Consumption Inequality
Evidence and measurement problems

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Has the increase in income inequality been matched by an equally large increase in consumption inequality?

From here we might conclude that consumption inequality follows income inequality quite closely. But the issue is controversial.

Source: Attanasio and Davis (1996)
Has the increase in income inequality been matched by an equally large increase in consumption inequality?

Alternative evidence

Source: Krueger and Perri (2006). Notes: LEA is after-tax labour earnings plus transfers, i.e. the sum of wages and salaries of all household members, plus a fixed fraction of self-employment farm and nonfarm income, minus reported federal, state, and local taxes (net of refunds) and SS contributions, plus government transfers (unemployment insurance, food stamps, and welfare). Household’s consumption ND+ is the sum of expenditures on nondurables, services, and small durables (such as household equipment), plus imputed services from housing and vehicles. Each expenditure component is deflated by expenditure-specific, quarter-specific consumer price indexes (CPIs).
Has the increase in income inequality been matched by an equally large increase in consumption inequality?

Source: Krueger and Perri (2006). Notes: LEA is after-tax labour earnings plus transfers, i.e. the sum of wages and salaries of all household members, plus a fixed fraction of self-employment farm and nonfarm income, minus reported federal, state, and local taxes (net of refunds) and SS contributions, plus government transfers (unemployment insurance, food stamps, and welfare). Household’s consumption ND+ is the sum of expenditures on nondurables, services, and small durables (such as household equipment), plus imputed services from housing and vehicles. Each expenditure component is deflated by expenditure-specific, quarter-specific consumer price indexes (CPIs).

From here we may conclude that consumption inequality increased much less than income inequality. Why do we have this contradictory evidence?
Potential causes for contradictory evidence

- **Datasets:** Consumer Expenditure Survey, Panel Study of Income Dynamics, Nielsen Homescan Data
- **Measure of consumption:** expenditures with food, non-durables, total consumption (treatment of durables?)
- **Measures of income:** wages, earnings, income, including or excluding taxes and transfers
- **Measure of inequality:** 90th-10th percentile difference, variance, gini-coefficient
- **Unit under analysis:** Individual, household, per capita, household “equivalized”

Overall, one of the main problems is that there are no good datasets with consumption and income levels by household. At the same time, it is important to address the role of the measurement error in income and consumption comparisons.
Measurement error

Sources:

- Bias in CPI (CPS-U vs. CPS-U-RS)
- Nonresponse for both income and consumption
- Under-reporting of income and some consumption items, treatment of top-coding, mean-reversion
Bias in the Price Deflator
Sources of bias in the price deflator

(a) Quality bias
Inadequate adjustments for the quality improvements in products over time.

(b) Substitution bias
A fixed market basket does not account for the fact that people substitute away from high relative price items.

(c) Outlet bias
Movement of purchases toward low-price discount or big-box stores like Walmart.

(d) New product bias
Omission or long delay in the incorporation of new products into the CPI basket.
Do price deflators rise unequally?

Why is it important to look at measurement error of price indices when studying inequality?
Using CPI or PCE implicit price deflator, may yield a distorted picture of changes in living standards for groups whose consumption baskets are different from the "aggregate" bundles used in the deflators. An increase in the aggregate price level associated with an increase in the price of necessities relative to luxuries, for example, will increase the level of "true poverty" compared with the same aggregate price increase associated with a relative increase in the price of luxuries.

Should the price adjustment vary by income level?
The standard consumption inequality literature uses a single price index. Nevertheless, there is some evidence that points to slower price increases for the bottom of the income distribution. We will develop this further.
How different are the most used deflators?

- Often measures of income/consumption per person/household are deflated using the CPI-U and CPI-U-RS price index (“U” Stands for urban, “RS” stands for research series).
  - CPI-U is inconsistent to study long time periods. CPI-U methodology changes over time, while CPI-U-RS presents an estimate of the CPI for all Urban Consumers from 1978 to present that incorporates most of the improvements made over that time span into the entire series.
    - For example, inflation rate if the current rental equivalence method of measuring the cost of homeownership had been in place prior to 1983.
  - CPI-U-RS uses estimates based on BLS research covering a short period of time and extrapolated to a longer period.
  - There have been several improvements in the CPI not incorporated into the CPI-U-RS. This is the case when improvements do not represent changes in methodology, have negligible impacts on the CPI’s growth rate, or it was impossible to systematically estimate the impacts of the new methods in past years.
How different are the most used deflators?

- The CPI-U-RS increases over 1979-2007 at an annual rate of 3.50 percent, 0.25 points slower than the conventional CPI-U. The difference vis-à-vis the PCE and GDP are even larger:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CPI-U-RS</td>
<td>3.5</td>
<td>4.24</td>
<td>2.3</td>
<td>2.65</td>
</tr>
<tr>
<td>PCE</td>
<td>3.27</td>
<td>4.16</td>
<td>1.76</td>
<td>2.32</td>
</tr>
<tr>
<td>GDP</td>
<td>3.15</td>
<td>3.87</td>
<td>1.64</td>
<td>2.58</td>
</tr>
</tbody>
</table>

Recreated from Gordon (2008)
Literature on the deflator bias

- Boskin commission (Boskin et al. 1996)
  - Group of economist appointed by the Senate Finance Commission concluded that the annual bias in the CPI-U was 1.1–1.3 percentage points per year in the 1980s and 1990s.

  - Shows that the arrival of a Walmart store in a community reduces consumer prices for food by 25 percent, of which 20 percent is the direct Walmart impact and the other 5 percent represents the response of local stores to the Walmart arrival.
  - What should be Walmart impact on inequality?
    - There is no quantitative evidence on the magnitude of this effect on inequality. But notice that both because low-income households shop at Walmart, and because they spend a larger proportion of their household income on food than high-income households, there should be significant reduction in their cost of living. The CPI ignores this effect.
Hobijn and Lagakos (2005)

- Study differences across households to see if there are systematic relationships between inflation rates and household characteristics. No effect is found. There may be some problems with their approach:
  - depends on official CPI data, which is subject to the outlet substitution bias (e.g. Walmart prices as a measured decline in the price level),
  - focuses on deviations in household inflation rates over three-month intervals rather than the long-run (more suited for the study of consumption inequality).

Gordon (2006)

- Recent changes in the methodology of CPS-U and CPS-U-RS continue to present a bias of 0.8 percentage points per year.


- Construct income series correcting for biases in price deflator: substitution bias, outlet bias, quality bias and new-product bias.
- Concludes that the increase in inequality and poverty rates may be overestimated.

The impact of the deflator can be very large

Official and alternative income poverty rates

Notes: Data are from the CPS-ASEC/ADF and CEX. Official Income Poverty follows the U.S. Census definition of income poverty using official thresholds. For measures other than the official one, the threshold in 1980 is equal to the value that yields a poverty rate equal to the official poverty rate in 1980 (13.0 percent). The thresholds in 1980 are then adjusted over time using the adjusted CPI-U-RS, which subtracts 1.1 percentage points from the CPI-U-RS each year from 1960-1977 and 0.8 percentage points from the CPI-U-RS each year from 1978-2010. Poverty status is determined at the family level and then person weighted. After-Tax Money Income includes taxes and credits (calculated using TAXSIM). CE data are not available for the year 1962-1971, 1974-1979, 1982-1983.
Evidence on Nonresponse and Under-reporting
Nonresponse is increasing over time in most surveys

Non-response rate for wages (PSID)

Recreated from PSID-Technical Series Paper #11-02
Nonresponse patterns change with modifications in the questions.

Non-response rate for spending on food consumed at home (PSID)

Recreated from PSID-Technical Series Paper #11-02
Who are the nonreporters?

Lillard, Smith and Welch (1986) compare earnings (self-reported and imputed) and found that relation between earnings and the probability of not reporting is U-shaped-hitting its trough between $16,000 and $19,000.

<table>
<thead>
<tr>
<th>Income interval</th>
<th>Earnings</th>
<th>Earnings only</th>
<th>Any other items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000-2,999</td>
<td>18.2</td>
<td>8.4</td>
<td>8.4</td>
</tr>
<tr>
<td>3,000-5,999</td>
<td>17.1</td>
<td>7.9</td>
<td>9.2</td>
</tr>
<tr>
<td>6,000-11,999</td>
<td>15.7</td>
<td>7.6</td>
<td>8.1</td>
</tr>
<tr>
<td>12,000-24,999</td>
<td>14.9</td>
<td>8.3</td>
<td>6.6</td>
</tr>
<tr>
<td>25,000-34,999</td>
<td>17.2</td>
<td>9.9</td>
<td>7.3</td>
</tr>
<tr>
<td>35,000-39,999</td>
<td>19.6</td>
<td>12.5</td>
<td>7.1</td>
</tr>
<tr>
<td>40,000-49,999</td>
<td>23.7</td>
<td>15.1</td>
<td>8.6</td>
</tr>
<tr>
<td>Over 50,000</td>
<td>26.0</td>
<td>18.1</td>
<td>7.9</td>
</tr>
</tbody>
</table>

Reproduced from Lillard, Smith and Welch (1986)
Who are the nonreporters?

Non-response rates to average wage calculation from 1980-2000 Census, 5% sample

<table>
<thead>
<tr>
<th></th>
<th>1980</th>
<th>1990</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Women</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>white</td>
<td>0.047</td>
<td>0.155</td>
<td>0.249</td>
</tr>
<tr>
<td>black</td>
<td>0.095</td>
<td>0.239</td>
<td>0.359</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.061</td>
<td>0.175</td>
<td>0.267</td>
</tr>
<tr>
<td>Asian</td>
<td>0.062</td>
<td>0.160</td>
<td>0.229</td>
</tr>
<tr>
<td>Native American</td>
<td>0.077</td>
<td>0.175</td>
<td>0.249</td>
</tr>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>white</td>
<td>0.070</td>
<td>0.177</td>
<td>0.286</td>
</tr>
<tr>
<td>black</td>
<td>0.131</td>
<td>0.295</td>
<td>0.404</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.090</td>
<td>0.229</td>
<td>0.344</td>
</tr>
<tr>
<td>Asian</td>
<td>0.091</td>
<td>0.184</td>
<td>0.261</td>
</tr>
<tr>
<td>Native American</td>
<td>0.105</td>
<td>0.215</td>
<td>0.290</td>
</tr>
</tbody>
</table>

Source: IPUMS 5% sample.
Imputation methods can create bias

Male and female wage-age profiles (left and right, respectively)

Reproduced from Bollinger and Hirch (2006). Estimates are from a pooled wage equation of respondents and imputed earners using the CPS-ORG for 1998–2002. The male sample size is 388,578 (276,909 respondents and 111,669 imputed). The female sample size is 369,762 (270,537 respondents and 99,225 imputed). The sample includes all nonstudent wage and salary workers, ages 18 and over. Shown are log wage differentials at each age relative to earnings of respondents who are age 18. In addition to the education dummies, control variables include race-ethnicity (four dummy variables for five categories), foreign born, labor market size, region, and year.
Over- and Under-reporting

Bollinger (1998) utilizes an exact match file between the 1978 March CPS and administrative records from the SSA to analyze errors in the reporting of annual income using nonparametric methodology. Their findings point to higher measurement error in cross-sectional samples than in panels and a negative relationship between measurement error. This last result is driven largely by overreporting among male low earners.

Reproduced from Bollinger (1998). Sample of males. Income in ten thousands of dollars. The continuous line represents the conditional mean, the dashed lines represent the 95% confidence bounds.
Literature

For a general literature review on income measurement error:

- Bound, Brown, and Mathiowtiz (2001)
  - Surveys several studies and concludes that measurement error is mean revert ing in several datasets (e.g. CPS, PSID), in the sense that persons with low earnings tend to overstate their earnings and persons with high earnings tend to understate their earnings.

How are the inequality measures affected by measurement error?

- Gottschalk and Huynh (2010)
  - Shows how non-classical measurement error affects some summary measures of inequality and mobility.
Main Datasets with Data on Expenditures
Datasets

Consumer Expenditure Survey (CEX)

- Main characteristics
  - In the past, the CEX had been conducted approximately every ten years, starting in the early 1900s and ending in 1980. Since 1980, it has been conducted on a continuous basis (repeated cross-sections).
  - Main purpose of the survey is to collect information to be used in computing the weights for the Consumer Price Index
  - It is made of two separate and independent samples:
    - Interview Survey
    - Data Survey
  - Comprehensive and detailed information about consumption expenditure and its components
    - The categories are almost exhaustive of total consumption, with the exception of personal care items
  - Also collects some income and demographic data
Main problems:

- CEX does a poor job at reproducing the level of expenditure in the NIPA, and it is getting worse over time (Gerner and Maki, 2004).

## Ratio of CEX to PEC for comparable categories

<table>
<thead>
<tr>
<th>Year</th>
<th>All</th>
<th>Durable</th>
<th>Nondurable</th>
<th>Owned housing</th>
<th>Other services</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>.88</td>
<td>.88</td>
<td>.69</td>
<td>1.23</td>
<td>.90</td>
</tr>
<tr>
<td>1997</td>
<td>.88</td>
<td>.80</td>
<td>.67</td>
<td>1.26</td>
<td>.86</td>
</tr>
<tr>
<td>2002</td>
<td>.84</td>
<td>.75</td>
<td>.63</td>
<td>1.25</td>
<td>.82</td>
</tr>
<tr>
<td>2003</td>
<td>.82</td>
<td>.79</td>
<td>.61</td>
<td>1.26</td>
<td>.80</td>
</tr>
<tr>
<td>2005</td>
<td>.83</td>
<td>.75</td>
<td>.63</td>
<td>1.26</td>
<td>.81</td>
</tr>
<tr>
<td>2007</td>
<td>.81</td>
<td>.69</td>
<td>.61</td>
<td>1.30</td>
<td>.81</td>
</tr>
</tbody>
</table>

Reproduced from Garner, McClelland, and Passero (2009)
Interview data and Diary data have different implications in terms of evolution of consumption inequality over time (Attanasio, Battistin and Ichimura, 2007; Bee, Meyer and Sullivan (2012)).

Standard Deviation of log per capita monthly expenditure. Reproduced from (Attanasio Battistin and Ichimura, 2007)
Comparisons of CEX Diary and CEX interview to PCE Aggregates

Food at Home

Clothing and Shoes

Reproduced from Bee, Meyer and Sullivan (2012)
Fraction of consumer units with zero spending by some spending categories

<table>
<thead>
<tr>
<th>PCE category</th>
<th>2010</th>
<th></th>
<th></th>
<th>1991</th>
<th></th>
<th></th>
<th>1986</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DS</td>
<td>IS</td>
<td>DS-IS</td>
<td>DS</td>
<td>IS</td>
<td>DS-IS</td>
<td>DS</td>
<td>IS</td>
</tr>
<tr>
<td>Household appliances</td>
<td>0.961</td>
<td>0.816</td>
<td>0.146</td>
<td>0.968</td>
<td>0.799</td>
<td>0.169</td>
<td>0.971</td>
<td>0.783</td>
</tr>
<tr>
<td>Food</td>
<td>0.189</td>
<td>0.012</td>
<td>0.177</td>
<td>0.090</td>
<td>0.008</td>
<td>0.082</td>
<td>0.117</td>
<td>0.009</td>
</tr>
<tr>
<td>Clothing materials</td>
<td>0.983</td>
<td>0.972</td>
<td>0.011</td>
<td>0.963</td>
<td>0.916</td>
<td>0.047</td>
<td>0.966</td>
<td>0.901</td>
</tr>
<tr>
<td>Rent and utilities</td>
<td>0.720</td>
<td>0.024</td>
<td>0.696</td>
<td>0.629</td>
<td>0.028</td>
<td>0.601</td>
<td>0.708</td>
<td>0.034</td>
</tr>
<tr>
<td>Child care</td>
<td>0.990</td>
<td>0.974</td>
<td>0.016</td>
<td>0.966</td>
<td>0.942</td>
<td>0.024</td>
<td>0.953</td>
<td>0.931</td>
</tr>
<tr>
<td>Mean difference</td>
<td>0.133</td>
<td></td>
<td></td>
<td>0.161</td>
<td></td>
<td></td>
<td>0.169</td>
<td></td>
</tr>
<tr>
<td>Median difference</td>
<td>0.065</td>
<td></td>
<td></td>
<td>0.110</td>
<td></td>
<td></td>
<td>0.120</td>
<td></td>
</tr>
</tbody>
</table>

For more categories see Table 6 in Bee, Meyer and Sullivan (2012)
Higher income households are increasingly likely to underreport their expenditures relative to lower income (Aguiar and Bils, 2011)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative Mis-Measurment 1980–1982</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Income – Low Income</td>
<td>0.13</td>
<td>0.10</td>
<td>0.10</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.05)</td>
<td>(0.05)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Change 1980/82–1991/93</td>
<td>-0.17</td>
<td>-0.12</td>
<td>-0.11</td>
<td>-0.10</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.06)</td>
<td>(0.06)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>Change 1980/82–2005/07</td>
<td>-0.35</td>
<td>-0.24</td>
<td>-0.23</td>
<td>-0.16</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.07)</td>
<td>(0.07)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>Change 2005/07–2008/10</td>
<td>0.06</td>
<td>0.03</td>
<td>0.04</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.06)</td>
<td>(0.05)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>Categories Included</td>
<td>All</td>
<td>All</td>
<td>Without durbables</td>
<td>All</td>
</tr>
<tr>
<td>Specification</td>
<td>OLS</td>
<td>GLS</td>
<td>GLS</td>
<td>WLS (NIPA Shares)</td>
</tr>
</tbody>
</table>

Note: This table reports the change in the estimated income-specific measurement error for high-income respondents relative to low-income respondents: $\delta^3 - \delta^1$ from equation (6). The specification for each column is the same as in table 3. The first row is the level for the period 1980–82, and the next three rows report the change over the indicated period. Standard errors are calculated using a bootstrap with 500 replications.
On top of the problems capturing expenditure levels, there is also
evidence that CEX does not capture as much income as other surveys.
For example, the CEX aggregate income is in average only 94 per cent
of CPS aggregate income (Passero, 2009), whereas the CPS also
under-reports based on NIPA. This may be because high-income CEX
households are less likely to report their income accurately and/or the
very top of income distribution are under-represented in the CEX.
Sabelhaus et al. (2012) develops a new approach to disentangle between those two explanations. They link the average Adjusted Gross Income (AGI) by zip-code to the CEX sampled households (both respondents and non-respondents). The figure shows that households in the top AGI percentile zip-codes are 10 percent less likely to participate than the rest of the sample.
Moreover, households within the top AGI percentiles that do participate are more likely to have lower incomes than the households in that zip-code who did not participate.

The main conclusion of Sabelhaus et al. (2012) is that under-reporting in high households is likely to explain why CEX does not capture as much income as other surveys.
Other datasets

Panel Study of Income Dynamics

- Main characteristics:
  - Longitudinal survey
  - Starts in late 1960s
  - Very good income and demographics
  - Also collects information on consumption
  - Until 1997, only food expenditure is available. Housing/utilities (most of the time)
  - After 1997, broader measures are collected, covering now 70% of total CEX spending.

- Main problems:
  - Only limited coverage of spending categories (until 1997 only food, after 1997, around 70% of total expenditures)
  - Growth in non-response
Evidence on Consumption Inequality
Summary of contributions by the literature

<table>
<thead>
<tr>
<th>Data source</th>
<th>Time Period</th>
<th>Sample</th>
<th>Deflator</th>
<th>Data and adjustments</th>
<th>Methodology and contribution</th>
<th>Main results</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEX Interview Survey for 1960-61, 1972-73, 1980, 1984 and 1988. (CPS for income)</td>
<td>1960s, 1970s and 1980s</td>
<td>The Cex survey has several modifications and the sample selection changes. Different sub-samples were considered to test for robustness.</td>
<td>CPI and PCE</td>
<td>Two measures of consumption: total expenditures (except indirect purchases, such as fringe benefits), and total consumption, i.e. total expenditure, minus spending on insurance, pensions, and SS, and minus owned houses and vehicles, plus imputed rents.</td>
<td>Explore consumption (by looking at total expenditure and out-of-pocket expenditures) and other measures of the disadvantaged individuals and families (those in the lower part of the income distribution)</td>
<td>The distribution of cons. is more equally distributed than income. Consumption ineq. was greatly reduced from the early 1960s to the early 1970s, and then increased in the 1970s and 1980s.</td>
</tr>
<tr>
<td>Attanasio and Davis (1994, 1996)</td>
<td>1980-1990</td>
<td>CEX: Include HH head male 23-59. Exclude non-urban, residing in a student housing. CPI: exclude students, military, self-employed, &lt;75% minimum wage. Imputation methods are used.</td>
<td>CEX: Expenditure-specific, group specific CPIs. CPI: GDP.</td>
<td>Consumption measure equals household expenditures on nondurable goods and services. Exclude expenditure on durables, health, education, and housing. Hourly earnings are computed as annual earnings divided by the product of weeks worked and usual hours per week.</td>
<td>Focus on differences across education and year of birth cohorts (i.e. it does not account for intra-cohort inequality). Looks at household expenditures on nondurable goods and services (exclude expenditure on durables, health, education, and housing)</td>
<td>Using measures of between groups inequality, the main conclusion is that relative wage changes are reflected in relative consumption changes.</td>
</tr>
<tr>
<td>Slesnick (2001)</td>
<td></td>
<td>Up through 1995. CEX starting in 1980, the PCE starting as early at 1948</td>
<td>CPI, CPI-X (an experimental CPI) and the PCE index.</td>
<td>Used share-based Engle curves to argue that consumer welfare has been improving. Nutritional and Equivalence Scales (such as by Deaton and Muellbauer 1980) and subjective equivalence scales.</td>
<td>1) compares inflation of CPI and other possibly superior inflation indexes. 2) infers from consumption shares of food and other goods that real income has increased (Engle 1895) 3) Adjusts HH income via adult-equivalent scales (taking into account a decrease in family size) 4) Measures inequality using the logarithm of per equivalent consumption as the measure of HH welfare (that is, adjusting for HH size).</td>
<td>Standard of Living indexes using the CPI deflator are biased downward. The biggest bias took place from 1973-1983. Accounting for per equivalent consumption implies that inequality decreased from 1950 to 1970 and remained flat thereafter.</td>
</tr>
<tr>
<td>Data source</td>
<td>Time Period</td>
<td>Sample</td>
<td>Deflator</td>
<td>Data and adjustments</td>
<td>Methodology and contribution</td>
<td>Main results</td>
</tr>
<tr>
<td>----------------------</td>
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<td>--------------------------------------------------------------------------------------------</td>
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<td>---------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Krueger and Perri (2006)</td>
<td>1980-2003</td>
<td>Complete HH income respondents. Alternative samples are considered (e.g., excluding elderly and rural households)</td>
<td>Expenditure-specific, quarter-specific CPIs</td>
<td>Income is defined as a sum of wages and salaries, plus a fraction of self-employment income, minus taxes and SS contributions. Consumption is the sum of exp. on nondurables, services, and small durables, plus imputed services from housing and vehicles. Income and consumption is divided by the # of adult equivalents.</td>
<td>1) Compares the cross-sectional income and consumption distributions and computes inequality measures. 2) Explores theoretical models. 3) Assess whether the model is quantitatively consistent with the observed trends for within- and between-group consumption inequality.</td>
<td>The main finding is that consumption inequality increased only moderately (consistent across measures), while income inequality increased substantially, specially at the top of the income distribution. The theoretical models considered understate and overstate consumption inequality depending on the assumptions used.</td>
</tr>
<tr>
<td>Attanasio, Battistin and Ichimura (2007)</td>
<td>1982-2001</td>
<td>Head HH 25 to 60 and not self-employed (and complete income observations for some exercises). Data is trimmed at the 1st and 99th percentiles of expenditure distribution.</td>
<td>CPI quarter-specific</td>
<td>Consumption is measured focusing on the expenditure on non-durable goods and services. Excludes consumption on durables, health, education as well as mortgages and rent payments. Uses OECD's adult equivalence scale.</td>
<td>Combines the two CEX samples. For each category of expenditure, one of the two sources is selected (using subjective information). With some additional assumptions estimates the cross sectional variance.</td>
<td>Consumption inequality (at individual level, measured by the variance) increased by around 5.4 percent over the 1990s.</td>
</tr>
<tr>
<td>Data source</td>
<td>Time Period</td>
<td>Sample</td>
<td>Deflator</td>
<td>Data and adjustments</td>
<td>Methodology and contribution</td>
<td>Main results</td>
</tr>
<tr>
<td>-------------</td>
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<td>----------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Aguiar and Bils (2012)</td>
<td>1980-2010</td>
<td>Head HH 25 to 64. Exclude non-urban, if &quot;incomplete&quot; income reporter. If spend &gt; $1/2 after-tax income on any category (no food and vehicle), top and bottom 5% to mitigate top coding problems.</td>
<td>CPI-U</td>
<td>Income and expenditure at HH level. Include expenditure for food and rental equivalence. Food at home increased by 11% in 1982-1987. Savings data adjusted for mortgages related to refinancing (does not affect C-ineq).</td>
<td>Incorporates measurement error and defines a robust procedure that measures consumption inequality by looking at how high - versus low-income households allocate spending towards luxuries versus necessities. Measure 1: income - adjusted savings. Measure 2: consumption expenditures from demand system correcting for multiplicative measurement error term for good specific and income studies expenditure categories well measured in the CEX-interview, and CEX-diary and scale the measures of cons. to account for measurement error. Construct new measures of ineq. by looking at measures of stock of cars. Use PSID to measure cons. ineq.</td>
<td>Estimates point that consumption inequality (at HH level but controlling for HH characteristics) increased by close to 30 percent between 1980 and 2010: around 20 percent until 1993, 13 percent from 1993 to 2007, a small reduction in the last 3 years. Depending on the sample and measure of expenditure, the estimates of the increase in the st.dev of log cons. ranged between 0.15 and 0.2 log points between 1980 and late 2000s.</td>
</tr>
<tr>
<td>Attanasio, Hurst and Pistaferri (2012)</td>
<td>1980-2010</td>
<td>Head HH 25 to 64. Exclude non-urban, if &quot;incomplete&quot; income reporter.</td>
<td>CPI-U; CPI food</td>
<td>CEX. Nondurable consumption HH equilized. Exclude expenditure on health and education, interest on loans and mortgages, contributions to charities. PSID.</td>
<td>Refine consumption data -&gt; convert vehicle spending to service flow equivalent; convert housing expenditures to housing consumption flows; impute rental value of government or subsidized housing; exclude spending that is better interpreted as investment (education and health care and retirement savings). Construct poverty measures that take into account transfers, as well counting co-habiting partners as members of the same household. Official measures overstate poverty and understate reductions in poverty. Demographic changes other than increased education explain only a small share of change in poverty since 1960's. Tax rate changes and tax credits have sharply reduced poverty.</td>
<td></td>
</tr>
</tbody>
</table>
| Meyer and Sullivan (October, 2012) | 1960-2010 | CEX from 1960-1961, 1972-1973, 1980-1981, and 1984-2010. 200k households annually in CPS. | CPI-U based official methods of poverty w/ alternatives. | Adjust consumption data to account for flows from stocks. Account for transfers and taxes. | | 1) Confirm upward bias in CPI-U, the index used to adjust official poverty thresholds for inflation. 2) Using measures for consumption that include the EITC and Child Care Credit, food stamps, housing benefits, and other transfers show a faster declining poverty over time. 3) Measuring consumption of families directly and 4) attribute changes in poverty to changes in government policy.

Sara Moreira  
Consumption Inequality  
39
Attanasio, Hurst and Pistaferri
(2012, NBER)
Attanasio, Hurst and Pistaferri (2012)

Contributions

- Use multiple datasets (in particular the CEX Diary survey, Interview data and the PSID) to check consistency of estimates
- Correct for the non-classical measurement error (potentially correlated to income, expenditure categories and demographics characteristics) in CE data
  - Focus on consumption categories that were documented as well measured (Meyer and Sullivan 2012, Gerner and Maki 2004)
  - Take a stand on the nature of measurement error
- Crucially, use a log linear demand system to impute total consumption using PSID
Attanasio, Hurst and Pistaferri (2012)

Samples

• CEX sample
  • Contains households of urban areas, whose respondents are aged between 25 and 65.
  • Households that did not answer all 4 surveys are excluded. [Notice that this may create attrition bias]

• PSID sample
  • Contains households whose respondents are aged between 25 and 65.
  • Exclude the Latino sub-sample and keep the SEO subsample
  • Exclude observations with outlier records in income and food consumption.
Attanasio, Hurst and Pistaferri (2012): CEX sample

Let

- $C_{it}$ be the total consumption of household $i$ in period $t$
- $C_{it} = \sum_{k=1}^{K} q_{it}^k$, where $q_{it}^k$ is the spending in category $k$ ($k = 1, \ldots, K$)

Suppose

- $q_{it}^1$ and $q_{it}^2$ are two commodities that are known to be measured without systematic error. [It is not clear why this is the case. The authors did not test for alternative pairs of goods] [Assumption 1]
- $q_{it}^1$ a luxury and $q_{it}^2$ a necessity
- can be expressed in terms of Engel curves [Assumption 2]

\[
\begin{align*}
q_{it}^1 &= C_{it}^{\alpha_1} u_{it}^1 v_t^1, \quad \alpha_1 > 1 \\
q_{it}^2 &= C_{it}^{\alpha_2} u_{it}^2 v_t^2, \quad \alpha_2 < 1
\end{align*}
\]

where $\alpha_1$ and $\alpha_2$ are income elasticities, $v_t^1$ and $v_t^2$ are aggregate factors (e.g. relative prices), and $u_{it}^1$ and $u_{it}^2$ are unobserved idiosyncratic taste shocks.
Attanasio, Hurst and Pistaferri (2012)

Taking the logs of the ratio between $q_{1it}$ and $q_{2it}$ yields

$$\log\left(\frac{q_{1it}}{q_{2it}}\right) = (\alpha_1 - \alpha_2) \log(C_{it}) + \log\left(\frac{v_{1t}}{v_{2t}}\right) + \log\left(\frac{u_{1it}}{u_{2it}}\right)$$

Then the cross-sectional variance is given

$$\text{Var}\left(\log\left(\frac{q_{1it}}{q_{2it}}\right)\right) = (\alpha_1 - \alpha_2)^2 \text{Var}\left(\log(C_{it})\right) + \text{Var}\left(\log\left(\frac{u_{1it}}{u_{2it}}\right)\right) + 2(\alpha_1 - \alpha_2) \text{Cov}\left(\log(C_{it}), \log\left(\frac{u_{1it}}{u_{2it}}\right)\right)$$

By assuming that the idiosyncratic taste shocks are uncorrelated \[\text{Assumption 3], simplifies to}\]

$$\text{Var}\left(\log\left(\frac{q_{1it}}{q_{2it}}\right)\right) = (\alpha_1 - \alpha_2)^2 \text{Var}\left(\log(C_{it})\right) + \text{Var}\left(\log\left(\frac{u_{1it}}{u_{2it}}\right)\right)$$
We can get the variance of total consumption as

\[ \text{Var} \left( \log(C_{it}) \right) = \frac{1}{(\alpha_1 - \alpha_2)^2} \left[ \text{Var} \left( \log \left( \frac{q_{it}^1}{q_{it}^2} \right) \right) - \text{Var} \left( \log \left( \frac{u_{it}^1}{u_{it}^2} \right) \right) \right] \]

If we are willing to assume that the variance of taste shocks is invariant over time [Assumption 4], then changes (for example, between time \( t \) and time \( j \)) in the variance of log consumption can be computed as:

\[ \text{Var} \left( \log(C_{it}) \right) - \text{Var} \left( \log(C_{ij}) \right) = \frac{1}{(\alpha_1 - \alpha_2)^2} \left[ \text{Var} \left( \log \left( \frac{q_{it}^1}{q_{it}^2} \right) \right) - \text{Var} \left( \log \left( \frac{q_{ij}^1}{q_{ij}^2} \right) \right) \right] \]

where the proportionality factor \( \frac{1}{(\alpha_1 - \alpha_2)^2} \) is taken from the literature.
The previous procedure was applied to spending on entertainment services ($q_{it}^1$) and expenditure on food at home ($q_{it}^2$).

Why?

- One good has elasticity greater than 1 and the other good lower than 1 (This ensures that the proportionality factor is well defined. Nevertheless, one just need that $|\alpha_1 - \alpha_2| > 0$)
- Components relatively well measured (according to evidence on Meyer and Sullivan, 2012)
According to Aguiar and Bils (2012) $\alpha_1 - \alpha_2 = 1.4$. Instead, according to the estimates in Lechene and Levell (2012) no adjustment is needed as $\alpha_1 - \alpha_2 = 1$. 
Main problem with PSID:

- Until 1997, it only includes measures of food consumption (food at home, away from home, and the value of food stamps). After 1997, broader measures are collected, covering around 70% of total CEX spending:
  - Includes spending on utilities (electricity, heating, water, miscellaneous utilities), home insurance premiums, health (health insurance premiums, nursing care, doctor visits, prescriptions, other health spending), vehicle spending (vehicle insurance premiums, vehicle repairs, gasoline, parking), transportation (bus fares, taxi fares, other transportation expenses), education (tuition, other school expenses), and child care.

To create a measure of total consumption, the authors used imputation methods:

- Ziliak (1998)
  - Consumption is defined as the difference between income and the changes in assets (sum of liquid assets and equity, where the difference between the self-reported home value and the remaining principal on the home mortgage).
Estimate a food demand equation using CEX data

\[ \ln \text{food}_{it}^{CEX} = X_{it}^{CEX} \beta_t + \ln C_{it}^{CEX} \gamma_t (E_{it}^{CEX}) + \varepsilon_{it}^{CEX} \]

where \( X_{it} \) includes number of children, a quadratic in the household head’s age, a dummy for self-employment, education dummies; \( \ln C_{it} \gamma_t (E_{it}) \) includes log consumption and the interaction between log consumption and education; and \( \varepsilon_{it} \) is an idiosyncratic taste preference shifter.

Using \( \hat{\beta}_t^{CEX} \) and \( \hat{\gamma}_t^{CEX} \), one can get a measure of consumption with PSID data by computing

\[ \ln C_{it}^{PSID} = \frac{\ln \text{food}_{it}^{PSID} - X_{it}^{PSID} \hat{\beta}_t^{CEX}}{\hat{\gamma}_t^{CEX} (E_{it}^{PSID})} \]
Attanasio, Hurst and Pistaferri (2012)

Attanasio, Hurst and Pistaferri (2012)

Notes: (top right) Imputed using BPP’s procedure, (top left) Imputed using Ziliak’s procedure, (bottom) Observed food consumption.
Attanasio, Hurst and Pistaferri (2012)

Notes: (right) Imputed using BPP’s procedure, (left) Imputed using Ziliak’s procedure.
Meyer and Sullivan (2011)
Meyer and Sullivan (2011)

- Construct income series correcting for biases in price deflator
- Account for the role of taxes and transfers
- Correct CE Survey consumption measures accounting for durables and misreporting
Meyer and Sullivan (2011)

Notes: Authors calculations using CEX. All measures are reported in 2005 dollars using adjusted CPI-U-RS, are calculated at the family level, are person weighted, and are adjusted for differences in family size using the NAS recommended equivalence scale. Each scale adjusted measure is multiplied by 2.14, the mean adult equivalent value across all years. The consumption excluded MOOP, education and retirement spending.
Meyer and Sullivan (2011)

Notes: Authors calculations using CEX and CPS. All measures are reported in 2005 dollars using adjusted CPI-U-RS, are calculated at the family level, are person weighted, and are adjusted for differences in family size using the NAS recommended equivalence scale. Each scale adjusted measure is multiplied by 2.14, the mean adult equivalent value across all years. The consumption excluded MOOP, education and retirement spending. Non-cash benefits include food stamps and housing and school lunch subsidies.
Meyer and Sullivan (2013)

Consumption and Income Inequality and the Great Recession

Note: Income is after-tax money income plus food stamps and housing and school lunch subsidies. Consumption is adjusted for under-reporting by calculating a predicted value of consumption from a regression of unadjusted consumption on core consumption and demographic characteristics using data from 1980 and 1981.
Meyer and Sullivan (2013)

Real Changes in income (left) and Consumption (right) at various percentiles

Note: Income is after-tax money income plus food stamps and housing and school lunch subsidies. Figures are adjusted for inflation using the adjusted CPI-U-RS. Consumption is adjusted for under-reporting by calculating a predicted value of consumption from a regression of unadjusted consumption on core consumption and demographic characteristics using data from 1980 and 1981. See text for more details. Figures are adjusted for inflation using the adjusted CPI-U-RS.
Measurement problems are also relevant when studying income inequality...

Burkhauser, Larrimore, and Simon (2012, NBER)
Burkhauser, Feng, Jenkins, and Larrimore (2012, ReStat)
Armour, Burkhauser, Larrimore (2013, AER)
Have middle class American failed to benefit from recent economic growth?

Findings suggest that the middle class is not sharing proportionately in the fruits of American economic growth:

- Income of middle class households as measured by median household income (inflation-adjusted) has consistently grown over time in most business cycles. (CPS data)

- There is evidence that the fraction of market income going to the top 10 percent of tax units is at its highest level since at least 1917. (IRS administrative records by Piketty and Saez (2003) and Saez (2009))

Burkhauser and coauthors show that this evidence is far from clear.
A second opinion

- This paper uses cross-sectional data to capture the economic resources available to individuals at the same point in the distribution over time. Under different criteria, several income series are constructed.
- The evidence suggests that the middle class decline is far from clear, and that such results are highly sensitive to how available resources are measured and assumptions on the unit under analysis.
Main data sources

What data was used in previous papers?

- **IRS tax record data:**
  - Data on tax units (population that file taxes), available since 1917
  - Contains information on the pre-tax, pre-transfer cash income
  - Affected by schemes to limit tax liabilities (more easily done by top income units)

- **Annual March CPS:**
  - Data on households (sample of population), available since 1967
  - Contains pre-tax, post-transfer cash income excluding capital gains. Also includes the value of all public transfers (including welfare, Social Security, and other government provided cash assistance), much of which is not taxable
  - Affected by top coding, under report, undercoverage
Data sources

Is the source of data relevant? Burkhauser and coauthors reconcile estimates from both sources.

Most evidence results from March CPS data (non public version):

- Supplemented with cell-means to overcome top-coding of high incomes (Larrimore et al. 2008).
- Adjusted for inflation to 2008 dollars using the CPI-U-RS.
- To overcome the fact that CPS does not directly inquire about tax credits, tax liabilities, or about the value of in-kind compensation (such as employer or government provided health insurance), they impute this information for each individual using NBER TaxSim 9.0.
- To overcome the fact that CPS does not accounts for the ex-ante value of in-kind health insurance benefits, the authors impute cell means of employer contributions from the Medical Expenditure Panel Survey Insurance Component (MEPSIC).
Assumptions

Exploring the importance of assumptions:

- measures of income
- unit of analysis:
  - sharing units: household, families, and tax units
  - unit of comparability: household, household “equivalized”
Measures of income

• **Pre-tax, pre-transfer (market) income**: includes income from wages and salaries, interest, dividends, rents, trusts, and retirement pension income but excludes transfers which are not included in market income (it also does not include capital gains)

• **Pre-tax, post-transfer income**: Adds cash transfers, including income from welfare transfer programs such as AFDC/TANF as well as from social insurance programs such as Social Security and Workers’ Compensation. It excludes transfers directly tied to the tax system such as the Earned Income Tax Credit. It also excludes any in-kind government transfers, such as the value of Medicare or Medicaid insurance.

• **Post-tax, post-transfer income**: incorporates tax credits and liabilities.

• **Post-tax, post-transfer income plus health insurance**: includes ex-ante value of employer provided health insurance and ex-ante value of government provided health insurance via Medicaid and Medicare.
Unit of analysis

If you are doing a study of wage rates or earnings, the natural unit is the **individual**. When studying people’s economic wellbeing, the individual is certainly not the right unit of analysis. People live and share income. So, researchers need to think carefully to get the sharing unit correct.

There are three different sharing units:

- **Household** (“people that live together”)
- **Family** (blood relative or who you are married to)
- **Tax unit** (Who you put on your income tax form when you pay your money to the government. Typically consists of an adult, his or her spouse, and any dependent children.)
Unit of analysis

Which is the more appropriate unit for the sharing unit?

Does it make a difference when studying inequality?

In a “traditional family arrangement”, a tax unit would be “equivalent” to household (and to family). However, exceptions to such traditional households are becoming more common. For example, cohabiters, roommates who share expenses, children who move back in with their parents (so called boomerang kid) or older parents who live with their adult children will contain more than one tax unit.

Burkhauser and coauthors study this and conclude that the **distinction between tax units and households** as sharing units is not trivial and cannot be treated interchangeably.
Unit of analysis

To compare sharing units we need to adjust for the size of the household (often called “equivalized” measures).

- Measures that do not account for the composition of the household, consider measures of income of the sharing unit with the following adjustment

\[ y = \frac{Y}{n^\theta}, \theta \in [0, 1] \]

- If \( \theta = 1 \), then its is income per capita and it does not account for economies of scale.
- If \( \theta = 0 \), we impose perfect economies of scale.
- It is common to use \( \theta = \frac{1}{2} \). That is, a sharing unit of four needs exactly twice as much as a sharing unit of one to be at the same level of economic well-being.

- Alternative measures such as the ones used by OECD take into account the composition of the sharing unit.
Table 1: Comparing the total growth from 1979-2007 using each sharing unit, size-adjustment, and income series combination.

<table>
<thead>
<tr>
<th></th>
<th>Tax Unit</th>
<th>Household</th>
<th>Size-Adjusted Tax Unit</th>
<th>Size-Adjusted Household</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-tax, pre-transfer</td>
<td>3.2%</td>
<td>12.5%</td>
<td>14.5%</td>
<td>20.6%</td>
</tr>
<tr>
<td>Pre-tax, post-transfer</td>
<td>6.0%</td>
<td>15.2%</td>
<td>17.0%</td>
<td>23.6%</td>
</tr>
<tr>
<td>Post-tax, post-transfer</td>
<td>9.5%</td>
<td>20.2%</td>
<td>25.0%</td>
<td>29.3%</td>
</tr>
<tr>
<td>Post-tax, post-transfer + Health Insurance</td>
<td>18.2%</td>
<td>27.3%</td>
<td>33.0%</td>
<td>36.7%</td>
</tr>
</tbody>
</table>

Source: Public Use March CPS data.

Note: Changes in income between 1992 and 1993 are suppressed and assumed to be zero given the trend-break resulting from the CPS redesign in those years. See main text for details.

Health insurance information not available prior to 1988. The rate of growth in the value of health insurance from 1979-1989 is assumed to match that of post-tax, post-transfer income.
Results

- The upper-left corner of the table matches the definitions used by Piketty and Saez (2003)
- Moving to broader definitions of income improves the median income.
- Using tax units also limits the measured income growth. Why?
  - number of tax units per household increased
    - increase in the number of cohabiters and adult children living with their parents
- Using adjustments for the size of the household also increases the median income.
  - average number of individuals per household decreased
Table 2: Trends in the size of tax units and households.

Panel A: Tax Units per Household

<table>
<thead>
<tr>
<th>Year</th>
<th>Tax Units (Thousands)</th>
<th>Households (Thousands)</th>
<th>Mean Tax Units per Household</th>
<th>Percent of Households with one, two, or more Tax Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>One</td>
</tr>
<tr>
<td>1979</td>
<td>98,958</td>
<td>79,399</td>
<td>1.25</td>
<td>80.3</td>
</tr>
<tr>
<td>1989</td>
<td>119,705</td>
<td>93,626</td>
<td>1.28</td>
<td>78.4</td>
</tr>
<tr>
<td>2000</td>
<td>137,810</td>
<td>106,512</td>
<td>1.29</td>
<td>77.1</td>
</tr>
<tr>
<td>2007</td>
<td>153,322</td>
<td>116,881</td>
<td>1.31</td>
<td>76.2</td>
</tr>
</tbody>
</table>

Panel B: Unrelated Tax Units per Household

<table>
<thead>
<tr>
<th>Year</th>
<th>Unrelated Tax Units (Thousands)</th>
<th>Households (Thousands)</th>
<th>Mean Unrelated Tax Units per Household</th>
<th>Percent of Households with one, two, or more Unrelated Tax Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>One</td>
</tr>
<tr>
<td>1979</td>
<td>83,690</td>
<td>79,399</td>
<td>1.05</td>
<td>95.3</td>
</tr>
<tr>
<td>1989</td>
<td>100,606</td>
<td>93,626</td>
<td>1.07</td>
<td>93.4</td>
</tr>
<tr>
<td>2000</td>
<td>117,146</td>
<td>106,512</td>
<td>1.10</td>
<td>91.2</td>
</tr>
<tr>
<td>2007</td>
<td>128,751</td>
<td>116,881</td>
<td>1.10</td>
<td>91.1</td>
</tr>
</tbody>
</table>
### Results

Table 2: Trends in the size of tax units and households.

#### Panel A: Tax Units per Household

<table>
<thead>
<tr>
<th>Year</th>
<th>Tax Units (Thousands)</th>
<th>Households (Thousands)</th>
<th>Mean Tax Units per Household</th>
<th>Percent of Households with one, two, or more Tax Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979</td>
<td>98,958</td>
<td>79,399</td>
<td>1.25</td>
<td>80.3, 15.8, 3.9</td>
</tr>
<tr>
<td>1989</td>
<td>119,705</td>
<td>93,626</td>
<td>1.28</td>
<td>78.4, 16.8, 4.8</td>
</tr>
<tr>
<td>2000</td>
<td>137,810</td>
<td>106,512</td>
<td>1.29</td>
<td>77.1, 18.0, 4.9</td>
</tr>
<tr>
<td>2007</td>
<td>153,322</td>
<td>116,881</td>
<td>1.31</td>
<td>76.2, 18.2, 5.6</td>
</tr>
</tbody>
</table>

#### Panel B: Unrelated Tax Units per Household

<table>
<thead>
<tr>
<th>Year</th>
<th>Unrelated Tax Units (Thousands)</th>
<th>Households (Thousands)</th>
<th>Mean Unrelated Tax Units per Household</th>
<th>Percent of Households with one, two, or more Unrelated Tax Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979</td>
<td>83,690</td>
<td>79,399</td>
<td>1.05</td>
<td>95.3, 4.2, 0.5</td>
</tr>
<tr>
<td>1989</td>
<td>100,606</td>
<td>93,626</td>
<td>1.07</td>
<td>93.4, 6.0, 0.6</td>
</tr>
<tr>
<td>2000</td>
<td>117,146</td>
<td>106,512</td>
<td>1.10</td>
<td>91.2, 7.9, 0.9</td>
</tr>
<tr>
<td>2007</td>
<td>128,751</td>
<td>116,881</td>
<td>1.10</td>
<td>91.1, 8.0, 0.9</td>
</tr>
</tbody>
</table>

#### Panel C: Individuals per Tax Unit

<table>
<thead>
<tr>
<th>Year</th>
<th>Individuals (Thousands)</th>
<th>Tax Units (Thousands)</th>
<th>Mean Individuals per Tax Unit</th>
<th>Percent of Tax Units with one, two, or more Individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979</td>
<td>217,965</td>
<td>98,958</td>
<td>2.20</td>
<td>36.3, 28.6, 35.2</td>
</tr>
<tr>
<td>1989</td>
<td>243,886</td>
<td>119,705</td>
<td>2.04</td>
<td>41.7, 27.7, 30.6</td>
</tr>
<tr>
<td>2000</td>
<td>271,359</td>
<td>137,810</td>
<td>1.97</td>
<td>45.0, 26.9, 28.1</td>
</tr>
<tr>
<td>2007</td>
<td>292,895</td>
<td>153,322</td>
<td>1.91</td>
<td>47.2, 26.7, 26.0</td>
</tr>
</tbody>
</table>

#### Panel D: Individuals per Household

<table>
<thead>
<tr>
<th>Year</th>
<th>Individuals (Thousands)</th>
<th>Households (Thousands)</th>
<th>Mean Individuals per Household</th>
<th>Percent of Households with one, two, or more Individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979</td>
<td>217,965</td>
<td>79,399</td>
<td>2.75</td>
<td>22.7, 31.2, 46.1</td>
</tr>
<tr>
<td>1989</td>
<td>243,886</td>
<td>93,626</td>
<td>2.60</td>
<td>24.8, 32.2, 43.0</td>
</tr>
<tr>
<td>2000</td>
<td>271,359</td>
<td>106,512</td>
<td>2.55</td>
<td>26.2, 33.2, 40.6</td>
</tr>
<tr>
<td>2007</td>
<td>292,895</td>
<td>116,881</td>
<td>2.51</td>
<td>27.6, 33.2, 39.3</td>
</tr>
</tbody>
</table>

Source: See Table 1.
Table 3: Growth in median incomes using alternative income series

Panel A: Total median income growth in each business cycle

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1979-1989</td>
<td>0.2%</td>
<td>6.6%</td>
<td>9.2%</td>
<td>12.0%</td>
<td>12.0%</td>
</tr>
<tr>
<td>1989-2000</td>
<td>9.1%</td>
<td>9.3%</td>
<td>13.4%</td>
<td>14.4%</td>
<td>16.6%</td>
</tr>
<tr>
<td>2000-2007</td>
<td>-5.5%</td>
<td>-1.2%</td>
<td>-0.1%</td>
<td>1.0%</td>
<td>4.8%</td>
</tr>
<tr>
<td>1979-2007</td>
<td>3.2%</td>
<td>15.2%</td>
<td>23.6%</td>
<td>29.3%</td>
<td>36.7%</td>
</tr>
</tbody>
</table>

Panel B: Annualized median income growth in each business cycle

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1979-1989</td>
<td>0.02%</td>
<td>0.66%</td>
<td>0.92%</td>
<td>1.20%</td>
<td>1.20%</td>
</tr>
<tr>
<td>1989-2000</td>
<td>0.82%</td>
<td>0.85%</td>
<td>1.22%</td>
<td>1.31%</td>
<td>1.51%</td>
</tr>
<tr>
<td>2000-2007</td>
<td>-0.79%</td>
<td>-0.17%</td>
<td>-0.02%</td>
<td>0.14%</td>
<td>0.68%</td>
</tr>
<tr>
<td>1979-2007</td>
<td>0.12%</td>
<td>0.54%</td>
<td>0.84%</td>
<td>1.05%</td>
<td>1.31%</td>
</tr>
</tbody>
</table>

Source: See Table 1.