Macroeconomic Conditions and U.S. Household Wealth: Asset Diversification Insights from the Survey of Consumer Finances

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Abstract

Household asset diversification reflects financial goals, investment horizons, and risk tolerance. Various factors influence the composition of U.S. household wealth. This study analyzed data from the Survey of Consumer Finances to establish a relationship between macroeconomic indicators and asset diversification among U.S. households. Household asset diversification was measured using the Herfindahl-Hirschman Index, and linear regression analysis was employed to determine the relationship between asset diversification and various macroeconomic factors. The study findings indicate that officially designated periods of economic recessions and changes in real gross domestic product had little effect on household asset diversification. Conversely, the federal funds rate and consumer price index were positively correlated with diversification, while the unemployment rate was negatively correlated with diversification. Additionally, higher education and income levels consistently correlated with higher portfolio diversification across financial and nonfinancial assets. The study findings indicate that household portfolio modification occurred in response to key variables underlying monetary policy such as inflation and the federal funds rate.

Introduction

Household assets comprise an array of financial and nonfinancial assets such as transaction accounts, certificate of deposit, stocks, bonds, retirement accounts, vehicles, primary residence and equity in business. Previous studies have found that household assets are generally poorly diversified in the U.S and most household assets include simple and safe assets consisting of checking account, savings account and tax-deferred retirement account (Bertaut and Starr-McCluer, 2000; Campbell, 2006). Household asset diversification reflects financial goals, investment horizons, and risk tolerance. Several socioeconomic characteristics such income, wealth, education, financial literacy and demographic characteristics such age, race, and ethnicity affect household asset

diversification (Guiso et al, 2002). The accessibility of financial markets to individual investors has significantly increased over the past decades. Subsequently, individual investors have sought to identify patterns between macroeconomic shifts and investment performance, and utilize this information to maximize returns (Baltussen et al., 2023). Individual investors, unlike institutional investors, often base their investment decisions on short-term changes in macroeconomic factors such as real gross domestic product, the consumer price index, the unemployment rate, and the federal funds rate (Lindblom et al., 2017). Therefore, the response of individual investors to macroeconomic shifts provides a stronger outlook of household portfolios than the response of institutional investors to macroeconomic shifts. Despite the importance of macroeconomic shifts regarding portfolio management and financial well-being, literature regarding changes in macroeconomics primarily focuses on investment performance, and there is a lack of existing research on whether or not macroeconomic factors influence household asset diversification (Amato and Lohre, 2020; Badarinza et al., 2016; Campbell, 2006).

This present study introduced the relationship between macroeconomic shifts and household asset diversification to develop a stronger understanding of what economic indicator fluctuations are associated with U.S. households elevating asset diversification levels. This paper hypothesized that changes in macroeconomic indicators would result in changes in U.S. household asset diversification levels. The study analysis consisted of a linear regression between macroeconomic indicators and household financial and nonfinancial asset diversification using the data from the Survey of Consumer Finances conducted between 1989 and 2022. Asset diversification was measured using the Herfindahl–Hirschman index (HHI). This study established that changes in the officially designated recessions and real gross domestic product were not correlated with changes in household asset diversification. The federal funds rate and consumer price index were positively correlated with asset diversification. In contrast, the unemployment rate was negatively correlated with asset diversification. The study also establishes that household asset diversification correlated with household income level and the education of reference persons with higher income and educational levels correlated with higher diversification. There was an overall decrease in household asset diversification over the years between 1989 and 2022 which can be attributed to changes in relative shares of different asset classes. The study findings have significant implications for policy makers, market regulators and financial advisors as it identifies key variables underlying monetary policy such as inflation and federal funds rate along with education and income affecting household asset diversification.

Literature Review

Household portfolio decisions that lead to asset diversification is less

understood. Several socioeconomic and demographic factors such as income, age, education, risk aversion, cost of investment services and asset liquidity constraints affect household asset diversification. Campbell (2006) found that household assets are generally poorly diversified in the U.S. A study by Bertaut and Starr-McCluer in 2000 found that most U.S. household portfolios included fairly simple and safe assets consisting of a checking account, savings account and tax-deferred retirement account. In addition, less than one-half of the household portfolios included equities; household portfolios were less diversified even among the top quintile of wealth distribution in spite of the availability of a wide variety of financial products. A study by Barasinska et al., in 2008 found that higher levels of investment risk tolerance correlated with higher household asset diversification in Germany.

A recent study by Sierminska and Silber (2020) analyzed the data from the Survey of Consumer Finances using the Gini-Simpson diversity index to assess the impact of the 2007-2009 great recession on household asset diversification in the United States. The study found an increase in diversification among 10 financial asset classes when analyzed either individually or grouped into safe, fairly safe and risky categories between 2007 and 2009. The study found that the majority of household financial assets were held in the risky category (about 73% to 83%) with remaining assets distributed roughly equally between the safe and fairly safe asset categories. The share of financial assets in the risky assets category decreased by about 10% between 2007 and 2009, which was mainly attributed to decrease in the value of stocks and mutual funds rather than change in ownership. In addition, an increase in household asset diversification was associated with increase in age, higher education and income levels, higher wealth and active money management. The study found that aggregation of asset types affected the analysis of asset diversification (lower Gini-Simpson diversity index) compared to analysis of individual asset types.

A study by Worthington in 2009 examined the effects of demographic, socioeconomic and risk tolerance characteristics of households on asset diversification in Australia. The study found that household asset portfolios were generally less diversified in Australia. The households with major portions of their income derived from wages, salaries, businesses and investments; larger households; older households; and moderately risk-taking households held more diversified assets. In addition, wealthier Australian households held greater proportions of their assets in market assets. Similar to other countries, retirement accounts and home constituted major portions of financial and nonfinancial assets, respectively, in Australian households.

Macroeconomic factors reflect the health of the economy and have considerable influence on asset returns. They are investigated as indicators of various assets' performance. A study that analyzed institutional portfolios has attributed 95% of variance in 13 global asset class returns to

six macroeconomic factors including economic growth, real rates, inflation, credit, emerging market and commodities (Bass et al., 2017). Economic growth, inflation, and volatility were identified as the most significant macroeconomic factors that affect asset allocation. Any unexpected changes in the economic growth, inflation, and volatility, rather than their levels, affect investment decisions and returns (Ang, 2014). Implementation of investment strategies based on macroeconomic factors has been a challenge (Martellini and Milhau, 2018) as they have low explanatory power in explaining variation in asset returns (Grinold and Kahn, 1999) and constructing portfolios mimicking a macroeconomic factor is difficult as macroeconomic factors are not themselves directly investable (Amato and Lohre, 2020). Studies have investigated potential benefits of regime-based asset allocation (RBAA) strategies, which are based on the macroeconomic environment, as opposed to static asset allocation, to enhance long-term returns on investments and minimize losses during periods of economic downturns. A regime-based asset allocation framework is based on a dynamic asset allocation approach with the premise that different asset classes have contrasting returns and risk tolerance in different market environments (Ang and Bekaert, 2004; Nystrup et al., 2015; Kollar and Schmieder, 2019). Economic cycles are dynamic with varying periods of positive growth, inflationary growth, stagflation and recession. Nonetheless, there is a lack of existing research on how macroeconomic factors influence household asset diversification.

The present study analyzed household asset data from the Survey of Consumer Finances spanning a period of over three decades (1989 to 2022) which included 4 recession periods of varying degree and duration, and included a historically low federal funds rate (below 1%) period between 2009 and 2017. The study indicates a lack of correlation between recessions/GDP and household asset diversification. In contrast, both inflation and federal funds rate, the variable underlying monetary policy, were positively correlated with household asset diversification.

Methods

Survey of Consumer Finances (SCF) Data

This study used data from the Survey of Consumer Finances (SCF), which is conducted by the Board of Governors of the Federal Reserve System, and includes information about household income, net worth, balance sheet components, credit use, and other financial outcomes of American households. The survey was conducted triennially between 1989 and 2022. Data on financial and nonfinancial asset subclass holdings for each survey year was obtained from the University of California, Berkeley's SDA online analysis in February 2024. All dollar amounts provided in the survey are adjusted to 2022 dollars. Information about financial and nonfinancial subsets can be found online in the flowchart and Appendix A.

Macroeconomics Data

Data for periods of economic recession was provided by the National Bureau of Economic Research's Business Cycle Dating Committee. Data on real gross domestic product (compounded annual rate of change, quarterly, seasonally adjusted), the consumer price index (CPI, all items: total for United States, compounded annual rate of change, quarterly, seasonally adjusted), the unemployment rate (percent, quarterly, seasonally adjusted), and the federal funds effective rate (percent, quarterly, not seasonally adjusted) were collected from the Federal Reserve Economic Data.

Measure of Household Asset Diversification (Herfindahl-Hirschman Index)

The study used the Herfindahl-Hirschman Index to determine diversification of household financial and nonfinancial assets (Herfindahl, 1950; Hall and Tideman., 1967). The financial and nonfinancial asset subclasses included in the analysis are provided in the Appendix A. To determine HHI of financial and nonfinancial asset subclasses for households, each asset subclass was expressed as a percentage of total financial assets or nonfinancial assets, respectively. Then, each asset subclass percentage was squared and all of the squared asset subclass percentages were summed to find the HHI value for that household. A few data points with negative values (less than 0.45%) for the net equity in non-residential real estate and businesses were excluded from analysis. The study determined the conditional median (cMedian) and conditional mean (cMean) of the Herfindahl-Hirschman Index for all households in each survey year. As the surveys were conducted triennially, quarterly cMedian and cMean estimates for financial and nonfinancial assets were interpolated using the autofill series linear option in Microsoft Excel. Conditional median and cMean of the Herfindahl-Hirschman Index for different educational groups (education of reference person) and income groups (percentile of usual income) were also determined.

$$HHI = (A_1)^2 + (A_2)^2 + (A_3)^2 \ldots\ldots (A_n)^2$$

Where: A_1, A_2, A_3.....A_n represent the percentage of asset subclasses for each household

Correlation between Household Asset Diversification and Macroeconomic Factors

The study used the least squares regression model to estimate correlation between cMedian and cMean of HHI (household asset diversification) and macroeconomic factors, economic recession, real gross domestic product (GDP), consumer price index (CPI), unemployment rate, federal funds rate and survey year.

One-Tailed Paired *t*-test

A one-tailed paired *t*-test was used to determine differences between the cMedian of HHI among different educational groups (education of reference person) and income groups (percentile of usual income) using GraphPad Prism (Version 6.07).

Results

Macroeconomic conditions in the United States during 1989 – 2022

The macroeconomics indicators i.e., real GDP, CPI, unemployment rate and federal funds effective rate (FFER) in the U.S. during 1989 -2022 are presented in Figure 1. During this period, the U.S. economy experienced 4 recessions: 1990 Q3 through 1991 Q1; 2001 Q1 through 2001 Q4; the great recession of 2007 Q4 through 2009 Q2; and the COVID-19 pandemic recession of 2019 Q4 through 2020 Q2. During recessions, the real GDP showed negative growth. The CPI was well above the Federal Reserve's target of 2% prior to recessions. Unemployment rates stayed well above 5% during and immediately following recession periods. The federal funds effective rate was greater than 5% prior to the 1990, 2001, and 2007 recessions. After the 2007 great recession, the federal funds effective rate was kept historically low below one percent until 2017.

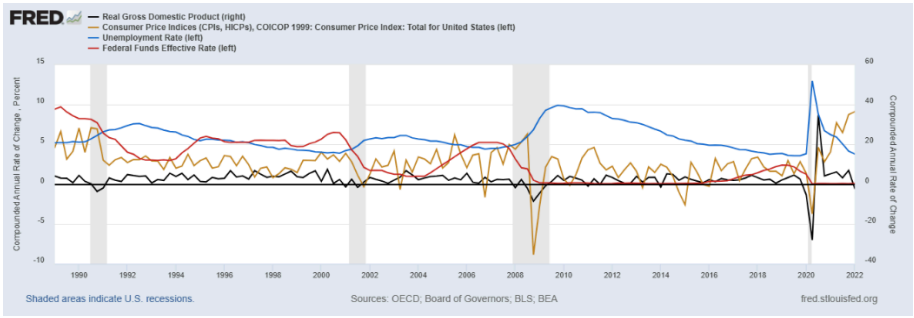

FIGURE 1. U.S. economic recessions and changes in macroeconomic indicators between 1989 and 2022. Shaded areas indicate the U.S. recessions. The real gross domestic product, the consumer price index (CPI), the unemployment rate, and the federal funds effective rate are presented. Source: Federal Reserve Bank of St. Louis (http://www.myf.red/g/1qMrk)

Financial Assets of All Households

The study used the Herfindahl-Hirschman Index (HHI) to calculate asset diversification levels of every household surveyed from the SCF. HHI is inversely proportional to asset diversification and takes numerical values of 10,000 (least diversification) or lower. The study determined the cMedian and cMean of HHI values for financial and nonfinancial assets for all

households and for households at different usual income levels (income groups) and education of reference person (education levels), and then interpolated cMean and cMedian of HHI values quarterly (Figure 2 through 7). The study estimated linear regression using ordinary least squares to determine correlation between macroeconomic indicators and household asset diversification (Table 1 and Appendix B).

Among all households, economic recession and changes in real GDP were not correlated with changes in household financial asset diversification ($P > 0.05$; Table 1). The relationship between household financial asset diversification (cMedian of HHI) and other macroeconomic indicators i.e., the CPI, the unemployment rate, and the federal funds was statistically significant ($P < 0.01$; Table 1). However, changes in household financial asset diversification can be minimally attributed to the CPI and the unemployment rate whose R^2 values were 0.050 and 0.120, respectively, for the cMedian of HHI. In contrast, a strong positive correlation was observed between household financial asset diversification and the federal funds rate ($P < 0.001$, R^2 value of 0.664 for the cMedian of HHI). The household financial asset diversification decreased in later years of the survey compared to earlier surveys ($P < 0.001$, R^2 value of 0.768 for cMedian of HHI; Table 1 and Figure 2).

Financial Assets of Educational Groups

The study examined diversification of financial assets among different educational groups (Figure 3; Table 1). Financial asset diversification corresponded to education of the reference person [no high school diploma (EDCL1), high school diploma (EDCL2), some college (EDCL3) or college degree (EDCL4)] in that households with greater financial asset diversification were associated with higher education levels (Figure 3, $P < 0.0001$, one-tailed t-test). Changes in financial asset diversification in educational groups (EDCL2 and EDCL4) can be minimally attributed to the CPI ($P < 0.05$ and R^2 values < 0.073 for the cMedian of HHI). Similarly, changes in the unemployment rate can be minimally attributed to changes in financial asset diversification for all educational groups ($P < 0.05$ and R^2 values < 0.083 for the cMedian of HHI). Changes in the federal funds rate positively correlated with changes in financial asset diversification in all educational groups ($P < 0.001$, R^2 value ranged between 0.680 and 0.713 for the cMedian of HHI).

The household financial asset diversification decreased in later years of the survey compared to earlier surveys for all educational groups ($P < 0.001$, R^2 value ranged between 0.795 and 0.871 for cMedian of HHI; Table 1).

Financial Assets of Income Groups

The study examined diversification of financial assets among households grouped by percentile of usual income. Financial asset diversification corresponded to the percentile of usual income [less than 20 (INCCAT1);

20-39.9 (INCCAT2); 40-59.9 (INCCAT3); 60-79.9 (INCCAT4); 80-89.9 (INCCAT5) and 90-100 (INCCAT6)] in that households with greater financial asset diversification were associated with higher income levels (Figure 4, $P < 0.0001$, one-tailed *t*-test; Table 1). Changes in financial asset diversification in income groups INCCAT5 and INCCAT6 can be minimally attributed to the CPI ($P < 0.001$ and R^2 value < 0.175 for the cMedian of HHI). The unemployment rate was negatively associated with changes in financial assets diversification for usual income levels in the bottom 20 percentile, INCCAT1 ($P < 0.001$ and R^2 value of 0.31 for the cMedian of HHI). In contrast, the unemployment rate can be minimally attributed to changes in financial asset diversification in all other income groups, INCCAT2 through INCCAT6 ($P < 0.001$ and R^2 value < 0.174 for the cMedian of HHI). Changes in the federal funds rate positively correlated with changes in financial asset diversification for the income levels of INCCAT2 through INCCAT6 ($P < 0.001$, R^2 value ranged between 0.361 and 0.665 for the cMedian of HHI).

The household financial asset diversification decreased in later years of the survey compared to earlier surveys for the income groups INCCAT2 through INCCAT6 ($P < 0.001$, R^2 value ranged between 0.368 and 0.702 for cMedian of HHI; Table 1).

Financial Assets	***Contraction***	***Real GDP***	***CPI***	***UNEMP***	***FEDFUNDS***	***Year***
All Households	NS	NS	-34.77** (0.050)	70.84*** (0.120)	-108.03*** (0.664)	31.40*** (0.768)
EDCL1	NS	NS	NS	93.11* (0.049)	-224.20*** (0.680)	65.50*** (0.795)
EDCL2	NS	NS	-56.34* (0.034)	110.44** (0.075)	-220.44*** (0.713)	65.17*** (0.853)
EDCL3	NS	NS	NS	96.16*** (0.083)	-179.69*** (0.691)	54.51*** (0.871)
EDCL4	NS	NS	-31.04** (0.073)	29.39* (0.038)	-81.98*** (0.700)	24.34*** (0.845)
INCCAT1	NS	NS	NS	65.47*** (0.310)	NS	NS
INCCAT2	NS	NS	NS	93.53*** (0.086)	-147.26*** (0.503)	42.42*** (0.572)
INCCAT3	NS	NS	NS	96.62*** (0.174)	-117.57*** (0.610)	33.20*** (0.666)
INCCAT4	NS	NS	NS	62.42*** (0.130)	-85.27*** (0.578)	25.20*** (0.691)
INCCAT5	NS	NS	-47.32*** (0.101)	56.36*** (0.083)	-103.46*** (0.665)	28.73*** (0.702)
INCCAT6	NS	NS	-14.46*** (0.175)	4.16*** (0.008)	-17.76*** (0.361)	4.84*** (0.368)
Non-Financial Assets	***Contraction***	***Real GDP***	***CPI***	***UNEMP***	***FEDFUNDS***	***Year***
All Households	NS	NS	-23.16* (0.035)	34.53* (0.046)	-90.98*** (0.751)	30.47*** (0.924)

EDCL1	NS	NS	NS	49.14** (0.068)	-94.26*** (0.593)	26.71*** (0.653)
EDCL2	NS	NS	NS	NS	-83.35*** (0.575)	25.58*** (0.742)
EDCL3	NS	NS	NS	NS	-103.26*** (0.707)	31.61*** (0.907)
EDCL4	NS	NS	-41.78** (0.053)	NS	-132.99*** (0.739)	40.27*** (0.927)
INCCAT1	-26.85* (0.038)	NS	NS	NS	NS	NS
INCCAT2	NS	NS	-27.74* (0.051)	NS	-90.44*** (0.743)	25.74*** (0.824)
INCCAT3	NS	NS	-20.12* (0.040)	NS	-62.31*** (0.525)	18.59*** (0.640)
INCCAT4	NS	NS	NS	28.32** (0.050)	-61.41*** (0.563)	17.93*** (0.657)
INCCAT5	NS	NS	NS	NS	-55.43*** (0.322)	20.35*** (0.594)
INCCAT6	NS	NS	-19.59** (0.054)	NS	-59.84*** (0.692)	18.14*** (0.870)

TABLE 1: Correlation between household financial and nonfinancial assets diversification (cMedian of HHI) and macroeconomic indicators. Linear least squares regression analysis was performed to determine the correlation between the cMedian of Herfindahl-Hirschman Indices (measure of diversification) for the U.S. household assets (financial and nonfinancial) and macroeconomic indicators. The coefficient values for the independent variables and R-squared values (in parentheses) are presented. EDCL: Education of the reference person [no high school diploma (EDCL1), high school diploma (EDCL2), some college (EDCL3) or college degree (EDCL4)]. INCCAT: Percentile of usual income [less than 20 (INCCAT1); 20-39.9 (INCCAT2); 40-59.9 (INCCAT3); 60-79.9 (INCCAT4); 80-89.9 (INCCAT5) and 90-100 (INCCAT6)]. CPI: Consumer price index; UNEMP: Unemployment rate; FEDFUNDS: Federal funds effective rate; Year: Survey year; NS: Not Significant; *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

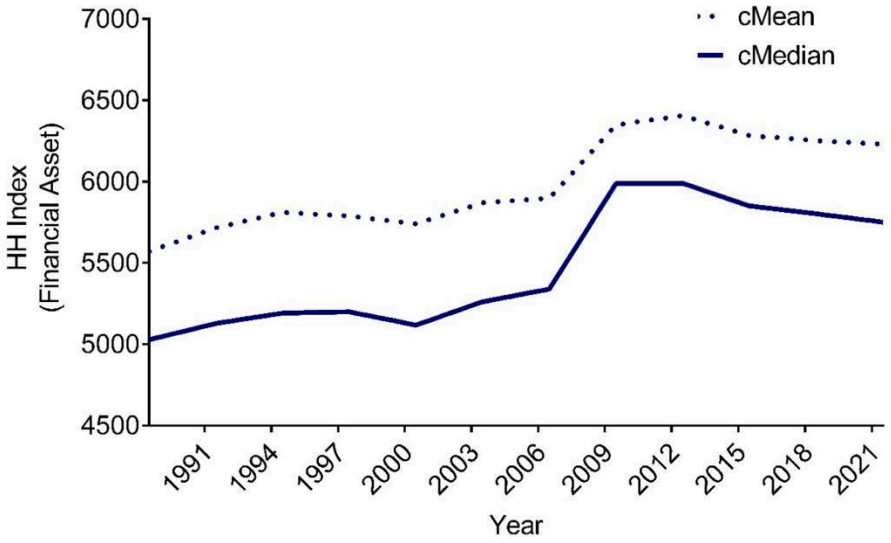

FIGURE 2. Changes in the U.S. household financial asset diversification between 1989 and 2022. Conditional mean (cMean) and median (cMedian) of the Herfindahl-Hirschman Indices (HHI: measure of asset diversification) for household financial assets are presented. Twenty-six financial asset categories included in calculation of HHI are presented in Appendix A.

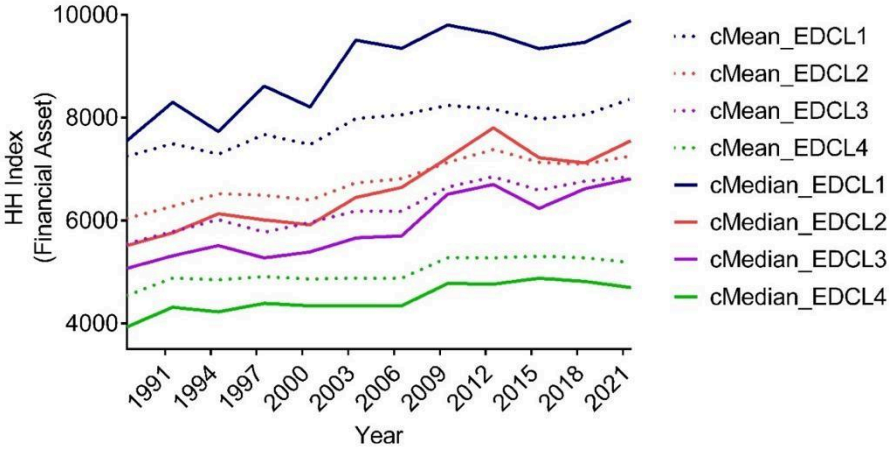

FIGURE 3. Changes in the U.S. household financial asset diversification among different educational groups between 1989 and 2022. Conditional mean (cMean) and median (cMedian) of the Herfindahl-Hirschman Indices (HHI: measure of asset diversification) for household financial assets among different educational groups are presented. EDCL: Education of the reference person [no high school diploma (EDCL1), high school diploma (EDCL2), some college (EDCL3) or college degree (EDCL4)]. Twenty-six financial asset categories included in calculation of HHI are presented in

Appendix A.

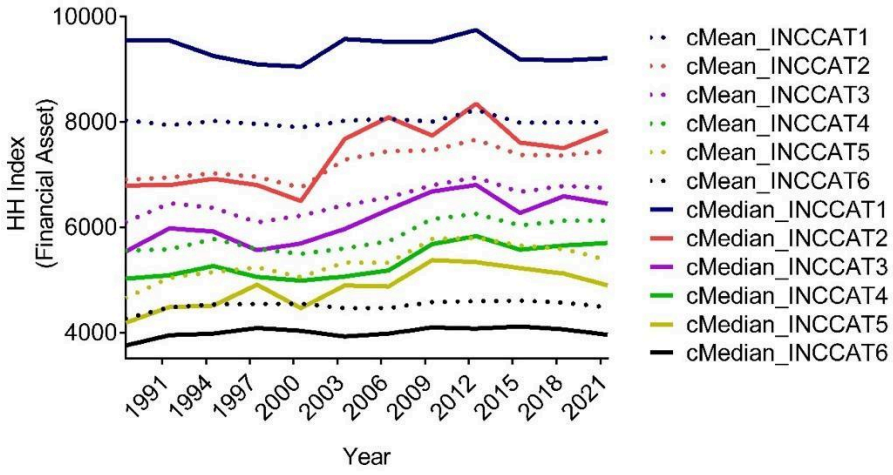

FIGURE 4. Changes in the U.S. household financial asset diversification among different income groups between 1989 and 2022. Conditional mean (cMean) and median (cMedian) of the Herfindahl-Hirschman Indices (HHI: measure of asset diversification) for household financial assets among different income groups are presented. INCCAT: Percentile of usual income [less than 20 (INCCAT1); 20-39.9 (INCCAT2); 40-59.9 (INCCAT3); 60-79.9 (INCCAT4); 80-89.9 (INCCAT5) and 90-100 (INCCAT6)]. Twenty-six financial asset categories included in calculation of HHI are presented in Appendix A.

Nonfinancial Assets of All Households

Among all households, the economic recession and changes in real GDP were not correlated with changes in household nonfinancial asset diversification ($P > 0.05$; Table 1). The relationship between household nonfinancial asset diversification (cMedian of HHI) and other macroeconomic indicators i.e., the CPI, the unemployment rate, and the federal funds was statistically significant ($P < 0.05$; Table 1 and Figure 5). However, changes in household nonfinancial asset diversification can be minimally attributed to the CPI and the unemployment rate whose R^2 values were 0.035 and 0.046, respectively, for the cMedian of HHI. In contrast, a strong positive correlation was observed between household nonfinancial assets diversification and federal funds rate ($P < 0.001$, R^2 value of 0.751 for the cMedian of HHI; Table 1).

The household nonfinancial asset diversification decreased in later years of the survey compared to earlier surveys ($P < 0.001$, R^2 value of 0.924 for cMedian of HHI; Table 1).

Nonfinancial Assets of Educational Groups

The study examined diversification of nonfinancial assets among different educational groups. Nonfinancial asset diversification corresponded to education of the reference person in that households with greater nonfinancial asset diversification were associated with higher education levels (Figure 6, $P < 0.0001$, one-tailed *t*-test; Table 1). Changes in nonfinancial asset diversification in the educational group EDCL4 can be minimally attributed to the CPI ($P < 0.01$ and R^2 value < 0.053 for the cMedian of HHI). Changes in nonfinancial asset diversification in the education group EDCL1 can be minimally attributed to unemployment rate ($P < 0.01$ and R^2 value < 0.068 for the cMedian of HHI). Changes in federal funds rate positively correlated with changes in nonfinancial asset diversification in all educational groups ($P < 0.001$, R^2 value ranged between 0.575 and 0.739 for the cMedian of HHI).

The household nonfinancial asset diversification decreased in later years of the survey compared to earlier surveys for all educational groups ($P < 0.001$, R^2 value ranged between 0.653 and 0.927 for cMedian of HHI; Table 1).

Nonfinancial Assets of Income Groups

The study next examined diversification of nonfinancial assets among households grouped by percentile of usual income. Nonfinancial asset diversification corresponded to the percentile of usual income in that households with greater nonfinancial asset diversification were associated with higher income levels (Figure 7, $P < 0.0001$, one-tailed *t*-test; Table 1). Changes in nonfinancial asset diversification in the income group, INCCAT1 can be minimally attributed to the economic recession ($P < 0.05$ and R^2 value 0.038 for the cMedian of HHI). The consumer price index is positively associated with changes in nonfinancial asset diversification for usual income levels, INCCAT2, INCCAT3 and INCCAT6 ($P < 0.05$ and R^2 values < 0.054 for the cMedian of HHI). The unemployment rate can be minimally attributed to changes in nonfinancial asset diversification in the income group, INCCAT4 ($P < 0.01$ and R^2 value 0.05 for the cMedian of HHI). Changes in federal funds rates were positively correlated with changes in nonfinancial asset diversification in the income levels, INCCAT2 through INCCAT6 ($P < 0.001$, R^2 value ranged between 0.322 and 0.743 for the cMedian of HHI).

The household financial asset diversification decreased in later years of the survey compared to earlier surveys for the income groups INCCAT2 thorough INCCAT6 ($P < 0.001$, R^2 value ranged between 0.594 and 0.870 for cMedian of HHI; Table 1).

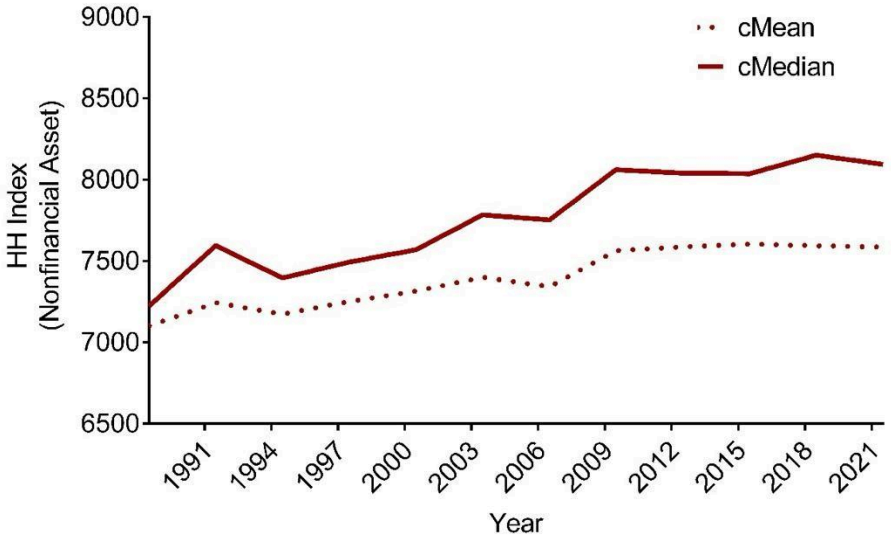

FIGURE 5. Changes in the U.S. household nonfinancial asset diversification between 1989 and 2022. Conditional mean (cMean) and median (cMedian) of the Herfindahl-Hirschman Indices (measure of asset diversification) for household nonfinancial assets are presented. Six nonfinancial asset categories included in calculation of HHI are presented in Appendix A.

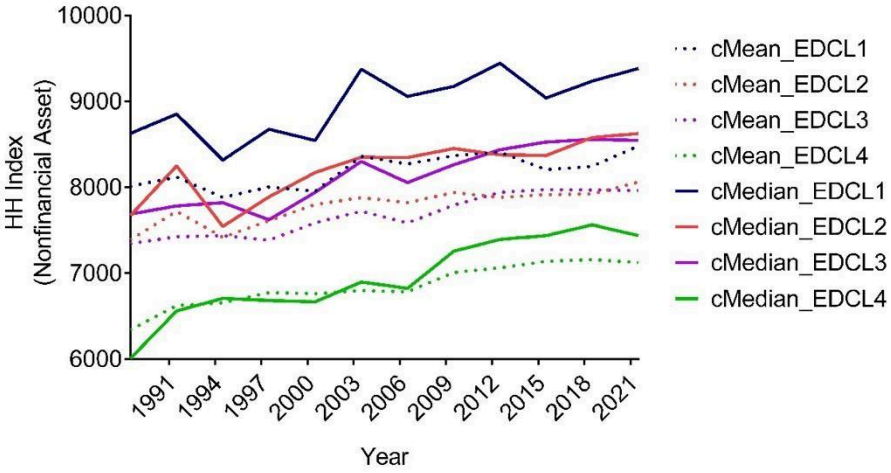

FIGURE 6. Changes in the U.S. household nonfinancial asset diversification among different educational groups between 1989 and 2022. Conditional mean (cMean) and median (cMedian) of the Herfindahl-Hirschman Indices (measure of asset diversification) for household nonfinancial assets among different educational groups are presented. EDCL: Education of the reference person [no high school diploma (EDCL1), high school diploma (EDCL2), some college (EDCL3) or college degree (EDCL4)]. Six nonfinancial asset categories included in calculation of HHI are presented in Appendix A.

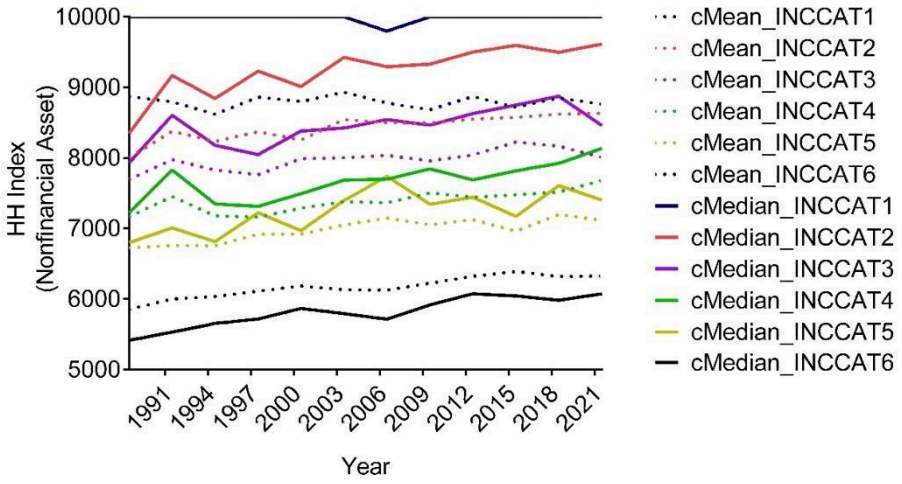

FIGURE 7. Changes in the U.S. household nonfinancial asset diversification among different income groups between 1989 and 2022. Conditional mean (cMean) and median (cMedian) of the Herfindahl-Hirschman Indices (measure of asset diversification) for household nonfinancial assets among different income groups are presented. NCCAT: Percentile of usual income [less than 20 (INCCAT1); 20-39.9 (INCCAT2); 40-59.9 (INCCAT3); 60-79.9 (INCCAT4); 80-89.9 (INCCAT5) and 90-100 (INCCAT6)]. Six nonfinancial asset categories included in calculation of HHI are presented in Appendix A.

Discussion

Household assets provide stability during economic downturns, and a well-diversified household asset portfolio is expected to help families move up the economic ladder (Lerman and McKernan, 2008). Several socioeconomic and demographic factors such as household income, education, marital status, age, availability of professional financial services and diverse financial products, and inheritance influence household asset portfolio composition and investment decisions (Guiso et al, 2002). In addition, macroeconomic conditions can significantly influence the distribution of assets and their performance and value. Although a number of studies have investigated the correlation between macroeconomic indicators and the performance of different asset categories managed by institutional investors, few studies have comprehensively addressed the association between stages of economic cycles and/or macroeconomic indicators and U.S. household asset diversification (Sierminska and Silber, 2020). Modern portfolio theory proposed by Markowitz (1952), which states that investors select assets based on the mean and variance of portfolio returns, may not directly apply to household assets (Badarinza et al., 2016; Campbell, 2006; Guiso and Sodini, 2012).

The present study used data from the triennial Survey of Consumer Finances conducted by the Federal Reserve Board between 1989 and 2022.

The Hirschman-Herfindahl Index (HHI) was used to determine diversification of household financial and nonfinancial assets. A study by Worthington (2009) employed HHI to examine household asset diversification in Australia and the study found a low level of asset diversification among households. Sierminska and Silber (2020) analyzed the data from the Survey of Consumer Finances using the Gini-Simpson diversity index to assess the impact of the 2007 great recession on household asset diversification in the U.S. The HHI is commonly used to determine market concentration of a particular industry in a geographic area (Hall and Tideman, 1967). By squaring market share of each firm in an industry, the HHI measures two dimensions of distribution: the relative size of firms and number of firms. The Gini-Simpson diversity index is used in ecology to assess species diversity which involves measuring richness (a measure of the number of different kinds of organisms or species present in a geographical habitat) and evenness (a measure of relative abundance of each species present). Gini-Simpson's diversity index is analytically identical to the HHI index of economic concentration. The numerical values of the Gini-Simpson diversity index and the Herfindahl-Hirschman Index complement each other and vary between 0 and 1 with higher values indicating higher species diversity and higher market concentration (lower diversity), respectively (Adajar et al., 2019).

The present study indicated that the four designated periods of recession and changes in real GDP had little effect on U.S. household financial and nonfinancial asset diversification between 1989 and 2022. Short durations of recessions, which are often designated retrospectively, may explain lack of correlation with household asset diversification although the 2007 great recession lasted for 7 quarters. Both CPI and unemployment rate had low but statistically significant power in explaining diversification of household financial and nonfinancial assets. CPI was positively correlated with changes in household financial and nonfinancial asset diversification, indicating households are likely to diversify their assets during periods of high inflation which tend to precede periods of recession except the COVID-19 pandemic recession of 2019 Q4 through 2020 Q2. In contrast, the unemployment rate was negatively correlated with changes in household asset diversification indicating households are likely to consolidate their assets during periods of high unemployment rate which tends to rise during the periods of recession and peak immediately after recessions. Both the federal funds effective rate and year had high and statistically significant power in explaining household financial and nonfinancial assets' diversification. The federal funds effective rate is positively correlated with changes in household asset diversification indicating households tend to diversify their assets during periods of high federal funds effective rates which is likely influenced by the bond market or return on interest-bearing assets. The Federal Reserve in the U.S. uses monetary policy to influence the federal funds effective rate based on economic data such as employment, consumer spending and inflation. The

rates are cut to spur economic growth during the periods of high unemployment and recession, while the rates are hiked during periods of inflationary growth to curb the inflation. During periods of high federal funds effective rate, bonds become attractive as new bonds are issued with higher interest payments. In contrast, bond prices rise when the federal funds rate falls as the old bonds with higher interest rates become more attractive than the newly issued bonds with lower interest rates.

This study indicated that household financial and nonfinancial asset diversification decreased over the years between 1989 and 2022 which are most likely due to changes in shares of different asset classes (Appendix D). Among financial assets, shares of directly held pooled investment funds (excluding money market funds), directly held stocks and other managed assets (annuities and trusts) increased by 472%, 90% and 32%, respectively, between 1989 and 2002. In contrast, categories of all types of transaction account (liquid assets), certificates of deposit, savings bonds, directly held bonds (excluding bond funds or savings bonds), cash value of whole life insurance, quasi-liquid retirement accounts and other miscellaneous financial assets decreased by 37%, 81%, 26%, 76%, 44%, 28% and 91%, respectively, between 1989 and 2022. Among nonfinancial assets, shares of vehicles, residential property excluding primary residence and businesses and other miscellaneous nonfinancial assets increased by 2%, 18%, 26% and 28%, respectively, between 1989 and 2022. In contrast, shares of primary residence and net equity in non-residential real estate have decreased by 35% and 75%, respectively, between 1989 and 2022. The present study indicates that household income and education level of the reference person have a significant impact on asset diversification with higher diversification associated with higher income and education levels. Previous studies have shown a positive correlation of financial literacy with risk taking, household asset diversification and wealth accumulation (Hastings et al., 2013; Van Rooij et al., 2011; Von Gaudecker, 2015). Studies have also documented a strong correlation between active participation in formal financial markets and household education, income and wealth (Badarinza et al., 2016).

Limitations

The present study has some limitations in analyzing household asset diversification. One of the limitations of this study is that the Survey of Consumer Finances is a triennial survey limiting analysis of correlation between macroeconomic indicators and household asset diversification at a higher frequency. In addition, no recession periods aligned directly with the surveys conducted. Therefore, we interpolated cMedian and cMean of HHI values of household asset diversification quarterly to determine whether there was a correlation with macroeconomic indicators throughout the different stages of the economic cycle. The survey has multiple forms of sampling biases, including nonresponse biases and decreased

participation of households with extremely low and high net worth, leading to diminished representation of wealth inequality. However, the survey has used over-sampling to offset sampling biases. In addition, a distinct asset holding may appreciate or depreciate in value more greatly than other asset holdings affecting asset diversification, although households may not have reallocated capital. A change in economic conditions is unlikely to affect some asset holdings with liquidity constraints such as primary residence and vehicles. Therefore, the present study analyzed the household financial and nonfinancial data separately to mitigate this effect. The study used a linear regression model using ordinary least squares which assumes linearity of relation between dependent (asset diversification) and independent variables (macroeconomic factors) and constant covariance.

Conclusions

In conclusion, the present study provides new insights into U.S. household asset diversification using the Survey of Consumer Finances data which spanned over three decades and included four economic downturns. The study indicated that economic recessions and real GDP had little effect on household financial and nonfinancial asset diversification. Importantly, both CPI and federal funds rates, key variables underlying monetary policy, were positively correlated with household asset diversification. In contrast, unemployment rate was negatively correlated with household asset diversification. CPI and unemployment rates had low power in explaining household asset diversification. In contrast, federal funds rates had high explanatory power in delineating variations in household asset diversification. Household asset diversification, as assessed in the present study, has decreased over the years which is likely due to changes in shares of the individual assets. Both household usual income and education of reference person have significant influence on financial and nonfinancial asset diversification with greater diversification associated with higher income and education levels. The present study has profound implications for policy makers, market regulators and financial advisors as the study identifies important variables underlying monetary policy such as inflation and the federal funds rate, along with education as key factors affecting household asset diversification. Policymakers can leverage these insights to enhance financial literacy initiatives and design policies that promote economic stability, while market regulators may consider adjustments to ensure equitable access to diverse investment opportunities. Financial advisors can use these findings to develop tailored strategies that help households navigate changing economic conditions and optimize their investment portfolios.

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Appendix A
Financial and Nonfinancial Asset Categories

Financial assets [FIN]

All types of transaction account (liquid assets) [LIQ]‡
- Money market accounts [MMA]†
- Checking accounts (excl. money mkt) [CHECKING]†
- Savings accounts [SAVING]†
- Call accounts [CALL]†
- Prepaid cards [PREPAID]†

Certificates of deposit [CDS]†‡
Directly held pooled investment funds (exc. money mkt funds) [NMMF]‡
- Stock mutual funds [STMUTF]†
- Tax-free bond mutual funds [TFBMUTF]†
- Govt. bond mutual funds [GBMUTF]†
- Other bond mutual funds [OBMUTF]†
- Combination mutual funds [COMUTF]†
- Other mutual funds [OMUTF]†

Savings bonds [SAVBND]†‡
Directly held stocks [STOCKS]†‡
Directly held bonds (exc. bond funds or savings bonds) [BOND]‡
- Tax-exempt bonds [NOTXBND]†
- Mortgage-backed bonds [MORTBND]†
- US govt & govt agency bonds & bills [GOVTBND]†
- Corporate and foreign bonds [OBND]†

Cash value of whole life insurance [CASHLI]†‡
Other managed assets [OTHMA]‡
- Annuities [ANNUIT]†
- Trusts [TRUSTS]†

Quasi-liquid retirement accounts [RETQLIQ]‡
- Individual retirement accounts/Keoghs [IRAKH]†
- Account-type pensions on current job [THRIFT]†
- Future pensions [FUTPEN]†
- Currently received account type pensions [CURRPEN]†

Other misc. financial assets [OTHFIN]†‡

Nonfinancial assets [NFIN]

Vehicles (incl. RVs, planes, boats, etc.) [VEHIC]†
Primary residence [HOUSES]†
Residential property excl. primary resid. [ORESRE]†
Net equity in non-residential estate [NNRESRE]†
Businesses (with either an active or nonactive interest) [BUS]†
Other misc. nonfinancial assets [OTHNFIN]†

† Categories included in calculation of the Herfindahl–Hirschman Index (HHI) for financial assets.
‡ Categories included in calculation of shares of financial assets
Names in brackets refer to asset categories presented in the graphs.

Appendix B

Financial Assets	*Contraction*	*Real GDP*	*CPI*	*UNEMP*	*FEDFUNDS*	*Year*
All Households	NS	NS	-27.85** (0.055)	50.30*** (0.103)	-85.56*** (0.710)	24.64*** (0.806)
EDCL1	NS	NS	NS	46.08** (0.056)	-101.52*** (0.641)	30.76*** (0.806)
EDCL2	NS	NS	-35.92* (0.044)	55.11** (0.060)	-125.44*** (0.736)	37.00*** (0.877)
EDCL3	NS	NS	-32.14* (0.030)	59.61** (0.060)	-135.48*** (0.740)	40.56*** (0.909)
EDCL4	NS	NS	-25.64** (0.073)	32.42** (0.067)	-68.79*** (0.716)	19.71*** (0.805)
INCCAT1	NS	NS	NS	15.01*** (0.149)	-10.50*** (0.173)	2.55*** (0.140)
INCCAT2	NS	NS	NS	50.47*** (0.105)	-76.85*** (0.580)	22.22*** (0.664)
INCCAT3	NS	NS	NS	60.38*** (0.161)	-79.28*** (0.657)	21.87*** (0.685)
INCCAT4	NS	NS	NS	55.23*** (0.129)	-75.54*** (0.571)	22.56*** (0.697)
INCCAT5	NS	NS	-42.52*** (0.105)	55.29*** (0.102)	-95.70*** (0.727)	25.66*** (0.716)
INCCAT6	NS	NS	-1276*** (0.173)	NS	-17.31*** (0.437)	4.20*** (0.352)
Non-Financial Assets	***Contraction***	***Real GDP***	***CPI***	***UNEMP***	***FEDFUNDS***	***Year***
All Households	NS	NS	-15.73* (0.045)	18.58* (0.036)	-55.25*** (0.757)	18.48*** (0.929)
EDCL1	NS	NS	NS	34.77*** (0.122)	-49.16*** (0.580)	15.10*** (0.600)
EDCL2	NS	NS	NS	NS	-53.73*** (0.672)	17.66*** (0.797)
EDCL3	NS	NS	-17.95* (0.031)	NS	-73.68*** (0.723)	25.25*** (0.932)
EDCL4	NS	NS	-23.18** (0.057)	NS	-69.48*** (0.703)	24.25*** (0.940)
INCCAT1	NS	NS	NS	-9.84** (0.065)	NS	NS
INCCAT2	NS	NS	-12.21* (0.034)	NS	-48.04*** (0.714)	14.20*** (0.854)
INCCAT3	NS	NS	-12.44* (0.047)	NS	-36.15*** (0.544)	11.15*** (0.709)
INCCAT4	NS	NS	NS	21.09** (0.076)	-38.50*** (0.599)	11.14*** (0.687)
INCCAT5	NS	NS	NS	NS	-38.01*** (0.462)	13.39*** (0.786)
INCCAT6	NS	NS	-15.64** (0.064)	NS	-42.99*** (0.666)	13.46*** (0.895)

Correlation between household financial and non-financial assets diversification (cMean of HHI) and macroeconomic indicators. Linear least square regression analysis was performed to determine the correlation between the cMean of Herfindahl-Hirschman Indices (HHI: measure of diversification) for U.S. household assets (financial and nonfinancial) and macroeconomic indicators.

The coefficient values for the independent variables and R-squared values (in parentheses) are presented. EDCL: Education of the reference person [no high school diploma (EDCL1), high school diploma (EDCL2), some college (EDCL3) or college degree (EDCL4)]. INCCAT: Percentile of usual income [less than 20 (INCCAT1); 20-39.9 (INCCAT2); 40-59.9 (INCCAT3); 60-79.9 (INCCAT4); 80-89.9 (INCCAT5) and 90-100 (INCCAT6)]. CPI: Consumer price index; UNEMP: Unemployment rate; FEDFUNDS: Federal funds effective rate; Year: Survey year; NS: Not Significant; *$P < 0.05$; **$P < 0.01$ ***$P < 0.001$

Appendix C
Skewness of Herfindahl-Hirschman Index (HHI)

Skewness of distribution of Herfindahl-Hirschman Indices for each survey year was determined using the formula below in Microsoft Excel.

$$\text{Skewness} = \frac{n}{(n-1)(n-2)} \sum_{i}^{n} \left(\frac{x_i - \bar{x}}{s} \right)^3$$

where:
n = sample size
Σ = summation
x_i = the value of the ith value
$\bar{x}$ = mean
s = standard deviation

Conditional Skewness (cSkewness) of Herfindahl-Hirschman Index (HHI) for Financial Assets

Survey Year	*1989*	*1992*	*1995*	*1998*	*2001*	*2004*	*2007*	*2010*	*2013*	*2016*	*2019*	*2022*
All Households	0.45	0.40	0.34	0.36	0.40	0.31	0.31	0.07	0.06	0.13	0.13	0.14
EDCL1	-0.27	-0.46	-0.35	-0.59	-0.45	-0.76	-0.89	-0.81	-0.84	-0.66	-0.83	-0.93
EDCL2	0.27	0.16	0.04	0.11	0.15	-0.06	-0.06	-0.21	-0.34	-0.21	-0.20	-0.30
EDCL3	0.51	0.37	0.27	0.34	0.29	0.19	0.19	-0.02	-0.10	0.07	-0.06	-0.09
EDCL4	0.93	0.79	0.76	0.74	0.78	0.73	0.76	0.51	0.55	0.51	0.56	0.61
INCCAT1	-0.66	-0.71	-0.73	-0.69	-0.63	-0.72	-0.76	-0.71	-0.93	-0.68	-0.64	-0.72
INCCAT2	-0.10	-0.11	-0.15	-0.11	-0.03	-0.29	-0.42	-0.35	-0.51	-0.27	-0.29	-0.36
INCCAT3	0.29	0.09	0.15	0.27	0.23	0.09	0.02	-0.05	-0.12	0.07	-0.01	0.01
INCCAT4	0.48	0.51	0.36	0.45	0.56	0.44	0.39	0.23	0.19	0.29	0.23	0.22
INCCAT5	0.89	0.66	0.64	0.59	0.62	0.54	0.49	0.30	0.36	0.36	0.48	0.55
INCCAT6	0.99	0.93	0.90	0.87	0.91	0.86	0.92	0.74	0.87	0.79	0.83	0.89

Distribution of HHI values for the household financial assets

The distribution of HHI values for total household financial assets had a low positive skewness with skewness values ranging from 0.06 to 0.45, indicating some households have disproportionately low financial asset diversification (Figure 2). The distribution of HHI values for the financial assets in the educational group, EDCL1, had a low to moderate negative skewness, with skewness values ranging from -0.27 to -0.89, indicating some households had disproportionately high financial asset diversification in this group (Figure 3). In contrast, the distribution of HHI values for the financial assets

in the educational group, EDCL4, had a moderate positive skewness, with skewness values ranging from 0.51 to 0.93, indicating some households in this group had disproportionately low financial asset diversification (Figure 3). The distribution of HHI values for the financial assets in the income group INCCAT1 had a moderate negative skewness, with skewness values ranging from -0.63 to -0.93, indicating some households had disproportionately high financial asset diversification (Figure 4). In contrast, the distribution of HHI values for the financial assets in the income group, INCCAT6, had a moderate positive skewness, with skewness values ranging from 0.74 to 0.99, indicating some households in this group had disproportionately low financial asset diversification. The distribution of HHI values for the financial assets in the income group INCCAT2 had negative skewness (skewness values ranging from -0.03 to -0.51) and the groups INCCAT4 and INCCAT5 had positive skewness (skewness values ranged from 0.19 to 0.89) with higher positive skewness in the latter income group for all survey years (Figure 4).

Conditional Skewness (cSkewness) of Herfindahl-Hirschman Index (HHI) for Non-Financial Assets

Survey Year	*1989*	*1992*	*1995*	*1998*	*2001*	*2004*	*2007*	*2010*	*2013*	*2016*	*2019*	*2022*
All Households	-0.20	-0.30	-0.23	-0.26	-0.29	-0.37	-0.35	-0.47	-0.46	-0.46	-0.50	-0.46
EDCL1	-0.66	-0.81	-0.57	-0.61	-0.64	-0.95	-0.90	-0.83	-0.95	-0.72	-0.82	-0.95
EDCL2	-0.32	-0.53	-0.27	-0.42	-0.55	-0.58	-0.66	-0.66	-0.59	-0.63	-0.67	-0.73
EDCL3	-0.36	-0.36	-0.38	-0.33	-0.43	-0.58	-0.45	-0.59	-0.62	-0.69	-0.72	-0.65
EDCL4	0.18	0.00	-0.01	-0.03	-0.03	-0.08	-0.06	-0.20	-0.23	-0.22	-0.29	-0.24
INCCAT1	-1.44	-1.44	-1.17	-1.35	-1.37	-1.61	-1.48	-1.28	-1.38	-1.28	-1.51	-1.34
INCCAT2	-0.63	-0.97	-0.76	-0.90	-0.80	-1.15	-1.10	-1.06	-1.06	-1.10	-1.22	-1.14
INCCAT3	-0.43	-0.64	-0.49	-0.50	-0.61	-0.70	-0.69	-0.68	-0.69	-0.83	-0.85	-0.62
INCCAT4	-0.20	-0.40	-0.23	-0.18	-0.25	-0.32	-0.37	-0.42	-0.38	-0.39	-0.42	-0.55
INCCAT5	-0.08	-0.14	-0.06	-0.18	-0.15	-0.33	-0.40	-0.29	-0.30	-0.18	-0.38	-0.29
INCCAT6	0.33	0.29	0.26	0.26	0.21	0.24	0.26	0.19	0.12	0.17	0.15	0.17

Distribution of HHI values for the household nonfinancial assets

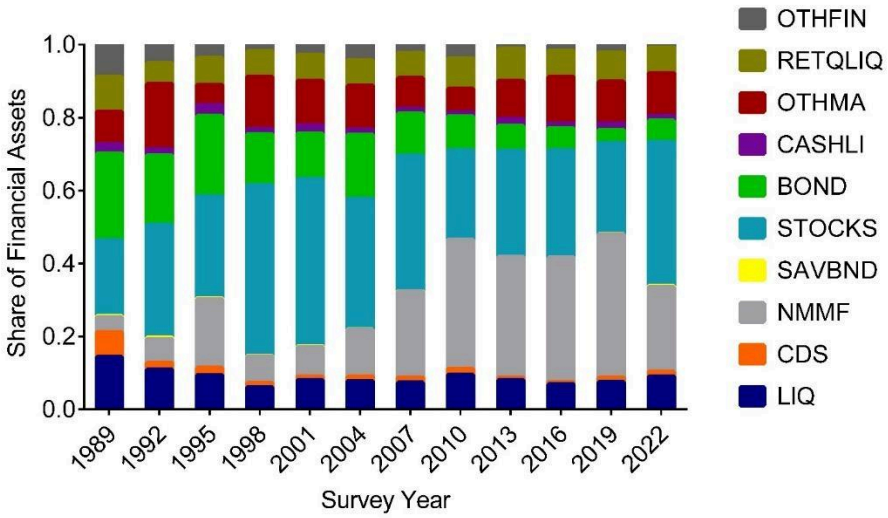
The distribution of HHI values for the household total nonfinancial assets had a low negative skewness, with skewness values ranging from -0.20 to -050, indicating some households have disproportionately high nonfinancial asset diversification (Figure 5).

The distribution of HHI values for the nonfinancial assets in the educational group EDCL1 had a moderate negative skewness, with skewness values ranging from -0.57 to -0.95, indicating some households had disproportionately high financial asset diversification (Figure 6). Similarly, the distribution of HHI values for the nonfinancial assets in the educational groups, EDCL2, EDCL3 and EDCL4, had a low to moderate negative skewness with skewness values ranging from -0.01 to -0.73, except for EDCL4 in the years 1989 and 1992, indicating some

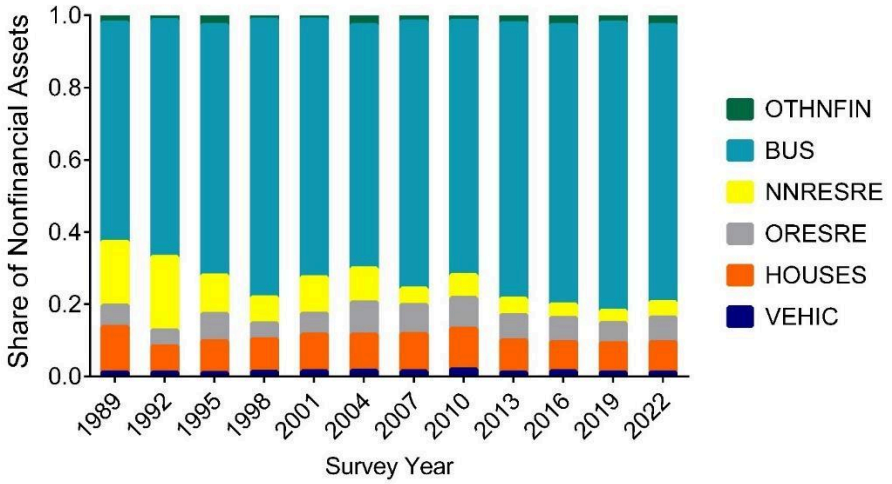
households in these groups had disproportionately high financial asset diversification.

The distribution of HHI values for the nonfinancial assets in the income group INCCAT1 had a strong negative skewness, with skewness values ranging from -1.17 to -1.61, indicating some households had disproportionately high financial asset diversification (Figure 7). In contrast, the distribution of HHI values for the nonfinancial assets in the income group, INCCAT6, had a low positive skewness, with skewness values ranging from 0.15 to 0.33, indicating some households in this group had disproportionately low financial asset diversification. The distribution of HHI values for financial assets in the income groups of INCCAT2 through INCCAT5 had negative skewness (skewness values ranging from -0.06 to -1.15) with lower negative skewness in higher income levels.

Appendix D



Changes in the shares of major financial asset categories among U.S. households during 1989 and 2022. Shares of ten major financial asset categories among U.S. households are presented. Values of each asset category from different survey years are adjusted to 2022 dollars. The shares of directly held pooled investment funds (excluding money market funds) [NMMF], directly held stocks [STOCKS] and other managed assets [OTHMA] have increased by 472%, 90% and 32%, respectively, between 1989 and 2022. In contrast, categories of all types of transaction account (liquid assets) [LIQ], certificates of deposit [CDS], savings bonds [SAVBND], directly held bonds (excluding bond funds or savings bonds) [BOND], cash value of whole life insurance [CASHIL], quasi-liquid retirement accounts [RETQLIQ] and other miscellaneous financial assets [OTHFIN] decreased by 37%, 81%, 26%, 76%, 44%, 28% and 91%, respectively, between 1989 and 2022.



Changes in the shares of nonfinancial asset categories among U.S. households during 1989 and 2022. Shares of nonfinancial asset categories among the U.S. households are presented. Values of each asset category from different survey years are adjusted to 2022 dollars. The shares of vehicles [VEHIC], residential property excluding primary residence [ORESRE], businesses [BUS] and other miscellaneous nonfinancial assets [OTHNFIN] have increased by 2%, 18%, 26% and 28%, respectively, between 1989 and 2022. In contrast, shares of primary residence [HOUSES] and net equity in non-residential real estate [NNRESRE] have decreased by 35% and 75%, respectively, between 1989 and 2022.