

Inequality and Mobility over the Past Half Century using Income, Consumption and Wealth

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Abstract:

Inequality in income, consumption, and wealth is increasing, and inequality in the joint distributions is increasing faster than inequality in any of the single distributions (Fisher, Johnson, Smeeding, and Thompson, 2018). Studying the joint distribution of income, consumption, and wealth tells us something about past well-being, current well-being, and future well-being.

We use the Panel Study of Income Dynamics (PSID), which has followed individuals and families over almost five decades. The PSID has been the benchmark source for measuring both intra- and inter-generational mobility, and it is the only data set with income, consumption and wealth. This paper builds on our previous work (Fisher et al. (2016)) and extends these results back to 1968. Following the methods in Fisher and Johnson (2006), we impute consumption to the earlier years in the PSID to obtain measures of inequality and mobility from 1968 to 2017. We find that consumption mobility is higher than income mobility, which is higher than wealth mobility. We also find that people with low wealth are less likely to move up relative to those with high wealth. By examining cohorts, we find that inequality increases and mobility falls within each cohort and that the younger cohorts experience higher inequality and lower mobility.

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Milton Friedman suggested that a society with a great deal of mobility could also demonstrate a high level of inequality in any particular year, and that this could be "...a sign of dynamic change, social mobility, equality of opportunity."² If we are interested in lifetime well-being when there is mobility, then using a series of one-year snapshots of inequality may be misleading. In addition, income, consumption, and wealth distributions inform our perceptions of economic well-being – both inequality and mobility. The recent Stiglitz report (Stiglitz et al., 2009 pg. 33) states: "...the most pertinent measures of the distribution of material living standards are probably based on *jointly* considering the income, consumption, and wealth position of households or individuals." Yet most research on inequality limit analysis to just one of these variables. Even the studies using more than one almost invariably do so one at a time.³⁴ Examining the joint distributions of income, consumption and wealth and how they evolve over the life-cycle can further highlight the relationship between inequality and mobility.

Most research shows there has been a large increase in income and wealth inequality. Saez and Zucman (2014) and Wolff (2014) find that income and wealth inequality are highly related. Piketty (2014) makes this point more dramatic by arguing that the increase in income inequality yields more wealth inequality, which in turn increases income inequality. Fisher, Johnson and Smeeding (2015) find that consumption inequality is about 80 percent as large as disposable income inequality and that the rise in consumption inequality was two-thirds that of income inequality in the United States from 1984 to 2011.

Studying these measures separately misses the important synergy between the three measures explicit in the life-cycle budget constraint. An increase in income held by the top of the distribution means that consumption and/or wealth of the top also increases. The joint distribution between any two, and more importantly the conjoint distribution amongst all three, provides more information than any of the univariate distributions. The concern is whether the increases over time in all three are similar, or whether the rankings across countries are similar. Recent evidence shows that the levels of income, consumption and wealth inequality are different, with wealth inequality greater than income, which is greater than consumption.

One must also ask, how does inequality of income translate to consumption or wealth? Alternatively, if one increases and another remains constant – what does that mean about well-being or the effects of inequality on social mobility? Piketty (2014) suggests that increases in wealth inequality translate to increases in income inequality, stating "...many shocks to the wealth trajectories of families can contribute to making the wealth distribution highly unequal (indeed, in every country and time period for which we have data, wealth distribution *within each age group* is substantially more unequal than income distribution...)." Alternatively,

² See Friedman (1962)

³ For income, see Piketty and Saez, 2003; CBO, 2018; for consumption, Fisher et al., 2015; Attanasio and Pistaferri, 2014, Aguiar and Bils, 2015; for wealth, Saez and Zucman, 2014; Wolff, 2016, Pfeffer and Schoeni, 2016.

Krueger and Perri (2006) show that the increased availability of financial markets could suggest that increases in income inequality do not lead to increases in consumption inequality. These life-cycle trajectories of income and wealth affect the consumption path, which all impact the trends in inequality and mobility over time. Our purpose is to examine the relationship between inequality and mobility over individuals' life-cycle paths.

PSID has been the primary source to study income mobility in the U.S. (see Duncan, Rodgers, and Smeeding, 1993; Duncan, Boisjoly, and Smeeding, 1996; Shin and Solon, 2011; Dynan, Elmendorf, and Sichel, 2012; DeBaker, et al., 2010; Latner, 2018; Bayaz-Ozturk, Burkhauser, and Couch, 2013). More recently with the addition of wealth and consumption to the PSID, researchers have used the PSID to study wealth mobility (Charles and Hurst, 2003; Pfeffer and Killewald, 2015) and consumption mobility (Fisher and Johnson, 2006; Jappeli and Pistaferri (2006); Bruze (2018)). One of our contributions is to present income, consumption, and wealth mobility for the same households over the same period. Then we extend the research to understand income and consumption mobility by wealth, highlighting the interactions between the three measures.

Following the methods in Fisher and Johnson (2006), Fisher et al. (2016) and Fisher et al. (2018), we look at multi-dimensional inequality and mobility by comparing mobility in income and consumption by initial wealth quintile. Here we examine all three measures of inequality using the entire 1968-2017 Panel Study of Income Dynamics (PSID). The PSID allows for longitudinal analysis and intra- and inter-generational mobility issues not feasible with any other dataset.⁵

Fisher and Johnson (2006) demonstrated the relationship between income and consumption mobility, and Fisher et al. (2018) show that inequality in the joint distribution of income, consumption and wealth has increased more than inequality in any single dimension.⁶ Combining these methods, we confirm that wealth inequality is higher than income inequality, which is higher than consumption inequality, but all three increase of the 50 year period. We expand this result to also show that consumption mobility is higher than income mobility, which is higher than wealth mobility. Finally, focusing on the differences by cohort, we find that

⁵ In other ongoing comparable work we combine income and wealth in the SCF with consumption in the Consumer Expenditure (CE) Survey databases to pursue similar aims. While the SCF does not follow individuals longitudinally, it does include a special sample of the top one percent of the income and wealth distributions, something missing from the PSID and all other household income or consumption databases. The SCF aggregates compare well with National income and Product Accounts suggesting an important confluence of both macro and microeconomic accounts (Dettling et al., 2015).

⁶ This paper is a natural extension of our previous work (Fisher and Johnson, 2006; Fisher et al., 2016; and, Fisher et al., 2018). Our earlier work looked at 1984-1999 but only looked at one dimension of mobility at a time and not the interaction (Fisher and Johnson, 2006). Our later work looked at the interaction but only started in 1999 (Fisher et al., 2016; and, Fisher et al., 2019). We extend the work by going back to 1968.

inequality increases and mobility falls within each cohort and that the younger cohorts experience higher inequality and lower mobility.

The Distribution of Income, Consumption and Wealth

To measure household well-being over a lifetime, ideally we would have a measure of lifetime income, or permanent income. In a world of perfect information, with no borrowing or liquidity constraints, and with accurate surveys that measure both income and consumption, we could measure permanent income using consumption at one point in time. One year of consumption would contain all of the information needed to understand inequality, intra-generational mobility, and intergenerational mobility. Because perfect surveys do not exist, foresight is imperfect, and there are real world constraints on both borrowing and liquidity, one year of consumption is insufficient. Researchers have turned to using income, consumption, *or* wealth to measure resources available to households.

However, using income, consumption, or wealth alone is imperfect. Given that all consumers do not follow the life-cycle, permanent income hypothesis, the need to study income, consumption, and wealth for the same households can be demonstrated using the intertemporal budget constraint (Blundell, 2014).

$$\sum_{k=0}^{T-t} Q_{t+k} C_{t+k} = \sum_{k=0}^{L-t} Q_{t+k} Y_{t+k} + A_{i,t}$$

where Q is a discount rate, C represents consumption, Y represents income, and A represents net wealth. Time T is death, and time L is retirement. In surveys, we observe snapshots of consumption, income, and wealth. Each individual measure alone provides a noisy estimate of life-time well-being at a point in time. A retired household may have high wealth, with consumption above income. Using income alone would make the household seem worse off, while wealth may overstate the household's well-being because they are drawing down wealth.

The joint distribution of all three provides more information about well-being over the life-time. Blundell (2014) states in his presidential address: "These different dimensions capture different aspects of inequality, and analyzed together they can considerably enhance our understanding of inequality dynamics." OECD (2013) further explains: "For given levels of consumption and wealth, and everything else being equal, people with a higher income can be regarded as having a higher level of economic well-being than people with a lower income." They suggest that for given levels of consumption and income, people with greater wealth have a higher level of economic well-being. Basically, they will have more opportunity to increase consumption both now and in the future; wealth informs about past savings behavior and provides a future capacity

to consume. Hence, studying the joint distribution of income, consumption, and wealth tells us something about past well-being, current well-being, and future well-being.

Other research demonstrates that the consumption changes in response to income changes differ across the income and wealth distribution. For instance, Kaplan, Violante, and Weidner (2014) find the wealthy hand-to-mouth households, with high illiquid wealth but little liquid savings, have the largest response (or highest marginal propensity to consume). Johnson et al. (2006) find that consumption response to the 2001 tax rebates were larger for households with low wealth and for households with low income. Fisher et al. (2019) find that the marginal propensity to consume is higher for low wealth families.

Recent work by Krueger et al. (2016) emphasizes the importance of examining heterogeneity in the income and wealth to the changes in consumption and the overall macroeconomic outcomes. Their work again highlights that income, consumption, or wealth alone miss important heterogeneity in household behavior, and that this heterogeneity can be better captured looking at the interactions of income, consumption, and wealth.

Recent research has begun documenting the important interactions between income, consumption, and wealth. Fisher et al. (2016) are the first to use the PSID to examine the conjoint distribution of income, consumption and wealth. They rely on the 1999-2013 PSID because wealth and consumption are not always available prior to those years. They find that intra-generational income and consumption mobility are about the same but that wealth mobility is lower. They also find that intra-generational income mobility is lower at the top and bottoms of the wealth distribution, highlighting the role that wealth can play in income and consumption mobility.

Many studies examine the intragenerational mobility on income (see) and find that mobility has either remained flat or fallen over time. Fisher and Johnson (2006) are the first to examine the intragenerational mobility of consumption in the U.S. Japelli and Pistaferri (2006) conducted a similar analysis for Italy. Both papers found that consumption mobility was higher than income mobility. In examining Spanish data, Gradin, et al. (2008) also find that expenditure mobility is higher than income mobility. Attanasio and Pistaferri (2016) find a similar result for *intergenerational* mobility and suggest that "...as consumption is more equally distributed than income, there is also more intergenerational mobility when looking at consumption than income." Charles, et al. (2014) also find intergenerational consumption mobility higher than income mobility. D'Ambrosia et al. (2019) examine the volatility of income, consumption and wealth and find that the volatility of consumption is less than income, which is lower than wealth volatility. While volatility examines the absolute changes in resources, we examine the relative mobility. Since the income distribution is more disperse than the consumption distribution, changes in income that may not affect the *relative* position of a family in the income distribution,

may translate into smaller changes in consumption that yield less volatility but that do impact their relative position in the consumption distribution yielding more mobility.

Japelli and Pistaferri (2006) provide a framework to examine the relationships between income and consumption mobility and the influence of other factors (such as wealth or education). They show that consumption mobility would be zero in a consumption insurance model where complete consumption smoothing is possible. Consumption mobility would be highest (and similar to income mobility in a rule of thumb economy). Finally, in the permanent income model, with partial consumption smoothing, consumption mobility would be in between the two extremes. They also show that the presence of measurement error and/or taste shocks increases consumption mobility.

To better understand the household's well-being, we expand the analysis and study the joint distribution of consumption, income, and wealth rather than any of these measures alone. A household with high income, high consumption, but low wealth may have very different future prospects as a household with high income, high consumption, and high wealth. An unexpected income shock will negatively affect the household with low wealth as that household may not be able to smooth consumption as well as an otherwise similar household with high wealth. That scenario may suggest wealth alone is sufficient because it summarizes the ability to consume in the future independent on income, but we also need to know how high wealth is relative to consumption and/or income. A household with \$100,000 in wealth and \$20,000 in consumption is much different than a household with \$100,000 in wealth and \$100,000 in consumption.

Data and Imputation

The analysis that follows uses two data sets: the Consumer Expenditure (CE) Survey and the PSID. Because the PSID only begins collecting consumption information in 1999, we use the more comprehensive data from the CE to impute total consumption to the PSID.

Consumer Expenditure Survey Data

The CE survey has been a continuing quarterly survey since 1980, with an earlier collection in 1972-73. Data are collected from consumer units five times over a 13 month period.⁷ The second through fifth interviews are used to collect expenditures for the previous three months; for example, a consumer unit that is visited in March reports expenditures for December, January and February. Also collected in this survey is the inventory of certain durable goods, e.g., homes, real estate, vehicles, and major appliances. To obtain an annual measure of consumption and income, we use consumer units who participate in the survey for all interviews (representing 75-80 percent of all consumer units). The consumer units are then placed in the quarter in which

⁷ A consumer unit comprises members of a household who are related or share at least two out of three major expenditures--housing, food, and other living expenses. Since 2015, data are only collected for four quarters.

their last interview occurred, and the weights and household demographics are those from the last interview.

Our measure of consumption includes the amount that the consumer unit actually spends for current consumption plus the estimated service flows from homeownership and vehicles. It includes expenditures for food, housing, transportation, apparel, medical care, entertainment, and miscellaneous items for the consumer unit.⁸

Panel Study of Income Dynamics (PSID) Data

The PSID is a longitudinal survey of households and their individuals that began in 1968. The PSID began with a representative sample of about 5,000 households in 1968 and continues to follow the individuals and households over time. From 1968-1997, families are interviewed each year. Beginning in 1999, interviews took place every other year. The PSID is a commonly used data set and others have provided a comprehensive overview of the PSID (see Brown, Duncan, and Stafford 1996).

Data are collected in the year of the survey; income is reported for the previous taxable year, wealth is reported for the time of interview (the survey year), and consumption is a mixture of time periods. In our analysis, we use the survey year to represent the year for the resource means. For the inequality and mobility measures we adjust by family size using an equivalence scale given by the square root of family size, and we use the family level file, merge the individual file, and use longitudinal weights.⁹

Total Family Income is the sum total of taxable, transfer, and social security income of the head, wife, and other family units.¹⁰ Total household wealth is the sum total of eight asset variables minus debt. Asset variables are farm and business, checking and savings, other real estate (i.e. second home, land, rental real estate, or money owed on a land contract), stocks, vehicles, other assets (i.e. life insurance policy), annuity/IRA, and home equity. Up until 2007, debt was total debt. Beginning in 2009, debt is the sum total of debt from farm or business, real estate, credit card, student loan, medical, legal, family loan, or other.

The definition of consumption changes in the PSID. Up until 2003, consumption is the sum total of food,¹¹ housing, transportation, education, and child care. Beginning, in 2005, consumption

⁸ Excluded are expenditures for pensions and social security, savings, life insurance, principal payments on mortgages, and gifts to organizations or persons outside the consumer unit.

⁹ We also compare the cross-section results using the family weights and results are qualitatively similar.

¹⁰ In the future, we will use after tax income, by imputing taxes using a model constructed by Kimberlin et al. (2014) using NBER TAXSIM.

¹¹ Following Fisher and Johnson (2006) and Attanasio and Pistaferri (2014), we include the amount of food stamps (or SNAP) in the total food consumption.

also includes spending on travel, clothing, other recreation, home repair, home furnishings, and home phones.

The PSID attempts to follow individuals of the original family even as they form separate families and households. The PSID attempts to follow both adults of a divorced family, if they were both part of a 1968 PSID family. As a result, the PSID increased the number of families it followed from 4,802 in 1968 to 9,607 in 2017 (see PSID (2019)). From 1968-2017, there are about 1000 people who were heads or spouse/partners in 1968 and who are still in the survey in 2017.

For most of the analysis in the current paper, we use the entire 1968-2017 period with additional analysis focusing on the 1984-2017 period because collection on wealth began in 1984. Eventually, we will have wealth imputed for every wave since the PSID began in 1968. Family income, however, is collected from every family for the entire 50 years.

Consumption imputation

The PSID has included spending on food and rent in almost every year since 1968, but a more complete measure of consumption began in 1999. We impute consumption to the PSID using the CE Survey.

Several researchers have imputed consumption for the PSID individuals using the CE data. Skinner (1987) first imputed total consumption for the PSID, and most subsequent research has followed this method. Using CE data, Skinner (1987) estimates an equation with total consumption as the dependent variable. In his preferred specification, the independent variables are food at home, food away from home, rent if a renter, utilities, market value of the home if a homeowner, and the number of vehicles owned. More recently, Blundell et al. (2008) estimate a log-linear demand function for food consumed at home. Blundell et al. (2008) deviate from the Skinner (1987) methodology because they argue that their demand for food equation comes from economic theory rather than a statistical procedure.

In this work, our estimated equation expands the Skinner model, but we also follow the Blundell et al. method by including demographic characteristics in the estimated equation. To impute total consumption for the PSID, we will estimate the following using the CE:

$$\ln(C) = \alpha_0 + X'\alpha_1 + \alpha_2 * \text{food home} + \alpha_3 * \text{food away} + v$$

The dependent variable, C , equals total household consumption as described above.¹² The vector X contains demographic characteristics such as a spline for the age of the household head, region

¹² Bee, Meyer, and Sullivan (2012) find that reported total food away from home is falling in the CE relative to the PCE aggregates over time. We will test the sensitivity of the imputation to the exclusion of food away from home

of residence, family size, number of children, race, education, number of labor income earners, and whether the household owns or rents.

Following our earlier work in imputing income (Fisher, Johnson, and Smeeding, 2015), we use the multiple imputation methodology of Rubin (1987) and produce five estimates of consumption for each wave. Multiple imputation methods allow researchers to account for the extra uncertainty generated by the imputed values relative to reported values. In this paper, we impute consumption for all years 1968-2017. We impute consumption from 1999-2017 even though the PSID includes reported consumption in those years. We compare inequality and mobility between reported consumption and imputed consumption to show that our results are consistent with both measures (Figure A3 and Figure A4).¹³

Now that we have a measure of total consumption for the PSID, we present the results for inequality and mobility using income, consumption, and wealth. All results use the square root of family size to create equivalent values.

To place the cohort data in context, Figure 1 shows the overall inequality for the entire sample over the 1968-2017 period. This figure shows the Gini coefficients and demonstrates the standard result that wealth inequality is higher than income inequality, which is higher than consumption inequality. All three measures demonstrate increases in inequality.¹⁴ Appendix Figure A1 compares the results to other measures of income, consumption and wealth inequality and confirms that our measures have similar trends to the others using other data sets.¹⁵

Cohorts

We present results by cohort to show how inequality and mobility has changed across successive birth cohorts. The PSID timing lines up well typical conceptions of cohorts in the United States and with our ability to smooth out some year-to-year shocks by pooling across years. We create 10-year birth cohorts and center the cohorts around the first Baby Boom wave. Our oldest cohort was born between 1916 and 1925, and we observe them in the PSID when they are 45-54 years old in 1970. We use 1970 in order to use three-year moving averages for income and consumption (and eventually wealth). For 1970, we use average household income from 1969, 1970, and 1971. The first cohort we observe at the beginning of their working career is the second half of the Silent Generation, those born from 1936-1945, which we observe at ages 25-34 in 1970. Our youngest

on the right-hand side. We will also examine using the rank in the food away from home distribution instead of the level of spending.

¹³ Our consumption imputation matches inequality and mobility well, but the levels are still low, as seen in Appendix Figure A3. We are working to address this concern.

¹⁴ Appendix Figure A2 also shows the mean log deviation and log variance inequality measures, which show larger increases in inequality over this period.

¹⁵ Figure A1 shows a remarkable similarity to the consumption Gini produced by Attanasio and Pistaferri (2015) using the PSID and a different imputation method.

cohort captures the tail end of Generation X and the beginning of Millennials, those born 1976-1985. Table 1 details the seven cohorts. We begin with the age profiles by cohort, inequality by cohort, and then mobility by cohort.¹⁶

Table 1: Cohort definition

Birth years	First used observation in PSID	Age range at first observation	Sample size
1916-1925	1970	45-54	423
1926-1935	1970	35-44	525
1936-1945	1970	25-34	818
1946-1955	1980	25-34	2,244
1956-1965	1990	25-34	2,927
1966-1975	2001	26-34	2,732
1976-1985	2011	26-34	3,836

Age profiles

Figures 2A-2C show the age-income, age-consumption, and age wealth profiles by cohort.¹⁷ Income peaks in the late 50s, while consumption peaks at slightly older ages. The profiles exhibit a clear inverted U-shape for income, but the consumption profiles flatten out after the peak rather than making a distinct downturn, consistent with consumption smoothing in retirement (as shown by Fisher et al. (2008) and Haider and Stephens (2007)). Wealth, on the other hand, continues to increase with age until at least 70.

A clear pattern across the income, consumption, and wealth profiles is the increasing standard-of-living between our oldest cohort and the first Baby Boom cohort. From the first age we observe them until the peak in income, each successive cohort experienced higher average equivalent income through those born between 1946 and 1955 (Figure 2A). After age 55, it appears that there is little difference in mean income between the 1936-1945 cohort and the 1946-1955 cohort. A similar pattern across our four oldest cohorts is seen for consumption (Figure 2B).

After the 1946-1955 cohort, there are smaller gains in income and consumption when the cohorts were in their late 20s. The improvements are more obvious for consumption than income. The

¹⁶ There is concern that imputation will understate the true variance in the distribution. Multiple imputation addresses at least some of the concerns that the distribution of imputed values from mean regressions will understate the dispersion in the true distribution. Multiple imputation adds noise, and calculating the dispersion measures correctly involves using all imputed values and adding the extra term for the uncertainty inherent in imputation (Rubin, 1987).

¹⁷ For now, we only have wealth for 1984, 1989, 1994, and 1999-2017. We are also imputing wealth to every year of the PSID and will update results with those results in a future version of the manuscript.

improvements in income disappear after age 40 for income and consumption. After age 40, little difference is observed in the age-income, age-consumption, and age-wealth profiles for our four younger cohorts. The gains experienced by older cohorts were not experienced by the younger cohorts. The younger cohorts are not worse off than the older cohorts, but they are about the same at least in terms of mean income, consumption, and wealth at a given age.

We next turn to the age profiles at the 10th, 50th, and 90th percentiles of the distribution to help understand whether the patterns observed at the mean persist through the entire distribution. The increase in inequality over the last 40 years is driven by the top of the distribution (Piketty and Saez, 2003; Saez and Zucman, 2016), and our results are consistent with that finding. The largest gains across cohorts is at the 90th percentile (Figure 3). For income and consumption, smaller gains are seen for the more recent cohorts at the 50th percentile, while there are little improvements at the 10th percentile. At the 10th percentile, we can see that consumption often exceeds income. For wealth, younger cohorts show lower wealth at the 10th and 50th percentiles than older cohorts. All of the wealth gains across cohorts have gone to the top of the distribution, while at least the bottom half of the wealth distribution has lower wealth for the younger cohorts.

Inequality by cohort

We turn from individual points in the distribution to summary measures of inequality. Specifically, we use the Gini coefficient by cohort and age, presenting Gini-age profiles. The inequality-age profile for income shows clear increases in income inequality within and across cohorts (Figure 4A), consistent with the patterns across the points of the distribution (Figure 3). The increases in inequality across cohorts is most obvious at younger ages. The income Gini for the 1946-1955 cohort is just above 0.3 when the cohort is in their late 20s, while the income Gini is closer to 0.4 for the three younger cohorts. After age 50, there is less of a difference in inequality.

Consumption inequality is lower than income inequality (Figure 4B). Consumption inequality is higher for younger cohorts, increasing from about 0.24 around age 30 for our two cohorts born from 1936-1955 to 0.33 for the next two younger cohorts and 0.3 for our youngest cohort. We also see increasing consumption inequality within cohorts, at least after the cohorts turn about 40-years old, matching the results from Deaton and Paxson (1994), which found increasing consumption inequality within cohorts.

Wealth inequality increases substantially across cohorts (Figure 4C). For our second oldest cohort, the Gini when the cohort is around age 60 is 0.60, while the Gini for our older Baby Boom cohort around age 60 is 0.67-0.74. Wealth inequality is also higher at the youngest ages for our younger cohorts, with our three younger cohorts showing higher wealth inequality in their 30s than the first Baby Boom cohort.

Thus, we see stagnant real income and consumption for our three youngest cohorts (Figures 2A-2C) but higher inequality for those cohorts (Figures 4A-4C). The mean is staying the same but the spread is increasing, driven by relatively little change at the 10th percentile and large improvements across cohorts at the 90th percentile (Figure 3).

Mobility measures

A common method to measure mobility is to simply examine the transition matrices between periods for each of the measures – income, consumption and wealth. For this analysis, we focus on cohort 4, those who were 25-34 in 1980. Tables 2A and 2B show the transitions between quintiles of the income, consumption, and wealth distributions between 2001 and 2011, and 1995 and 2017 (1994 for wealth). In contrast to inequality, the pattern is that consumption mobility is greater than income mobility, while wealth mobility is lower than income mobility (Jappelli and Pistaferri (2006); Attanasio and Pistaferri (2016)).

Table 2A shows the transition mobility matrices for income and consumption for the shorter period, 2001-2011, and Tables 2B show the matrices for the longer period, 1995-2017. These tables show the standard twin peaks phenomenon seen in the relative mobility literature – with larger percentages remaining in the top and bottom quintiles than in the middle three quintiles (see Fisher and Johnson (2006)).

These tables suggest that mobility is highest for consumption, then income, and lowest for wealth. Another key difference is in that the stickiness at the top is more apparent in wealth, than in income and consumption. The elements of the main diagonal detail the proportion of individuals that remain in the respective quintile. For example, in Table 2A, 68 percent of individuals were in the bottom quintile of equivalent income in both 2001 and 2011. There are more transitions across the three middle quintiles than at the bottom and top quintiles for both income and consumption. In the middle three quintiles, only 29 to 37 percent of individuals remain in the same quintile, while 59 and 68 percent of individuals remain in the top or bottom quintile. For consumption, 64 percent and 43 percent remain in the bottom and top quintiles between 2001 and 2011. The twin peaks are most prominent for wealth, with 67 percent of individuals in the top wealth quintile in 2001 and 2011. Turning to the longer period, we find the same twin peaks. Similar to others (see Bayaz-Ozturk et al. (2014)), mobility increases for all three measures as the period becomes longer. Table 2B shows that over the longer period there are fewer stuck at the top or the bottom of the distribution. However, the relationship of mobility remains the same; consumption mobility is higher than income mobility, which is higher than wealth mobility. As we will see this holds for all cohorts. In fact, examining the mobility for the older cohorts for income and consumption over the entire period we find higher mobility, with many of the cells close to 20 percent.

Following Fisher et al. (2016), we can examine the mobility for income and consumption by the level of wealth by creating separate mobility matrices for the top and bottom wealth. As expected, there is less income mobility at lower wealth quintiles. Table 3 shows the transition probabilities for moving across income and consumption quintiles (between 1995 and 2017) for those in the bottom and top wealth quintiles in 1994. People in the bottom wealth quintile are much less likely to move out of the bottom income quintile than people in the top wealth quintile (38 percent compared to 90 percent). Similar results hold for consumption mobility; 38 percent of low wealth move out of the bottom consumption quintile and 65 percent of high wealth people move out).

Mobility using rank-rank correlations

Another method to measure mobility is to use the rank-rank correlations. These are obtained by ranking everyone in the initial year by vingtile and then determining the average vingtile ranking for these people in the final year (see Mazumder (2018)). The sample sizes in our three older cohorts do not support using percentiles as each of the younger cohorts has less than 1,000 people (Table 1). Taking the 423 people in our oldest cohort and splitting them into 100 groups results in about four people per centile. Instead we bin them into 20 groups, yielding approximately twenty people per vingtile.

Figure 5 shows the 10-year rank-rank correlation at various ages by cohort. For example, we take everyone in a given cohort who is 25-34 in a given year and rank them into twenty bins. We then do the same for the same cohort 10 years later when they are the 35-44 years old. We regress the rank when they are 35-44 years old on the rank when they were 25-34 years old and report the resulting coefficient. We repeat this exercise for every age we observe the cohort until we can no longer observe them for long enough. When the PSID switches to every other year, we use the observation 11 years later if we cannot use the measure 10 years later. For our youngest cohort, the first year we observe them at least 25 years old is 2011, and the last year of data is 2017. We measure mobility for this six-year period as our best proxy of the 10-year mobility, but caution should be used when comparing this youngest cohort to the older cohorts because the number of years between the two observations is different.

Figure 5 shows the age-mobility profile using the rank-rank correlation by cohort. Our Generation X cohort, those born between 1966 and 1975, have a higher income rank-rank correlation than older cohorts, indicating less income mobility for Generation X. For consumption and wealth, Generation X is more in line with the two Baby Boom cohorts that just precede it.

Using both Figure 5A and Figure 4A we can show a positive correlation between inequality (given by the cohort Gini) and immobility (using the 10 year rank-rank correlation). This yields intragenerational Great Gatsby curves (see Krueger (2012)), demonstrating that higher inequality

is associated with less mobility. Figure 6 plots these two measures for each 10 year interval for each cohort and shows that cohorts have a positive relationship between the Gini coefficient and the rank-rank correlation for each resource measure..

We can use the rank-rank results to examine two-dimensional mobility. Using the rank-rank between income and wealth shows that they are less correlated between periods than the rank-rank of income. This suggests that those at the lower wealth percentiles have a higher chance of moving to a higher income percentile than shown in the rank-rank for income. Figure 7A and 7B use cohorts 4, 5 and 6 to compare the rank-rank plots between the ages of 35 and 45. The left panel for income shows that the rank-rank correlations increase with the cohort. As we have shown above, income mobility is lower for the younger cohorts. There is little difference across these three cohorts using consumption. The right panels use cohort 4 to compare the mobility for those with low and high wealth (comparing the bottom two quintiles of wealth to the top two quintiles). Figure 7A shows that those in the top wealth quintile have higher income mobility, more likely to move up from the bottom of the distribution and more likely to move down from the top of the income distribution compared. For consumption, the slope of the lines are similar but the intercept is higher for consumption (Figure 7B), indicating that higher wealth households are more likely to move up from lower income quintiles and less likely to fall down from the top income quintiles.

Mobility using Shorrocks index

We can also use the transition matrices to create another summary measure of relative mobility, the Shorrocks index. The Shorrocks index equals the number of groups (five in our case) minus the sum of the main diagonal, all divided by the number of groups minus one. If there are no transitions, meaning households remain in their respective quintile, then the Shorrocks index equals zero. If 20 percent of households remain in their respective quintiles, then the index equals one.

The Shorrocks index uses the transition matrices above and can be interpreted as the proportion of individuals moving across the distribution. Using Table 2B, between 1995 and 2017, 77 percent of individuals move across the income distribution while 82 percent move across the consumption distribution, and only 72 percent of the wealth distribution. These results summarize the intuition that consumption mobility is higher than income mobility and wealth mobility is low. As Japelli and Pistaferri (2006) demonstrate, consumption and income mobility can be similar if households follow a rule of thumb model with similar income and consumption paths. They also show that consumption mobility can be 10 percent higher due to measurement error and changes in tastes over the period.

Figures 8 show the trends in the Shorrocks index by cohort similar to the rank-rank coefficients in Figures 5. Both Figures demonstrate that consumption mobility is higher than income

mobility for almost all cohorts in almost all years. As a fall in the Shorrocks index indicates a fall in mobility, Figure 8A matches Figure 5A in showing a fall in mobility for all cohorts over this period. Similar to Figure 5B, Figure 8B shows that consumption mobility remains fairly flat over each cohort's life-cycle.

Mobility using Gini index

Finally, we examine the Gini index of mobility constructed by Yitzhaki and Wodon (2004), which uses the covariance between individual income or consumption and the individual's rank in that distribution over the two periods. The index, M , is defined as:

$$M = \frac{G_1(1 - \Gamma_{12}) + G_2(1 - \Gamma_{21})}{G_1 + G_2}$$

G_i equals the Gini coefficient of inequality for period i , and $\Gamma_{ij} = cov(Y_i, (F_j(Y)))/cov(Y_i, F_i(Y))$, $i \neq j$; $F_i(Y)$ represents the cumulative distribution of the measure of well-being in year i , which represents the individuals rank or relative position in the distribution.¹⁸ If the individual's income and rank do not change between periods, then $\Gamma=1$ and $M = 0$, indicating that there was no mobility. On the opposite extreme, if the distribution completely flips between the two periods – the richest person becomes the poorest and the second richest becomes the second poorest, then $\Gamma = -1$ and $M = 2$, meaning there was complete mobility. The range of the Gini index of mobility, M , is then from zero to two, and an increase in the Gini index for mobility indicates an increase in mobility. An advantage of the Gini index is that it uses the entire distribution and does not depend on the number of groups (e.g, deciles or quintiles) used in construction and their different break points.

Figures 9 show the same cohorts and the Gini mobility index for income, consumption, and wealth. Similar to the Shorrocks measure, the mobility index falls over time suggesting that mobility falls as cohorts age. Comparing the income and consumption figures confirms that consumption mobility is uniformly higher than income mobility for all cohorts in each year. We also see that mobility is higher at older cohorts at the same age, again confirming the finding across a third mobility measure. Wealth continues to be a little different and harder to discern a pattern.

Conclusion and Next Steps

¹⁸ The Γ_{ij} equal the covariance of the individual's income in period i with his rank in the income distribution in period j divided by the covariance of the individual's income in i with his rank in the income distribution in the same period.

Using income, consumption and wealth provides a more complete picture of the inequality and mobility of individuals and families. In order to evaluate all three and their inter-relationships, we need a data source with all measures for the same individuals – the PSID provides that unique opportunity. While wealth inequality is higher than income inequality, which is higher than consumption inequality, we find the reverse relationship for intra-generational mobility – Consumption mobility > income mobility > wealth mobility. We also show that all cohorts experience a fall in intra-generational mobility over the 50 year period. This is coupled with increasing inequality within cohorts. Finally, we find that the younger cohorts, while experiencing higher mean income and consumption than their older cohorts, also experience higher inequality and lower mobility.

The next step is to impute wealth every wave back to 1968 and include children and other adults in the families. With this new dataset we will extend the intra-generational results, and examine intergenerational mobility. We will use both a rank-rank of parents' and children's resources for all three measures and the rank-rank for income and consumption by wealth quintile of parents. This latter measure allows us to determine the importance of initial wealth (mainly home-ownership) in the eventual mobility for children. The crucial question is how important is the income, wealth, and consumption of parents to the future economic well-being of children.

TABLES AND FIGURES

Table 2A: Mobility transition matrices between 2001 and 2011 by income, consumption, and wealth for cohort 4 (in percent; each row adds to 100 except for rounding errors)

	Income (2001-2011)				
	Q1	Q2	Q3	Q4	Q5
Q1	68%	20%	9%	3%	0%
Q2	22%	37%	28%	10%	3%
Q3	8%	23%	29%	29%	10%
Q4	3%	13%	19%	36%	29%
Q5	2%	4%	11%	23%	59%
	Consumption (2001-2011)				
	Q1	Q2	Q3	Q4	Q5
Q1	64%	23%	8%	5%	0%
Q2	28%	29%	19%	16%	7%
Q3	14%	19%	30%	20%	16%
Q4	4%	17%	22%	27%	30%
Q5	3%	8%	19%	27%	43%
	Wealth (2001-2011)				
	Q1	Q2	Q3	Q4	Q5
Q1	59%	29%	8%	4%	1%
Q2	24%	45%	22%	7%	2%
Q3	14%	20%	37%	21%	8%
Q4	4%	5%	25%	41%	25%
Q5	4%	1%	7%	21%	67%

Table 2B: Mobility transition matrices between 1995 and 2017 by income, consumption, and wealth for cohort 4 (in percent; each row adds to 100 except for rounding errors)

	Income (1995-2017)				
	Q1	Q2	Q3	Q4	Q5
Q1	55%	25%	13%	5%	2%
Q2	27%	29%	23%	14%	6%
Q3	9%	20%	29%	24%	18%
Q4	7%	17%	21%	28%	26%
Q5	2%	7%	14%	27%	51%

	Consumption (1995-2017)				
	Q1	Q2	Q3	Q4	Q5
Q1	61%	18%	12%	5%	4%
Q2	25%	25%	25%	14%	11%
Q3	10%	20%	23%	27%	20%
Q4	10%	16%	26%	25%	23%
Q5	6%	12%	16%	26%	40%
	Wealth (1994-2017)				
	Q1	Q2	Q3	Q4	Q5
Q1	57%	22%	12%	5%	4%
Q2	29%	34%	21%	13%	3%
Q3	13%	22%	32%	18%	15%
Q4	7%	13%	21%	35%	24%
Q5	4%	7%	9%	25%	55%

**Table 3: Transition Probabilities for Income and for Consumption by Wealth Quintile
Income (1995-2017)**

Bottom wealth quintile in 1994					
	Q1	Q2	Q3	Q4	Q5
Q1	62%	23%	12%	3%	0%
Q2	37%	31%	18%	8%	6%
Q3	9%	16%	24%	31%	21%
Q4	32%	5%	21%	26%	16%
Q5	20%	10%	10%	10%	50%
Top wealth quintile in 1994					
	Q1	Q2	Q3	Q4	Q5
Q1	10%	30%	10%	0%	50%
Q2	22%	17%	17%	22%	22%
Q3	2%	20%	31%	22%	24%
Q4	3%	20%	18%	26%	33%
Q5	1%	1%	13%	23%	62%

Consumption (1995-2017)

Bottom wealth quintile in 1994					
	Q1	Q2	Q3	Q4	Q5
Q1	61%	20%	10%	5%	3%
Q2	35%	22%	22%	11%	10%
Q3	15%	19%	24%	24%	18%
Q4	11%	16%	26%	31%	16%
Q5	3%	16%	28%	30%	22%
Top wealth quintile in 1994					
	Q1	Q2	Q3	Q4	Q5
Q1	35%	21%	13%	23%	8%
Q2	12%	20%	22%	26%	20%
Q3	6%	18%	20%	31%	26%
Q4	6%	12%	27%	28%	28%
Q5	4%	10%	13%	25%	47%

Figure 1: Inequality in income, consumption, and wealth by year for all individuals

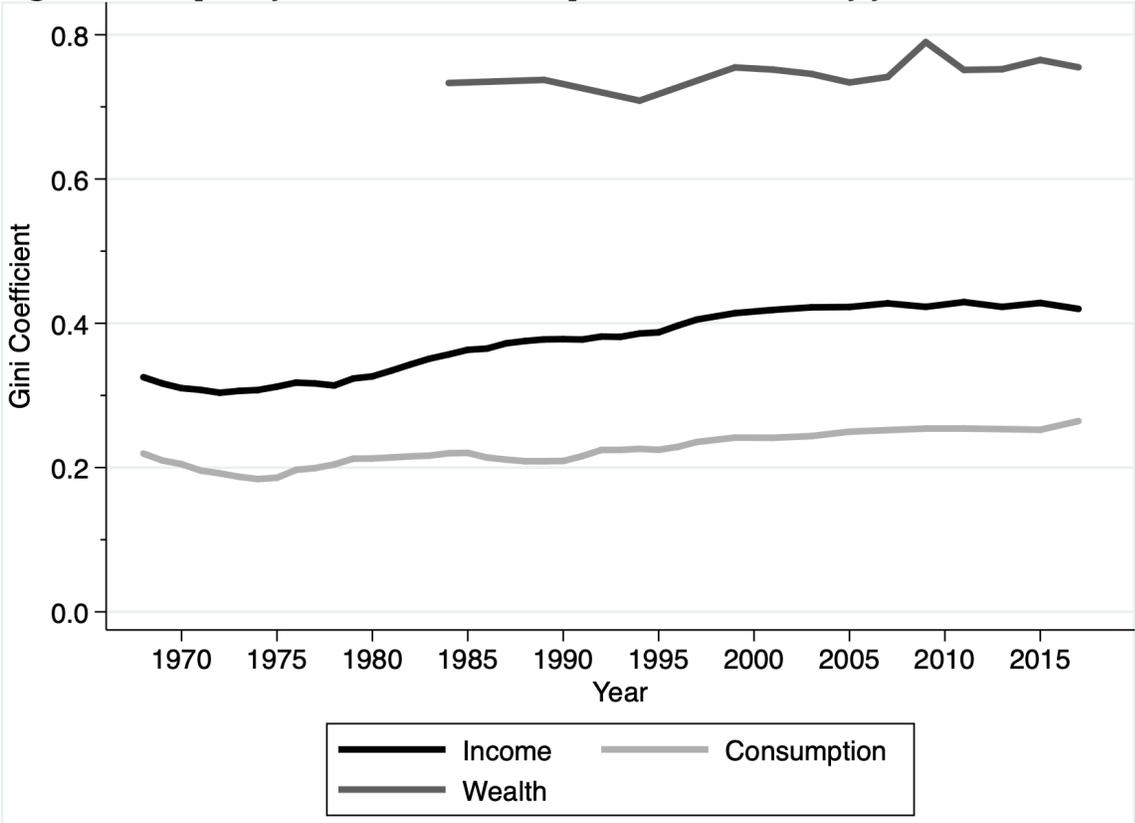


Figure 2A: Mean age-income profile by cohort

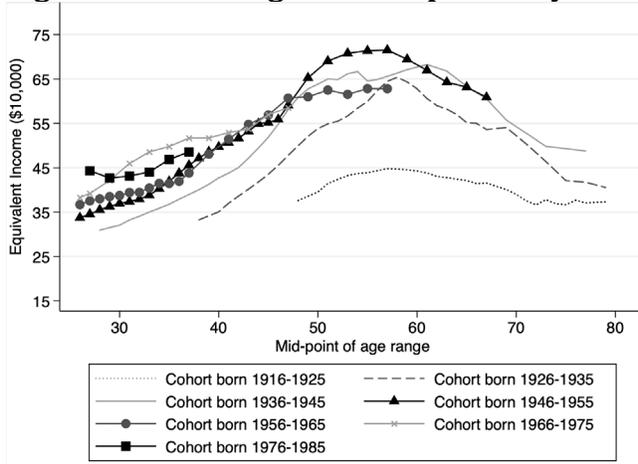


Figure 2B: Mean age-consumption profile by cohort

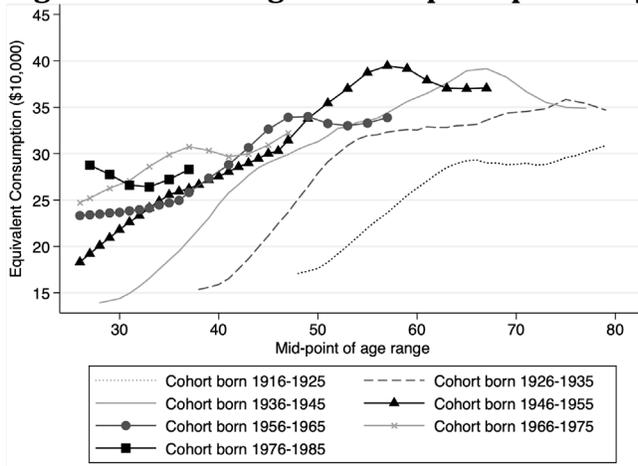
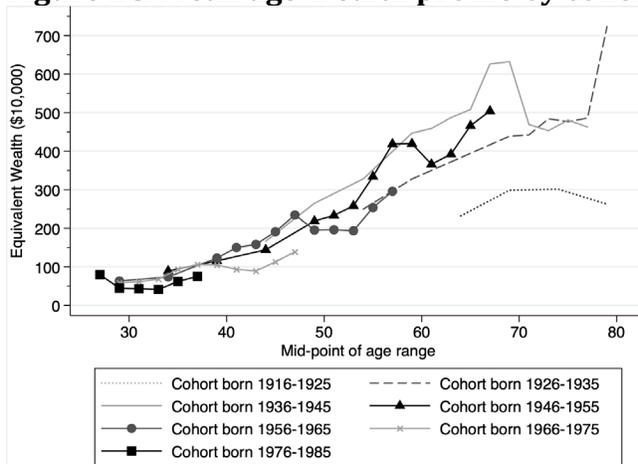
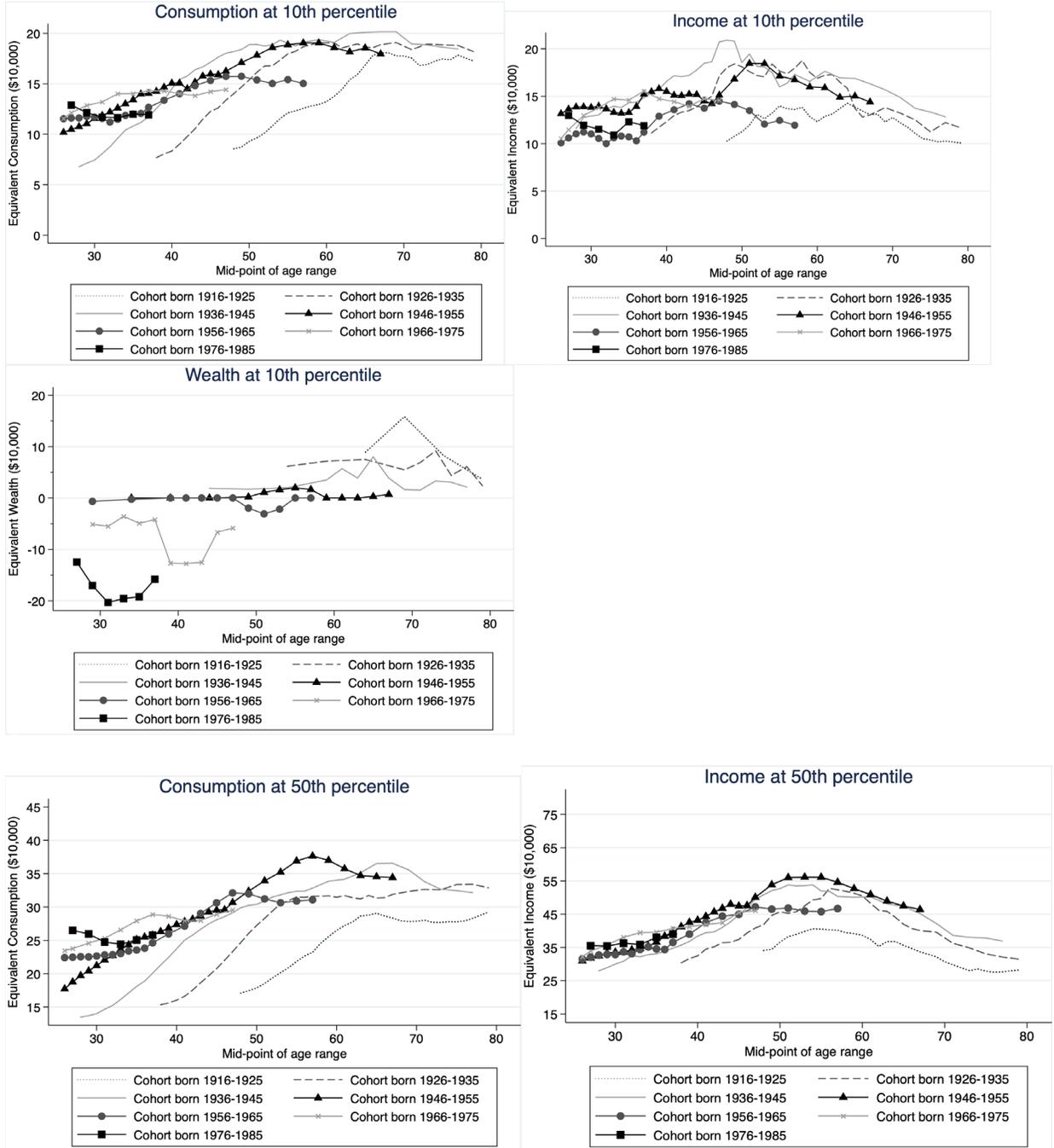


Figure 2C: Mean age-wealth profile by cohort



Source: Author's calculations using the 1968-2017 PSID.

Figure 3: Age-profiles at 10th, 50th, and 90th percentiles for income, consumption, and wealth



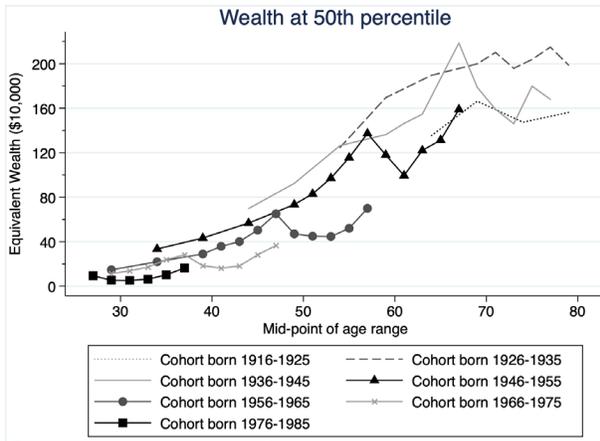


Figure 3 continued: Age-profiles at 10th, 50th, and 90th percentiles for income, consumption, and wealth

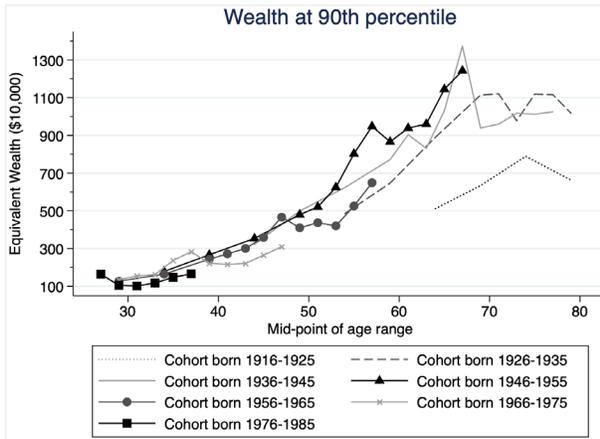
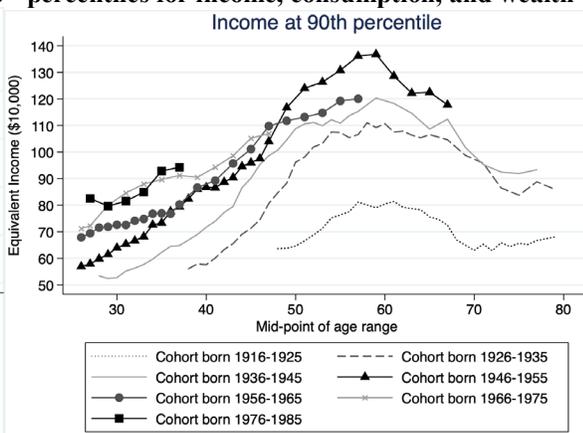
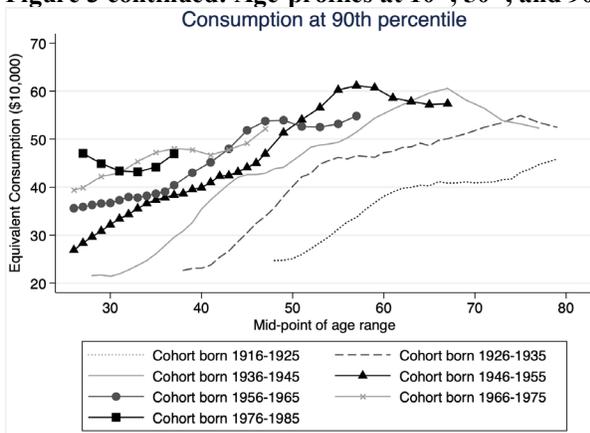


Figure 4A: Income inequality by cohort using Gini coefficient

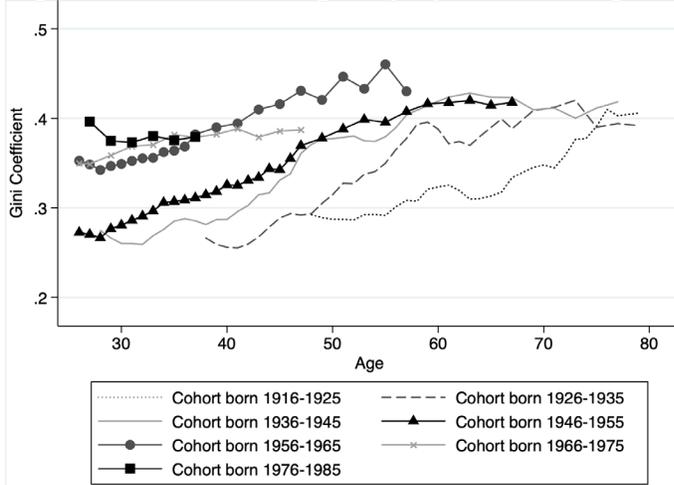


Figure 4B: Consumption inequality by cohort using Gini coefficient

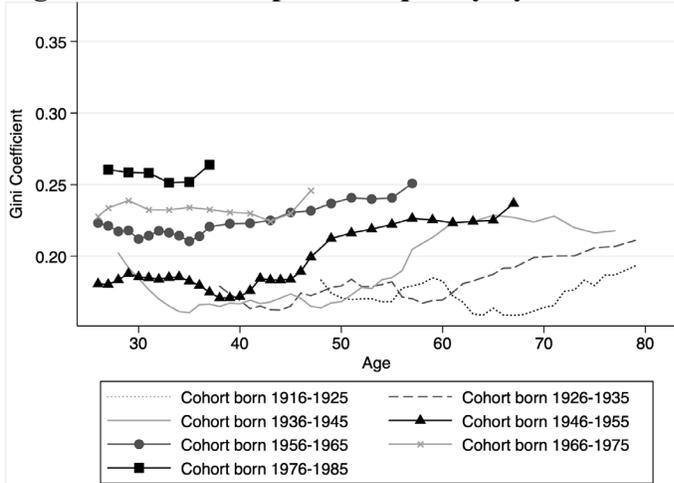


Figure 4C: Wealth inequality by cohort using Gini coefficient

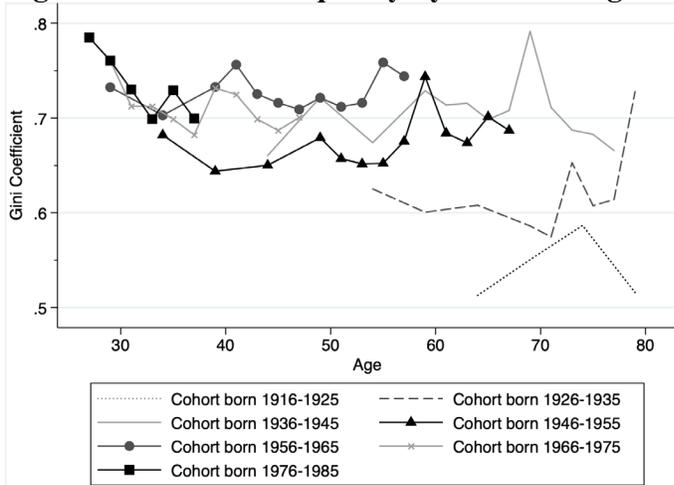
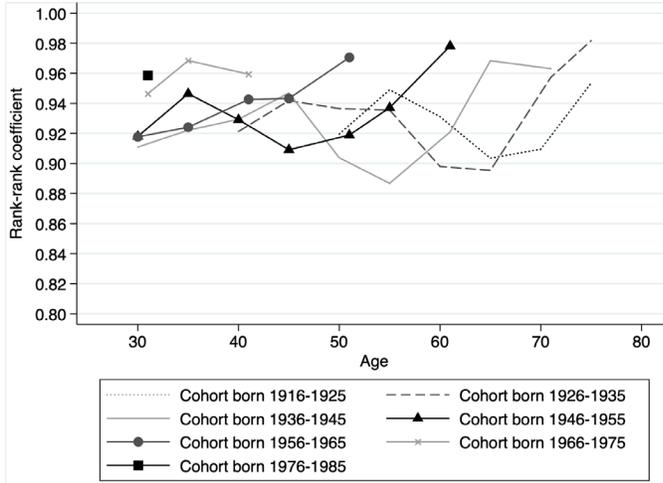
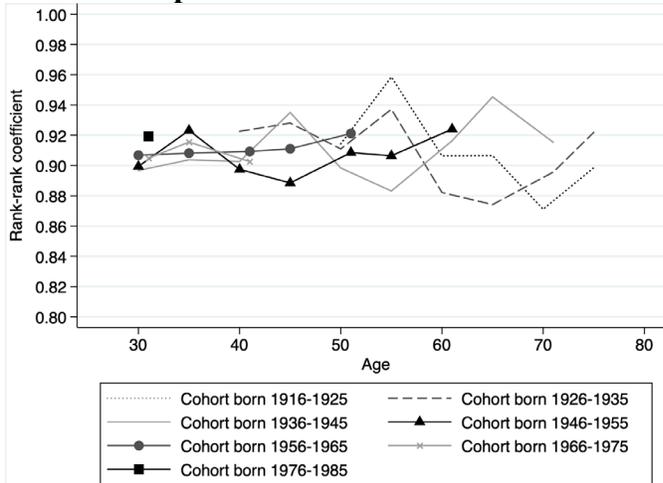


Figure 5: Rank-rank coefficient for income, consumption, and wealth by cohort

5A: Income



5B: Consumption



5C: Wealth

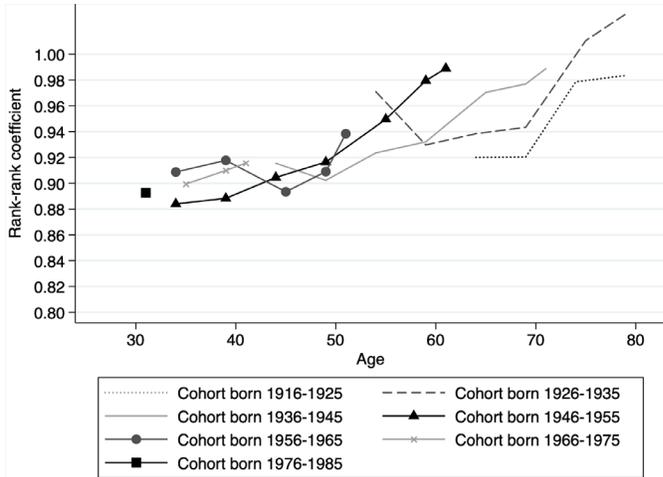
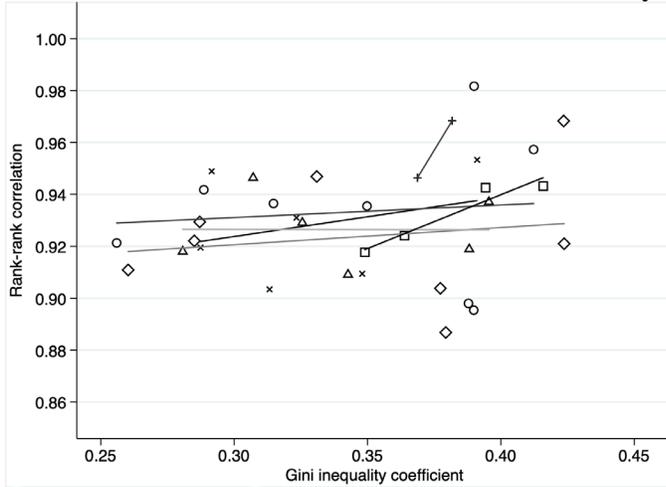
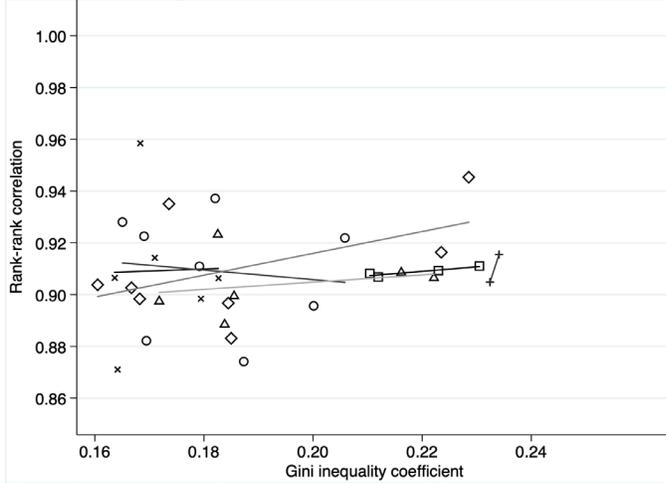


Figure 6: Intragenerational Great Gatsby Curve for Income, Consumption, and Wealth
6A: Income Gini and Rank-rank correlation by cohort



6B: Consumption Gini and Rank-rank correlation by cohort



6C: Wealth Gini and Rank-rank correlation by cohort

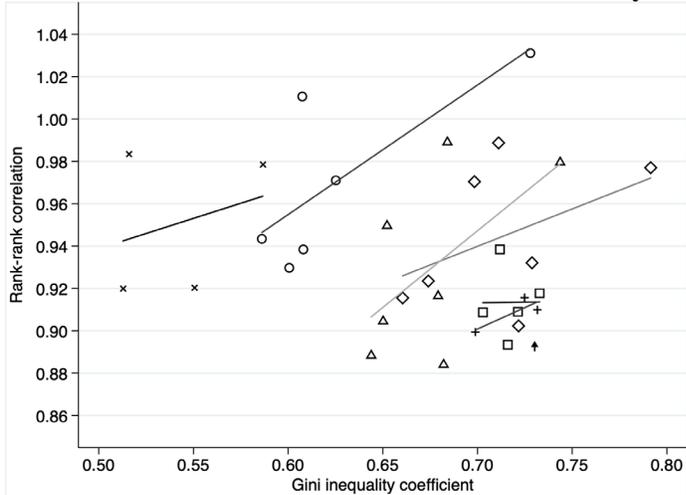


Figure 7: Mobility in 2D: Income and consumption mobility for top and bottom Wealth quintile using rank-rank deciles

Figure 7A

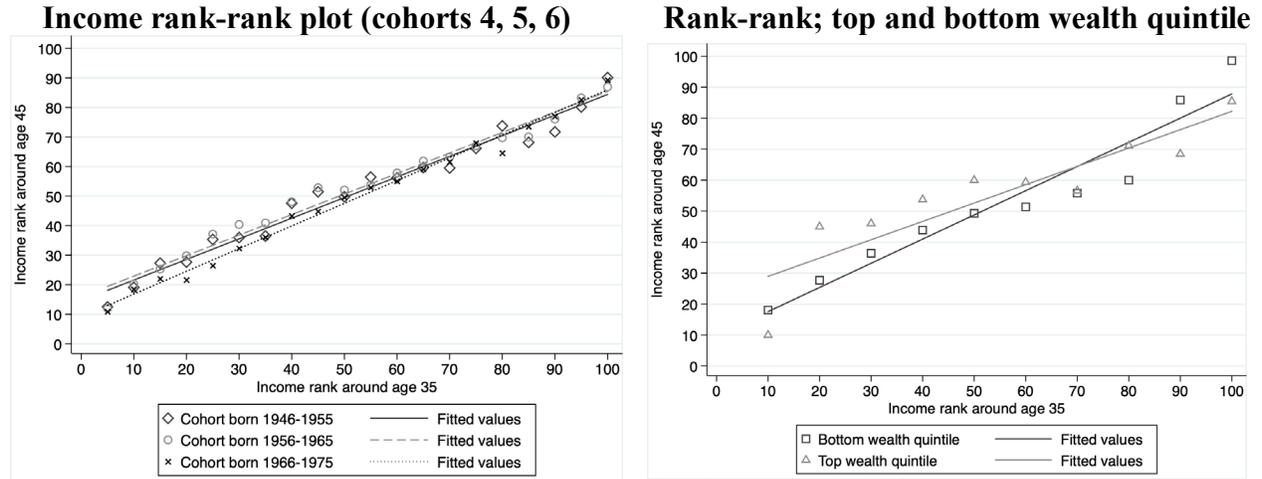


Figure 7B

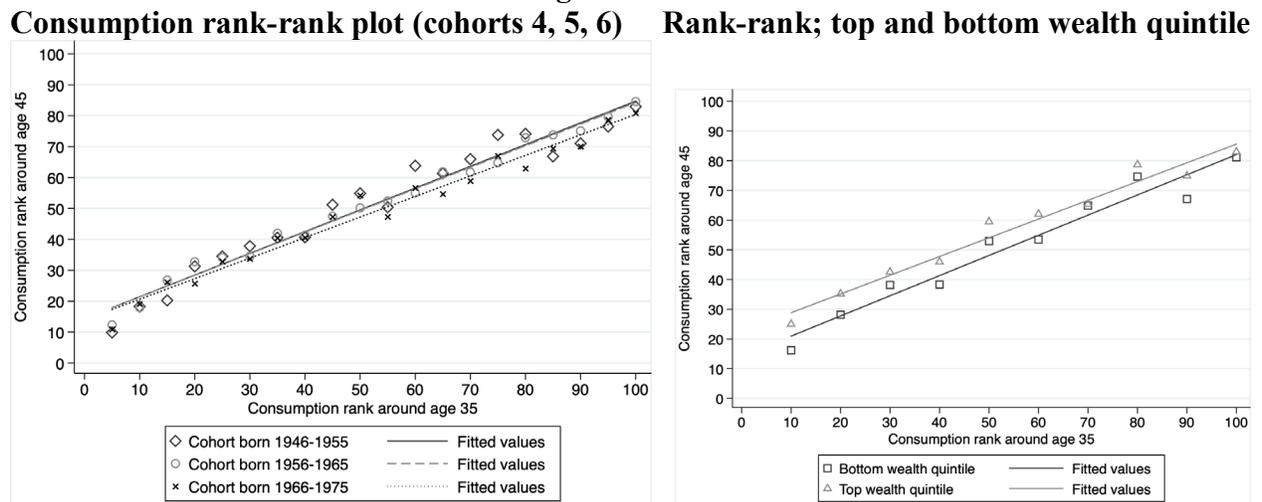
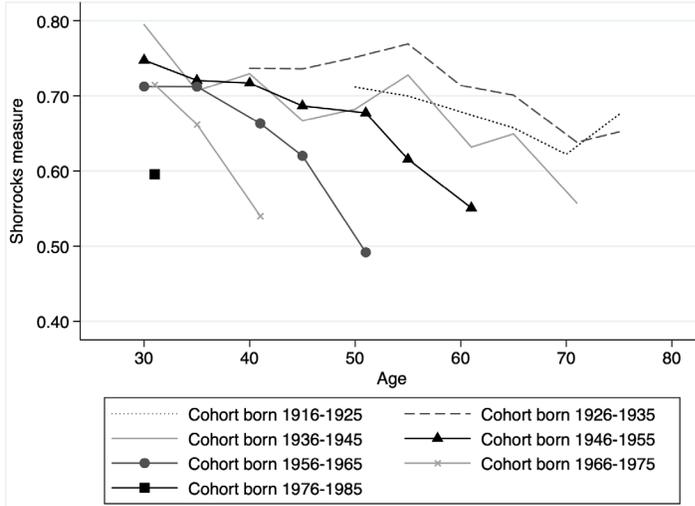
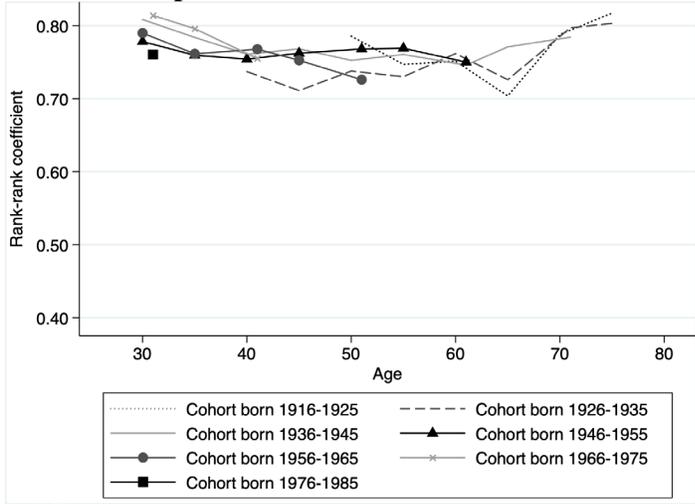


Figure 8: Shorrocks mobility measure for income, consumption and wealth by cohort
8A: Income



8B: Consumption



8C: Wealth

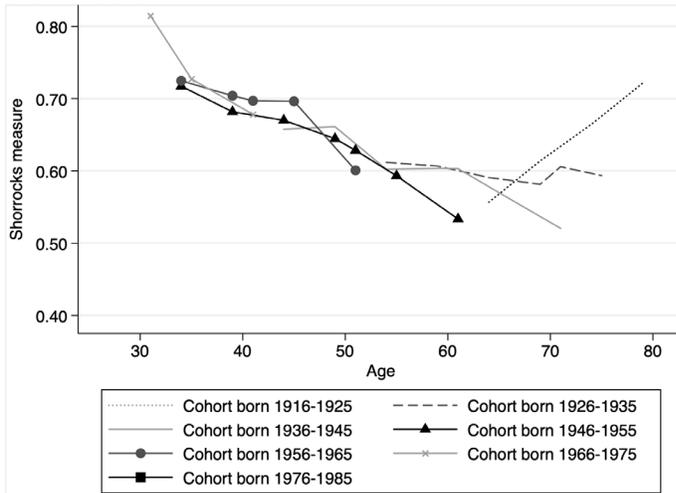
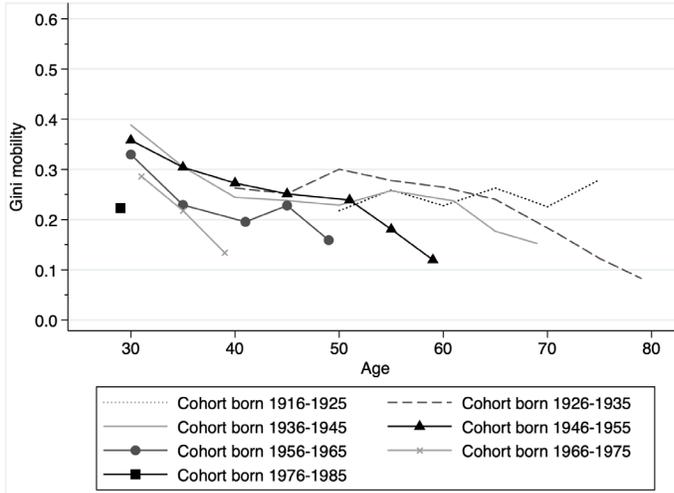
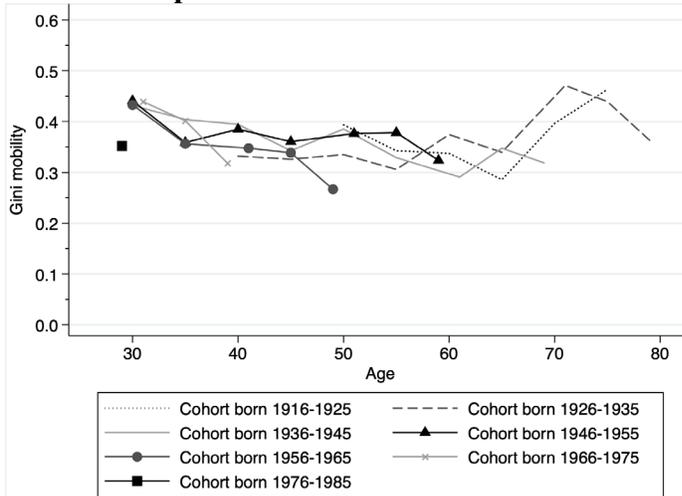


Figure 9: Gini Mobility measure for income, consumption and wealth by cohort

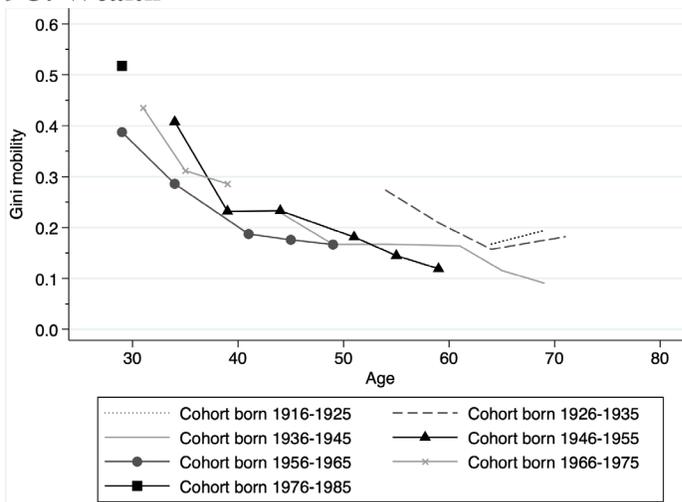
9A: Income



9B: Consumption



9C: Wealth



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Appendix Figures

Figure A1: Comparison of Gini Coefficients for wealth (SCF), income (CPS), and consumption (Attanasio and Pistaferri) to those from PSID

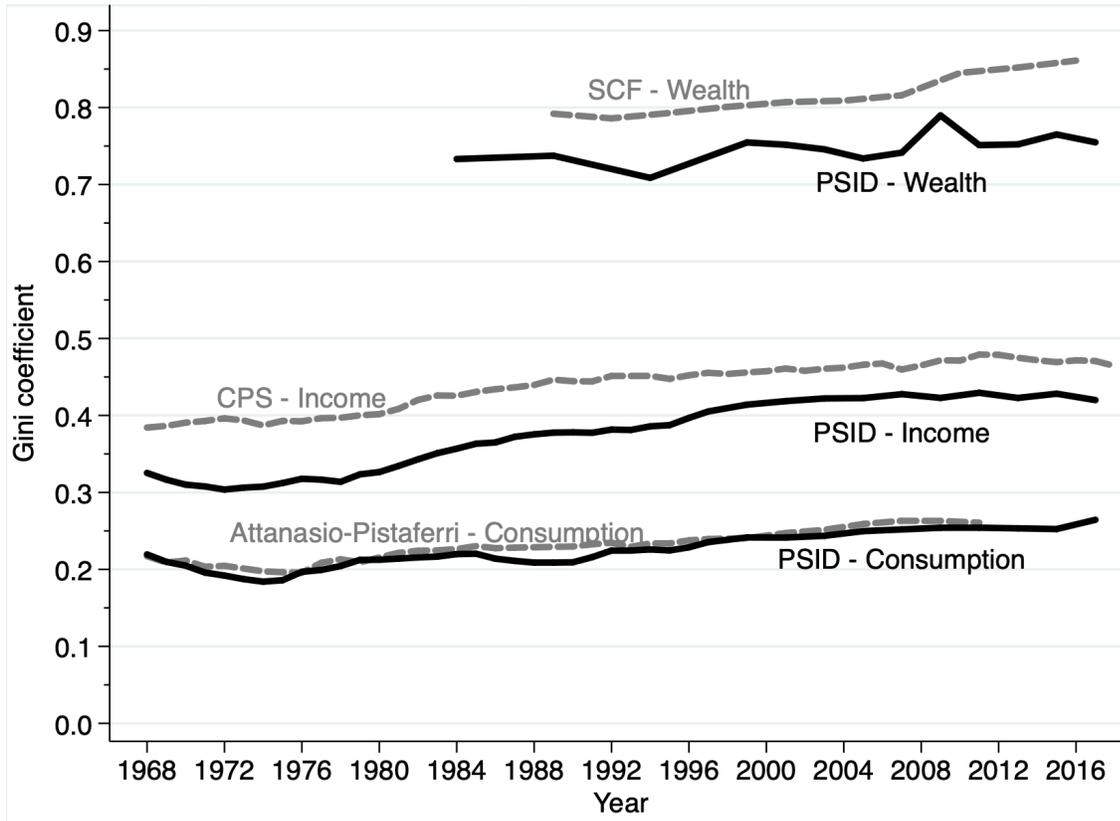


Figure A2: Mean Log Deviation and Log-variance inequality measures, 1968-2017

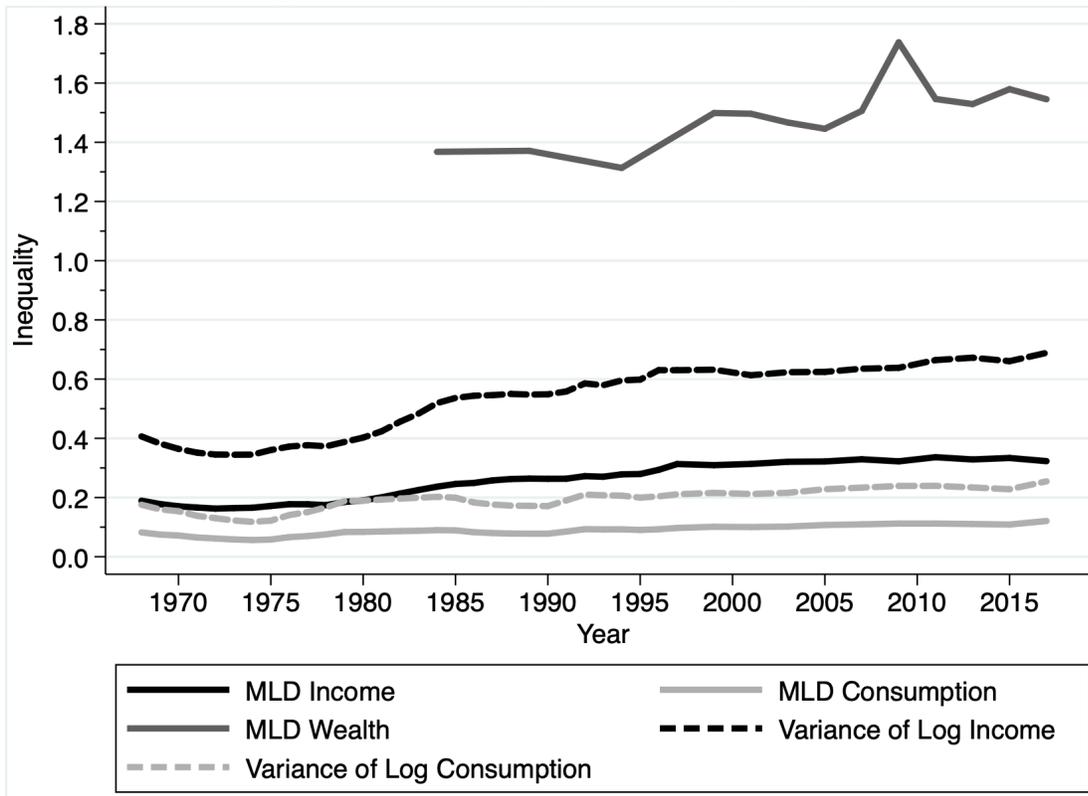


Figure A3: Comparing Imputed Gini Coefficient to Reported Gini Coefficient

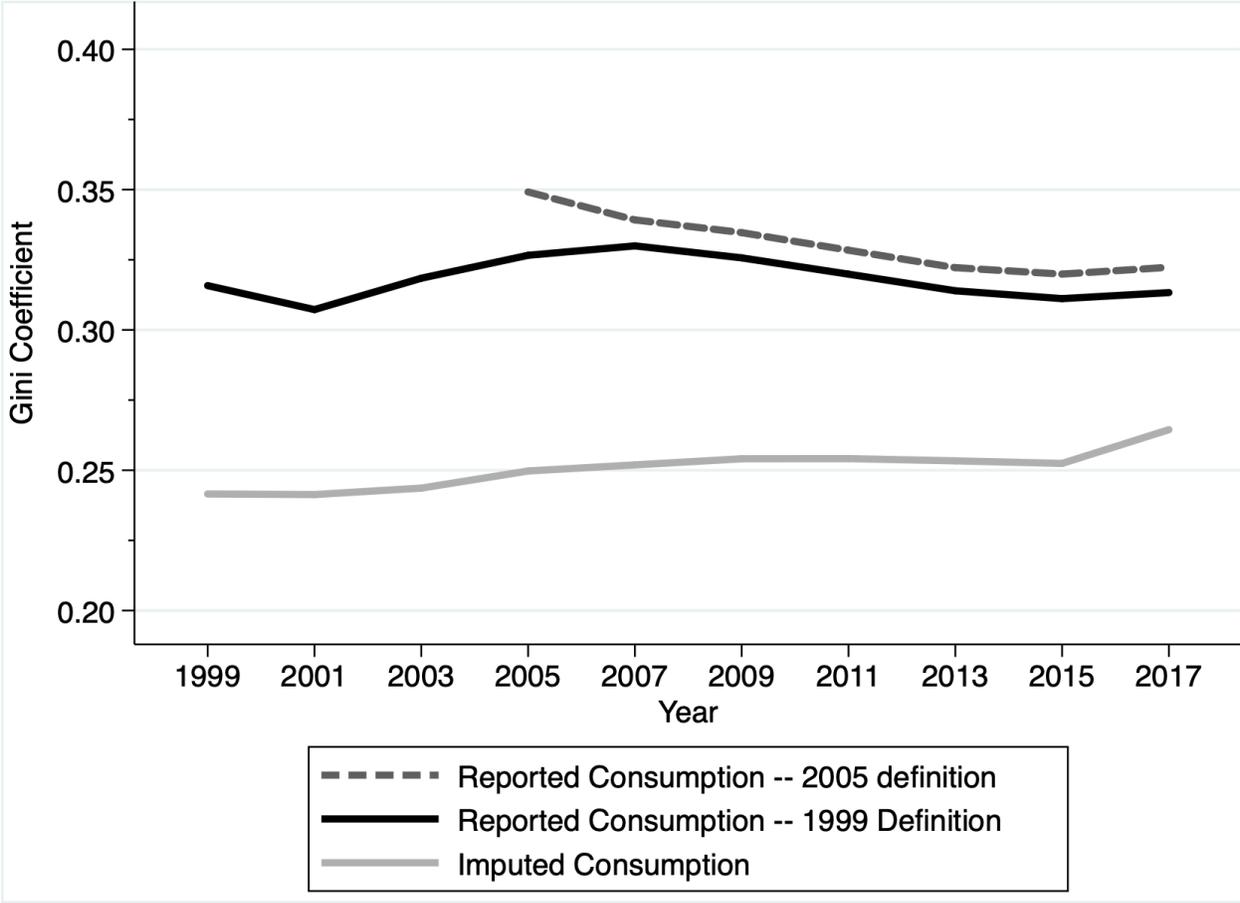
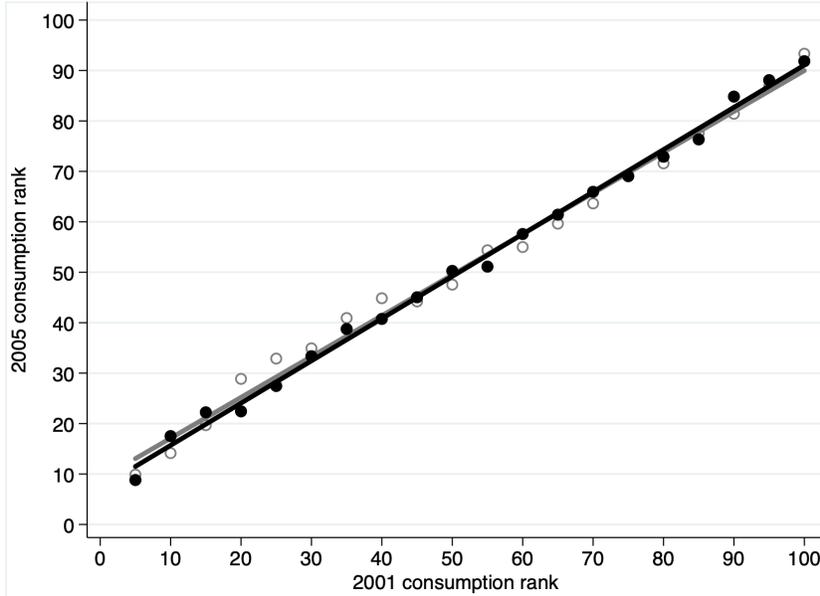


Figure A4: Comparing Mobility using Imputed and Reported Consumption

Panel A: Cohort 6 rank-rank scatterplot from 2001-2005



Panel B: Rank-rank correlation coefficients for 2001-2005 and 2011-2015

