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Median Income and Income Inequality: From 2000 and Beyond

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I. Introduction

The first decade of the 21st century was a turbulent economic period for the average American. Based on Current Population Survey (CPS) data, in 2000, median household income hit a record high, but fell for the next four years in the aftermath of the 2001 recession. By the end of 2007, even after three years of growth, median income was still below its 2000 peak. When the Great Recession hit in 2007, median income fell by a total of 6.78 percent over the next three years—a percentage drop greater than any previous recession since the CPS began annual collection of this information in the 1960s.

Consequently, the household income of the median American was lower in 2010 than in 2000, both because median income did not grow over the business cycle of 2000-2007 and because it then fell by a record amount over the three years of the Great Recession. Furthermore, an increasing number of policymakers, considering research based on Internal Revenue Service income tax data, argued that while the income of the average American was stagnating, U.S. income inequality was rapidly growing. In this chapter we pose four questions about income trends:

- 1. Are the incomes of the middle class stagnating?*
- 2. Is income inequality between the rich and the poor growing?*
- 3. What has been the impact of economic changes (e.g., employment, earnings, transfer payments) on median incomes and inequality?*
- 4. In the future, as our population ages and grows more ethnically/racially diverse, will those demographic shifts increase inequality and slow median income growth?*

We evaluate the evidence of a stagnating American middle class and an increasingly unequal income distribution over the first decade of the 21st century, reporting the agreement and disagreement among researchers. We use the public-use version of the March Current Population Survey (CPS) to track levels and trends in income and its distribution over this period. Then, in a

shift-share model, we estimate the importance of demographic and economic factors in accounting for trends in both median income and income inequality over the tumultuous 2000s, comparing the trends to previous decades. Finally, as the United States ages and grows more ethnically/racially diverse, we extend our shift-share model to predict the consequences of these demographic changes on median income and income inequality in the future.

The vast majority of research on trends in median income and income inequality in the U.S. is based on two data sources—the CPS and the Internal Revenue Service (IRS) Statistics of Income tax return data. Only the CPS can be used to consistently measure changes in median income, so we will use CPS data to estimate trends in median income. However, the CPS didn't begin collecting this data annually for households until the 1960s. While the IRS data series begins much earlier, it captures the income only of those Americans who file federal income tax returns – and therefore is poorly suited for measuring trends in median income. However, the IRS data are far more suitable for measuring long-term historical trends in income inequality back to the early 20th century, something the CPS data can only do annually since the late 1960s.

But can the CPS be used to measure trends in income inequality even then? The answer matters since these two datasets yield different findings. While researchers using both datasets agree that income inequality is currently at or near its peak over the past 50 years, they disagree on the timing of inequality growth. Research using the CPS data suggests that inequality increased substantially in the 1970s and 1980s but has since grown at only a moderate pace (Gottschalk and Danziger 2005 and Burkhauser *et al.* 2011). Conversely, research using IRS tax return data suggests that inequality continued to grow rapidly through the 1990s and 2000s (Piketty and Saez 2003).¹

¹ Their paper was one of the first in a rapidly expanding literature using tax return data to examine income inequality trends around the world. See: Piketty (2003) for France; Atkinson (2005) for the United Kingdom; Saez and Veall

Because recent public debates have highlighted income distribution trends, these discrepancies merit attention. Here we summarize the state of research using CPS- and IRS-based data. We reconcile their seemingly contradictory results, argue that the CPS is capable of capturing trends in income inequality, use the CPS to measure not only changes in median income but also in income inequality in the 2000s, and compare these changes to changes in previous decades.

We then focus on the demographic (age, racial composition, marital status) and economic (employment and earnings, non-labor income, transfer payment, etc.) changes behind these trends. While demographic factors form a baseline for our analysis, economic factors play the most important role over the last 30 years. We argue that while the employment and earnings of men have influenced median household income trends, since 1979 the employment and earnings of women have played a far more important role.²

Finally, looking ahead, the Baby Boom generation will increasingly age into retirement, and the Hispanic population will continue to grow. We predict that these two demographic changes will drag down median income over the next two decades, unless we reduce the persistent income gap between older and younger households and between white and minority households.

(2005) for Canada; Bach, Corneo and Steiner (2009) for Germany; Dell (2005) for Germany and Switzerland; and Atkinson and Leigh (2007) for Australia. In addition, Atkinson and Piketty (2007) and Leigh (2009) provide comprehensive literature reviews. Most recently Atkinson, Piketty and Saez (2011) review this literature.

² Throughout this chapter, when we discuss the earnings and employment of men and women, we are referring to the household head of the household and his or her spouse. The household head is the person (or people) who officially owns or rents the dwelling. When there is no such person, it may refer to any adult member of the household excluding boarders. In cases of married individuals, we treat them equally as joint heads of the household. The focus on household heads is typical in the types of shift-share analyses we employ in this paper. When we discuss the earnings of other household members, we explicitly say so.

2. Data

We base our analysis on data from the unrestricted public-use March Current Population Survey (CPS), a nationally representative survey of approximately 200,000 individuals conducted by the U.S. Census Bureau. The March CPS supplement contains a detailed questionnaire on the sources of income of household members and is commonly used to evaluate income and income inequality trends (see e.g. Gottschalk and Danziger 2005; Daly and Valetta 2006; Blank 2011; Burkhauser *et al.* 2011).

We focus on the pre-tax, size-adjusted household income of persons, including labor and non-labor earnings as well as in-cash government transfers.³ We adjust all income for inflation using the Consumer Price Index Research Series (CPI-U-RS) to capture income trends in real dollar terms.⁴

Overview of the March CPS and corrections to capture top-incomes

The March CPS does not report the actual top incomes. To protect the confidentiality of high-income respondents and to prevent random sampling of them from adding volatility to income estimates, the Census Bureau “topcodes” each of the 24 income sources.⁵ Any individual with income above this topcode threshold has his/her income reported as the topcode threshold, not the actual recorded income. Topcoding is performed on each income source

³ Size-adjusted household income accounts for economies of scale in household consumption by dividing income by the square root of household size. This income measure 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 Organization 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). This measure assumes that income is shared equally among all household members, so each member receives the same amount for personal consumption.

⁴ The CPI-U series reported by the Bureau of Labor Statistics has undergone methodological improvements that have not been incorporated retroactively. The CPI-U-RS accounts for these changes to provide a more accurate historical series of inflation which is typically below that found using the CPI-U (Stewart and Reed 1999).

⁵ Prior to 1987, the Census Bureau reported 11 (rather than 24) income sources, and each of these 11 income sources were topcoded.

separately, including social security income and unemployment compensation (UC) (Burkhauser, Feng, and Jenkins 2009). The topcode thresholds also vary by source. For example, topcodes on primary earnings range from \$50,000 to \$200,000, depending on the year; and topcodes for Social Security income range from \$10,000 – \$50,000, again, depending on the year. Since topcode thresholds are not consistent from year-to-year, the fraction of the population that is topcoded changes over time. In 1985, less than 1 percent of individuals had topcoded incomes while in 2007 almost 6 percent did (Larrimore *et al.* 2008). Since different amounts of income are suppressed in each year, inequality measures using the unrestricted public-use March CPS data may be inconsistent. To overcome these problems, we use cell means from Larrimore *et al.* (2008) that provide information on incomes above the topcode threshold.⁶

Additionally, due to changes in Census data collection procedures (Ryscavage 1995, Jones and Weinberg 2000) the data show an artificial increase in inequality between 1992 and 1993.⁷ We removed this artificial spike.⁸

⁶ This cell-mean series replaces topcoded values with the mean of all topcoded incomes from the specified income source in each year, thus maintaining the total level of top incomes and only losing their dispersion. This series has previously been shown to closely match both the levels and trends of Gini coefficients in the internal restricted-access CPS data used by the Census Bureau for producing their official income statistics (Larrimore *et al.* 2008). See Blank (2011) for a recent use of this series to measure changes in income inequality. The Census Bureau has offered a similar cell-mean series for the public-use data since 1996, although this series was not made available for the years prior to its introduction in 1996. The cell means from Larrimore *et al.* (2008) are available from 1967-2004 and can be used in conjunction with the Census-provided cell means since 2004 to obtain a consistent series back to 1967. Readers should also be aware that the internal data also have some limited censoring of extremely high incomes. This exists to minimize recording errors and prevent volatility in annual statistics due to the random sampling of outliers. See Semega and Welniak (2007) for details on internal censoring and Burkhauser *et al.* (2012) for an attempt to overcome it.

⁷ Burkhauser *et al.* (2012) provide further evidence that this one-year increase is artificial. They show that trends in top income shares of tax-units in the March CPS closely match Piketty and Saez's (2003) results using IRS tax records in most years. But this is not the case for 1992-1993, where the top 1% income share increases substantially in the March CPS but is relatively constant in the IRS tax records.

⁸ To remove this artificial inequality spike, we use a procedure similar to that used by Atkinson, Piketty, and Saez (2011), Burkhauser *et al.* (2012), and Larrimore (Forthcoming), and adjust all our income series upward for the years prior to 1993 as if the post-1993 data collection methods had already been in place and there was no change in income statistics between 1992 and 1993.

3. Comparing IRS and CPS data

As discussed above, while we use the March CPS data, some researchers focused on inequality instead use tax return data provided by the IRS Statistics of Income. Those researchers have recently observed faster inequality growth than those using the March CPS. For example, Saez's updated data from Piketty and Saez (2003) observe that from 2000-2010, the share of income going to the top 1 percent of the income distribution, excluding capital gains, rose by 5.6 percent (from 16.49 percentage points to 17.42 percentage points).⁹ In contrast, DeNavas-Walt, Proctor, and Smith (2011) observe in their annual report for the Census Bureau that when looking at their preferred inequality measure, the Gini coefficient, income inequality rose by just 1.5 percent (from 0.462 to 0.469) in the CPS data over the same time period. These differences are even greater when looking at the earlier 1990s period.

A common explanation for these differences is that deficiencies in one or both datasets restrict their ability to capture true income trends. For example, the survey-based CPS may suffer from greater recall bias than seen in IRS administrative data. Furthermore, the Census Bureau's topcodes restrict the CPS's ability to observe changes at the top of the income distribution. To the extent that inequality changed in this censored region of the data, researchers using the CPS may inaccurately measure trends (see e.g. Levy and Murnane 1992, Slemrod 1996, Burkhauser *et al.* 2003-2004, Piketty and Saez 2006, and Burkhauser, Feng, and Jenkins 2009). Consequently, some researchers argue against using both the restricted-access and public-use CPS data to measure income trends.

On the other hand, while IRS-based research avoids recall bias, respondents, particularly high-income earners, have a financial incentive to under-report income or classifying income in

⁹ Updated data is provided via Saez's website: <http://elsa.berkeley.edu/~saez/>

ways that minimize their taxes (e.g., classifying income as either wage earnings or business profits) but also results in an appearance of lower incomes (Sivadasan and Slemrod 2008). Hence changes in tax laws can result in researchers who use tax-based data conflating increases in income that is now subject to taxation with an increase in income. For instance, after the reductions in the top individual tax rates during the 1980s, many high-earners switched from classifying income as Subchapter-C corporation profits, which are not reported on personal income tax forms, to Subchapter-S corporation profits and personal wages, which are reported (Slemrod 1995).¹⁰

These data deficiencies in both datasets cannot be ignored. But Burkhauser *et al.* (2012) show that the differences in results between users have more to do with differences in their methodologies for measuring income and inequality than to data inconsistencies, in one or both datasets. In particular, they highlight three major differences: 1) the focus on household income;¹¹ 2) the definition of income;^{12,13} and 3) differing measures of inequality.¹⁴ To test the

¹⁰ See Feenberg and Poterba (1993) for an earlier discussion of this problem and other concerns regarding measuring top income with tax return data. Burkhauser, Hahn, and Wilkins (2013) find a similar problem occurs for researchers who do not control for the 1980s tax reforms in Australia which broaden the tax base by, for the first time, taxing realized capital gains held more than one year.

¹¹ Researchers using March CPS data typically focus on household income, assuming that income is shared across all individuals in the households, not just people who together file a tax return. In many traditional families, the tax unit is identical to the household. However, in non-standard families (including cohabiting couples and boomerang children), the sharing of income may occur across tax units.

¹² There are numerous ways to measure income; the choice will yield different measurements of distribution. For example, Burkhauser, Larrimore, and Simon (2012) observe that the choice of what income to include and how broadly it is shared across family or household members can result in median income growth between 1979 and 2007 of 3 to 36 percent. While CPS-based research, including this chapter, generally focuses on pre-tax post-transfer cash income, by necessity IRS-based research often restricts income to taxable income sources only, which excludes many sources of transfer income. Consequently, the IRS-based income measure is generally narrower than that based on the CPS. Nevertheless, while the CPS money income definition is broader than the income definition used in the tax-return based literature, some researchers have recently suggested that the CPS income definition is itself too narrowly defined. For example, the Bureau of Economic Analysis (BEA) estimates over \$2 trillion more personal income in the United States in 2001 than that observed in the CPS (\$8.7 trillion versus 6.4 trillion), with most of the difference coming from the BEA's broader income definition (Ruser, Pilot, and Nelson 2004). Notably, the BEA personal income definition includes non-cash compensation and in-kind transfer payments including employer-provided health insurance, Medicaid, and food stamps, as well as interest and dividends received by individuals by pension plans and fiduciaries on individual's behalf. Discussions of such broader income measures are beyond the scope of this report, but given the findings of Burkhauser, Larrimore, and Simon (2012) and Armour,

importance of these measurement differences, Burkhauser *et al.* (2012) compare inequality using the two datasets, while imposing the same sharing units, income definitions, and inequality metrics.¹⁵ They observe that outside of the top 1 percent of the income distribution, the two datasets provide remarkably consistent results. Even within the top 1 percent, the results are largely consistent across the two datasets when the topcoding of Census data is addressed. Therefore, Burkhauser *et al.* (2012) conclude that differences in results in the literatures based on these two datasets diverge not because of fundamental flaws in either dataset but because researchers are measuring different income and inequality concepts which are not always aligned. As such, we use the Census Bureau's March CPS data that, unlike the tax records, allows for analyses of median incomes since it is nationally representative rather than representative of tax filers only.

Burkhauser and Larrimore (2013) that broadening the income definition through the inclusion of in-kind benefits substantially increases income growth for middle- and low-income individuals, recent increases in in-kind benefits would likely be important for mitigating inequality growth since 1979. However, other differences in the BEA data, such as assigning pension income to individuals at accrual rather than receipt, would dramatically increase inequality as it moves income from the elderly, with relatively little other income, to their working years.

¹³ A commonly discussed income difference between the datasets is that some, but not all, IRS-based research includes income from taxable realized capital gains. While tax return data includes taxable realized capital gains, it excludes untaxed capital gains, including gains that occur in tax-sheltered accounts and most capital gains on owner-occupied housing. Focusing on realized taxable capital gains also distorts the timing of capital gains receipts when compared to a Haig-Simon income measure, which would use yearly accrued gains, since individuals can delay the realization of gains for tax purposes. Given these limitations, even tax return data likely presents an incomplete picture of the impact of including capital gains on the trends in income distributions. For a further discussion of the sensitivity of measures of top incomes to the measure of capital gains used, see Armour, Burkhauser, and Larrimore (2013).

¹⁴ Since CPS-based researchers recognize their limited ability to capture the very top of the income distribution, they generally focus on the Gini coefficient or 90/10 ratios for measuring inequality; each are relatively insensitive to changes at the tails of the income distribution. In contrast, IRS-based researchers generally focus on top income shares that are relatively insensitive to changes in the lower tail and middle of the distribution

¹⁵ In order to better capture the very top of the income distribution despite the limited censoring that occurs even in the internal CPS data, they use a Generalized Beta of the Second Kind (GB2) distribution to estimate top incomes.

4. Trends in median income and income inequality

In Figure 1 we report trends in size-adjusted household pre-tax, post-transfer in-cash income excluding capital gains, of the median American between 1979 and 2010.¹⁶ While we primarily focus on income and inequality trends over the past decade, the figure is extended back to 1979 to provide context for the more recent results. The left-axis denotes median income in constant dollars; the right-axis normalizes 1979 to 1 to denote its percentage change since 1979. Peaks of each business cycle (1979, 1989, 2000, and 2007) are denoted by solid vertical lines; troughs (1983, 1992, and 2004) are denoted by dashed vertical lines.^{17,18}

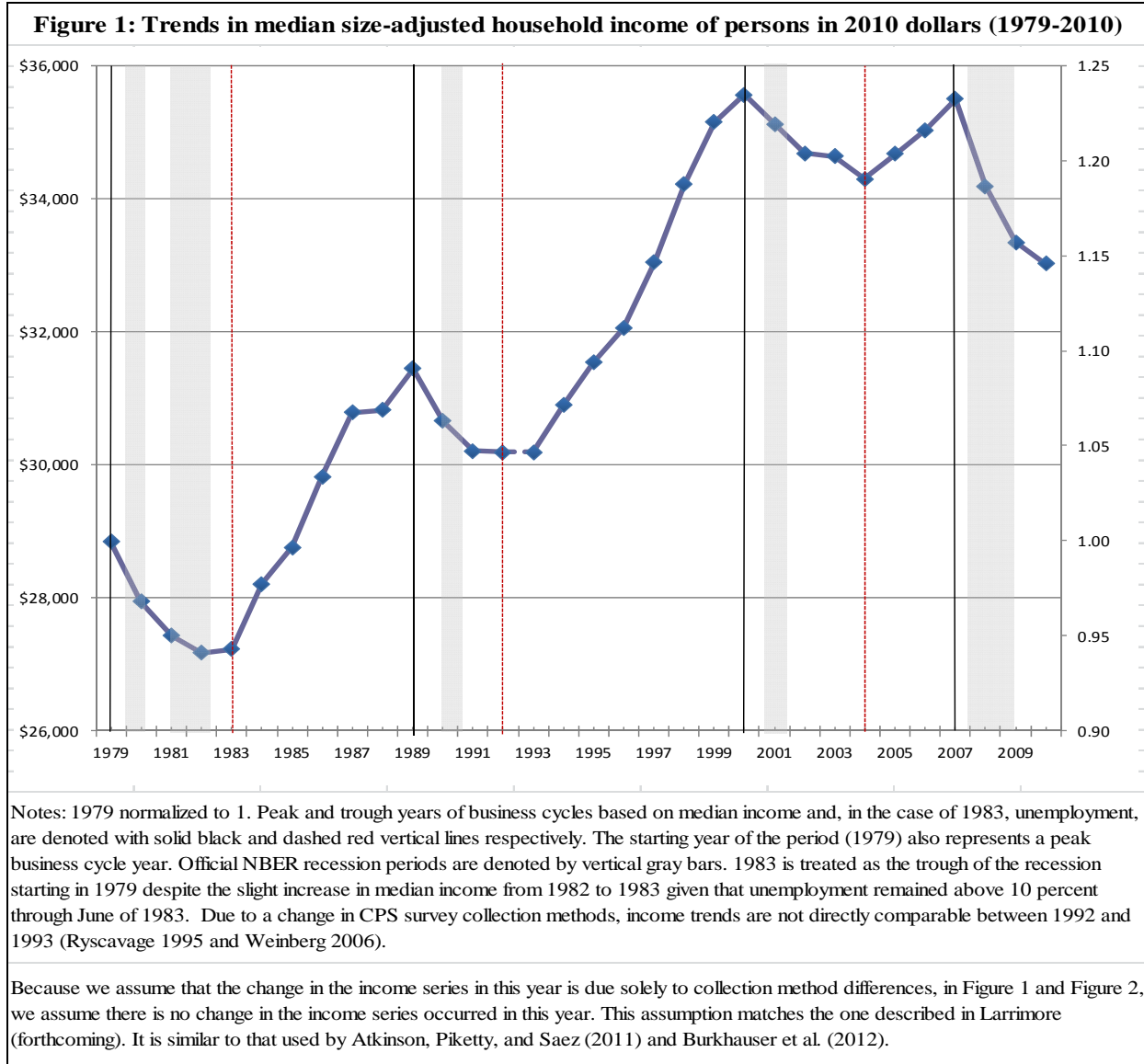
While median income is sensitive to business cycle variations (cyclical changes), historically median income has risen when measured at equivalent points in the business cycle. This was true in both the 1979-1989 business cycle, when it rose by about 9 percent, and the 1989-2000 business cycle, when it rose by about 13 percent. However, this did not happen over the 2000-2007 business cycle. In the aftermath of the 2001 recession, median income fell from its all-time high in 2000, and after bottoming out in 2004 rose over the next three years to \$35,500 or \$71,000 for a household of four in 2007, just below its previous peak in 2000. This was the first business cycle since at least the 1970s where median income was not higher at the

¹⁶ A common refinement on size-adjusted household income of persons is to calculate it for a four-person household. Since the size-adjustment is the square root of the household size, these values can be obtained by doubling the size-adjusted household income for a single person presented here.

¹⁷ Peak and trough years are defined based on peaks and troughs in size-adjusted median income rather than strict NBER macroeconomic business cycles, which are denoted by gray vertical bars in Figures 1 and 2. Because median income declined continuously from 1979 to 1983, we consider this double-dip recession as a single continuous recession.

¹⁸ Due to the break in the CPS data between 1992 and 1993 around the trough of that recession, the trough was assumed to occur in 1992 before the break in the data series. (See: Ryscavage 1995 and Weinberg 2006 for discussions of issues related to this break in the data).

peak following a business cycle than at the previous peak.¹⁹



Of course, any analysis of the past decade must include the Great Recession that began at the end of 2007 and continued through 2010.²⁰ When we include this period and compare troughs of business cycles, the picture is similar to our description for peaks. Unlike the previous

¹⁹ Burkhauser, Larrimore, and Simon (2012) demonstrate that this observation is sensitive to the measurement of income. If income is measured as post-tax income including the value of employer-provided health insurance and the ex ante value of Medicare and Medicaid rather than pre-tax income excluding these in-kind benefits, then there was small income growth from 2000-2007. Nevertheless, income growth was slower over this business cycle's peak years than the previous two business cycles.

²⁰ The most recent March CPS available to us shows that median household income continued to fall at least through 2011.

business cycles, when we measure trough to trough, median income falls between 2004 and 2010. In this case, however, the 3.7 percent drop between 2004 and 2010 is already much larger than the 0.2 percent drop between peak years 2000 and 2007. Furthermore, the 7 percent decline in median size-adjusted household income from 2007 through 2010 is steeper than the fall in median income over the 1979-1983 recession (5.6 percent), the 1989-1992 recession (4.0 percent), or the 2000-2004 recession (3.5 percent). Thus, the 2000s were particularly tumultuous for those in the middle class: over a seven-year business cycle, the middle class saw little change in their median income. With the Great Recession, the middle class saw their median income plummet - the sharpest drop since the CPS began collecting annual measures of this value.

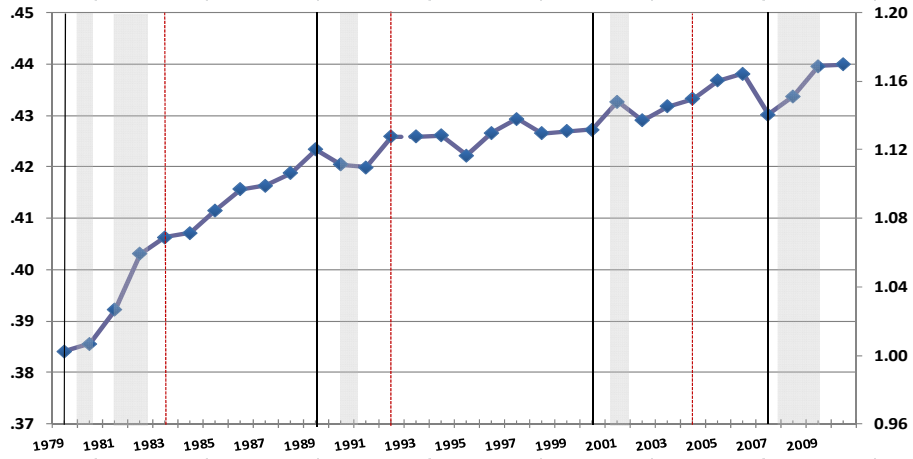
Figure 2 (panels A through C) show trends in income inequality (specifically, the trends in size-adjusted household pre-tax, post-transfer cash income excluding capital gains) using three common measures: the Gini coefficient, the P90/P10 ratio, and the top 5 percent income share.²¹ In each panel, the left axis denotes the level of the inequality measure and the right axis denotes its percentage change since 1979. As in Figure 1, solid vertical lines denote business cycle peaks (1979, 1989, 2000, and 2007); and dashed vertical lines, business cycle troughs (1983, 1992, and 2004).

Regardless of the inequality measure, several facts emerge. First, the level of inequality in 2010 is substantially above that observed three decades ago in 1979. This jibes with the conventional wisdom: income inequality is increasing. In 2010 inequality is 17 percent above the 1979 level (the Gini coefficient measure), 39 percent higher (the 90/10 ratio), and 14 percent

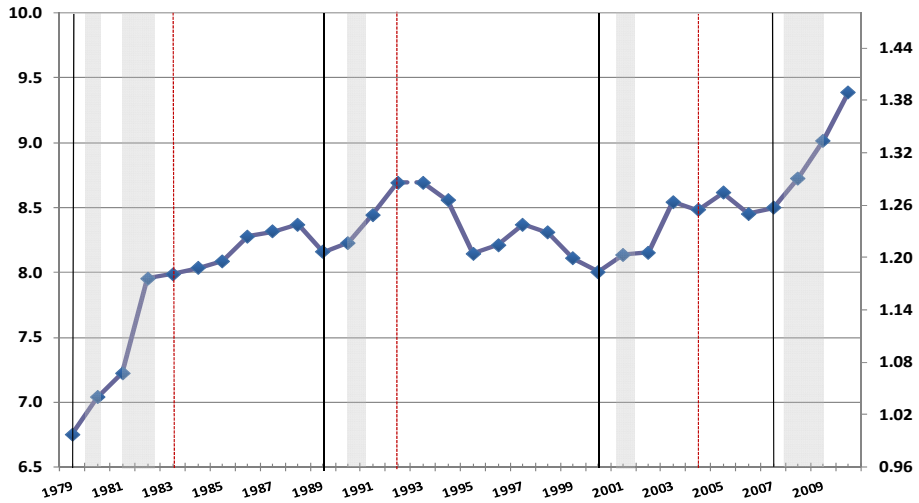
²¹ The Gini coefficient is our preferred series since it is a commonly used measure of inequality that, unlike P90/P10 ratios or top income shares, satisfies the desirable properties of an inequality index described by Jenkins and Van Kerm (2009). A Gini coefficient of zero indicates that all individuals have identical incomes and a value of one indicates that a single individual controls all income in the society.

Figure 2: Trends in the distribution of size-adjusted household income of persons, 1979-2010

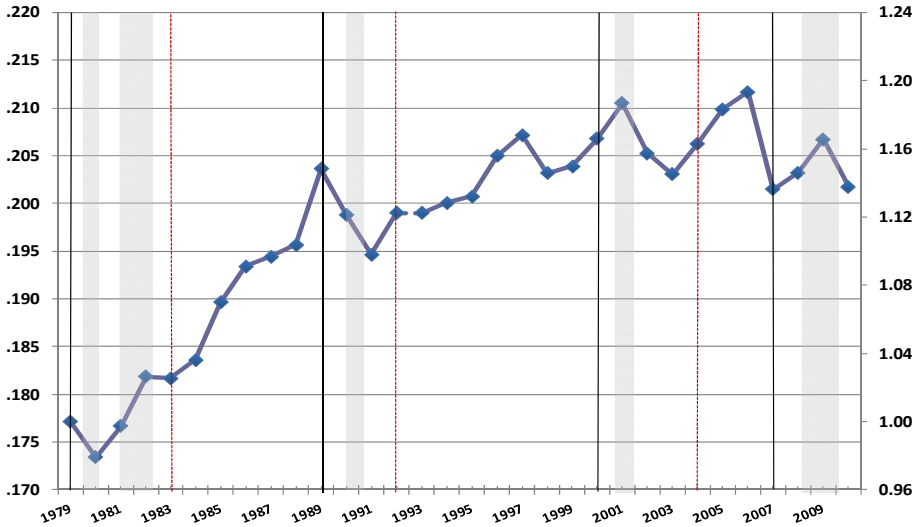
Panel A: Gini Coefficient



Panel B: 90/10 Ratio



Panel C: Top 5% share



higher (top 5 percent). However, while inequality is currently at or near record highs in all three series, using each of these three inequality measures, inequality growth is fastest in the 1979-1989 business cycle before slowing dramatically or reversing over the subsequent two business cycles through 2007. In the most recent full business cycle (2000-2007), the measures offer divergent statistical pictures. The Gini coefficient increases by just 0.7 percent (from 0.427 to 0.430) and the top 5 percent income share actually declines. Only the 90/10 ratio exhibits a larger increase in inequality than it did in the 1990s—although even here the 6.2 percent increase in the 90/10 ratio is smaller than the 20 percent increase in this inequality measure in the 1980s.

The Great Recession also coincided with changes in income inequality. Using the broad-based Gini coefficient, inequality grew by 2.3 percent between 2007 and 2010. The annual growth in the Gini coefficient over this period (0.76 percent per year) was well above the annual inequality growth in either of the previous two complete business cycles—although still below the 1.0 percent annual Gini growth over the 1980s. The 90/10 ratio shows a faster pace in the increase in income inequality — an increase of 3.5 percent per year during the Great Recession vs. a 2.1 percent per year growth in the 1980s. However, different measures of the distribution can lead to different trends. Inequality as the share of income held by the top 5 percent of the distribution changed very little over the Great Recession and earlier recessions. These findings suggest that the growth in inequality during the Great Recession came primarily at the lower end of the distribution. While the top-earners (the top 5 percent of household incomes) saw their income decline along with the rest of the population, the poor suffered the most.²²

²² The growth in Food Stamps (SNAP) and other in-kind transfers as well as the use of tax credits in the Bush and Obama stimulus packages disproportionately helped the bottom part of the income distribution during the Great Recession. Because these in-kind transfers and tax credits are not captured in the standard household size-adjusted pre-tax post in-cash transfer income of a person's measure of income used here, we disproportionately understate the income available to low-income persons. Armour, Burkhauser, and Larrimore (2013) show that differences between their results using this broader measure of income and those of the Congressional Budget Office (2011, 2012) are

5. Method of accounting for shifts in median income and income inequality

Policymakers and analysts should also understand the factors behind these trends. To isolate those factors, we use a shift-share analysis similar to Burtless (1999), Iceland (2003), Daly and Valetta (2006), and Larrimore (Forthcoming). We separately estimate the degree to which changes in demographic and economic factors over the full peak-to-peak business cycle (2000-2007) and the peak-to-trough recession (2007-2010) years account for the changes in median income and income inequality reported in Figure 1 and Figure 2, Panel A. We then compare these trends to those over similar business cycles and peak-to-trough recession years of the 1980s and 1990s.

Our shift-share approach allows 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. For example, we account for the impact of the changing U.S. racial composition, holding all else constant. We do so by assuming that the income distributions of whites, blacks, and Hispanics at the beginning of each business cycle or economic downturn remains the same over the entire business cycle or recession period we explore, while allowing the share of the population in each of these racial groups to shift to match actual population trends. Hence the shift in the share of each racial group alone accounts for the change in income that we measure.

Once we account for demographic factors, we focus on economic factors. We first separately consider the employment and earnings of male and female heads of household and their spouses. As previously noted, for ease of exposition future references to men and women

primarily due to the inclusion of realized capital gains in their analysis, not to differences in their measures of in-kind transfers.

refer only to the household heads and their spouses, as other household members are considered separately. We then consider the labor earnings of other household members; the returns from private non-labor income sources; and the benefits from public-transfer programs. By definition, these changes in individual sources of income will sum to the total change in median household income or income inequality found in the CPS data.

We use a two-step procedure to determine the importance of changes in the distribution of these sources on median income or income inequality. We initially consider the change in the distribution of each income source using a rank-preserving income exchange. Taking the income distribution from the first year of each business cycle, we assign each individual a percentile rank based on his/her level of income from a given source, conditional on his/her demographic characteristics and employment status. We then construct an equivalent ranking for the income source in the end-year of the business cycle, or, when analyzing economic declines, in the trough year of the business cycle. When we analyze the relationship between changes to the distribution of this source of income and the overall income distribution, we replace the source-level income from an individual at the X percentile of the source-level distribution with the source-level income from the individual at the X percentile of the source-level distribution in the latter year. We then replace the change in income statistics and inequality resulting from this replacement with the changes in the level and distribution of income from this income source. For example, John Smith receives income from wage earnings, along with income from other sources. His wage earnings are at the 60th percentile of male earnings with the same demographic characteristics. We calculate his total income as the sum of wage earnings and income from other sources at year 1. At year 2, we assume that his wage earnings are still at the 60th percentile, but may be higher or lower than they were initially depending on what the wage earnings of the man

at the 60th percentile of the wage earnings distribution are at that time. Incomes from other sources remain unchanged. We then calculate his new total income by summing his new imputed wage earnings with his earnings from other sources. Repeating this for all members of the population, and calculating inequality statistics for this new income distribution, provides the extent to which inequality would have changed from year 1 to year 2 if the changes to the male earnings distribution occurred but no changes occurred for other income sources.

This procedure, by construction, holds the rank-correlation of income across income sources constant over time. For example, if the man at the 50th percentile of the male-head earnings distribution in 2000 is married to the woman at the 30th percentile of the female-head earnings distribution at the beginning of the business cycle, we assume that this will still be the case at the end of the business cycle in 2007. To capture the change in the rank-correlation of income over time, we redo the rank-preserving income exchange analysis, treating household (head and spouse) earnings as a single, combined income source.

We perform the rank-preserving income exchange with the sources combined and compare it to the change in household income distributions when conducting the procedure on each separately. We attribute this change to the changing correlation of the income sources. We determine each of the correlation components in this way, combining the income source with all previously analyzed income sources (using the order of the rows in the table of results as our order of analysis). By doing so, the correlation change for a given income source represents the changing correlation of that source relative to all the previously analyzed income sources.

Although we include the income of all household members in our analysis, we focus on changes in the employment and earnings of the household head and, if that head is married, on his or her spouse. The household head and spouse are, in most cases, the primary earners

(defined in the CPS as the primary owners or primary renters of the dwelling), and their employment and earnings outcomes are correlated. But even more importantly, we want to focus on the changing roles of women and men in the labor market and their impact on the trends in median income and income inequality (Figure 1 and Figure 2, Panel A).

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. Details on the specific procedures are available in the Technical Appendix and a discussion of the order of analysis is available in the decomposition stacking order discussion box (see Larrimore, Forthcoming, for a further discussion of the decomposition approach, including discussions of robustness to order of analysis and variants to the sharing unit definition).²³

²³ 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. A common approach to test for order of analysis effects is to reverse the order of analysis and re-examine each factor's contribution (see e.g. Daly and Valletta 2006, Larrimore Forthcoming). When we do so here, the results are largely consistent.

Decomposition Stacking Order

A well-known limitation of the shift-share approach we employ here to analyze the components of income trends is that our results may be sensitive to the order in which we analyze the component factors (Daly and Valletta 2006, Fournier 2001, Jenkins 1995, and Larrimore Forthcoming). This concern increases as the period of our analysis grows since the interaction effects have more time to compound.

While any ordering will be arbitrary, the logic we use is to begin with factors that are least able to be affected by the individual's behavior. Hence we first consider factors that cannot be changed by the individual in response to his or her other life circumstances—the person's age and race. We then analyze a factor that, while alterable, is generally not a short-run choice—the individual's marital status. Only then do we measure factors that are more alterable— income elements—roughly in the order of their importance to a household. We start with the employment and earnings of men which are the primary income source for households; we follow with the employment and earnings of women, and then include all other income sources. Since public transfers are often means-tested, we consider them last.

To minimize stacking order concerns we analyze each business cycle separately. Thus, we analyze the 1979-1989 business cycle based on the 1979 base year, the 1989-2000 business cycle based on the 1989 base year, and the 2000-2007 business cycle based on the 2000 base year. This method is particularly important for readers concerned, for example, with how changing race relations since 1979 may impact our results. If the earnings gap were falling between races and we did not reset the base-year for each business cycle, then our demographic factors could potentially overestimate the impact of race on income trends. However, given the stability of the white-black and white-Hispanic earnings gaps over the past 30 years, this concern should be limited in any case, but analyzing each business cycle separately should further mitigate remaining concerns.

Larrimore (Forthcoming), using a similar decomposition approach, reversed his order of analyzing income elements. This is a common way to address stacking order concerns (see e.g. Daly and Valletta 2006). Like us, Larrimore found little difference in his results. While he did not include race or age in his initial decomposition or its reversal, those factors must always be analyzed first since placing them last would, by definition, result in them having no effect on the income distribution. This is because race and age have only indirect, rather than direct effects on incomes. Given the clear and persistent race/ethnicity income gaps we observe in the CPS data and the natural age-earnings profile with substantial income declines around retirement age, it is appropriate to assign responsibility for some level of the income trends to these demographic patterns. This is our reason for only assigning changes based on racial and age composition to race and age, while assigning any change in relative incomes within these demographic groups to the various income factors. Should the earnings gap widen or shrink between incomes of different race, ethnicity, or age groups, we view that as a change in the earnings distribution from the prior equilibrium in the country and assign the income and distributional effects of that change to the earnings factors rather than to the demographic ones.

Given the close relationship between income variables and demographic variables, we are not able to completely eliminate the stacking order effects which are present in all decomposition analyses. But we believe we have provided a plausible approach to mitigating them.

6. Decomposing median income trends from 2000-2007

We report the outcomes of our shift-share analysis in Table 1. To avoid distortions from business cycle variation, we present peak-year to peak-year comparisons of each business cycle in an attempt to capture longer term secular change. Table 1 (Row 1) reports the average percentage point change per year in the median size-adjusted pre-tax post-transfer in-cash income of persons across each of the last three business cycles (1979-1989, 1989-2000, and 2000-2007). These average percentage point changes in median income per year were first reported in Figure 1. The next 14 rows of Table 1 report the percentage point change in median income per year accounted for by the change in the demographic or economic factors. Each row has three values, one for each period we consider. The sum of the 14 values we report for the 1979-1989 business cycle in column 1 of each of these rows will equal 0.87, the average yearly change in median income over this business cycle.

We first consider three major demographic trends: an aging population, a more racially and ethnically diverse population, and the decline in the rate of marriage.²⁴ Table 1 (Rows 2 through 4) reports the change we account for by changes in these demographic factors, holding the distribution of incomes within each demographic group constant at its level at the start of each business cycle. These estimated effects focus exclusively on changes in the share of people in the demographic groups, not on changes in the income gaps between these groups.

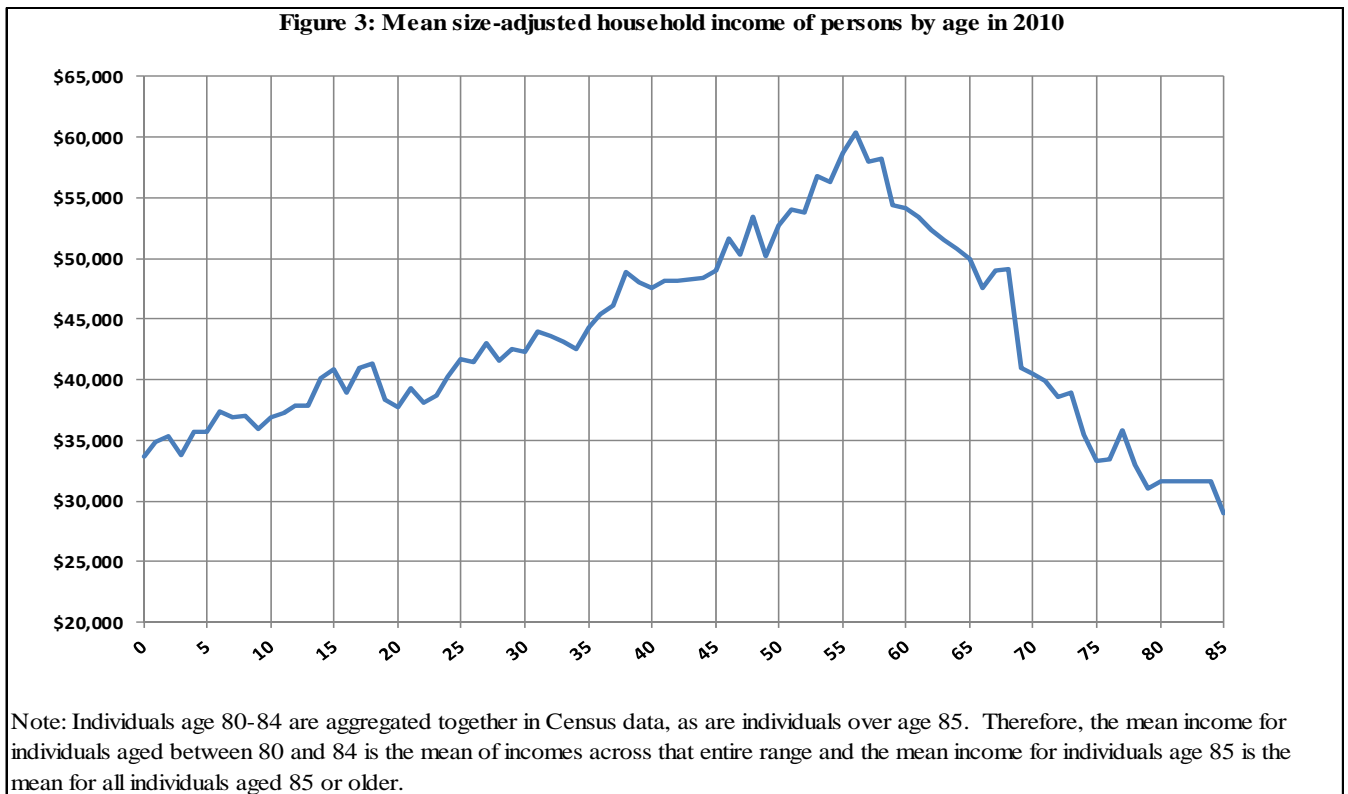
²⁴ We consider aging patterns using four categorical age groups: children (0-18), young adults (19-44), older adults (45-64) and the aged (age 65 and older). We consider races as white non-Hispanic, black, and Hispanic. We include other races besides blacks and Hispanics with white non-Hispanics because 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.

Table 1: Factors accounting for changes in median size-adjusted household income of persons during each business cycle since 1979 (average change per year)			
	1979-1989	1989-2000	2000-2007
(1) Percentage change in median income	0.87	1.11	-0.02
<i>Change accounted for by:</i>			
(2) Age	0.00	0.05	0.13
(3) Race	-0.14	-0.15	-0.29
(4) Marriage	-0.01	-0.03	-0.12
(5) Male-head Employment	-0.05	0.12	-0.10
(6) Male-head Earnings	-0.02	0.31	0.20
(7) Female-head Employment	0.31	0.24	-0.01
(8) Female-head Earnings	0.37	0.33	0.22
(9) Spouse Correlation	0.02	0.01	0.09
(10) Earnings of Others	0.09	0.12	-0.06
(11) Earnings of Others Correlation	-0.04	0.01	-0.05
(12) Private Non-labor Income	0.42	0.00	-0.05
(13) Private Non-labor Correlation	-0.11	0.01	-0.02
(14) Public Transfers	0.01	0.07	0.02
(15) Public Transfers Correlation	0.01	0.03	0.01

While demography is not destiny and income trends within demographic groups can change, historically, age, race, and marital status have been key predictors of U.S. income. This continues to be the case.

Mean income rises with age, peaks around age 55 and declines as more and more people retire (Figure 3). Hence an upward shift in the share of younger or older people relative to those of working age will reduce the growth of median income in the population over time. Similarly, the gap in mean size-adjusted income between whites (who have relatively higher incomes) and blacks and Hispanics (who have relatively lower incomes) is persistent across the last three business cycles (Table 2). Hence an upward shift in the share of blacks and Hispanics relative to whites will reduce the growth of median income in the population. Similarly, a gap exists for those living in married vs. unmarried households: an upward shift in the latter will also

reduce the growth of median income in the population.²⁵ Without a concomitant reduction in the income gaps with working-age Americans, whites, and those living in married households, the growth in median income will slow. These demographic changes provide an underlying baseline for the median income trends shown in Figure 1. These changes slowed the pace of median income growth over each of our three business cycles (Table 1).



First, consider the aging of the population. Over the 2000-2007 business cycle the youngest Baby Boomers (born between 1946 and 1964) were entering their peak earning years while the oldest Boomers had not yet reached age 65. This aging of the population accounted for an average increase of 0.13 percentage points per year in median income (Table 1, Row 2) from

²⁵ For example, in the March CPS data in 2007 the mean size-adjusted household income of those living in married households was \$53,314, while the mean size-adjusted household income of those living in a household with just a male head was \$42,545. For those living in a household with just a female head it was \$29,521.

2000 to 2007, substantially larger than during the previous two business cycles. But, as will be discussed further below, as the Baby Boom Generation ages into retirement over the next two decades, this trend will reverse and drag down increases in median income growth.

The country is also growing more racially diverse – with an even greater impact on median income. The racial groups include white non-Hispanics, blacks, and Hispanics. The Hispanic share of the population has increased (Table 2). From 2000-2007, the Hispanic share grew by 3.14 percent (0.45 percent per year), almost twice as fast as it grew in the 1980s business cycle (2.35 percent, 0.24 percent per year). While these changes may seem small, given that the mean size-adjusted household income of Hispanics has recently been around 60 percent of whites, a small increase in the Hispanic share of the population translates into a sizable downward shift in median income.

Table 2: Racial characteristics of the U.S. population and size-adjusted household income (in 2010 dollars) by race during each business cycle since 1979

	% White	White mean income	% Black	Black mean income	Income Ratio Black / White	% Hispanic	Hispanic mean income	Income Ratio Hispanic / White
1979	82.45	36388	11.48	21534	59.18	6.08	24598	67.6
1989	79.48	42577	12.09	24745	58.12	8.43	25873	60.77
Change	-2.97	6189	0.61	3211	-1.06	2.35	1275	-6.83
% Change		17.0		14.9			5.2	
1989	79.48	42577	12.09	24745	58.12	8.43	25873	60.77
2000	75.17	51379	12.55	31556	61.42	12.28	29111	56.66
Change	-4.31	8802	0.46	6811	3.30	3.85	3238	-4.11
% Change		20.7		27.5			12.5	
2000	75.17	51379	12.55	31556	61.42	12.28	29111	56.66
2007	71.9	51561	12.68	31775	61.63	15.42	30185	58.54
Change	-3.27	182	0.13	219	0.21	3.14	1074	1.88
% Change		0.4		0.7			3.7	

During each business cycle since 1979, the increase in the share of blacks and Hispanics in the population accounted for at least a 0.14 percentage point per year reduction in median

income, holding constant each racial group's income distribution (Table 1, Row 3).²⁶ Over 2000-2007, this demographic shift nearly doubled, accounting for a 0.29 percentage point per year decline in median income. This represents the difference between the 0.02 percentage point per year decline in median income actually observed (Table 1, Row 1) and what would have been a 0.27 percentage point per year growth in median income. In sum, the growth in the share of blacks and especially Hispanics in the population, together with their persistent income gap with whites, was the single most important factor accounting for the change in median income over 2000-2007. In previous business cycles this was not the case.

One possible cause of the persistent white-Hispanic income gap: low-skilled Hispanics are migrating to the U.S. for higher-paying jobs. If they succeed, they will have raised their own income, but may well drive down the U.S. median income, other things equal. Another force behind the persistent gap, though, may be an underinvestment in the education and training of Hispanics born in the US.

Declining rates of marriage also drag down median income, since married households report higher incomes than unmarried ones. The decline in the share of Americans living in married households accounted for a 0.12 percentage point per year decline in median income in 2000-2007 (Table 1, Row 4). The reason remains the same: the income gap between married and non-married households. Once again, this is substantially higher than in the previous two business cycles.

Overall, demographic factors as a group accounted for a 0.28 percentage point per year slowdown in median income in 2000-2007 ($0.13 - 0.29 - 0.12$), nearly twice the slowdown they accounted for in each of the previous two business cycles. The persistently wide income gap

²⁶ Changes in the racial composition come both from differences in the birth and death rates of individuals of different races and differences in immigration rates. However, distinguishing between racial trends from immigration and from birth and death patterns is beyond the scope of this chapter.

between Hispanics and whites over the past three decades as the share of Hispanics in the population increases emerges as the key explanation. The Hispanic population is expected to increase substantially over the next two decades, which will continue to drag down median income growth should the wide income gap between these groups remain. The nation will be hindered in its ability to return to periods of substantial median income growth without shrinking this racial income gap. Similarly, the aging of the Baby Boom Generation will also pull down median income, although closing that income gap would mean higher elderly transfer payments, such as Social Security, increases in the return-on-assets for elderly individuals, or increases in work during retirement.

Changes in the employment and earnings of men and women

Although the long-term demographic changes reported above provide an important baseline, economic factors play a much more important role in accounting for changes in median income and income inequality within business cycles. These economic factors also account for the bulk of the change in median income across business cycles as well (Table 1, remainder of rows). Thus, we turn to the importance of changes in specific income sources on median income across our three business cycles.

In considering the impact of changes in each income source on household income (Table 1), we first focus on the primary members of a household: the household head and, if that head is married, on his or her spouse. In Table 1 (Rows 5 and 6) we focus on changes in the employment and labor earnings of men (who are household heads or spouses of a household head). In Rows 7 and 8 we focus on changes in the employment and earnings of women (again, who are household heads or spouses of a household head). Using data from the March CPS data, in 2007, we find that these household heads and spouses made up 79 percent of the entire adult population

and received 89 percent of all labor earnings in the U.S. Thus, our household head measures capture the vast majority of U.S. labor earnings.

The decision of women to enter the workforce made its mark. The employment and labor earnings of men are important, but are not the primary factors behind the substantial changes in household income distributions. Instead, the earnings of women and their employment are more central. As Table 3 shows, while men are much more likely to be employed than women (column 1 and 3 versus columns 5 and 7) and on average have greater labor earnings than their female counterparts (columns 2 and 4 versus columns 6 and 8), the changes in their employment and labor earnings over the last three business cycles are small compared to those of women.

Table 3: Employment and earnings (in 2010 dollars) of household heads and their spouses by gender during each business cycle since 1979								
	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
1989	62.39	\$59,487	17.77	\$26,811	33.92	\$36,196	27.01	\$14,246
Change	-1.03	\$4,028	-1.59	\$124	6.93	\$5,822	-2.58	\$2,817
% Change		7.3		0.5		19.2		24.6
1989	62.39	\$59,487	17.77	\$26,811	33.92	\$36,196	27.01	\$14,246
2000	64.60	\$68,345	14.20	\$31,132	40.35	\$42,352	23.81	\$18,778
Change	2.21	\$8,858	-3.57	\$4,321	6.43	\$6,156	-3.20	\$4,532
% Change		14.9		16.1		17.0		31.8
2000	64.60	\$68,345	14.20	\$31,132	40.35	\$42,352	23.81	\$18,778
2007	62.76	\$66,485	14.62	\$33,290	40.95	\$45,690	21.84	\$20,196
Change	-1.84	(\$1,860)	0.42	\$2,158	0.60	\$3,338	-1.97	\$1,418
% Change		-2.7		6.9		7.9		7.6

Over the 1979-1989 business cycle, the full-time employment of women increased by 6.93 percentage points versus a 1.03 decline for their male counterparts. At the same time, the mean labor earnings of female full-time workers increased by 19.17 percent versus a 7.26 percent increase for their male counterparts. The differences were smaller over the 1989-2000

business cycle (a 6.43 percentage point increase for women versus a 2.21 percentage point increase for men in full-time employment and 17.01 versus 14.89 percent increases in mean full-time labor earnings). Over the 2000-2007 business cycle, women's full-time employment was stagnant (a 0.60 percentage point increase) and the mean earnings of these full-time workers only increased by 7.88 percent. But men did even worse—full-time employment declined by 1.84 percentage points and full-time mean earnings declined by 2.72 percent.

Changes in women's employment (0.31 percentage points per year) and earnings (0.37 percentage points per year) combined (0.68 percentage points per year) emerged as the most important factor accounting for increasing median income over the 1979-1989 business cycle (Table 1, Rows 7 and 8). In contrast, the employment and labor earnings of men (Rows 5 and 6) combined accounted for a decline of 0.07 percentage points per year of median income.

While the combined growth (0.43 percentage points per year) in men's employment (0.12) and labor earnings (0.31) was more important in accounting for the growth of median income in the 1989-2000 business cycle, the growth in the employment and labor earnings of women was even more important—a combined increase of 0.57 percentage points per year.

The falloff in the employment and earnings of men and women over the 2000-2007 business cycle accounts for the overall slow growth in median income over this period relative to earlier periods. While the earnings of both men (0.20) and women (0.22) each accounted for increases of around 0.20 percentage points per year, relatively stagnant employment growth of women and an absolute decline in the employment of men accounted for concomitant declines in median income. The net result: female employment and earnings accounted for only a 0.21 percentage point per year increase in median income; and male employment and earnings accounted for only a 0.10 percent increase in median income during the 2000s business cycle.

These increases are far smaller than those of the 1990s business cycle.

Women augmented their households' income by entering to the labor force. Over the 1980s and 1990s, the employment and earnings of women were the primary driver of the growth in median household income. Now that more women are working and the rate of increase has slowed, what will replace these factors? This presents a challenge.

Changes to spouses' earnings correlations.

The correlation of the earnings of the man and woman in a couple can also affect income growth or declines (Table 1, Row 9). While these increases in earnings correlations influenced incomes at the tails of the distribution, as will be discussed later (Table 8), they generally accounted for only minor variations in median household income.²⁷

Changes to all other sources of income.

The three remaining sources of household income are 1) the earnings of other household members who are not household heads or their spouses, 2) private non-labor earnings, and 3) public transfers. In all cases, the data (Table 1, last six rows) represent the changing correlation of that source to all previously analyzed income sources from the order-of-presentation in the table.

As can be seen in Table 4 the mean values of each of these non-labor income sources are small relative to the mean earnings of heads and spouses reported in Table 3. Even so, shifts in the shares of these sources of income have, over certain business cycles, accounted for a non-trivial change in median income.

²⁷ While earnings correlations are included here for completeness of the decomposition and to be symmetric with the decomposition for income inequality, there is no simple exposition of their impact on median income since increases in the correlation can either increase or decrease median income. They are primarily included for the discussion of income inequality, which follows, where they make intuitive sense as increases in correlations increase income inequality and decreases in correlations reduce income inequality.

Table 4: Mean size-adjusted sources of income during each business cycle since 1979 (in 2010 dollars)

	Mean Private Non-labor							
	Public Transfers	Total Private Non-Labor Income	Income by Source		Mean Public Transfer Income by Source			
Private Investment Income			Other Private Income	Public Assistance or Welfare	SSI Income	Social Security Income	UC, WC, and Veteran's Benefits	
1979	\$2,410	\$3,043	\$1,741	\$1,301	\$239	\$95	\$1,650	\$426
1989	\$2,542	\$4,457	\$2,445	\$2,012	\$195	\$119	\$1,892	\$336
Change	\$133	\$1,415	\$704	\$711	-\$44	\$24	\$242	-\$90
% Change	5.5	46.5	40.4	54.6	-18.4	25.3	14.7	-21.1
1989	\$2,542	\$4,457	\$2,445	\$2,012	\$195	\$119	\$1,892	\$336
2000	\$2,798	\$4,523	\$2,347	\$2,175	\$63	\$158	\$2,241	\$337
Change	\$256	\$65	-\$98	\$163	-\$132	\$39	\$349	\$1
% Change	10.1	1.5	-4.0	8.1	-67.7	32.8	18.4	0.3
2000	\$2,798	\$4,523	\$2,347	\$2,175	\$63	\$158	\$2,241	\$337
2007	\$2,963	\$4,474	\$2,246	\$2,228	\$35	\$176	\$2,412	\$341
Change	\$165	-\$48	-\$101	\$53	-\$28	\$18	\$171	\$4
% Change	5.9	-1.1	-4.3	2.4	-44.4	11.4	7.6	1.2

The discussion thus far focused only on women and men who are household heads or the spouses of household heads, but earnings of other household members matter as well. Earnings of other household members moved in the same direction as that of women (who are household heads or the spouse of a household head) and accounted for a 0.09 percentage point per year increase in median income—less than the 0.37 percentage point per year increase accounted for by female householders but more than the 0.02 decline accounted for by male householders (Table 1, Row 10). The earnings of other household members then accounted for a slightly larger 0.12 percentage point per year increase in median income over 1989-2000. The small growth in the earnings of other household members and these increases together with the concomitant growth of public transfers (0.07 percentage points per year) help account for some of the 1.11 percent annual growth in median income over this period. Likewise, the declines in both the labor earnings of others and in private non-labor earnings in the early 2000s further contributes to why the 2000-2007 business cycle was the first full business cycle since at least the 1970s

where median income fell (-0.02 percent per year) in the United States.

7. Decomposing median income trends in the wake of the Great Recession

Because the first business cycle of the 21st century only lasted from 2000-2007, we compared it with the previous two business cycles of the 1980s and 1990s, focusing on peak-to-peak comparisons. Doing so, however, misses the consequences of the Great Recession on median income over the first decade of the 21st century. To consider more recent median income trends, we look at the changes in median income from the peak business cycle year of 2007 to the end of the decade in 2010. While median income fell even lower in 2011, our analysis will allow us to be consistent with the decade-long (2000-2010) focus of this book while still allowing us to compare the first three years of the Great Recession with the first three years of earlier business cycle recessions—particularly, the 1979-1983 double-dip recession which is closest to the Great Recession in its severity.

The first row values in Table 5 (first discussed in the context of Figure 1) report the declines in the median household size-adjusted pre-tax, post-transfer cash income of persons that occurred in the first three years of each economic downturn since 1979. Since these are consistent time periods, the results are for the entire three-year period rather than the average annual change. Consistent with the severity of the Great Recession, the median income decline over this period surpasses any of the three previous recessions. Table 5 (remaining rows) delineates the separate factors behind this decline, comparing their importance to earlier recessions.

Table 5: Factors accounting for changes in median size-adjusted household income of persons during the first three years of the last four economic downturns				
	1979-1982	1989-1992	2000-2003	2007-2010
(1) Percentage change in median income	-5.79	-3.96	-2.59	-6.97
<i>Change accounted for by:</i>				
(2) Age	0.14	-0.04	0.40	0.04
(3) Race	-0.34	-0.33	-0.96	-0.94
(4) Marriage	-0.23	-0.43	-0.35	-0.28
(5) Male-head Employment	-2.31	-1.40	-1.24	-2.90
(6) Male-head Earnings	-3.39	-1.55	0.56	-1.45
(7) Female-head Employment	0.57	0.72	-0.77	-1.13
(8) Female-head Earnings	0.22	0.57	1.05	0.27
(9) Spouse Correlation	-0.03	0.15	0.16	-0.30
(10) Earnings of Others	-1.61	-1.45	-0.95	-0.88
(11) Earnings of Others Correlation	0.02	-0.15	-0.01	-0.05
(12) Private non-labor income	1.12	-1.15	-0.87	-0.92
(13) Private non-labor correlation	-0.52	0.14	0.17	0.36
(14) Public Transfers	0.44	0.62	0.31	1.25
(15) Public Transfers Correlation	0.14	0.28	-0.02	0.02

We first look at the relative importance of changes in male earnings and employment.

Unlike our peak-to-peak comparisons (Table 1) across the entire business cycle, the combined employment and earning changes of men are the single most important factor accounting for the decline in median income during the Great Recession and all other recessions. But, comparing the Great Recession to the double dip recession in the early 1980s, the Great Recession differs in the relative importance of employment and earnings declines of men. Over the first three years of the early 1980s recession, declines in earnings among men accounted for more of a decline in median income than did their declines in employment. In contrast, during the Great Recession declines in male employment are twice as important as declines in labor earnings in accounting for declines in the earnings of those men still working. In short, unemployment increases were more important than a reduction in earnings, even for the median of the income distribution.

Consider the changing importance of the earnings and employment of male heads and spouses on median income found in the first four rows of Table 6. Over recession years 2007-2010, the decline in full-time employment (6.9 percentage points) exceeded the decline in full-time employment in the 1979-1982 recession (5.5 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.

Table 6: Employment and earnings of household heads and their spouses by gender during the first three years of the last four 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	63.4	\$55,459	19.4	\$26,687	27.0	\$30,374	29.6	\$11,429
1982	57.9	\$53,299	22.4	\$24,191	28.0	\$31,209	27.7	\$11,395
Change	-5.5	-\$2,161	3.0	-\$2,496	1.1	\$834	-1.9	-\$33
% Change		-3.9		-9.4		2.7		-0.3
1989	62.4	\$59,487	17.8	\$26,811	33.9	\$36,196	27.0	\$14,246
1992	59.4	\$57,788	19.2	\$24,360	35.3	\$37,142	25.8	\$14,579
Change	-3.0	-\$1,699	1.4	-\$2,450	1.3	\$946	-1.2	\$333
% Change		-2.9		-9.1		2.6		2.3
2000	64.6	\$68,345	14.2	\$31,132	40.4	\$42,352	23.8	\$18,778
2003	61.6	\$67,428	15.4	\$31,798	39.1	\$44,968	23.4	\$19,895
Change	-3.0	-\$916	1.2	\$666	-1.3	\$2,616	-0.4	\$1,117
% Change		-1.3		2.1		6.2		5.9
2007	62.8	\$66,485	14.6	\$33,290	41.0	\$45,690	21.8	\$20,196
2010	55.9	\$67,103	17.9	\$28,164	38.2	\$46,686	22.3	\$19,601
Change	-6.9	\$618	3.3	-\$5,126	-2.7	\$995	0.5	-\$595
% Change		0.9		-15.4		2.2		-2.9

In contrast, the real mean earnings of full-time men over recession years 2007-2010 rose by 0.9 percent. This compares to a 3.9 percent drop over the recession of 1979-1982. The small increase in earnings of those who are working may result from either fewer wage cuts among those who remain employed or the fact that layoffs in the Great Recession disproportionately impacted low-wage workers, compared to that seen in earlier recessions. Part-time employment increases partially offset the overall decline in employment in each recession, but not enough to

fully counteract the declines in median income from the earnings and employment of full-time men.

One potential explanation for this relative decline in the importance of earnings over the Great Recession is inflation. Over 2007-2010, inflation was at historic lows (1.6 percent annually based on the CPI-U-RS) while over 1979-1982 inflation was very high (9.4 percent annually based on the CPI-U-RS). Since nominal wages rarely fall, in periods of low inflation firms are more likely to lay off workers than to reduce wages. In contrast, during periods of high inflation, when real wages can fall more easily, firms may more easily cut real wages. This is especially true if the inflation is unexpected.

A second important story in the Great Recession focuses on women. Their combined employment and earnings accounted for increases in median income over the first three years of the three previous recessions (Table 5, Rows 7 and 8). This was not the case during the Great Recession. While the earnings growth of women continued to account for a small increase in median income, the decline in their employment more than offset that increase.

The explanation can be clearly seen in Table 6 (Columns 5 through 8). During the 1979-1982 and 1989-1992 periods, the full-time employment of women grew despite the recession and offset other factors accounting for declining median income. The strength of the long-term movement of women into the work force during the 1970s and 1980s was large enough to overcome cyclical employment declines during recession years. However, by the 2000s, the movement of women into the work force slowed and no longer offset cyclical declines in female employment during recession years.²⁸ Thus, in 2007-2010 female employment fell and

²⁸ Blau and Kahn (2007) document the slowdown in female labor supply growth in the 1990s. More recent statistics from Macunovich (2010) indicate that female labor force participation for adults age 16 and over peaked in 2000 and has fallen over the past decade. Blau and Kahn (2007) also find that the cross-price elasticity of female

accounted for a 1.13 percentage point decline in median income (Table 5, Row 7), a reversal from 1979-1982.

Although male and female heads and their spouses comprise the vast majority of adult workers, other household members saw their earnings fall, accounting for 0.88 percentage points of the fall in median income in the Great Recession, less than any of the previous recessions (Table 5, Row 10). Even this, however, may reflect the severity of the recession, if previous household heads or spouses moved in with relatives to weather the economic storm, thereby increasing the number of employed adults in a household.²⁹

Although labor earnings receive more attention during recessions, non-labor income (e.g. interest or dividends) and public transfers (e.g. Unemployment Insurance (UI), social security or cash welfare) are important components of many households' incomes. As such, changes to these sources also can account for changes in median income during recessions.

Table 7 (Column 1) provides details on the changes in mean size-adjusted non-labor income during each of the past four recessions. Mean private non-labor income fell by 9.7 percent over the Great Recession. This is partially due to the decline in real interest rates during this period. In contrast, during the first three years (1979-1982) of the 1980s recession fears of inflation increased real interest rates, pushing up private non-labor income by 11.8 percent.

During the Great Recession, this decline in private non-labor income helped account for declining median income (Table 5, Row 12), especially compared to the 1979-1982 period. Declines in private non-labor income during this recession accounted for a 0.92 percentage point decline in median income. While reduced pensions, smaller dividends and low interest on

employment to their husband's wages has declined since the 1980s, which suggests that women are now less likely to increase their employment to compensate for a decline in their husband's wages.

²⁹ 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 2007-2009 the mean household size of the middle quintile of the income distribution grew from 3.41 to 3.46 people.

savings accounts undoubtedly hurt those with high incomes, the decline hurt the median American as well.

Table 7: Mean size-adjusted sources of income during the first three years of the last four economic downturns (in 2010 dollars)

	Mean Private Non-Labor Income	Mean Public Transfer Income	Mean Public Transfer Income by Source			
			Public Assistance or Welfare	SSI Income	Social Security Income	UC, WC, and Veteran's Benefits
1979	\$3,043	\$2,410	\$239	\$95	\$1,650	\$426
1982	\$3,403	\$2,686	\$221	\$97	\$1,814	\$554
Change	\$360	\$276	-\$18	\$2	\$164	\$127
% Change	11.8	11.5	-7.3	2.1	10.0	29.8
1989	\$4,457	\$2,542	\$195	\$119	\$1,892	\$336
1992	\$4,078	\$2,807	\$206	\$145	\$1,974	\$483
Change	-\$380	\$265	\$10	\$26	\$82	\$147
% Change	-8.5	10.4	5.3	21.5	4.3	43.8
2000	\$4,523	\$2,798	\$63	\$158	\$2,241	\$337
2003	\$4,146	\$3,009	\$55	\$175	\$2,310	\$468
Change	-\$376	\$211	-\$8	\$18	\$69	\$132
% Change	-8.3	7.5	-12.3	11.1	3.1	39.1
2007	\$4,474	\$2,963	\$35	\$176	\$2,412	\$341
2010	\$4,040	\$3,616	\$43	\$201	\$2,617	\$756
Change	-\$435	\$653	\$8	\$25	\$206	\$414
% Change	-9.7	22.0	23.3	14.2	8.5	121.4

Public cash transfer income is especially important during recessions. Although public transfers, like Unemployment Insurance, increased during all recessions, they increased more during this recent one (Table 7, Column 2). While mean household size-adjusted public transfers per person increased by 11.5 percent during recession years 1979-1982, they increased by almost twice as much, 22.0 percent, from \$2,963 in 2007 to \$3,616 in 2010. During this period Congress extended UI benefits to 99 weeks, an unprecedented extension, at the same time that the program relaxed the criteria for eligibility. Approximately two-thirds of the increase in public transfer income during the Great Recession came from unemployment compensation, workers' compensation, and veterans' benefits (Table 7, Columns 3 through 6). From 2007 to 2010,

income from these sources increased by 121.0 percent, compared to a 29.8 percent increase from 1979 to 1982. (Burtless, 2010, contends that American Recovery and Reinvestment Act stimulus spending represented about 2.5 percent of the national economy in 2010.) Clearly these programs bolstered the short-term pre-tax income of many individuals—even without counting the increases in in-kind benefits such as food stamps.

This increase in public transfers during the Great Recession offset the declines in private sector income to a much greater extent than that seen in earlier recessions (Table 5, Row 14). While changes to public transfers programs during recession years 1979-1982 offset declines in median income by 0.44 percentage points (or 7.6 percent of the total change), public transfers mitigated median income declines by 1.25 percentage points (or 17.9 percent of the total change) in the 2007-2010 period. Thus, at least over the first three years of the Great Recession, the increase in public transfers—especially the growth and extension of UI benefits beyond that seen in previous recessions and the automatically triggered eligibility for means-tested transfer programs—mitigated the recessionary fall in median income.³⁰

Overall, in this recession median income fell, more as a result of declining employment (of both men and women) than seen in earlier recessions, less as a result of falling earnings of those who remained employed. Additionally, the falling non-labor income from declines in interest rates contributed to median income declines in a way that was not present in the early 1980s. Indeed, had it not been for the growth in public transfers that exceeded that seen in

³⁰ Admittedly, the results of shift-share analysis do not demonstrate causality. It is possible that the layoff of one spouse may impact the work effort of the other, indirectly altering the magnitude of each factor's causal relationship with median income. Similarly, it is possible 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. Jurajda and Tannery (2003) and Katz and Meyer (1990) suggest that this is the case (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). This unintended consequence of the dramatic increases in government transfers, especially Unemployment Insurance and Food Stamps, during the Great Recession is a major theme of Mulligan (2012). Nevertheless, these results demonstrate that the direct effect of these transfer payments had a substantial mitigating effect on median income declines over this period

earlier recessions, median income might have fallen farther.

8. Decomposing inequality trends from 2000-2007

Median income growth is the key to understanding the plight of “average Americans,” those at the middle of the income distribution. However, the evenness (or unevenness) of the distribution of incomes is also important. We undertake a similar analysis, decomposing the factors accounting for trends in income inequality in the U.S. Here we measure average changes in income inequality over the last three business cycles using the Gini coefficient. The values reported in Table 8 (Row 1) come from this income inequality series first reported in Figure 2, Panel A. Inequality grew in all three business cycles but was substantially faster during the 1980s business cycle than thereafter.

Demographic trends also account for trends in income inequality. Upward shifts in the share of blacks and Hispanics accounted for a 0.07 percentage point per year increase in the Gini coefficient from 2000-2007 and slightly smaller increases of 0.06 and 0.05 percentage point per year in the previous two periods (Table 8, Row 3). As discussed previously, this finding assumes no change in the income distributions within these demographic groups over the course of each business cycle but reflects their growth as a share of the population.

While the small contribution to inequality growth accounted for by demographic trends is relatively constant across the three business cycles, the remaining factors reported in Table 8 are much less so. In particular, in the 1980s business cycle, growth in the earnings inequality of male heads and spouses was by far the most important factor accounting for the rapid growth in income inequality—0.65 percentage points per year (Row 6). In the 1990s, while the inequality growth accounted for by their labor earnings inequality slowed to 0.27 percentage points per

year, it was once again the single most important factor accounting for the growth in income inequality. If not for other factors accounting for inequality declines in the 1990s, inequality growth would have been much faster. In contrast, while earnings inequality of men was again the most important factor (0.26 percentage points per year) in the 2000s, it was declining during this period, not increasing as it had in the earlier periods. Hence, the contribution of earnings inequality of male heads and spouses was offsetting the increase in income inequality in the early 2000s.³¹ So, to the extent that household income inequality grew in the beginning of the 21st century, it did not come from a rise in earnings inequality of men.

The opposite is the case with respect to the employment of women. Their employment declined slightly in the early 2000s after at least two decades of substantial increases (Table 3). In the 2000s their employment accounts for a slight increase in income inequality (0.03 percentage points per year) (Table 8, Row 7). This is a reversal from the previous two business cycles when increases in women's employment accounted for substantial reductions in household income inequality—a 0.15 percentage points per year decline in the 1980s and a 0.17 percent per year decline in the 1990s. In addition, in all three business cycles increases in women's earnings accounted for increases in income inequality. But in the 2000s the earnings of women account for a further increase in income inequality rather than an offset of their employment on income inequality. Thus, in the 2000s working women accounted for a net increase in income inequality, rather than the net decrease they accounted for before then.

³¹ The Gini coefficient for labor earnings of all male household-heads working full-time fell from 0.409 in 2000 to 0.355 in 2007. While we focus here on male household heads, the same pattern holds when we look at all male full-time workers. The labor earnings Gini coefficient for all male full-time workers, including non-heads, was 0.418 in 2000 and declined to 0.404 in 2007. This is also broadly consistent with Kopczuk, Saez, and Song (2010) who use Social Security Records data and find that male earnings inequality in 2004, the last year of their sample, was virtually the same as it was in 2000.

Table 8: Factors accounting for changes in the Gini coefficient of size-adjusted household income of persons during each business cycle since 1979 (average change per year)			
	1979-1989	1989-2000	2000-2007
(1) Percentage change in the Gini coefficient	0.97	0.08	0.10
<i>Change accounted for by:</i>			
(2) Age	-0.01	0.03	0.02
(3) Race	0.06	0.05	0.07
(4) Marriage	0.08	0.02	0.05
(5) Male-head Employment	0.03	-0.04	0.03
(6) Male-head Earnings	0.65	0.27	-0.26
(7) Female-head Employment	-0.15	-0.17	0.03
(8) Female-head Earnings	0.09	0.02	0.09
(9) Spouse Correlation	0.14	0.00	-0.02
(10) Earnings of Others	-0.01	-0.08	0.05
(11) Earnings of Others Correlation	0.03	-0.02	-0.02
(12) Private Non-labor Income	-0.09	0.06	0.05
(13) Private Non-labor Correlation	0.08	-0.02	0.00
(14) Public Transfers	0.01	-0.04	-0.01
(15) Public Transfers Correlation	0.06	0.00	0.01

As was the case with median income trends, the discussion thus far has assumed that the rank correlation across income sources remains unchanged; in short, high-earning men continue to marry low-earning women (and vice versa) at the end of each business cycle at the same rate as at the beginning. However, spouses' earnings have increased in correlation since the 1970s, which in turn increases the concentration of income in fewer households as high-earning men and women are now more likely to marry each other. Just as the inequality trends accounted for by the earnings of men and the employment of women have changed dramatically since 1979, the trends accounted for by the correlation of the earnings of heads and spouses have as well. In the 1980s, male and female earnings became more correlated and accounted for a 0.14 percentage point per year growth in income inequality (Table 8, Row 9).

In the 1990s, this increase in the correlation between spouses' earnings slowed and accounted for no further inequality growth. And in the 2000s business cycle the effect reversed directions and spouses' earnings became less correlated. This, in turn, accounted for declines in inequality. Thus, just as the earnings inequality growth of male heads and spouses accounted for rising inequality in the 1980s but now account for falling inequality, the same is the case for changes in the earnings correlations among household heads.

Larrimore (Forthcoming), who considers why earnings correlations are no longer increasing as they were in the 1980s, partially explains this phenomenon. Shifts in the correlation of earnings among dual-earner couples can impact earnings correlations, but so can changes in their places in the income distribution. In the 1980s, the most rapid rise in female employment occurred among women married to high-earning men. This increased the concentration of income among a smaller number of households. But in the next two business cycles, women married to non-working men entered employment at relatively faster rates. As a result, the number of no-wage-earner couples declined, which reduced earnings correlations and income inequality in the 1990s and 2000s.

Of course, other income sources have also influenced income inequality, although not to the same extent as the labor earnings of male and female heads and spouses and their correlations (Table 8, remaining rows). For example, public transfers are likely to be more consequential over business cycle downturn years. But we do not explore this possibility here. However, we still observe that in the 2000s business cycle, the increases in the inequality of non-labor income, which includes interest and dividend income, did account for small further increases in inequality.³²

³² We note that since the CPS data does not include capital gains income, this private non-labor income does not include the effect of capital gains. Some have suggested that including taxable realized capital gains would further

In many respects, the volatility of factors accounting for inequality growth over the past 30 years is remarkable. In the 1980s, a perfect storm of increases in the labor earnings inequality of men and women and their correlations accounted for 0.88 percentage points of the total inequality growth of 0.97 percentage points per year. By the 2000s, income inequality growth was a relatively slow 0.10 percentage points per year, in large part because of the decrease in the labor earnings inequality of men and women and the reversal in spouse earnings correlations.

9. Impact of demographic changes on future income distribution trends

We have focused on changes in median income and income inequality over the 2000s, the drivers of these changes, and the divergence from earlier decades. We showed that demographic trends produced a small headwind against median income growth. As the Baby Boom Generation enters retirement over the coming decades and as the share of blacks and Hispanics increase, this mild headwind may become a gale. Over the next two decades, the Baby Boom Generation will age into retirement (Table 9); by 2030 almost 20 percent of the entire U.S. population will be over the age of 65, an increase from 13 percent in 2010. Additionally, the Hispanic population is projected to increase from 16 to almost 22 percent of the U.S. population by 2030 and almost 28 percent by 2050 (U.S. Census Bureau, 2008).

We use our same shift-share analysis to develop baseline median income and income inequality trends for the coming decades based on these demographic projections, again assuming that the income distributions within each group remain unchanged (Table 10). The statistics foretell our society's Sisyphean challenge: if we are unable to close the income gaps

increase recent income inequality growth (Piketty and Saez, 2003). See our discussion of this issue in Armour, Burkhauser, and Larrimore (2013).

between retired and working-age Americans and between blacks/Hispanics and whites, how will we further increase median income and reduce inequality in the coming decades?

Table 9: Census Bureau demographic projections by age and race, 2007-2050

	Percent						
	Percent White	Percent Black	Percent Hispanic	Percent Children (0-18)	Percent Young Adult (19-44)	Percent Middle Age (45-64)	Percent Elderly (65+)
1979	82.4	11.5	6.1	30.3	38.6	20.2	11.0
1989	79.5	12.1	8.4	27.4	41.3	19.1	12.2
2000	75.2	12.5	12.3	27.6	37.9	22.5	12.0
2007	71.9	12.7	15.4	26.2	35.4	26.0	12.4
2010	71.3	12.9	15.8	25.5	35.2	26.2	13.0
2020	68.0	13.2	18.8	25.0	33.9	24.9	16.3
2030	64.7	13.5	21.8	24.4	33.0	22.8	19.8
2040	61.4	13.7	24.8	23.9	32.4	23.0	20.8
2050	58.2	14.0	27.8	23.7	32.4	22.8	21.1

Consider the average percentage point changes in median income and income inequality associated with a change in the age and racial composition of the U.S. across the last three business cycles (Table 10, Rows 1-3). (These values are taken from Tables 1 and 8, Rows 2 and 3). The remaining rows use our same shift-share analysis for 2007-2020 and for each succeeding decade.

Table 10: Projection of median income and income inequality—average annual changes from 2007 through 2050 from demographic trends

	Average annual median income change accounted for by:		Average annual Gini coefficient change accounted for by:	
	Racial		Racial	
	Age	Composition	Age	Composition
1979-1989	0.00	-0.14	-0.01	0.06
1989-2000	0.05	-0.15	0.03	0.05
2000-2007	0.13	-0.29	0.02	0.07
2007-2020	-0.09	-0.34	0.02	0.06
2020-2030	-0.17	-0.35	0.02	0.05
2030-2040	-0.02	-0.18	0.00	0.03
2040-2050	0.00	-0.24	0.00	0.03

Between now and 2030 the retirement of Baby Boomers will provide substantial headwinds against increasing median incomes. While changes in the age distribution accounted

for no increase, or even a positive increase in median income over the past three decades, over the next two decades they will account for first a 0.09 and then a 0.17 percentage point per year reduction in median income. The result is not surprising: retirees generally earn less. Unless Boomers delay retirement, or there is an increase in transfer income to retirees, this is not likely to change.

The increase in the share of the black and especially the Hispanic population over this time will further limit median income growth unless we close the income gap between these groups and white Americans. Since minority mean incomes are approximately 60 percent of the mean income of whites, this upward shift in the share of the black and Hispanic population is projected to reduce median income growth by an additional 0.34 percentage points per year through 2020 and by 0.35 percentage points per year between 2020 and 2030. Thus, the combined upward shift of these two populations will account for a 0.43 percentage point per year reduction in median income through 2020 and a 0.52 percentage point per year reduction between 2020 and 2030 if the income gaps between these groups and their working-age white counterparts are not reduced. This gale force is more than three times the power of the mild demographic headwinds of the 2000-2007 business cycle.

These demographic trends also will exacerbate income inequality, but to a lesser extent (Table 10, remaining columns). The increasing shares of retirees, blacks and Hispanics are projected to moderately increase income inequality over the coming decades. However, unlike our projections for median income, there is no marked difference in their impacts relative to the previous decades. This is partially because retirement-age persons, while having a low median income, are unlikely to be destitute, given Social Security and Supplemental Security Income. Thus, the increase in the retirement-age population does not have the same adverse effect on

inequality as it does on median income, since few retirement-age persons are at the extreme lower tail of the distribution.

10. Conclusion

The first decade of the 21st century was a turbulent economic time for the average American. For the first full business cycle since at least the 1970s, median income fell slightly between 2000 and 2007, and fell even more during the Great Recession. At the same time, while income inequality growth slowed, it remains at record-high levels.

Using a shift-share analysis, we show that the increased employment and earnings of women was the single most important factor accounting for rising median income over the business cycles of the 1980s and 1990s. While their earnings accounted for some increase in median income over the 2000s, for the first time their employment accounted for a small decline in median income. This, together with a much larger decline in the employment of men, primarily accounted for the stagnation in median income over the 2000s business cycle relative to its more robust growth over the 1990s and 1980s cycles.

The Great Recession spurred a larger decline in median income than any of the previous three recessions, including the double dip recession of the early 1980s. When we focused only on the changes in our factors during economic downturns, the fall in the employment and earnings of men is the most important factor behind the downturn in median income in all our periods of analysis. But their relative importance differed in the 2000s. Unlike the last major recession (the double dip recession of the early 1980s), the drop in employment, not in earnings, was more important. In addition, women, instead of increasing their employment as they did during the double dip recession, retreated, accounting for a further decline in median income.

The dramatic increase in public transfers, however, partially offset declines in median income during the Great Recession.

Similarly, looking at income inequality trends, the 2000s business cycle is the first since the 1970s where increases in the employment of women did not mitigate increases in income inequality. Over the 1980s and 1990s, the earnings of men accounted for rapid income inequality growth, but the earnings of women partially counterbalanced these increases. In the 2000s business cycle, this did not happen. Instead, the employment of women actually accounted for an increase in income inequality (along with the earnings of other household members). This, plus increased inequality from demographic changes, all more than offset the major decline in inequality accounted for by the changing male earnings patterns.

Looking forward, since retirees as well as blacks and Hispanics have consistently had lower incomes than working-age adults and whites, projected increases in their population shares, will increase inequality and reduce median income unless these income gaps close. Over the next two decades, median incomes within each of these groups will have to increase by over half a percent per year just to keep up with the demographic changes. Alternatively, policies that reduce the income gap between minorities and whites and encourage older workers to delay retirement could overcome these demographic headwinds.

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Technical Appendix

As described in the main text, our shift-share approach allows the demographic composition (age, race and marital status) and the sources of income of our total population to change, one factor at a time, thus separately accounting for each of these factor's relationship with changes in income and income inequality. Embedded within this approach are three distinct techniques for decomposing income distribution changes. The first considers changes in the size of subpopulation within the total population based on demographic factors of age, race, and marital status as well as the employment status of the household heads. The second considers changes to the source-level income distributions within these subpopulation groups, holding the rank-correlation of the income sources unchanged. The third considers changes in the correlation of income sources over time. We describe our technique below.

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 white, black, 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' . By increasing the weight of individuals with characteristics (e.g. Hispanic) that are more prevalent in year t' than in year t in this way, we are able 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 in this chapter, the base year, t , is the starting year of the business cycle. The comparison year t' is either the following business cycle peak for the long-run trends

or is the comparison year during the trough of the business cycle in the case of the short-run economic downturn discussion.

Changes in source-level income distributions within population groups. The second 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, including male head labor earnings, female head labor earnings, non-head earnings, non-labor income, or public transfer income.

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 :

$$Y_{ik}^t = f_{1ik}^t + f_{2ik}^t + \dots + f_{Nik}^t \quad (1)$$

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 the level and dispersion of 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_l have on income inequality, each individual's income from the source f_l in year t is replaced with the income of the individual at the same percentile rank of the source f_l income distribution in year t' :

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

This preserves the conditional earnings rank of each individual from source f_l and the rank-correlation of earnings from source f_l with other income sources, while capturing changes in the source-level income distribution of source f_l within each population group. Since this procedure

combines income across years, prior to the analysis we adjust all income for inflation using the CPI-U-RS.

Changes in income-source rank correlations within subpopulation groups. The third decomposition technique is based on Burtless' (1999) concept of measuring rank correlations and uses a method from Larrimore (2012) to operationalize the approach. The previous techniques hold the rank-correlation of income sources constant. That is, if the male and female heads 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:

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

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 to the rank-preserving income exchange before rather than after. Thus, calling each individual's percentile-rank in the g_1 distribution q_{fik} , we calculate estimated incomes as:

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

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). Using these three techniques, we fully account for changes in median income and income inequality via changes in the demographic,

employment, and source-level income distributions of individuals in each year.