage points, or 42 percent of the total change, in the 2007-2010 period. They were the single most important factor offsetting the decline in income over this period. This is consistent with Ziliak's (2013) observation that the SNAP program is successfully operating as an automatic stabilizer during the Great Recession.

Note however that there may be secondary effects of these programs which partially counteract the increased incomes from the direct effects observed here.[12] However, at least in the short-run, it appears that the direct effects of increases in public transfers—especially the growth and extension of in-cash unemployment benefits beyond that seen in previous recessions and the increased eligibility for means-tested in-kind transfer benefits like SNAP—mitigated a substantial fraction of the decline in market income during the recession on median post-tax income.

In addition to transfers, tax reductions and increases in tax credits are a tool increasingly used by policymakers as a countercyclical tool to offset market income declines. As can be seen in Column 7 of Table 4, despite the substantial decline in market income during the 1979-1982 recession, this did not occur. Mean taxes paid by households increased slightly despite the recession. In contrast, during the Great Recession, income declines reducing tax liabilities as well as changes in tax policies designed to reduce tax burdens resulted in a decline of 12.61 percent in mean tax liabilities paid by households.

Changes in tax liabilities during a recession come from two distinct sources. The first occurs in a policy-neutral environment. To the degree that a recession lowers personal income,

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[12] Mulligan (2012), for example, argues that the substantial increase in unemployment compensation and other public transfers could have delayed a return to work and hence partially contributed to the drop in employment. For an early review of the literature on the relationship between increasing unemployment compensation and the duration of unemployment, see Danziger, Haveman, and Plotnick (1981).

tax liabilities also fall. The second occurs through legislated tax policy changes that increase or reduce tax liabilities for individuals.

During the early 1980s recession, real market income fell and as a result, real tax liabilities fell when considered in a "policy-constant" setting. We account for this policy-constant component of tax liability in Row 13 of Table 2. In 1979-1982 falling real incomes would have reduced the decline in post-tax median income by 6.61 percent with no change to tax laws.

But this was a period of substantial inflation and Congress opted not to adjust tax brackets for inflation (See Appendix Table 1 for a description of tax policy changes enacted during each year of the four economic downturns). Because the Federal Income Tax during this period was highly progressive, with higher marginal taxes rates levied on higher income brackets whose bend points were not automatically adjusted for inflation, this resulted in substantial bracket creep and increased real tax liabilities.

Although the Economic Recovery Act of 1981 reduced tax rates in 1981 and 1982, this was not sufficient to offset the lack of indexing. Inflation-adjusted indexing of tax bracket bend points was not implemented until 1985. The "policy-change" components of tax liability are accounted for in Row 14 of Table 2, including both the lack of indexing and the newly legislated policies in the Economic Recovery Act of 1981. In 1979-1982 this increase in taxes on real income increased the decline in real income by 6.89 percent, somewhat more than offsetting the reduction in tax liability observed in the "policy-constant" environment. As a result, the combined impact of the policy-neutral liability changes and those due to policy changes accounted for an additional 0.28 percent decline in median incomes.

Contrast this with either the 2000-2003 recession or the Great Recession. In the 2000-

2003 recession, EGTRRA and JGTRRA substantially reduced tax rates throughout the income distribution. These policy changes accounted for an increase in median income of 2.95 percent which, when combined with the policy-constant tax changes, accounted for a 2.82 percent increase in median incomes. This, in large part, explains why post-tax median income increased slightly during the first three years after the 2000 recession despite the decline in pre-tax income over the same period reported in Table 1.

Similarly, tax changes during the Great Recession were used as a tool to offset falling market incomes. These changes include the refundable tax rebate in the Economic Stimulus Act of 2008, the Making Work Pay credit and other tax changes in ARRA in 2009, and the 2 percent payroll tax holiday in the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010. Tax policy changes since 2007 accounted for a 1.17 percentage point offset of median income declines during the Great Recession that added to the offset that would have occurred in a policy-constant environment. As a result, while increases in tax liabilities reduced median income by 0.28 percentage points in the early 1980s recession, decreases in tax liabilities in the Great Recession increased median income by 1.99 percentage points.

When we combine these median income increases from tax changes with those from public transfers, we estimate that government taxes and transfer policies accounted for a 3.69 percent increase in median post-tax income compared to the 0.06 offset during the 1979-1982 recession. This helps explain the surprising finding in Table 1 that when government taxes and in-kind transfers are added to pre-tax income, the decline in median post-tax income was smaller during the Great Recession than during the recession of 1979-1982.

Accounting for shifts at the bottom and top of the distribution

We use this same shift-share procedure to consider the factors accounting for trends in

the mean income of the bottom and the top of the post-tax income distribution. Table 5 provides such information for the bottom quintile while Table 6 does so for the top quintile.

Many of the same patterns emerge when accounting for income trends at the top or bottom of the distribution as were seen in the middle—although the magnitudes differ. At both the top and bottom of the distribution, decreases in primary male earnings account for the largest part of mean post-tax income declines in the early 1980s recession. In the Great Recession however, the decline in primary male earnings is less important than the decline in their employment. In the bottom quintile, the drop in primary male employment accounts for the largest part of the decline in mean post-tax income. But in the top quintile, reflecting the importance of investment income, the fall in non-labor income accounts for the largest part of the fall in mean income.

There are also dramatic differences in the importance of tax and transfer income on mean income of the bottom and top of the distribution. In the bottom quintile of the distribution, increases in public transfers are the single most important factor for mitigating income declines. During the Great Recession, increases in transfer income offset almost 6 percentage points of the fall in income. This is over 3 times the increase in bottom quintile income accounted for by increased transfers in any of the previous recessions. Since very little transfer income goes to households in the top quintile of the distribution, it accounts for only a 0.34 percentage point increase in the mean income of these households.

Similarly, while tax legislation enacted during the Great Recession was more broad based, it still was targeted more towards low income households. For example, the $800 refundable Making Work Pay tax credit represents 6.2 percent of the income for tax units reporting income at or below $12,903 per year. But this credit is limited to $800 per tax unit.

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Hence tax units making above $12,903 got no additional credits and the $800 credit is phased out at higher income levels. For couples, the credit was completely phased out at $150,000. So it is less important for higher income households. As a result, for the bottom quintile, reduced tax liabilities due to changes in tax policy accounted for more than a 3 percentage point increase in mean income. But for the top quintile, tax policy changes only accounted for a 0.24 percent increase in their mean income. This is in marked contrast to the 2000-2003 recession, where tax cuts in EGTRRA and JGTRRA offered substantial tax reductions for individuals at the bottom, middle, and top of the distribution through reductions in marginal tax rates at every income level. Thus, in the 2000-2003 recession tax policy changes accounted for a larger, 3.91 percent, increase in mean income for the top quintile of the distribution than the 2.28 percent increase it accounted for among the bottom quintile.

Median income over the course of the Great Recession and its Aftermath

In Table 2 we compared the 4.10 percentage point decline in median income over the first three years of the Great Recession and the sources that accounted for it with the first three years of earlier recessions. But, the declines in income across these Great Recession years were not uniform, nor were the sources of income that accounted for them. In Table 7 we repeat our analysis of the sources of income that accounted for median income declines over the Great Recession, but now do so on a year-by-year basis. Row 1 shows a decline in median post-tax income of 0.82 percentage points during the first year (2007-2008) of the Great Recession, before falling by over 2.09 percentage points between 2008 and 2009. These two years represent the official NBER time period of the Great Recession and the deepest drops in median income. But median income is a lag indicator of economic recovery. So while median income did not fall during 2009-1010 as it did during 2008-2009, it still fell by 1.19 percentage points. The sum of

these three years of decline equals the decline of 4.10 percentage points for the three year period reported in Table 2. The last two columns extend our analysis to 2010-2011, the fourth consecutive year of median income decline (1.80 percent) and 2011-2012, the first year since the beginning of the Great Recession during which our median post-tax income measure increased (0.54 percent).[13]

The rest of the rows in Table 7 show how much each of our demographic and economic variables account for these annual declines in median income and provide some insight for the continuing decline in median income we observe past the official NBER end of the Great Recession.

As discussed in Table 2, declines in primary male employment accounted for the largest single source of median income decline in the Great Recession. As can be seen in Table 7 the relative importance of primary male employment varied greatly over the four years of median income decline. In 2007-2008 a drop in the earnings of employed primary males was the most important factor, followed by a drop in their employment. In contrast, in 2008-2009 the drop in primary male employment accounted for, by far, the largest part of the decline in median income. After these official NBER recession years, primary male employment increased and hence accounted for modest increases in median income over the next three years. However, in 2009-2010 drops in their earnings completely offset increases in their employment. It was only in 2010-2011 that both their earnings and employment increased. But these modest increases were completely offset by declines in the sum of the employment and earnings of primary females and the earnings of others in the household. It was only in 2011-2012 that the sum of all employment

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[13] In each year from 2009 through 2012, pre-tax income fell by less or increased by more than post-tax income. As was previously observed in Figure 1, 2012 was also the first year that size-adjusted pre-tax household income rose. However, non-size-adjusted pre-tax household income fell slightly in 2012 (DeNavas-Walt Proctor, and Smith 2013).

and earnings factors in Table 7 accounted for an increase in median income.

The annual decomposition in Table 7 also illustrates the short-term nature of stimulus programs as they played out in the tax code and in public transfers. During the first official NBER recession year of 2007-2008, increased transfers accounted for a 0.34 percentage point increase in median income growth. More importantly, in 2008, the launch of the Economic Stimulus Act provided up to a $1,200 credit for married couples plus additional credits for each dependent child (Joint Committee on Taxation, 2008). Largely resulting from this credit, new tax policies in 2008 mitigated median income declines by 2.39 percent (Row 14).

In contrast, while tax policies in 2009 were still more generous to the median household than in 2007 before the recession, 2009 represented the start of the withdrawal of tax stimulus for the middle of the distribution. Although the implementation of the Making Work Pay credit in 2009 provided a maximum benefit of $800 to a married couple, this was a less generous credit than the one offered by the Economic Stimulus Act the year before. As a result, changes in tax policy in 2009 reduced median income growth by 0.74 percent between 2008 and 2009. These declines were offset, however, by substantial increases in public transfers in 2009 which mitigated median income declines by 1.46 percent (Row 12).

Thereafter, decreases in tax-based stimulus programs and decreases in public transfers both worked in the same direction, each offsetting some of the growth in private market sources of income as economic stimulus is withdrawn. From 2009 to 2010 transfers fell from their 2009 peak; and, as a result of ending the partial exclusion of unemployment benefits from taxable income along with some state tax increases, tax liabilities around the median grew. This reduction in public transfers from the previous year and these increased tax liabilities accounted for a decline in after-tax median income.

From 2010 to 2011, tax and transfer stimulus measures were further scaled back, accounting for additional declines in after-tax median income that offset the growth in private market income in that year. While public transfers abated in 2012, in part because of the continued improvement in the private-sector economy, it was the first year since 2008 that tax policy changes did not account for a year-over-year reduction in median income growth. This development, along with the continued employment and earnings gains of both men and women, allowed 2012 to be the first year since the start of the Great Recession that post-tax median income produced a year-over-year improvement.

Looking forward, however, phase outs of temporary tax reductions and supplemental transfer benefits resumed in 2013—the 2 percent payroll tax credit ended in January 2013, the temporary increase in SNAP benefits expired in November 2013 (Andrews and Smallwood 2012), the sequester reduced the generosity of unemployment benefits starting in 2013 (Rampell 2013), and the extended unemployment benefits which were available through the Great Recession to varying degrees are scheduled to expire at the end of December 2013 (US Department of Labor 2013). As a result, even if private market income grows in 2013 it is possible that the phase-out of these temporary tax and transfer programs will result in an additional year of post-tax median income declines.

Conclusions

Using a shift-share analysis to compare the factors underlying income trends in each of the past four recessions, we show that the falling real earnings of those who remained employed played a relatively minor role in median post-tax household income declines during the Great Recession. Instead, employment declines primarily drove these income declines, which would have been much greater, except for the unprecedented role of public tax and both in-cash and in-

kind transfer policies. Because previous decomposition studies have not included the role of either tax policies or in-kind transfers, they will greatly understate the increasing role that government policies have played in mitigating median post-tax household income declines and understate the resources that were available to the bottom half of the distribution of Americans over the Great Recession.

However something that cannot be drawn from our analysis is whether this unprecedented use of tax and in-cash and in-kind benefits indirectly discouraged work over the period. We cannot rule out the possibility that these policies lengthened unemployment spells and thus degraded labor-market skills, so that these short-term increases in benefits during the first three years of the Great Recession made a return to work and wage earnings less likely. Furthermore, both tax reductions and increased transfers come at the cost of increased public debt, which is not included in our analysis since it does not impact short-term economic resources.

What can be concluded is that the unprecedented importance of the direct effects of temporary tax and transfer policies for supporting median and bottom-quintile income during the recession means that their withdrawal—as policymakers shift their focus to deficit reduction and the scaling down of stimulus measures—is likely to result in short-term headwinds toward achieving growth in post-tax median income. Hence growth in post-tax median income over the remainder of the current business cycle will depend on the ability of currently under- or non-employed individuals to find full-time jobs in a growing economy as we scale back these temporary public-transfer programs which limited median income declines over the Great Recession.

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Figure 1: Trend in median size-adjusted household income of persons with and without taxes and in-kind transfers, 1979 normalized to 1 (1979-2012)
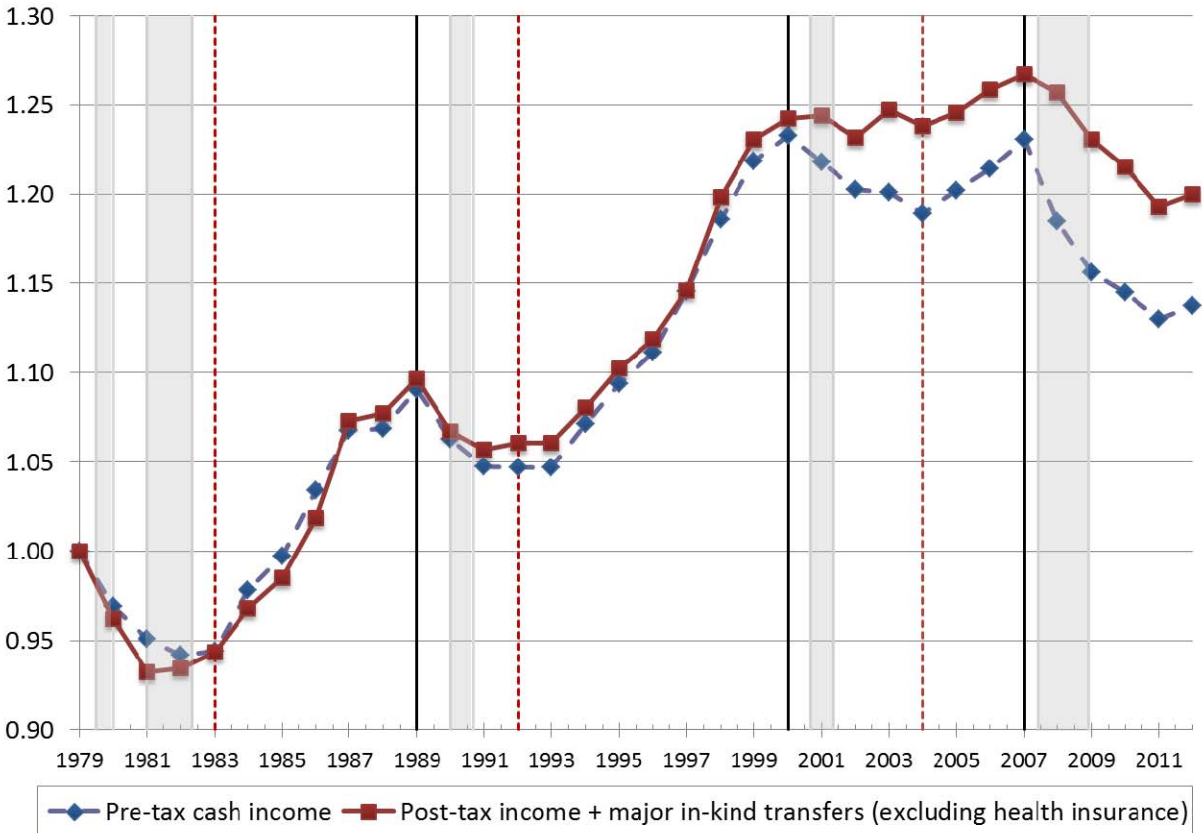
Notes: Peak and trough years of business cycles based on pre-tax median income and, in the case of 1983, unemployment are denoted with solid black and dashed red vertical lines respectively. The starting year of the period (1979) also represents a peak business cycle year. Official NBER recession periods are denoted by vertical gray bars. 1983 is treated as the trough of the recession starting in 1979 despite the slight increase in pre-tax median income from 1982 to 1983 given that unemployment remained above 10 percent for much of 1983 (Bureau of Labor Statistics 2012).

Due to a change in CPS survey collection methods, income trends are not directly comparable between 1992 and 1993 (Ryscavage 1995 and Weinberg 2006 discuss this issue further). Because we assume that the change in the income series in this year is due solely to collection method differences, in Figure 1, we assume there is no change in the income series in this year. This assumption matches that described in Larrimore (forthcoming), which is similar to that used by Atkinson, Piketty, and Saez (2011) and Burkhauser et al. (2012).

Source: Authors' calculations using Public-Use March CPS data (1980-2013)

Table 1: Percentage change in the median size-adjusted household income and income inequality of persons during the first three years of economic downturns since 1979

	Median Income		Bottom Quintile (mean)		Top Quintile (mean)	
	Pre-tax	Post-tax + in-kind	Pre-tax	Post-tax + in-kind	Pre-tax	Post-tax + in-kind
1979-1982	-5.79	-6.57	-13.96	-13.23	-1.38	-2.78
1989-1992	-4.01	-3.49	-7.87	-4.23	-4.01	-3.63
2000-2003	-2.59	0.35	-7.69	-4.62	-2.43	1.85
2007-2010	-6.97	-4.10	-12.26	-4.10	-4.24	-3.12

Source: Authors' calculations using Public Use March CPS Data (1980-2011).

Table 2: Factors accounting for changes in median size-adjusted household income of persons during the first three years of economic downturns since 1979

	1979-1982	1989-1992	2000-2003	2007-2010
(1) Percentage change in median income	-6.57	-3.49	0.35	-4.10
Change accounted for by:				
(2) Age	0.15	0.10	0.26	0.06
(3) Race and ethnicity	-0.30	-0.38	-0.98	-0.63
(4) Marriage	-0.04	-0.07	0.02	-0.07
(5) Male-head employment[a]	-1.95	-1.13	-1.24	-2.32
(6) Male-head earnings[a]	-4.01	-2.40	0.50	-1.98
(7) Female-head employment[a]	0.46	0.63	-0.64	-0.89
(8) Female-head earnings[a]	0.25	0.53	1.38	0.08
(9) Spouses' earnings correlation	-0.04	-0.16	0.40	-0.32
(10) Earnings of others	-1.66	-1.40	-1.77	-0.99
(11) Private non-labor income	0.51	-1.07	-0.62	-0.68
(12) Public transfers	0.34	1.05	0.23	1.70
(13) Policy-constant tax liability changes	6.61	1.04	-0.13	0.82
(14) Tax liability changes due to new tax policies	-6.89	-0.21	2.95	1.17

Source: Authors' calculations using Public Use March CPS Data (1980-2011).
Notes: (a) household heads and the spouses of household heads

Table 3: Employment and earnings of household heads by gender during the first three years of economic downturns (in 2010 dollars)

	Male Household Heads				Female Household Heads			
	% employed Full-Time	Mean FT Earnings	% employed Part-Time	Mean PT Earnings	% employed Full-Time	Mean FT Earnings	% employed Part-Time	Mean PT Earnings
1979	63.42	55,459	19.36	26,687	26.99	30,374	29.59	11,429
1982	57.91	53,299	22.37	24,191	28.04	31,209	27.74	11,395
Change	-5.51	-2,161	3.01	-2,496	1.05	834	-1.85	-33
% Change		-3.90		-9.35		2.75		-0.29
1989	62.39	59,487	17.77	26,811	33.92	36,196	27.01	14,246
1992	59.36	57,788	19.21	24,360	35.26	37,142	25.78	14,579
Change	-3.03	-1,699	1.44	-2,450	1.34	946	-1.23	333
% Change		-2.86		-9.14		2.61		2.34
2000	64.6	68,345	14.2	31,132	40.35	42,352	23.81	18,778
2003	61.6	67,428	15.36	31,798	39.06	44,968	23.39	19,895
Change	-3.00	-916	1.16	666	-1.29	2616	-0.42	1117
% Change		-1.34		2.14		6.18		5.95
2007	62.76	66,485	14.62	33,290	40.95	45,690	21.84	20,196
2010	55.91	67,103	17.91	28,164	38.22	46,686	22.30	19,601
Change	-6.85	618	3.29	-5126	-2.73	995	0.46	-595
% Change		0.93		-15.40		2.18		-2.94

Source: Authors' calculations using Public Use March CPS Data (1980-2011).

Note: Household heads refers to both the household head as defined by the Census Bureau and their spouse, so a married couple is considered to have one male household head and one female household head.

Table 4: Mean size-adjusted tax and transfer income during the first three years of economic downturns (in 2010 dollars)

	Mean Public Transfer Income, by disaggregated source						
	Public Assistance or Welfare	SSI Income	Social Security Income	UC, WC, and Veterans' Benefits	In-kind transfers	Mean Public Transfer Income, all sources	Mean Tax Liabilities
1979	239	95	1,650	426	210	2,620	7,637
1982	221	97	1,814	554	205	2,891	7,686
Change	-18	2	164	127	-5	271	49
% Change	-7.35	2.13	9.97	29.84	-2.55	10.33	0.65
1989	195	119	1,892	336	181	2,723	8,375
1992	206	145	1,974	483	223	3,030	7,814
Change	10	26	82	147	42	307	-561
% Change	5.30	21.54	4.31	43.8	22.94	11.26	-6.70
2000	63	158	2,241	337	141	2,939	10,620
2003	55	175	2,310	468	156	3,165	9,029
Change	-8	18	69	132	16	227	-1591
% Change	-12.31	11.14	3.10	39.06	11.04	7.71	-14.98
2007	35	176	2,412	341	174	3,137	9,302
2010	43	201	2,617	756	299	3,915	8,129
Change	8	25	206	414	125	778	-1173
% Change	23.25	14.15	8.53	121.45	71.97	24.80	-12.61

Source: Authors' calculations using Public Use March CPS Data (1980-2011).

Table 5: Factors accounting for changes in the mean income of the bottom quintile of the size-adjusted post-tax household income distribution over the course of the past four recessions

	1979-1982	1989-1992	2000-2003	2007-2010
(1) Percentage change in mean bottom quintile income	-13.23	-4.23	-4.62	-4.10
Change accounted for by:				
(2) Age	0.27	0.06	0.10	-0.05
(3) Race and ethnicity	-0.52	-0.64	-1.19	-0.68
(4) Marriage	-0.31	-0.31	-0.41	-0.25
(5) Male-head employment[a]	-2.83	-1.88	-1.88	-4.51
(6) Male-head earnings[a]	-6.18	-1.94	0.96	-2.47
(7) Female-head employment[a]	0.16	0.27	-1.30	-2.57
(8) Female-head earnings[a]	-0.12	0.02	0.68	-0.85
(9) Spouses' earnings correlation	-0.95	-0.03	-0.31	-0.59
(10) Earnings of others	-2.67	-1.87	-3.42	-1.91
(11) Private non-labor income	0.37	-1.52	-0.64	-0.53
(12) Public transfers	-0.48	1.85	1.01	5.98
(13) Policy-constant tax liability changes	2.43	0.87	-0.31	1.02
(14) Tax liability changes due to new tax policies	-2.34	0.94	2.28	3.32

Source: Authors' calculations using Public Use March CPS Data (1980-2011).

Notes: (a) household heads and the spouses of household heads

Table 6: Factors accounting for changes in the mean income of the top quintile of the size-adjusted post-tax household income distribution over the course of the past four recessions

	1979-1982	1989-1992	2000-2003	2007-2010
(1) Percentage change in mean top quintile income	-2.78	-3.63	1.85	-3.12
Change accounted for by:				
(2) Age	0.04	0.23	0.46	0.14
(3) Race and ethnicity	-0.16	-0.22	-0.65	-0.37
(4) Marriage	0.00	0.02	0.02	0.00
(5) Male-head employment[a]	-1.01	-0.77	-0.76	-1.07
(6) Male-head earnings[a]	-2.45	-2.97	-1.49	-0.72
(7) Female-head employment[a]	0.27	0.27	-0.07	-0.35
(8) Female-head earnings[a]	0.76	0.72	3.06	0.40
(9) Spouses' earnings correlation	0.61	0.36	-0.34	0.14
(10) Earnings of others	-0.66	-1.03	-0.24	0.21
(11) Private non-labor income	2.04	-1.66	-1.97	-2.55
(12) Public transfers	0.15	0.00	-0.12	0.34
(13) Policy-constant tax liability changes	10.91	1.72	0.15	0.47
(14) Tax liability changes due to new tax policies	-13.26	-0.23	3.91	0.24

Source: Authors' calculations using Public Use March CPS Data (1980-2011).

Notes: (a) household heads and the spouses of household heads

Table 7: Accounting for the annual trend in median size-adjusted post-tax household income of persons during the Great Recession

	2007-08	2008-09	2009-10	2010-11	2011-12
(1) Percentage change in median income	-0.82	-2.09	-1.19	-1.80	0.54
Change accounted for by:					
(2) Age	0.01	-0.02	0.07	-0.06	-0.11
(3) Race and ethnicity	-0.24	-0.16	-0.23	-0.43	-0.14
(4) Marriage	0.12	-0.03	-0.16	0.07	0.16
(5) Male-head employment[a]	-0.97	-1.48	0.14	0.49	0.24
(6) Male-head earnings[a]	-1.08	-0.32	-0.57	0.13	0.13
(7) Female-head employment[a]	-0.20	-0.44	-0.25	0.07	0.02
(8) Female-head earnings[a]	-0.76	0.76	0.08	-0.55	0.33
(9) Spouses' earnings correlation	-0.18	-0.27	0.13	-0.14	0.39
(10) Earnings of others	-0.62	-0.20	-0.17	-0.50	-0.15
(11) Private non-labor income	-0.54	-0.58	0.44	-0.37	0.18
(12) Public transfers	0.34	1.46	-0.10	-0.29	-0.36
(13) Policy-constant tax liability changes	0.94	-0.09	-0.03	0.35	-0.24
(14) Tax liability changes due to new tax policies	2.39	-0.74	-0.49	-0.56	0.06

Source: Authors' calculations using Public Use March CPS Data (2008-2013).

Notes: (a) household heads and the spouses of household heads.

Appendix Table 1: Major Tax Policy Changes by Year

Year	Major Federal Income Tax Policy Changes Enacted in Each Year of Economic Decline
	1979-1982 Economic Decline
1980	**Brackets:** Real tax bracket thresholds fell 10% due to non-indexed brackets. **Ordinary Rates:** None. **Other:** None.
1981	**Brackets:** Real tax bracket thresholds fell 8.7% due to non-indexed brackets. **Ordinary Rates:** Reduced for all brackets (top rate from 70% to 69.125%).[A] **Other:** Top capital gains rate reduced from 40% to 20%.[A]
1982	**Brackets:** Real tax bracket thresholds fell 5.7% due to non-indexed brackets. Top 5 tax brackets combined.[A] **Ordinary Rates:** Reduced for all brackets (top rate from 69.125 to 50).[A] **Other:** AMT Exemption increased.[B]
	1989-1992 Economic Decline
1990	**Brackets:** None. **Ordinary Rates:** Increased for top bracket from 28% to 31%.[C] **Other:** None.
1991	**Brackets:** None. **Ordinary Rates:** None. **Other:** EITC Benefits increased and indexed to inflation.[C] Personal Exemption Phaseout introduced for high income individuals.[C]
1992	**Brackets:** None. **Ordinary Rates:** None. **Other:** None.
	2000-2003 Economic Decline
2001	**Brackets:** Split brackets into 6 brackets from 5.[D] **Ordinary Rates:** Reduced for all brackets (top rate from 39.6% to 39.1%).[D] **Other:** Non-refundable $300(single)/$600(joint) tax rebate issued.[D] Child Tax Credit increased and made partially refundable.[D] AMT exemption increased.[D]
2002	**Brackets:** None. **Ordinary Rates:** Reduced for middle and upper income levels (top rate from 39.1% to 38.6%).[D] **Other:** End $300/$600 non-refundable tax rebate.[D]
2003	**Brackets:** None. **Ordinary Rates:** Reduced for middle and upper income levels (top rate from 38.6% to 35%).[E] **Other:** Tax rate on capital gains and dividends reduced; AMT exemption increased.[E]
	2007-2012 Economic Decline
2008	**Brackets:** None. **Ordinary Rates:** None. **Other:** Refundable tax credit of up to $600(single)/$1200(joint) plus $300 per dependent.[F] Capital Gains tax rate reduced from 5% to 0% for low-income taxpayers.[E] Personal Exemption Phaseout reduced for high income taxpayers.[D]
2009	**Brackets:** None. **Ordinary Rates:** None. **Other:** End $600/$1200 refundable credit.[F] Introduce $400(single)/$800(joint) Making Work Pay credit.[G] Increase EITC benefits for taxpayers with 3 or more children.[G] Partial exclusion of unemployment compensation from taxable income.[G]
2010	**Brackets:** None. **Ordinary Rates:** None. **Other:** Personal Exemption Phaseout eliminated for high income taxpayers.[D] End partial exclusion of unemployment compensation from taxable income.[G]
2011	**Brackets:** None. **Ordinary Rates:** None. **Other:** End $400/$800 Making Work Pay credit.[G] Introduce 2% payroll tax holiday.[H]

Source: Tax Policy Center (2011a), Tax Policy Center (2011b).

[A]Economic Recovery Tax Act (ERTA) of 1981
[B]Tax Equity and Fiscal Responsibility Act (TEFRA) of 1982
[C]Omnibus Budget Reconciliation Act (OBRA) of 1990
[D]Economic Growth and Tax Relief Reconciliation Act (EGTRRA) of 2001
[E]Jobs Growth and Tax Relief Reconciliation Act (JGTRRA) of 2003
[F]Economic Stimulus Act (ESA) of 2008
[G]American Recovery and Reinvestment Act (ASSA) of 2009
[H]Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act (TRA) of 2010